Environmental Drainage Maintenance Research Programme

Catchment-wide Assessment 2023

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Inland Fisheries Ireland

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Acknowledgments

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The report includes maps which contain data produced by the Environmental Protection Agency (https://gis.epa.ie/GetData).

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Executive Summary

Catchment-wide monitoring uses metrics in line with the Water Framework Directive to assign fish and hydromorphology status to OPW channels, using the EQR (Ecological Quality Ratio) and RHAT (River Hydromorphology Assessment Technique) methodologies respectively. From this year, each RHAT result will have recommendations for feasible ten steps that OPW drainage maintenance staff could implement, as well as proposed enhancement measures for the IFI Projects Office. The 2023 catchment-wide survey was conducted in the eastern part of the OPW Moy Arterial Drainage Scheme, and the majority of survey sites were within the scheme.

A total of 26 sites were fished using a ten-minute bank-based electro-fishing method to understand fish density, distribution, and population structure. Regarding classification, the Ecological Quality Ratio results indicate that 73% of the sites on the Moy meet the minimum requirements of Good status with a little over a third of these sites being High status. The remainder of fishing sites (27%) were classified as Moderate and Poor status, with no sites modelled as having Bad status.

30 sites were surveyed using the River Hydromorphology Assessment Technique, and 17% of these were classified as Good with the remainder being classified as Moderate and Poor status. Floodplain connectivity, riparian land use and channel form and flow types were the RHAT attributes with the lowest average score, contributing to the sub-optimal scores.

As part of the hydromorphological investigations, longitudinal connectivity in the catchment was assessed using IFI's Barrier Assessment and Screening Tool. There were 1,218 potential barriers identified during the survey and 98% of these were assessed in the field. Of those surveyed, 207 (17.5%) were surveyed as barriers to fish passage, comprising 193 bridge aprons/culverts, 11 weirs, 2 waterfalls and 1 sluice.

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1 Introduction

1.1 Background

IFI staff have been conducting catchment-wide surveys as part of the IFI-OPW research project since 2017 (see summary in Fleming *et al.*, 2023). These surveys assess for compliance with selected elements in the Water Framework Directive, namely fish and hydromorphology. Catchment-wide monitoring uses metrics in line with the WFD to assign fish and hydromorphology status to OPW channels, using the EQR (Ecological Quality Ratio) and RHAT (River Hydromorphology Assessment Technique) methodologies respectively. This gives the OPW valuable baseline data across their catchment areas. From 2023 onwards, each RHAT result will have proposed fishery enhancement measures as well as recommendations for feasible ten steps that OPW drainage maintenance staff could implement (see Appendices 7.1 and 7.2). It is envisaged that these recommendations could be incorporated into the OPW's arterial drainage maintenance planning and future activities.

1.2 Moy east catchment-wide assessment 2023

The Moy catchment is located in the west of Ireland and is well-known for angling tourism. Its total catchment area is 2,352 km^2, and the majority is located in county Mayo with small sections encroaching into Sligo and Roscommon. Given the large extent of the Moy catchment area, the 2023 catchment-wide survey focussed on an eastern portion of the catchment, comprising 960 km^2 (Figure 1.1). The urban areas in the catchment include Tobercurry, Charlestown, Swinford, Foxford, Kiltimagh and Knock. The main tributaries in this section of the catchment include the Owenaher, Owengarve, Eignagh, Mullaghanoe, Sonnagh, Swinford River, Spaddagh, Killeen, Gweestion (including the Trimoge, Glore and Pollagh) and the Strade.

The entire Moy catchment underwent large-scale drainage works between 1960 and 1971, benefitting an area of 24,685 hectares (Ryan Hanley, 2014b). Focussing only on the Moy east catchment there are 667 kilometres of channel length in the OPW scheme, out of a total of 1,313 kilometres of river channel length in the entire catchment.

The majority of the catchment area is underlain by Carboniferous age limestones, shales and siltstones. A notable geological and topographical high in the catchment is the Ox Mountains inlier which extends from Newport on the west coast of Mayo to Lough Gill in Sligo (seen in red in Figure 1.1). These mountains are composed of rocks of various ages, including metamorphic rocks and meta-sediments which are part of the Dalradian supergroup, and are

among the oldest rocks in Ireland. Intruded into the Dalradian rocks are Caledonian-era igneous intrusions, visible in the hills from south-west of Lough Talt to Foxford.

Land use in the catchment as delineated on the Corine 2018 mapping is as follows. Throughout the catchment, there are peat bogs, particularly evident in the northern section. Often adjacent to the bogs are heterogenous agricultural areas – land which is used for agricultural purposes, albeit sometimes quite marginal. There are more significant areas of pasture in the southern part of the catchment, where farming is more intensive. There are pockets of coniferous forest through the catchment and more significant areas of transitional woodland/scrub in the northern part. Quarrying is evident in the area around Ireland West Airport at Knock and Kilkelly, as well as outside Foxford.

The Moy main channel and various tributaries (Glore, Trimoge, Spadagh, Mullaghanoe, Owengarve) in this section of the catchment are designated as salmonid waters under the Salmonid Regulations (S.I. 293/1988). In the headwaters of the catchment area there are three Special Areas of Conservation – Ox Mountains Bogs SAC; Lough Nabrickkeagh Bog SAC and Lough Hoe Bog SAC. The main SAC concerning freshwater is the River Moy SAC. The Qualifying Interests include various terrestrial habitats as well as alluvial woodland. The QI species in the River Moy SAC include White-clawed Crayfish (*Austropotamobius pallipes*); Sea Lamprey (*Petromyzon marinus*); Brook Lamprey (*Lampetra planeri*); Atlantic Salmon (*Salmo salar*) and Otter (*Lutra lutra*). Based on the latest published data from the National Parks and Wildlife Service in 2020, there is a 'Catchment of other extant populations' of freshwater pearl mussel (*Margaritifera margaritifera*) in the upper Moy and Owenaher (NPWS, 2023).
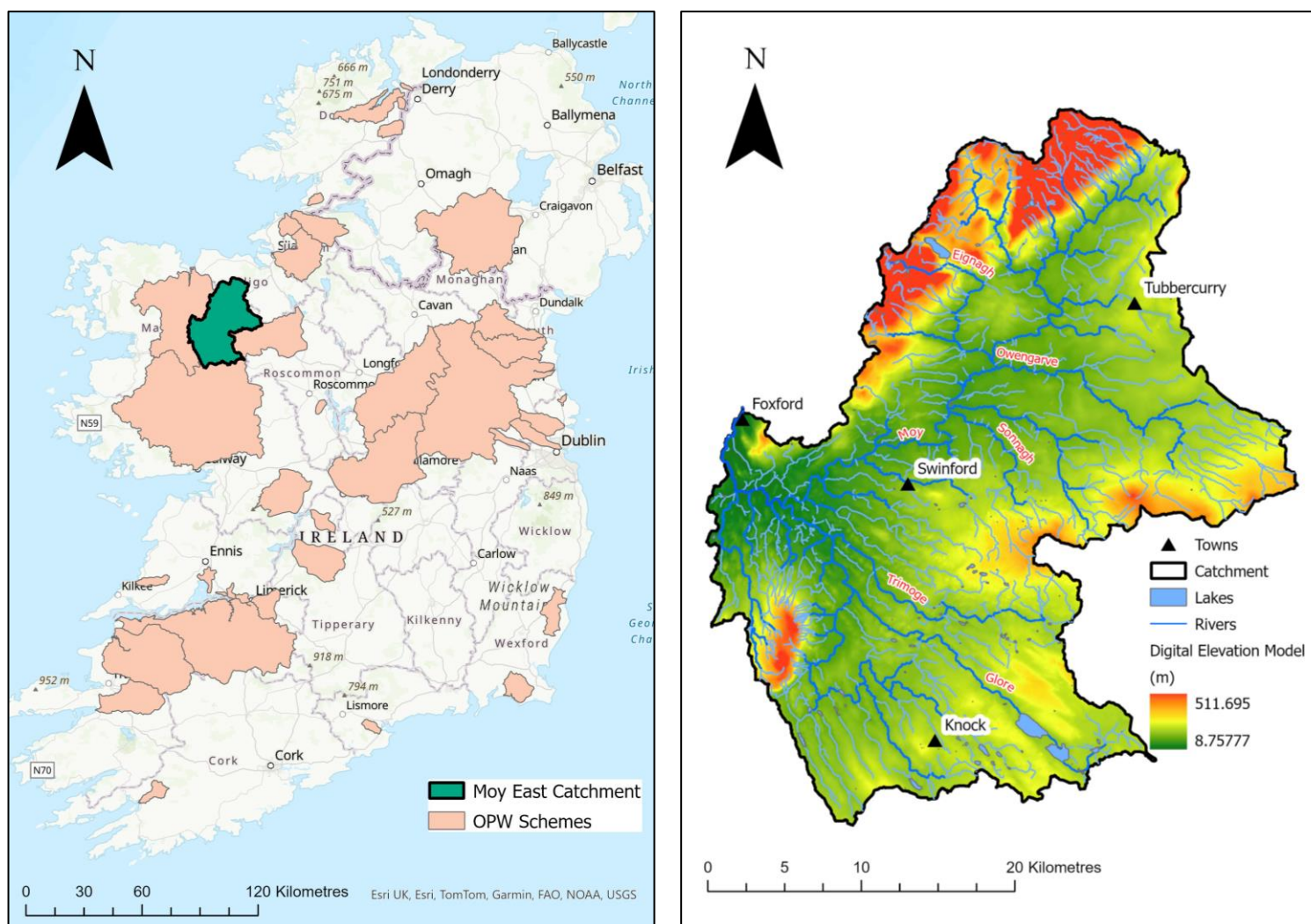
Figure 1.1 Location of the Moy east catchment within the OPW drainage scheme catchment areas (left). Geography of the Moy east catchment showing major tributaries, lakes, towns and elevation (right).

2 Fish Population Index

This section of the Moy catchment was electro-fished (CEN, 2003) on various dates from August to September 2023. A total of 26 sites were fished using a ten-minute bank-based electro-fishing method to understand fish density, distribution, and population structure (Figure 2.1). Of the 26 fishing sites, 23 were located on OPW channels with the remaining 3 sites were located on non-OPW channels. A RHAT survey was undertaken to identify potential hydromorphology pressures at each fishing site (see section 3.1, page 10).

Figure 2.1 Distribution of bank based ten-minute electro-fishing sites around the Moy east catchment.

Survey sites were fished using the bank-based timed ten-minute electro-fishing method which targets species present within the survey site at the time of the survey. The fishing sites averaged 24 metres in leng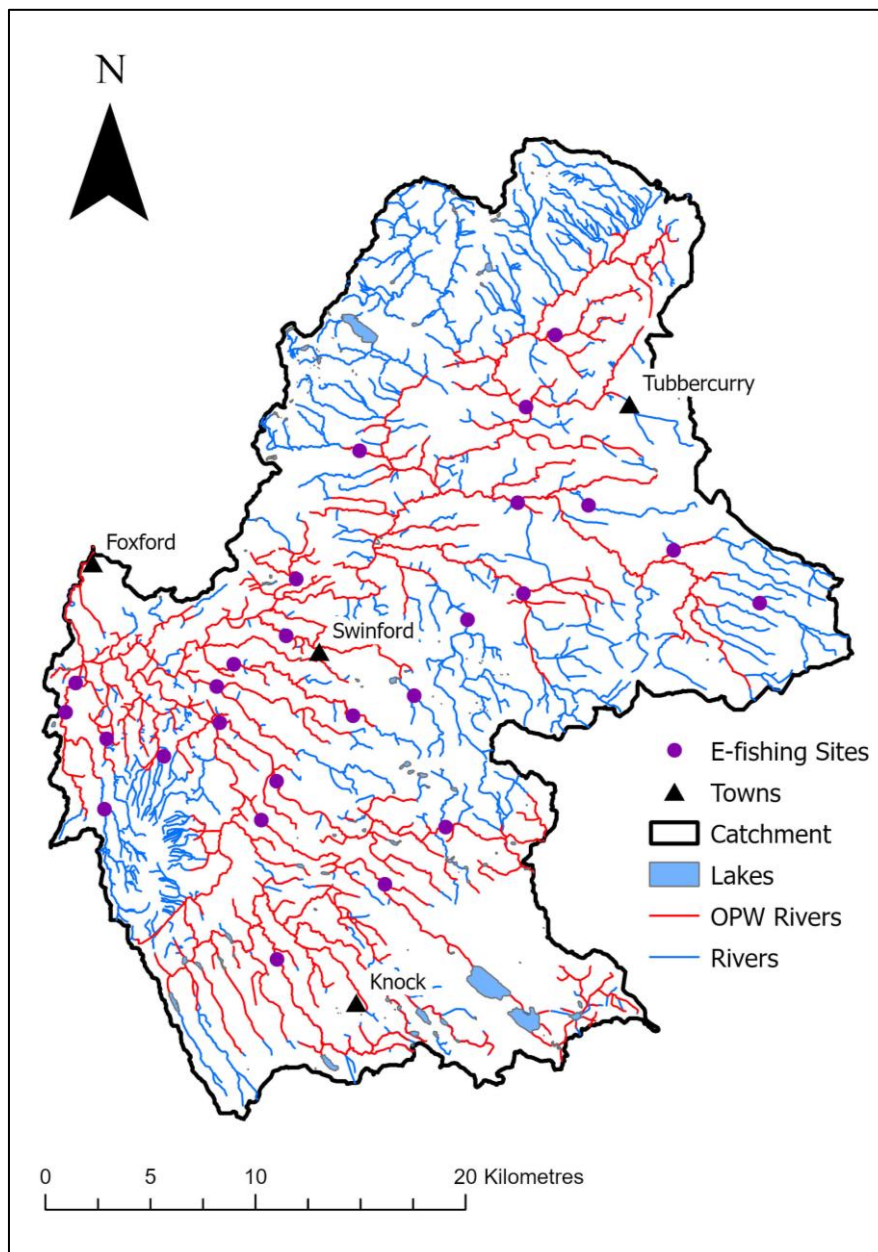th and 4 metres in wetted width. In total, 738 fish were captured, measured, and returned during the overall Fish Population Index (FPI) survey. Salmon were the most abundant fish, followed by brown trout, minnow, and stickleback (Figure 2.2).

Lamprey were only recorded at one site and were in low abundance (n=2). This site was located on the Cloonlavis River (C1/30/7/12). Crayfish were recorded at five fishing sites in low numbers, with an average of 2 per site. They were recorded at two sites on the Strade River, as well as the Spaddagh (C1/35), Trimoge (C1/30/5) and Tiraninny (C1/41) stream. In stating this, it is not possible to conclude that both species were not present in any of the other channels surveyed. The ten-minute bank-based fishing method utilised is not the optimal approach for capturing these rare and cryptic species, but it is the most favourable method used when targeting a multi-species population.
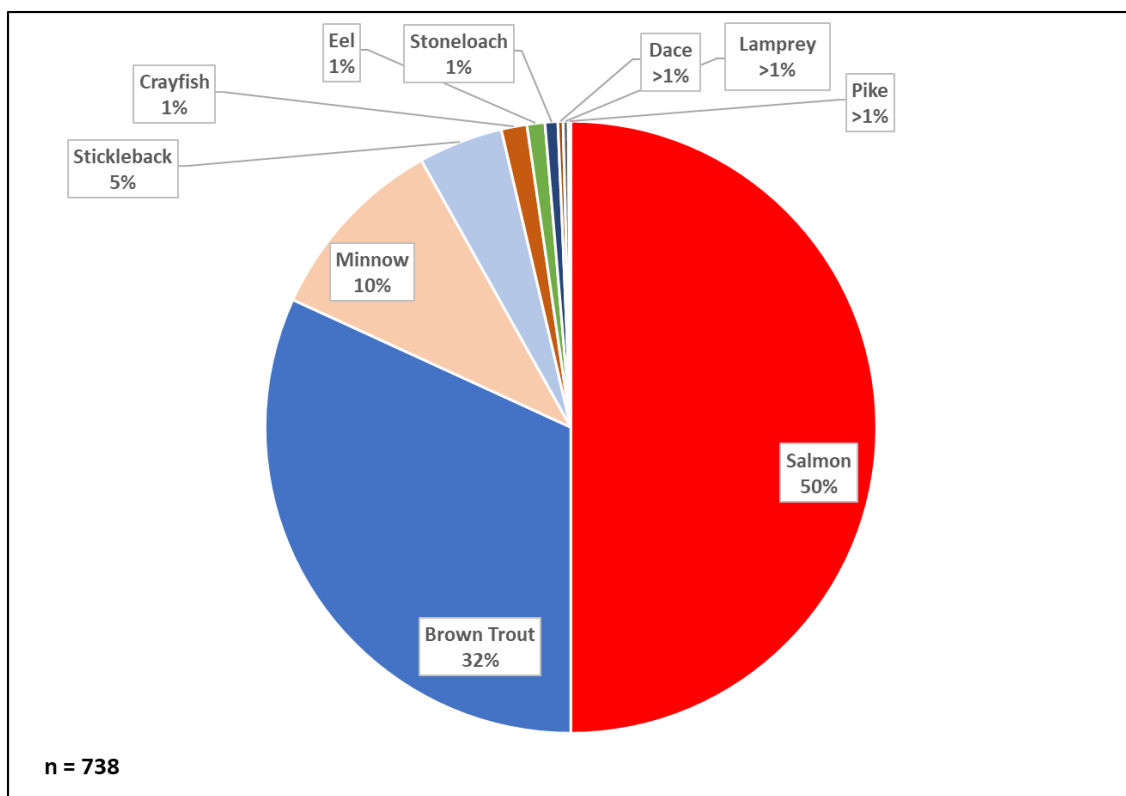
Figure 2.2 Pie chart showing composition of fish species captured during the timed ten-minute bank-based electrofishing surveys.

During the bank-based fishing, two age classes of brown trout were captured with 0+ fish measuring between 5-11 cm and the 1+ fish ranging from 12-23 cm. Two age classes of

salmon were also captured, with 0+ fish measuring between 5-9 cm and 1+ fish measuring greater than 10 cm (see Figure 2.3).
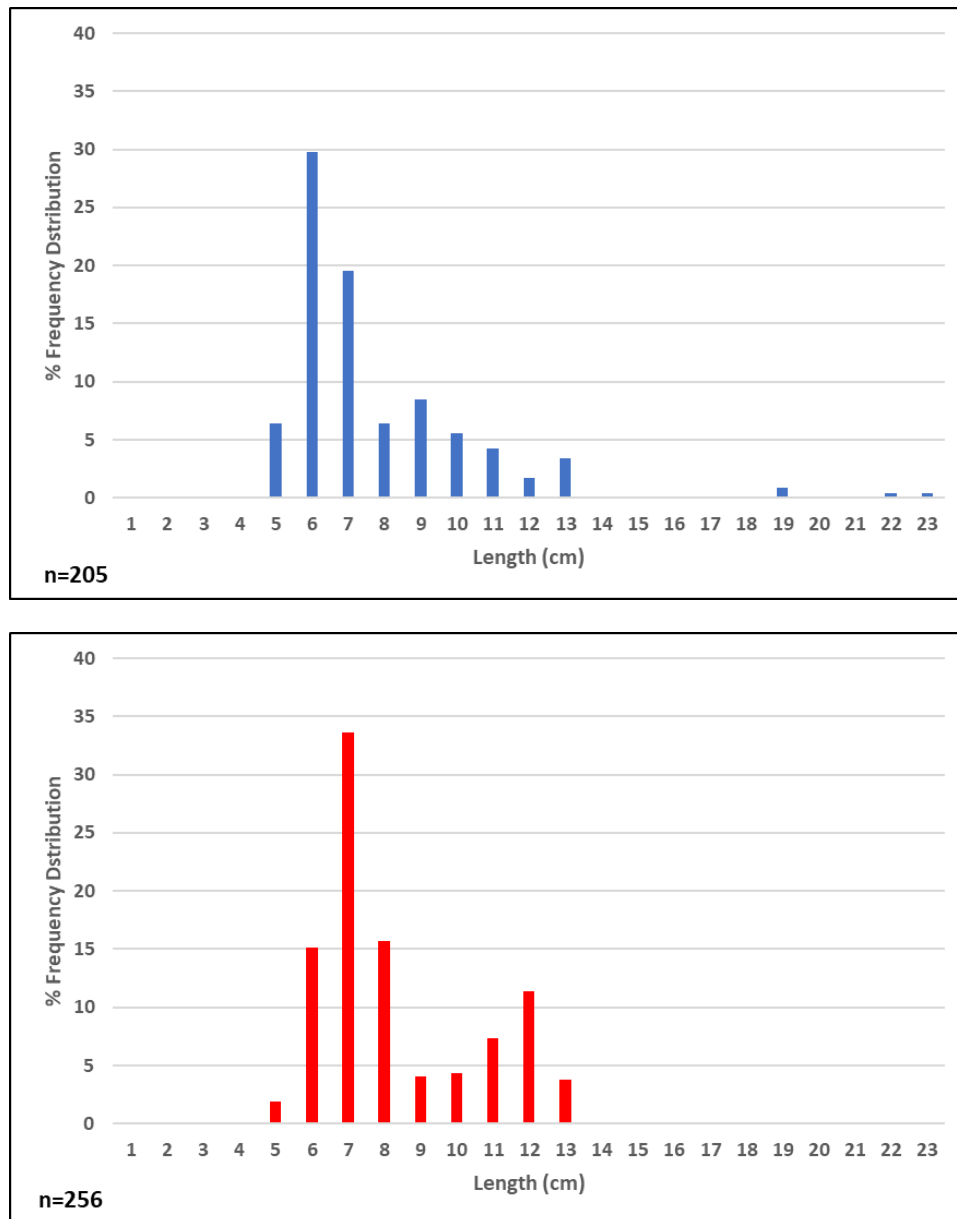
Figure 2.3 Percentage length frequency distribution of brown trout (top) and salmon (bottom) captured by bank based electro-fishing from the Moy FPI survey 2023.

Salmon and brown trout are widely distributed within this section of the Moy catchment. Salmon were present in 24 of the 26 fishing sites and brown trout present in 25 of the fishing sites. Fishing sites where salmon present numbers exceeded 20 were located on the following rivers: Sonnagh; Trimoge (C1/30/5); Strade (C1/23); Tiraninny (C1/41); and also the Tubbercurry (C1/52) and Swinford (C1/39) streams. Brown trout numbers exceeded 20 in sites on the Sonnagh and Trimoge (C1/30/5) as well as the Glore River (C1/30).
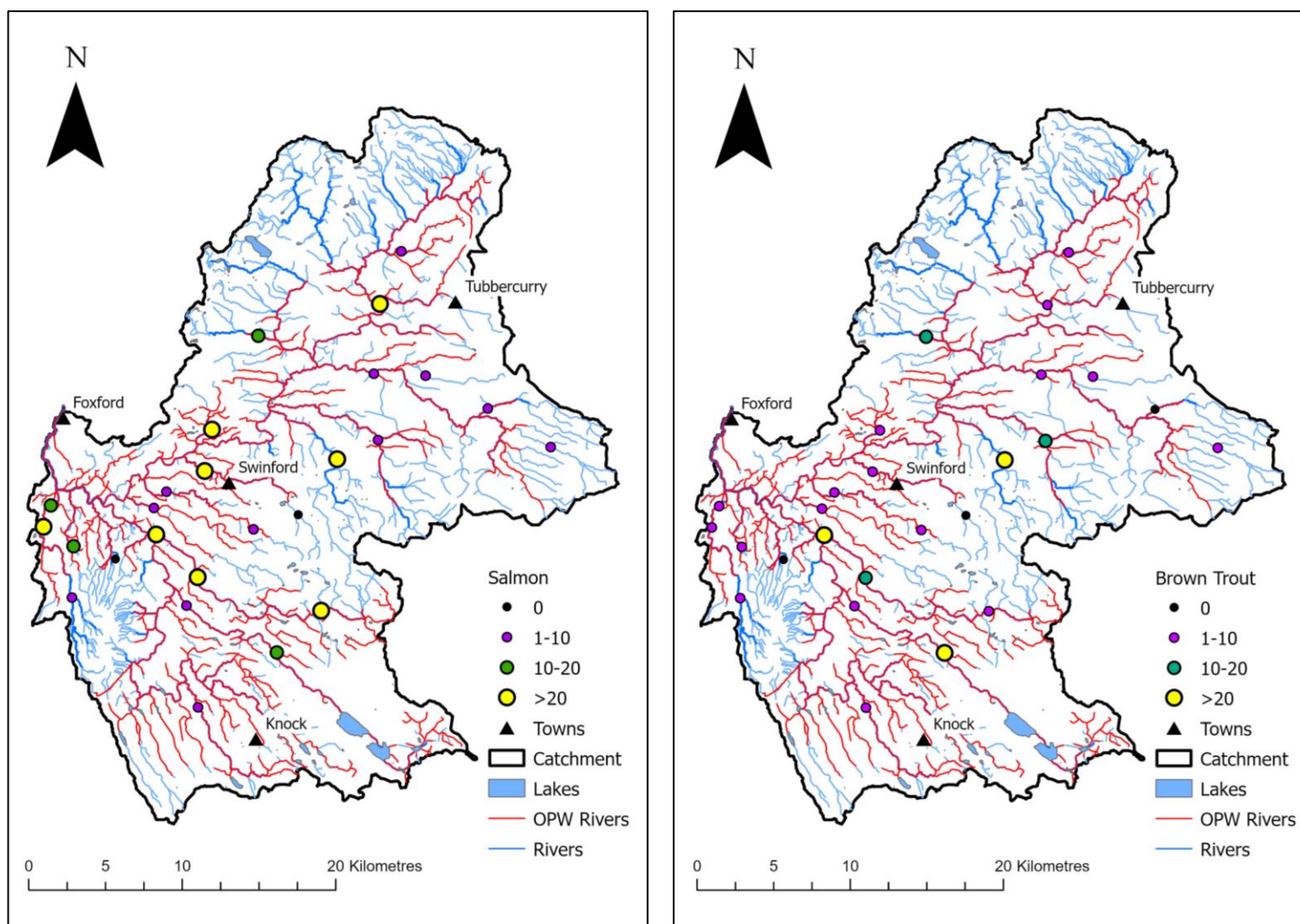
Figure 2.4 Distribution and abundance of salmon (left) and brown trout (right) within the Moy.

2.1 Ecological Quality Ratio (EQR)

The EQR is a WFD-compliant method used to determine fish status with respect to reference conditions. Presence and absence of salmonids influence the EQR score assigned to a water body. When calculating an EQR score for any waterbody, salmonids are scored by presence and abundance of both age classes (0+ and 1+ fish). This plays a significant role in the model output. If both 0+ and 1+ salmon/trout are recorded during the fishing survey, the waterbody will achieve a higher EQR score. However, if only one age class was present the riverine system would achieve a lower EQR score. Presence of both classes of salmonids at a given site is an indication of recruitment within the riverine system.

EQR scores were generated for each fishing site, and looking at the results, 8% of sites graded as Poor status (n=2); 19% Moderate status (n=5); 46% scored Good status (n=12) and the remaining 27% classified as High status (n=7, Figure 2.5). The WFD requirement is Good status and above, therefore 73% (n=19) of the sites from the catchment-wide fishing survey are meeting WFD standards for fish.

The following will detail how the presence of both brown trout and salmon influence the EQR score generated. Six of the seven sites graded as High status had both classes of salmon and brown trout present. The one High status site that had only one class of brown trout present had a diversity of other species also, among them eel, stickleback and crayfish. All these were low abundance in the site but positively influence the score due to the variety of species present. Twelve sites were classified as Good status, ten of which had two classes of salmon and brown trout present. One Good status site had only one age class of salmon and the other site only one age class of trout. However abundance was high (average =13) and the presence of other species captured at these sites positively influenced the EQR score to achieve its Good status.

Five sites achieved a Moderate score, two of which had only one age class of both salmon and trout present. The other three Moderate sites had only one age class of either salmon or brown trout. Fish number abundance was low in these sites (average n=4). These sites lacked species diversity, with stickleback and stoneloach accompanying the few brown trout and salmon captured. Only two sites were classified as Poor and none were graded as having Bad status. At the Poor status sites, no salmon were captured and only one trout was captured in one of the sites. Note that both of these sites are located on small tributaries. The only trout present in this particular fishing site was classified as a 0+ brown trout. The distribution of trout in this channel is still important to note as adults are running here but the number was low at this location at the time of survey.
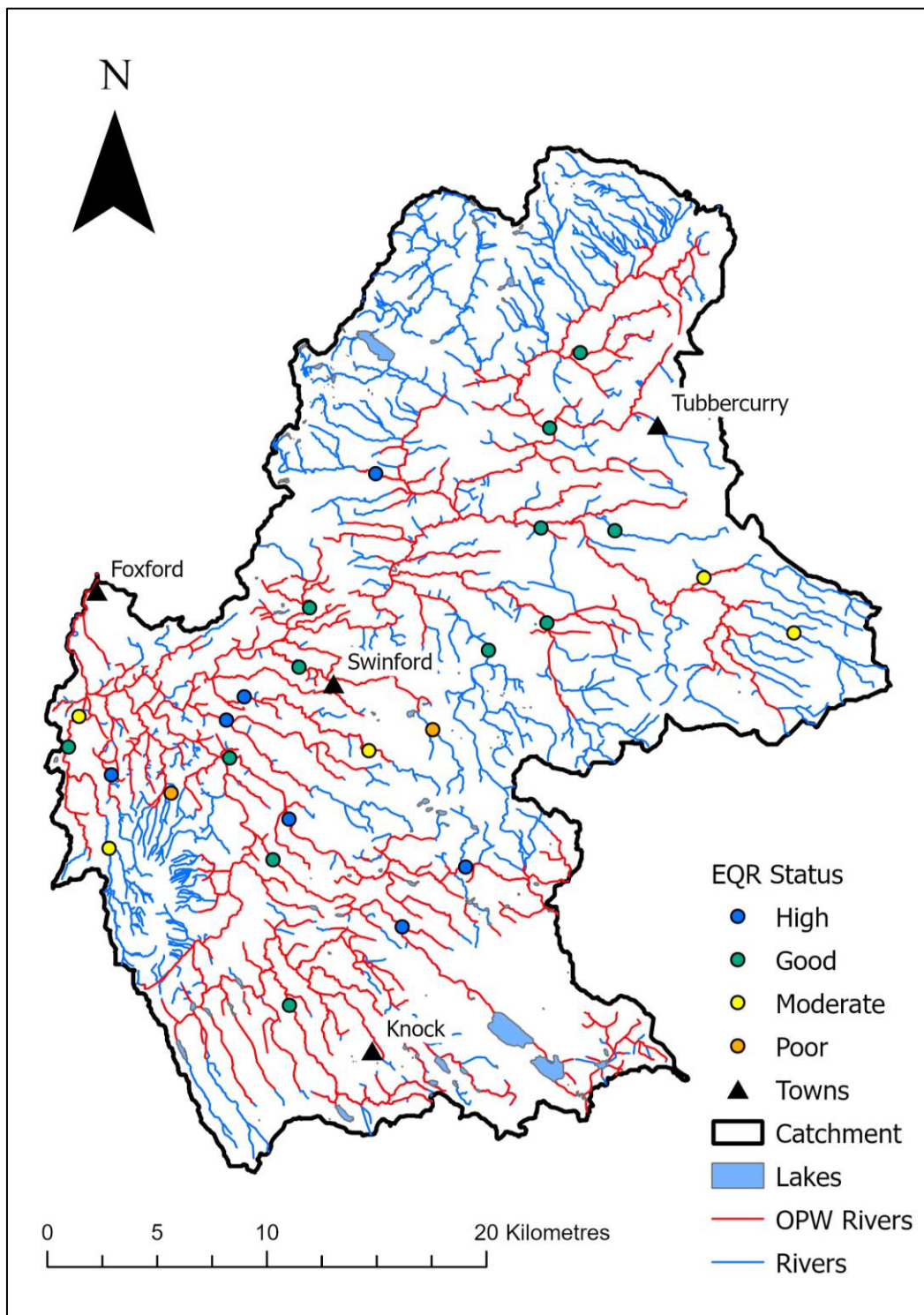
Figure 2.5 Fishing locations with Ecological Quality Ratio (EQR) scores generated for each site.

3 River Hydromorphological Assessment Technique

3.1 Results

The Moy catchment was surveyed for hydromorphology using the River Hydromorphology Assessment Technique (RHAT) following Murphy and Toland (2014). This method is the standard assessment for assessing hydromorphology for the WFD nationally at a field site scale. Visual field observations are recorded every 50 metres over a 500-metre walkover. All surveys in the Moy were carried out at similar water levels, at the same time of the year. 30 sites were surveyed using the RHAT on the Moy catchment with 26 of these located on the OPW scheme channels (Figure 3.1). Overall, 17% of sites classed as Good (n=5), 66% of sites classed as Moderate (n=20) and 17% classed as Poor (n=5).
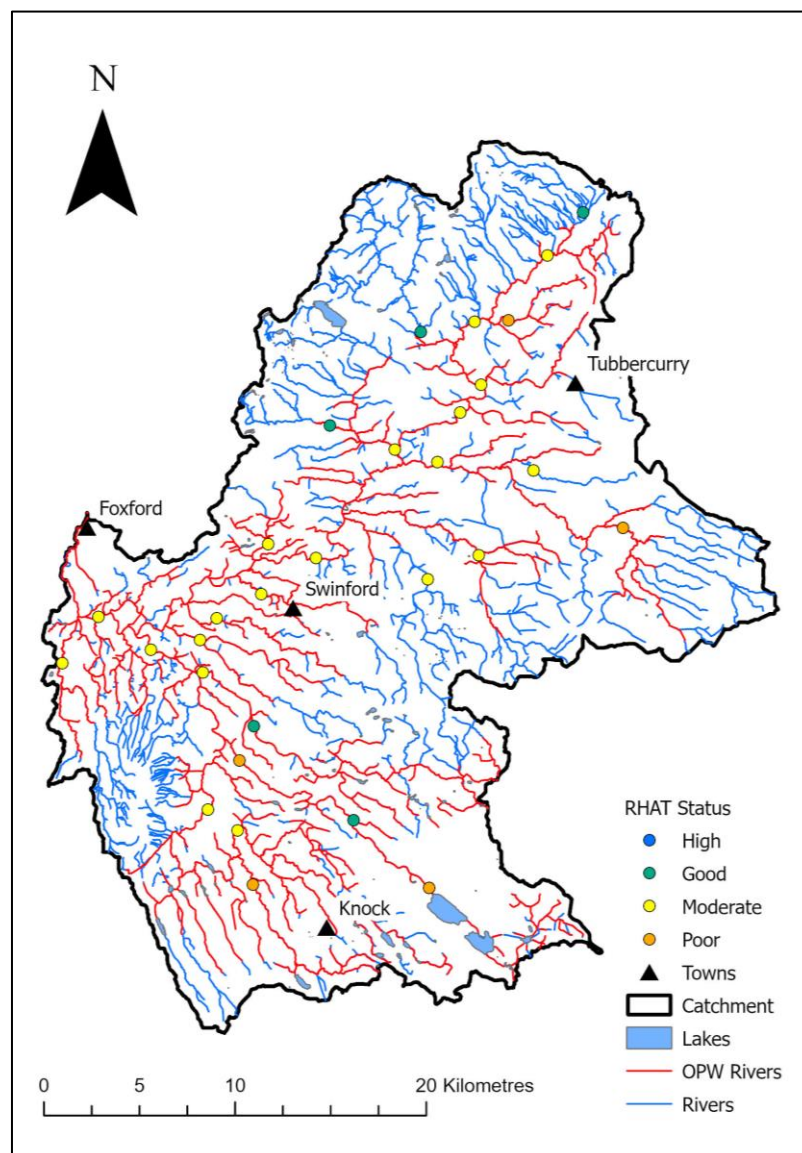
Figure 3.1 RHAT scores for sites surveyed in the Moy (n=30).

When considering only the 26 sites on the scheme, 12% of sites classed as Good (n=3), 69% of sites classed as Moderate (n=18) and 19% classed as Poor (n=5) Of the four non-OPW scheme channels, two were Good and two were Moderate. Interestingly, one of the Good sites crosses the threshold between the OPW and the channel area left untouched by drainage (see Figure 3.8, page 16).

When RHAT scores are averaged they ranged from 0.81-2.53 (Figure 3.2). Of the averaged attributes, floodplain connectivity and riparian land use scored lowest. Barriers to continuity, substrate condition and bank structure and stability score higher overall within the catchment.
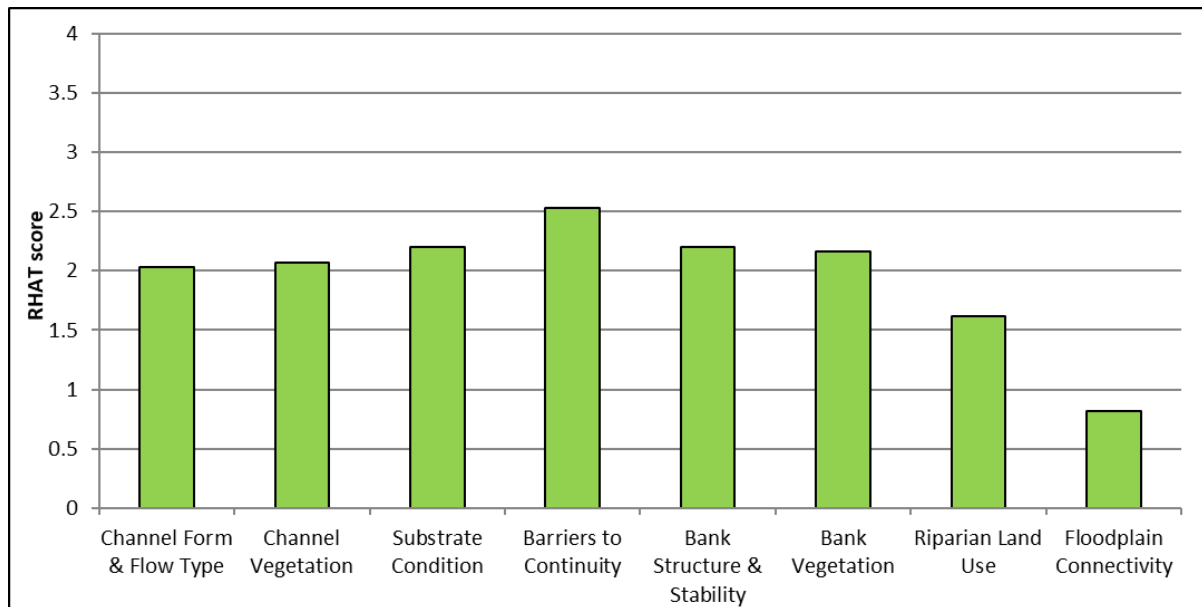
Figure 3.2 Mean RHAT scores for all sites in the Moy (n=30).

3.2 Case studies

There are examples below of sites scored using the RHAT. Save for the Owenaher, all are located on OPW scheme channels within the Moy Arterial Drainage Scheme. A range of scores are presented from Poor to Good.

3.2.1 Poor status

The site surveyed on the Glore River (C1/30) runs alongside a public walkway, park and an old mill. Overall it scored Poor status in the RHAT. This part of the Glore has been extensively straightened. Intermediate weirs (11) and deflectors (2) have been installed as structures within the channel which has altered the flows creating diversity in places, and impoundments elsewhere (Figure 3.3). The substrate condition on the day of the survey was quite poor – it appeared to be calcified and quite embedded. The substrate size was boulders and cobbles surrounded by a high proportion of finer material. It is likely that some of the coarser material was introduced to the channel. Reinforcement on both banks downgraded the score for bank structure and stability.

Figure 3.3 The Glore River (C1/30) showing calcified/embedded substrate and series of weirs (left) as well as impounded flow (right).

This site on the Corsallagh stream [C1/55 (F/156)] also scored Poor in the RHAT. It has been extensively straightened and re-aligned and suffers from a distinct lack of flow. The channel vegetation can be dense and in sections it is quite homogenous (Figure 3.4). Fine sediment is excessive which can also be typical of channels which are re-aligned and over-deepened to this extent. As can be seen in the images (Figure 3.4), there are no trees along the stretch surveyed.

Figure 3.4 Images of the Corsallagh Stream [C1/55 (F/156)] showing channel straightening, limited flows and lack of riparian vegetation (left), along with homogenous instream vegetation (right).

3.2.2 Moderate status

The site on the Trimoge (C1/30/5) is just upstream of the confluence with the Gweestion River. It scored as Moderate status overall but was on the higher end of the scale and very nearly achieved a Good result. The substrate condition and channel vegetation both scored Good. Riparian land use and floodplain connectivity scored Poor to Moderate, which brought down the score. The over-widening affected the score for channel form and flow. Bank structure and stability was one of the attributes which could be improved to augment the overall RHAT score. Poaching is extensive in one section in particular (Figure 3.5).

Figure 3.5 Extensive poaching extensive on the Trimoge River (C1/30/5, left). Geomorphological diversity including substrate, bank and channel vegetation (right).

Another channel which ranked as Moderate status overall is the Killeen River (C1/31). This channel has been historically straightened, and it has resulted in minimal variation in flows and depths across the reach surveyed. Channel vegetation scored poorly as there were significant areas with excessive homogenous instream vegetation (Figure 3.6).

Figure 3.6 Minimal flows (left) and homogenous instream vegetation (right) on the Killeen River (C1/31).

There is also excessive fine sediment loading across the reach. The left-bank was extensively poached with minor reinforcement, reducing that score. The right-bank was mostly fenced, with minor poaching. It also had more tree cover, albeit in sections rather than continuous cover.

3.2.3 Good status

The site on the Bellanamean River [C1/49/5 (F/1518)] is quite high up in the Moy catchment, and the survey stretch is located where the river reduces in gradient coming off the hills south-west of Lough Talt. The site scored Good status overall. Historically the river was over-deepened, but there is extensive recovery evident. The channel vegetation and substrate condition both scored well. A mixture of woody habitat and some macrophytes is apparent instream with a good diversity of coarse cobbles and finer gravels (Figure 3.7). The left-bank has minimal bank vegetation, but shading from the opposite bank is sufficient for the channel width. Anecdotal evidence from the landowner suggests that this site has not been maintained in some time, and the recommendation would be to continue in this vein as it is self-cleansing channel with nice variation in geomorphological features.

Figure 3.7 Good substrate condition (left), riparian cover, and instream vegetation (right) on the Bellanamean River [C1/49/5 (F/1518)].

The site surveyed on the Owenaher River straddled a section of natural river channel, as well as a section which has been arterially drained (C1/54). Like the Bellanamean River it also has good gradient as it comes down off the Ox Mountains. The section of river at this site which falls under the OPW scheme does not appear to be recently maintained. In that respect channel form and flow scored good as the channel is recovering from anthropogenic (human-induced) interference. It is notable that the flows are much less diverse in the area which has been severely over-deepened (Figure 3.8). There is good substrate and flows through most of the site, and the instream vegetation is predominantly woody habitat and mosses/lichens. The site was scored down for surrounding land use which is coniferous plantation on the right-bank.

Figure 3.8 The Owenaher river upstream of the OPW scheme (left) and section of channel within the scheme (C1/54, right).

4 Barrier Screening and Assessment

The Moy catchment has been surveyed for barriers using the Barrier Assessment and Screening Tool (i-BAST) developed by IFI's National Barrier Programme. Surveying is typically carried out by a two-person team using the i-BAST tool to locate and assess whether or not a structure is a barrier to fish passage. This data is collated annually for the OPW but is also available on IFI's Open Data Portal (IFI, 2024), where it is updated regularly.

There were 1,218 potential barriers identified in the catchment. 1,190 were visited and assessed with a further 28 not assessed due to issues of access or safety (Table 4.1, Figure 4.1). A total of 207 barriers to fish passage were identified and measured in the Moy catchment (Table 4.2, Figure 4.1). Of the cohort of 207 barriers, at least 89 coincide with the OPW structure database, and they were all classified as culverts/bridge aprons. The majority throughout the catchment area are culverts/bridge aprons with minor amounts of weirs, waterfalls and a sluice.

Table 4.1 Breakdown of barrier numbers

Structure type	Number
Potential points	1218
No access	28
No barrier	983
Barrier	207
Total surveyed (barrier + no barrier)	1190
Barrier % (barriers/ total surveyed)	**17.4%**

Table 4.2 Barriers identified and assessed in the Moy survey.

Structure type	Number
Culvert / bridge apron	193
Weir	11
Waterfall	2
Sluice	1
Total	**207**
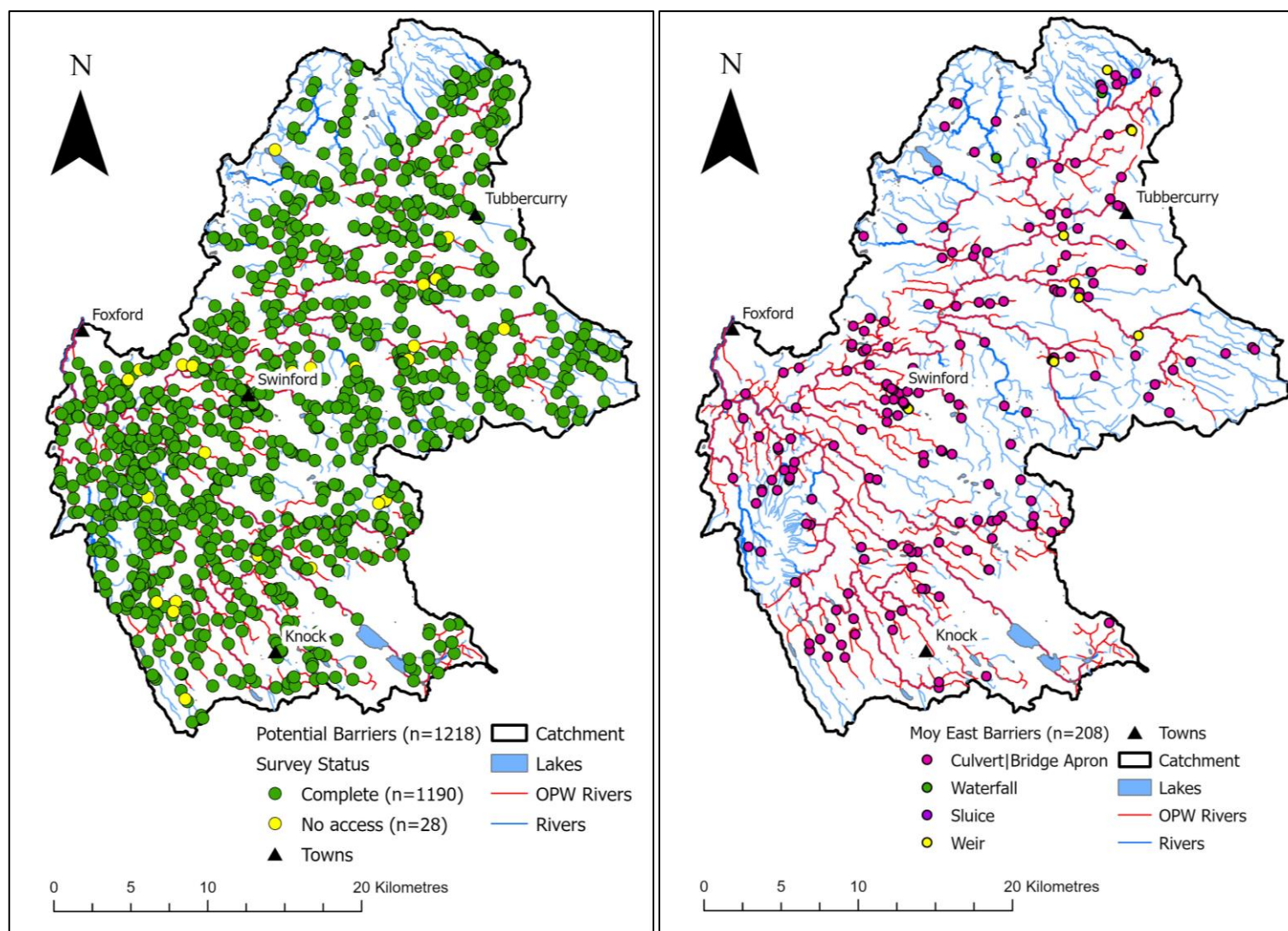
Figure 4.1 Potential barriers and survey status (left) and barriers identified and surveyed to date (right).

Not many issues with barriers were encountered on the main channel of the River Moy. One notable barrier was an elevated bridge apron, upstream of the confluence with the River Eignagh, east of Aclare (see Figure 4.2). The shallow apron is impassable to some species in low flows as can be seen in the photograph. Some of the main tributaries had barriers including the Little River (Figure 4.2), Sonnagh (Figure 4.3) and the Trimoge, Glore, Strade, Carroward, Killeeen (not pictured).

Figure 4.2 Examples of barriers on the main Moy (C1, top) and the Little River/Strade (C1/23/3, bottom).

Figure 4.3 Examples of barriers on the Sonnagh (C1/44/1, top left), Tiraninny (C1/41, top right) Corsallagh Stream [C1/55 (F/156), bottom left] and Tawnamullagh (C1/40, bottom right).

As is visible in the pictures, some bridge aprons have obvious steps in them, presenting a jump barrier to any fish moving in the channel during lower flows. In addition to this, the floor of such perched bridge aprons is usually covered with a shallow amount of water, also presenting a swim barrier to potential migratory species. The example on the Little River (Figure 4.2) looks recently retrofitted, however the solution does not address passability for all fish species.

There are a small amount of weirs in the section of the Moy which was surveyed (Table 4.2). Many of these include weirs with a small hydraulic head height such as those in the Charlestown Stream (Figure 4.4). Similarly, a series of small weirs are present in the Newpark stream in which also runs through an urban area, the town of Swinford.

Figure 4.4 Series of small weirs in the Charlestown stream (C1/45).

There is one major weir in the section of the Moy surveyed for barriers, on the Owengarve River. It is an historic structure, present on the Ordnance Survey six inch maps. It was surveyed using the WFD111 methodology developed by SNIFFER (Scotland and Northern Ireland Forum for Environmental Research, 2010) by the National Barrier Programme team in June 2023. Using this methodology, surveyors assess each structure dividing it into transects with similar hydraulic properties. Depending on the type of transect, various measurements of same are taken including hydraulic head height and dimensions. Flow is measured across each transect at the inlet, mid-point and outlet. Each transect is assessed for fish passability for a range of target species, and subsequently the structure is assigned an overall passability ranking.

It is a sloping weir with a total hydraulic head height of 1.24 m (Figure 4.5), with a pool-type fish pass located on one side. Transversal 1 – the face of the weir – was a swim barrier to fish passage. Passage issues at this transect are from the jump/swim height (1.24 m) required to pass the weir, the depth of water on the face of the weir (0.03 m) and the slope of the weir (35.4%). These factors in the prevailing water level conditions represented a complete jump and swim barrier to all fish species and their life stages, apart from juvenile eels. It also posed a high impact partial barrier to adult salmon and trout in flood conditions. Transversal 2 – the pool fish pass – was a jump barrier to fish passage. The step height (0.45 m) in the fish pass represents a high impact partial barrier to adult salmonids and a complete barrier to cyprinids, adult lamprey and juvenile salmonids. Limited climbing substrate is present for juvenile eel. It poses a low impact partial barrier to adult salmon and trout in flood conditions.

Figure 4.5 The weir on the Owengarve (C1/48) at Curry.

Of the cohort of 207 barriers to fish passage, 9 have been selected from this group with recommendations for further options reports for barrier removal or remediation (see Appendix 7.3). All of these are on OPW scheme channels and some are on the OPW bridge database.

5 Catchment context

5.1 Water quality

Water quality data can be accessed on the Environmental Protection Agency website (EPA 2024a). For the Moy East catchment, it was assessed in 2022, the year before our catchment-wide survey. Similar to other WFD metrics, Good status is the requirement. 65 sites were monitored for water quality in 2022. 88% (n=57) of sites passed the minimum requirement, of which 33 sites scored High and 24 sites scored Good status. 9% (n=6) of sites were categorised as Moderate and 3% (n=2) scored as Poor (Figure 5.1). Therefore, the water quality in this catchment is of Good Status, with only 12% of sites assessed failing to achieve required standards. Salmonids generally fare better at Q3 and above sites i.e. Moderate, Good or High (Kelly et al., 2007).
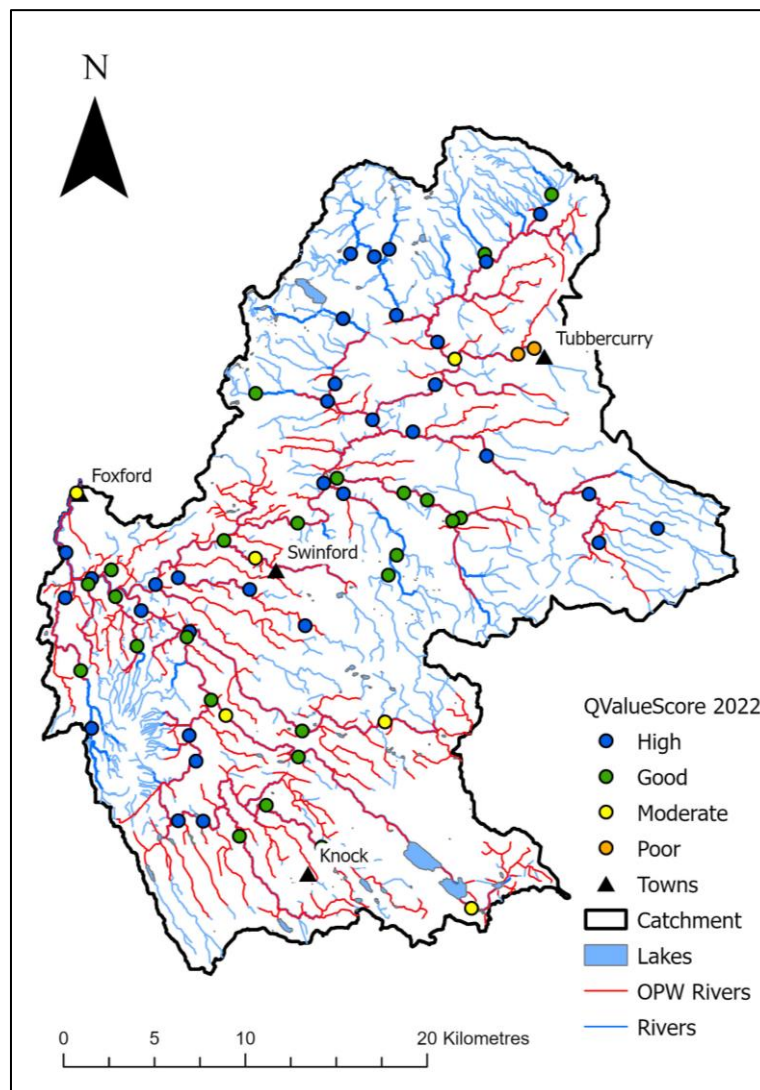
Figure 5.1 Water quality assessments undertaken by the EPA in 2022.

5.2 Pressures

There are nine sub catchment units within the survey area, following the EPA WFD regions (Figure 5.2). Their mainland uses and pressures are summarised in Table 5.1 using data from the Water Framework Directive Application (EPA, 2024b) and an online map portal (EPA, 2024a). Pasture is the main land use across six of the regions, with peat bog; cut peat bog dominating the remainder which was evident during the field surveys. Hydromorphology is a significant pressure in 6 of the 9 sub catchment areas. Arterial Drainage Maintenance has the potential to adversely affect hydromorphology.
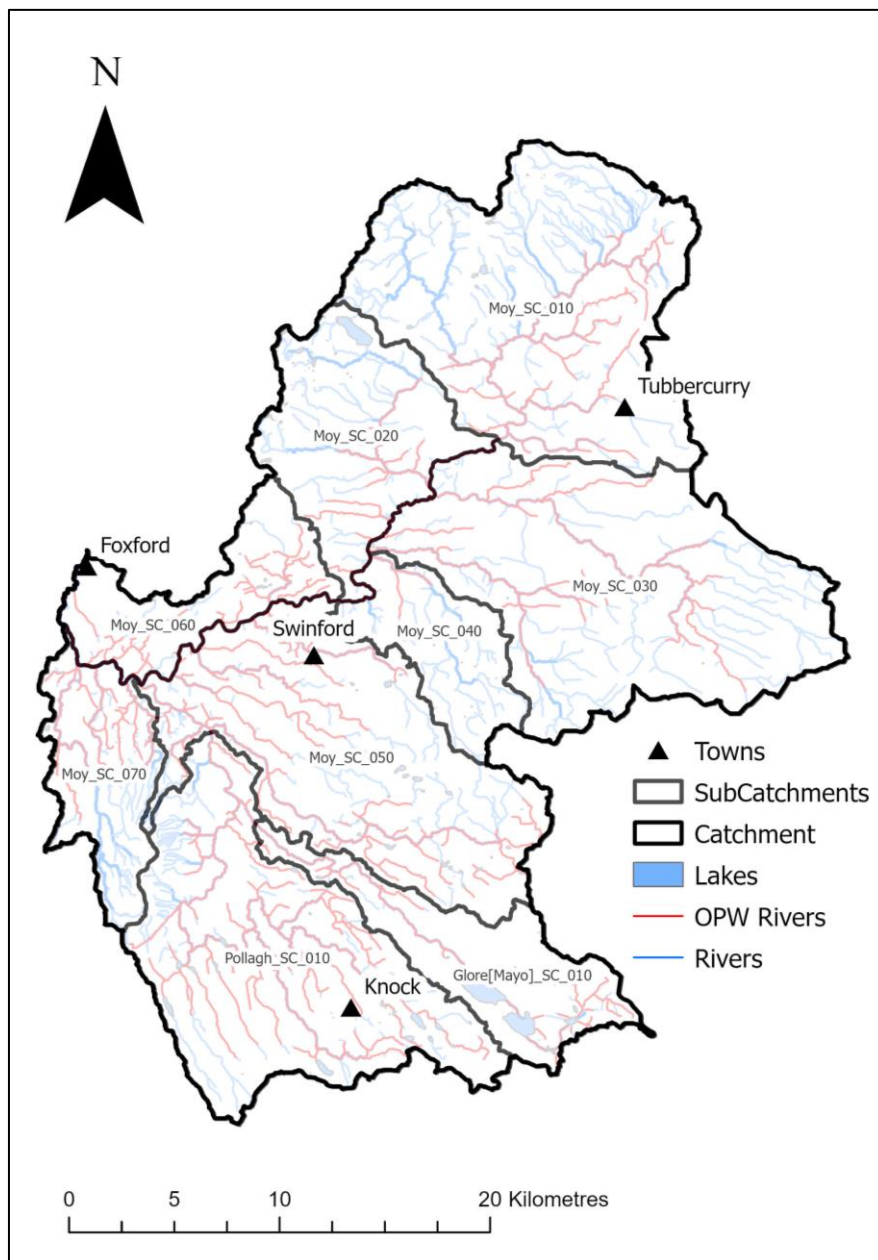
Figure 5.2 Sub catchments within the East Moy Catchment.

Hydromorphology is a listed significant pressure in sub catchments Moy_SC_010 – 040. Throughout these four sub-catchments 16 RHAT surveys were completed; 2 of which classified as Poor, 10 graded Moderate and 3 sites scored Good. The Pollagh_SC_010 and Glore[Mayo]_SC_010 catchments also had hydromorphology listed as a significant pressure. 5 sites in total were dispersed within the two sub catchments. Glore[Mayo]_SC_010 has 2 sites, one graded poor and the other scoring Good. The Pollagh_SC_010 had 3 RHAT Sites, 2 of which scored Moderate and the other scoring Poor for Hydromorphology. The main issues were with Channel form & flow; Channel vegetation; Substrate condition; Bank vegetation and Floodplain connectivity.

Table 5.1 Land use and pressures per sub catchment

Subcatchment	Urban area	Land use (*main)	Significant pressures
Moy_SC_010	Tobercurry	Forestry Pasture* Peat Transitional woodland/scrub	Agriculture Anthropogenic pressures Forestry Hydromorphology Urban waste water
Moy_SC_020	Aclare	Blanket peat* Cut bog Forestry	Abstractions Forestry Hydromorphology
Moy_SC_030	Curry Charlestown	Cut peat Forestry Pasture* Transitional woodland/scrub	Agriculture Anthropogenic pressures Hydromorphology Urban waste water
Moy_SC_040	Barnalyra Knock airport	Blanket peat Cut peat* Extractive industry/quarry Forestry Pasture* Transitional woodland/scrub	Anthropogenic pressures Hydromorphology Urban waste water
Moy_SC_050	Swinford Kilkelly Bohola	Extractive industry Peat bog Pasture*	Anthropogenic pressures Extractive industry Urban waste water

Subcatchment	Urban area	Land use (*main)	Significant pressures
Moy_SC_060	n/a	Cut peat* Pasture* Peat bog Forestry	Agriculture Extractive industry
Moy_SC_070	n/a	Pasture* Peat bog Forestry	n/a
Pollagh_SC_010	Knock Kiltimagh	Pasture Peat bog Natural vegetation	Anthropogenic pressures Agriculture Domestic waste water Forestry Hydromorphology Urban waste water
Glore[Mayo]_SC_010	Aghamore	Pasture Peat bog	Agriculture Hydromorphology

6 Conclusion

26 sites were surveyed for fish status using a ten-minute bank-based electro-fishing method (CEN, 2003). The Ecological Quality Ratio results indicate that 73% of the sites on the Moy meet the minimum requirements of Good status with 7 out of these 19 sites achieving High status. 30 sites were surveyed using the River Hydromorphology Assessment Technique. 17% of sites were classed as Good, with the remainder failing to achieve the required standard. Of the averaged attributes, riparian land use and floodplain connectivity scored lower followed by channel form & flow type and channel vegetation. Water quality data accessible on the Environmental Protection Agency website (EPA 2024a) demonstrates that in 2022, 88% (n=57) of sites passed the minimum requirement of Good status, of which 33 sites scored High and 24 sites scored Good status. 9% (n=6) of sites were categorised as Moderate and 3% (n=2) scored as Poor. These results are all summarised in catchment maps in Appendix 7.4. A total of 207 barriers to fish passage were identified and measured in the Moy east catchment overall, which is a proportion of 17.5%, high in comparison to recent catchment-wide surveys (Fleming *et al.*, 2023). That said, the majority are small structures, with very few large weirs in the system.

Pasture and bog are the dominant land uses in the catchment. Given much of the catchment consists of low-lying landscape and poorly-draining soils, agriculture is a significant pressure on water quality. Modelling on the EPA website (2024a) demonstrates that large areas of the catchment are susceptible to overland phosphate losses. There is potential for pathway interception of such losses with hedgerows or buffer strips and these should be targeted in the right areas. Where riparian zones already exist within the catchment, OPW drainage maintenance activities should endeavour to keep these intact. Conversely, where none exist, efforts should be made to encourage riparian buffer strips through fencing and planting.

Hydromorphology and anthropogenic pressures also feature as potential threats to water quality. In general, water quality is quite good across the catchment area, with problem sites related to specific local pressures. The wide distribution of both salmon and trout across the catchment area is reflective of this as salmonids generally fare better at Q3 and above sites i.e. Moderate, Good or High (Kelly et al., 2007). The RHAT attribute substrate condition is better on average in the Moy than all of the recent catchment-wide surveys (Fleming *et al.*, 2023). Good clean substrate provides important spawning habitat for fish. Numerous channels within the Moy have High status objectives for water quality including the Pollagh, Cloonlavis, Trimoge, Gweestion, Owengarve, Eignagh, Owenaher, as well as a section of main Moy and its tributaries. Any drainage maintenance activities which take place in the High status objective

waterbodies should be cognisant of this objective. Despite the high rate of disruption to longitudinal connectivity and limited scores in terms of hydromorphology, the Moy east area fares well with respect to fish stocks. The relatively good water quality plays a key role in this outcome. Gains can be made with regards to habitat quality (see appendix 7.1) and some of these recommendations would also facilitate protecting good water quality.

7 Appendices

7.1 RHAT: habitat works recommendations

Latitude	Longitude	Site Code	Channel reference	River	Sum of attribute scores	WFD class	Pool Riffle	Gravel	Deflectors	Stepped Structures	Random Boulder	Berm Management	Thalweg	LWD introduced	Barrier Removal/Mitigation	Bank Protection	Offline Drinkers	Fencing	Tree Management	Planting
53.81289	-8.83745	Site 1	C1/30	Glore	10	Poor														✓
54.08028	-8.77938	Site 19	C1/55 (F/156)	Corsallagh	10	Poor		✓						✓				✓		✓
53.87165	-8.98947	Site 13 (MYM0691)	C1/30	Glore	11.5	Poor		✓												
53.81339	-8.97721	Site 22	C1/30/7/12	Cloonlavis	12	Poor														✓
53.98329	-8.68643	Site 25	C1/30/7/12	Owengarve	12.5	Poor							✓	✓			✓			✓
53.84839	-9.01385	Site 11 (MYM0269)	C1/30/7	Pollagh	13	Moderate							✓	✓			✓	✓		✓
53.83868	-8.99015	Site 12	C1/30/7	Yellow	13	Moderate							✓							✓
54.07942	-8.80652	Site 20 (MYM2745)	C1	Moy	13	Moderate					✓			✓						
53.93814	-9.10318	Site 16 (MYM1436)	C1	Moy	13.5	Moderate					✓			✓						✓
53.92805	-9.02224	Site 23	C1/30/7	Killeen	13.5	Moderate								✓				✓		✓
54.03674	-8.81692	Site 8 (MYM3535)	C1	Moy	14	Moderate							✓	✓						

Latitude	Longitude	Site Code	Channel reference	River	Sum of attribute scores	WFD class	Pool Riffle	Gravel	Deflectors	Stepped Structures	Random Boulder	Berm Management	Thalweg	LWD introduced	Barrier Removal/Mitigation	Bank Protection	Offline Drinkers	Fencing	Tree Management	Planting
54.04976	-8.80058	Site 6 (MYM3492)	C1/52	Tubercurry	14.5	Moderate		✓												✓
54.0132	-8.83502	Site 7 (MYM3247)	C1/48	Owengarve	14.5	Moderate		✓			✓		✓	✓				✓		✓
53.96733	-8.93085	Site 15 (MYM2055)	C1	Moy	14.5	Moderate			✓					✓						✓
54.01884	-8.86898	Site 9 (MYM2154)	C1/49	Eignagh	15	Moderate		✓	✓					✓				✓		
53.91621	-9.13162	Site 2 (MYM0614)	C1/23	Strade	15.5	Moderate											✓	✓		✓
53.95009	-8.97414	Site 14	C1/39	Swinford	15.5	Moderate		✓						✓				✓		✓
53.96957	-8.80085	Site 26 (MYM3342)	C1/45	Mullaghanoe	16	Moderate														✓
54.11098	-8.74893	Site 18	C1	Moy	16.5	Moderate								✓			✓	✓		✓
53.97365	-8.96891	Site 24	C1/41	Tiraninny	17	Moderate								✓			✓			✓
53.92303	-9.06132	Site 3 (MYM1412)	C1/30	Gweestion	18	Moderate								✓			✓	✓	✓	✓
53.93844	-9.00903	Site 5	C1/35	Spaddagh	18.5	Moderate	**None feasible/required here**													
53.91292	-9.01949	Site 4 (MYM1194)	C1/30/5	Trimoge	19	Moderate	✓						✓	✓			✓	✓		
53.8443	-8.89793	Site 30	C1/30	Glore	19.5	Good		✓						✓	✓					✓
54.02986	-8.92124	Site 27	C1/49/5 (F/1518)	Bellanamean	20	Good								✓						✓

Latitude	Longitude	Site Code	Channel reference	River	Sum of attribute scores	WFD class	Pool Riffle	Gravel	Deflectors	Stepped Structures	Random Boulder	Berm Management	Thalweg	LWD introduced	Barrier Removal/Mitigation	Bank Protection	Offline Drinkers	Fencing	Tree Management	Planting
53.88788	-8.97843	Site 21	C1/30/5	Trimoge	21	Good		✓						✓						
54.0097	-8.757879	Site 29	n/a	Drumbaun	15.5	Moderate		✓							✓		✓	✓		
53.957933	-8.841352	Site 28	n/a	Sonnagh	19	Moderate		✓						✓						✓
54.07431	-8.849136	Site 10 (MYM2234)	n/a	Owenaher	19.5	Good											✓	✓		
54.131464	-8.720661	Site 17 (MYM3070)	n/a	Moy	24	Good	**None feasible/required here**													

RHAT WFD class and associated score:

WFD Class	Sum of attribute scores
High	≥ 26
Good	≥ 19.5 to < 26
Moderate	≥ 13 to < 19.5
Poor	≥ 6.5 to < 13
Bad	< 6.5

7.2 RHAT: 10 steps recommendations*

following EP 7 Environmental Drainage Maintenance in Brew & Gilligan (2019)

Latitude	Longitude	Site Code	Channel reference	River	Sum of attribute scores	WFD class	Protect Bank Slopes	Restrict Maintenance	Spoil Management	Selective Vegetation Removal	Leave Section Untouched	Management of Trees	Berm Management	Replace Stones and Boulders	Loosen Gravel Beds	Re-profile Channel Bed
53.812887	-8.837445	Site 1	C1/30	Glore	10	Poor	✓									
54.080282	-8.77938	Site 19	C1/55 (F/156)	Corsallagh	10	Poor		✓								
53.871649	-8.989465	Site 13 (MYM0691)	C1/30	Glore	11.5	Poor					✓					
53.813392	-8.977212	Site 22	C1/30/7/12	Cloonlavis	12	Poor					✓					
53.983285	-8.686434	Site 25	C1/30/7/12	Owengarve	12.5	Poor					✓					✓
53.848394	-9.013846	Site 11 (MYM0269)	C1/30/7	Pollagh	13	Moderate	✓				✓		✓			✓
53.83868	-8.990148	Site 12	C1/30/7	Yellow	13	Moderate										✓
54.079417	-8.806518	Site 20 (MYM 2745)	C1	Moy	13	Moderate		✓								
53.938138	-9.103184	Site 16 (MYM1436)	C1	Moy	13.5	Moderate					✓		✓			
53.928046	-9.022242	Site 23	C1/30/7	Killeen	13.5	Moderate	✓	✓			✓					
54.036742	-8.816922	Site 8 (MYM3535)	C1	Moy	14	Moderate										✓
54.049755	-8.800575	Site 6 (MYM3492)	C1/52	Tubercurry	14.5	Moderate					✓					
54.013202	-8.835024	Site 7 (MYM3247)	C1/48	Owengarve	14.5	Moderate										✓
53.96733	-8.93085	Site 15 (MYM2055)	C1	Moy	14.5	Moderate	✓	✓								
54.018837	-8.868976	Site 9 (MYM2154)	C1/49	Eignagh	15	Moderate					✓					

Latitude	Longitude	Site Code	Channel reference	River	Sum of attribute scores	WFD class	Protect Bank Slopes	Restrict Maintenance	Spoil Management	Selective Vegetation Removal	Leave Section Untouched	Management of Trees	Berm Management	Replace Stones and Boulders	Loosen Gravel Beds	Re-profile Channel Bed
53.916208	-9.131615	Site 2 (MYM0614)	C1/23	Strade	15.5	Moderate		✓			✓					
53.950094	-8.974136	Site 14	C1/39	Swinford	15.5	Moderate					✓					
53.969572	-8.800854	Site 26 (MYM3342)	C1/45	Mullaghanoe	16	Moderate				✓						✓
54.110976	-8.748934	Site 18	C1	Moy	16.5	Moderate					✓					
53.973652	-8.968909	Site 24	C1/41	Tiraninny	17	Moderate	✓	✓			✓					
53.923028	-9.061317	Site 3 (MYM1412)	C1/30	Gweestion	18	Moderate		✓								
53.938443	-9.009032	Site 5	C1/35	Spaddagh	18.5	Moderate					✓					
53.912922	-9.019493	Site 4 (MYM1194)	C1/30/5	Trimoge	19	Moderate	✓				✓					✓
53.844295	-8.897928	Site 30	C1/30	Glore	19.5	Good					✓				✓	
54.029862	-8.921237	Site 27	C1/49/5 (F/1518)	Bellanamean	20	Good		✓			✓					
53.887882	-8.978426	Site 21	C1/30/5	Trimoge	21	Good					✓					

7.3   Barrier removal/mitigation recommendations

Longitude	Latitude	Relative project size	U28 ID *	OPW channel reference [Bridge reference]	River	Nature of Obstruction	Photo page number
-8.86203	54.02658	Large	34_344_40	C1	Moy	Bridge with apron	35
-9.11069	53.89281	Medium	34_1132_258	C1/21/3 [B2]	Strade	New bridge apron with poor fish pass retrofitted to old masonry bridge	35
-8.95229	53.8553	Medium	34_2188_344	C1/30 [B10]	Glore	Bridge apron with a drop. Notched in apron, velocity a passage issue more as well as a jump	36
-8.86415	53.97428	Medium	34_2274_2	C1/44/1	Sonnagh	Bridge apron with drop	36
-9.10149	53.92794	Small	34_3376_82	C1/25 [B2]	Oughtagh	Apron with a drop	35
-8.678	53.95926	Small	34_2260_258	C1/48/7 [B1]	Owenlobnaglaur	Apron with drop	36
-8.77656	54.0797	Small	34_751_47	C1/55 (F/156)	Corsallagh	Shallow bridge apron, minor drop	37
-8.98085	53.96938	Small	34_3165_202	C1/41 [B1]	Tiraninny	Shallow bring apron, impoundment upstream. Fast water over floor	37
-8.80062	54.04941	Small	34_2633_59	C1/52	Tubercurry	Slope into short drop	37

Figure 7.1 Barrier removal/mitigation recommendations: Photos of Moy (34_344_40), Strade (34_1132_258) and Oughtagh (34_3376_82).

Figure 7.2 Barrier removal/mitigation recommendations: Photos of Glore (34_2188_344), Sonnagh (34_2274_2), Owenlobnaglaur (34_2260_258).

Figure 7.3 Barrier removal/mitigation recommendations: Photos of Corsallagh (34_751_47), Tiraninny (34_3165_202) and Tubercurry (34_2633_59).

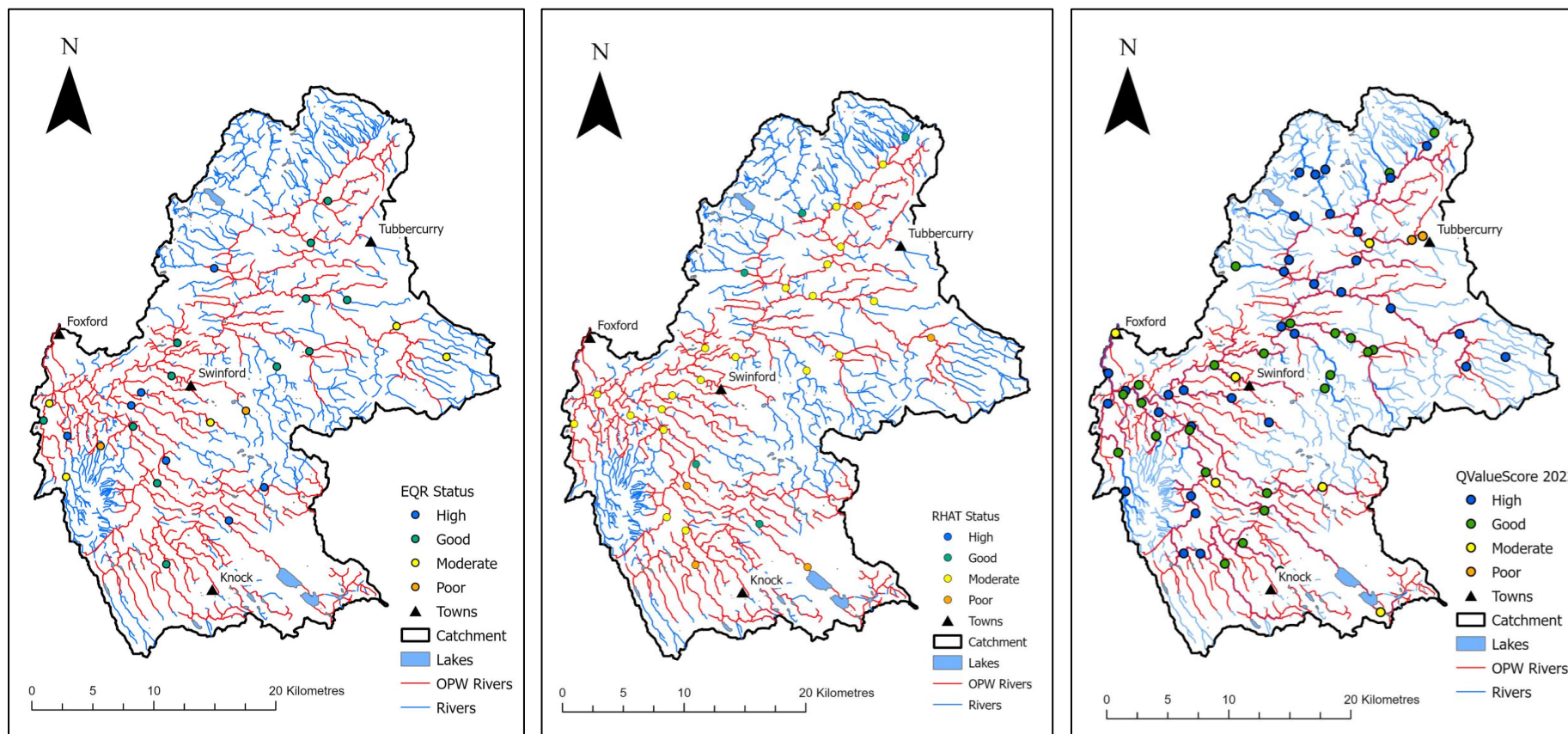## 7.4   Moy east catchment maps

Figure 7.4 Ecological Quality Ratio (EQR) scores (n=26) and RHAT scores (n=30) for sites surveyed in the Moy. Water quality assessments undertaken by the EPA in 2022 (right).

8 References

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