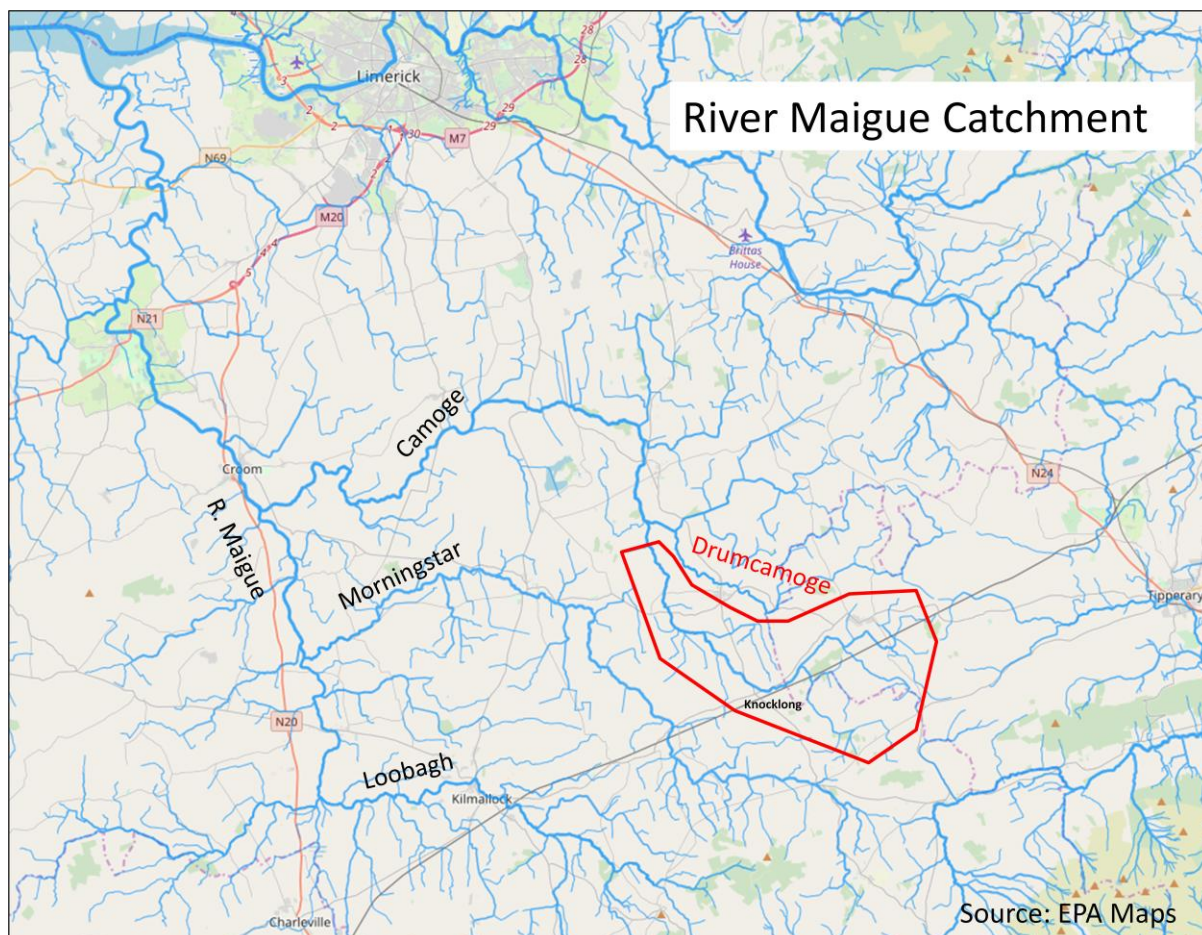


# Assessment of Habitat Quality and Future Directions for Enhancement of the River Drumcomoge



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**The Drumcomoge sub-catchment, Co. Limerick**

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## **Summary**

The Drumcomoge River is a headwater of the Camoge River, a sub-catchment of the R. Maigue, and one of eleven sub-catchments form the River Maigue catchment, Co. Limerick. The aim of the project is to improve the environmental quality of the river to the benefit of biodiversity, salmonid populations and the local community. The project reviews the current environmental status of the Drumcomoge sub-catchment in relation to biodiversity, water quality, hydromorphology and environmental pressures. The project attempts to fill the gaps in knowledge of the catchment by presenting the results of assessments of water quality, hydromorphology and habitat quality for salmonids. Community engagement has been an important part of the project in order to promote awareness among about the importance of the river catchment as an important natural resource, and foster a feeling of “environmental ownership” in relation to the catchment. This engagement has focussed on Atlantic salmon as an environmental issue in the catchment. The results of the project have identified an 8km stretch of the Drumcomoge that has the potential to be a productive spawning and nursery area for Atlantic salmon and trout. Measures to improve environmental quality here and in the broader sub-catchment are discussed, and future directions towards these improvements are outlined.



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## 1.0 Introduction

The Drumcomoge River is a headwater of the Camoge River, a sub-catchment of the R. Mague, and one of eleven sub-catchments form the River Mague catchment, Co. Limerick. The Drumcomoge catchment stretches from Emly in Co. Tipperary to downstream of Knockaine in Co. Limerick where it becomes the R. Camoge. The Drumcomoge catchment is approximately 15 km long and 66 km<sup>2</sup> in extent. There are three settlements in the catchment, Emly (pop. 820), Knocklong (pop. 700) and Knockaine (pop. 700). The primary economic activity in the catchment is grass-based agriculture – beef rearing and dairying. The Drumcomoge is a small river between one and two metres wide. Although the upper reaches of the sub-catchment, near Emly, have been highly modified by arterial drainage, the lower reaches experienced less modification and retain a more or less natural flow and structure in many sections. As a sub-catchment of the Mague, the Drumcomoge was formerly an important spawning and nursery habitat for Atlantic salmon, brown trout, sea lampreys and brook lampreys. Arterial drainage and declining water quality in recent years have had a negative impact on ecology and on biodiversity of the sub-catchment in general.

### 1.1 Aims

The aim of the project is to improve the environmental quality of the river to the benefit of biodiversity, salmonid populations and the local community. The objectives are:

- To carry out assessments of water quality, point pollution sources, hydromorphology and fish populations;
- Promote awareness among the local communities and landowners about the importance of the river catchment as an important natural resource, thereby empowering these stakeholders with a heightened sense of “environmental ownership” in relation to the catchment;
- To provide a forum for sharing of knowledge about the catchment and ideas about the future of the catchment between communities, landowners and other stakeholders,
- To identify areas in the Drumcomoge catchment for future enhancement work involving local stakeholders (landowners, local communities, public agencies).

### 1.2 Community Engagement

Community engagement, particularly with landowners, is essential to promote awareness of the importance of the river catchment as a natural resource, and foster a feeling of “environmental ownership” in relation to the catchment. As a first step an information exchange evening – “*Help Bring Back the Salmon to Limerick-the Drumcamogue Project*”- was organized by the Mague Rivers Trust (MRT) in Knocklong Community Centre on 1<sup>st</sup> October 2019. It was decided to focus on Atlantic salmon as an environmental issue for a number of reasons. There is a broad awareness in the community of the decline in Atlantic salmon numbers in Ireland and the Mague catchment. Many people in the catchment are aware of the former importance of the Mague as a salmon habitat and some of the factors that have led to its decline. This is an issue that is likely to resonate more strongly with people as a biodiversity loss issue that is linked water quality. Salmon survival and water quality are intertwined; it is important that it is appreciated that the presence of healthy juvenile salmon and trout populations in a river are an indicator of good water quality. A recovery in salmon numbers as a result of community action may be perceived as a more tangible outcome from actions than a numerical improvement in water quality.

Twenty-two participants attended on the evening. Prof. Ken Whelan gave a presentation on the challenges currently facing Atlantic Salmon. An outline of catchment issues and how they might be addressed was presented by the MRT and feedback was invited from the audience. Reactions were generally positive, but obstacles were recognized and possible solutions discussed. The evening provided a forum for sharing of knowledge about the catchment and ideas about the future of the catchment between communities, landowners and other stakeholders.

## 2.0 Background Review-Environmental Quality

**2.1 Biodiversity.** In 2013 a survey was carried out by Inland Fisheries Ireland on the Maigue catchment as part of the Environmental River Enhancement Programme<sup>1</sup>. Two sites were sampled on the Drumcomoge, downstream of Knocklong, and upstream at the confluence of the Bog River. In order of abundance, minnows, lamprey, trout 3-spined sticklebacks, stone loach and salmon (fry) were present downstream of Knocklong. Minnows, trout 3-spined sticklebacks and stone loach were the only fish present in the upstream site. Eels and crayfish were absent from both sites. The authors concluded that the absence of salmon in the upper headwaters of the Camoge and other rivers in the Maigue catchment “...is a reflection of poor water quality, making the water body unfavourable for salmon survival”. This conclusion is based on the work of Kelly et al.<sup>2</sup> who found that rivers rated by the Environmental Protection Agency (EPA) as having “Moderately Polluted” water quality (or Q3), will not sustain young salmon.

In 2018, Sweeney Consultancy<sup>3</sup> carried out a catchment-wide survey of river invertebrates, crayfish and otters on behalf of the MRT. Two Drumcomoge sites were included, one at Gortacloona downstream of Knockainy and the other on the Bog River upstream of Knocklong. Crayfish were found in moderate numbers at the Knockainy site but were absent from the Bog River. Otters were not detected at either site.

In a survey of riparian habitats in the Maigue catchment carried out by Wetland Surveys Ireland<sup>4</sup> on behalf of the MRT in summer 2019, 19 areas were identified as containing semi-natural riparian habitats or habitats with a high biodiversity values, but none of these were in the Drumcomoge sub-catchment.

**2.2 Water quality.** Water quality is critical for many organisms that live in rivers and lakes and particularly so in the case of small rivers that can suffer from low water in summer and reduced capacity to dilute pollutants. The Water Framework Directive (WFD) is the EU legislative framework which aims to improve water quality in our rivers and lakes. In the WFD, natural surface water bodies are assigned to one of five ecological status classes: High, Good, Moderate, Poor or Bad. Ecological status of a water body is assigned by monitoring the organisms that live in the water body or biological monitoring, its water chemistry and its physical condition.

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

There are 8 sites in Camoge catchment where water quality has been monitored by the EPA on a 3-year cycle. However, none of these sites are currently in the Dromcomoge sub-catchment and there has been no EPA monitoring of the Drumcomoge since 1988, so recent data on water quality from the EPA monitoring network is not available from here. More information on the EPA sites is given in **Appendix 2 Sect. 3.1.2**. Water quality was assessed at two sites on the Dromcomoge in the Sweeney Consultancy survey in 2018. Based on the range of invertebrates present, the Bog River had Poor water quality (Q3-Moderately Polluted), while Moderate water quality (Q3-4-Slightly Polluted) was found at Gortacloona. Currently therefore, the Drumcomoge has “Unassigned” status in relation to water quality and is deemed by the EPA to “At Risk” of not achieving satisfactory water quality status. It is recommended that consideration be given to adding this water body to the biological monitoring network<sup>2</sup>.

**2.3 Hydromorphology.** As part of a river hydromorphology assessment (RHAT) survey of the Maigne catchment carried out by Wetland Surveys Ireland on behalf of the MRT in summer 2019, 14 sites were surveyed in the Camoge catchment of which 8 were in the Dromcomoge sub-catchment<sup>4</sup>. One site near Knockainy was classified as Good, 4 were classified as Moderate, and 4 were classified as Poor, 3 of which were upstream of Knocklong in a stretch heavily modified by arterial drainage. The main factors contributing to Poor assessments were the previous channel alterations (deepening and widening/straightening), loss of riparian vegetation, and cattle access to the river leading to erosion and sedimentation.

**2.4 Environmental Pressures.** In order to achieve the objectives of the WFD, the current River Basin Management Plan (RBMP) 2018-2021 outlines a new approach that Ireland will take to protect rivers, lakes, estuaries and coastal waters over the next four years. A key element of the Plan is to identify pressures on water quality in each water body, and to implement specific measures to that will alleviate these pressures and achieve “Good” water quality. The Plan identified 190 Priority Areas for Action across the country with a total of 726 water bodies in these Areas that are considered “At Risk” of not achieving Good status. The R. Camoge and its headwaters, the Drumcomoge, have been selected as Priority Action Areas because both are considered at risk of not achieving Good status<sup>5</sup>. Other reasons for the selection of the Camoge included were the recent in-stream works carried out by IFI to improve salmonid spawning and the likelihood of obtaining significant improvement here. The Drumcomoge is considered to share similar pressures to the R. Camoge downstream. It is also regarded as a test case for poorly-draining soils that can impede efforts to improve water quality where nutrient pollution is a pressure.

Although there is limited information on the Drumcomoge, early desk studies carried out by the catchment assessment team of LAWPRO (Local Authority Waters Programme) suggests that the main pressure on water quality is nutrient pollution caused by phosphorus and nitrogen originating from agriculture. These nutrients cause excessive growth of algae and water plants, which indirectly have a negative impact on freshwater life such as mayflies, stoneflies, trout and salmon. Excessive sediment arising from erosion, agricultural activity and land drainage, can clog spawning gravels and adversely affect insect life, and is also likely to be significant in the Drumcomoge. There was a fish kill in the Drumcomoge in 2015. The local authorities identified the cause as agricultural activity.

Other pressures include the legacy of arterial drainage schemes, which were carried out in the 1970s in parts of the Drumcomoge. Arterial drainage involves the widening, deepening and sometimes the straightening of a river channel. Drained rivers are usually shallower and more uniform in depth and have lost connectivity to their floodplain. They also lose most of the features of a natural river such as pools, riffles, gravel beds, boulders and bank-side shading. Drained channels have a much



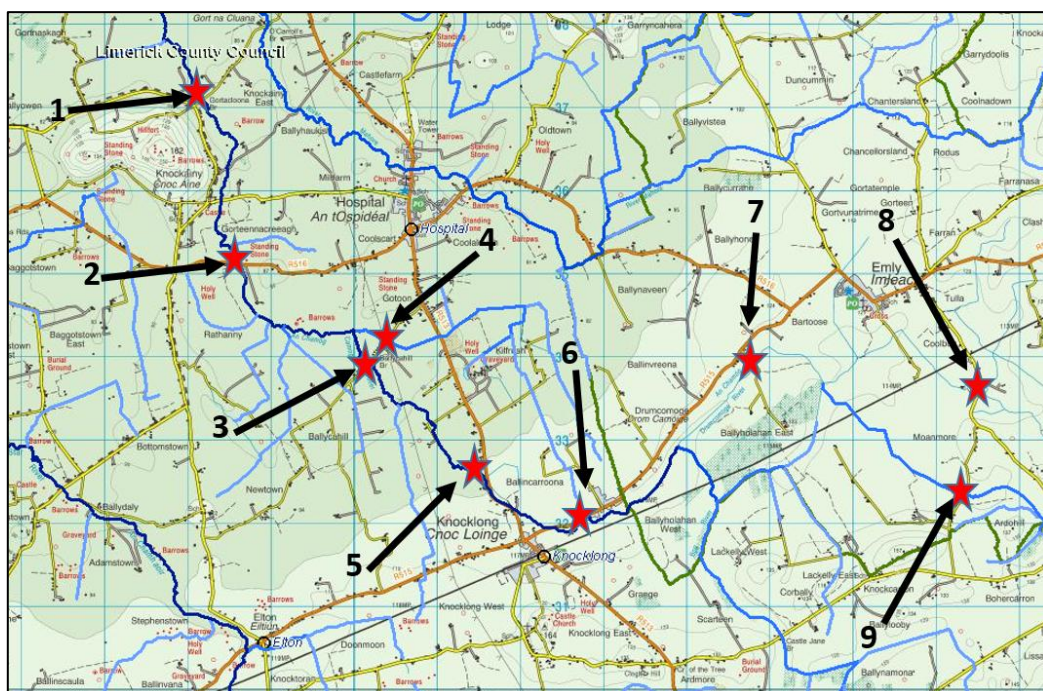
enhanced capacity to carry water in wet weather, but may suffer from low water levels in summer droughts, which are likely to increase in the future as result of climate change.

Another potential pressure in the catchment is nutrient pollution from wastewater (sewage) treatment works (WWTPs) and domestic septic tanks. There are two WWTPs in the Drumcomoge catchment, at Emly and Knocklong. The plant serving the village of Emly has a design capacity of 1500 population equivalents; Emly currently has a population of approximately 400. The Knocklong (pop. 260) plant has a design capacity of 468 population equivalents. More information on WWTPs is given in **Appendix 2 Sect 3.1.3**. There is no information on the number of domestic waste water treatment systems (“septic tanks”) for single houses in the catchment or on their potential impact on surface waters.

## 3.0 Survey Results

### 3.1 Water quality in the Drumcomoge sub-catchment

In September 20 after consultation with the MRT, Limerick City and County Council agreed to carry out a biological kick-sampling survey of the Drumcomoge River in order to assess current water quality based on biological (i.e. macroinvertebrate) indicators of water quality. This survey involved kick-sampling at nine sites marked out in **Fig. 1** below. The results of the invertebrate sampling were translated into the EPA Quality Rating System (Q-Value) score. They were also translated into the Small Streams Risk Score (SSRS), which identifies rivers that are definitely ‘at risk’ of failing to achieve the ‘good’ water quality status goals of the Water Framework Directive (WFD). This score focuses on first and second order streams and assists in identifying point source pollution which may otherwise be unidentified in a larger river downstream. The SSRS scores are categorised as follows: >7.25 – stream “probably not at risk”; 6.5 to 7.25 – stream “probably at risk”; < 6.5- stream “at risk”.



**Fig. 1.** Sites on the Drumcomoge kick-sampled in September 2019.

Of the nine sites selected only four sites were suitable for kick sampling. The other five could not be sampled due to depth of water, or excessive growth of in-stream vegetation (aquatic macrophytes). The macroinvertebrate profiles of the sites are given in **Appendix 2**. Q values and SSR Scores are given in **Table 1**. Three sites, Gortacloona, Ballycahill and d/s Knocklong had Moderate water quality (Q3-4) and one site, just u/s of Knocklong WWTP had Poor quality (Q3). Gortacloona, Ballycahill and u/s Knocklong WWTP had SSR scores < 7 and were deemed “At Risk”, while d/s of Knocklong was borderline and deemed “Probably at Risk”.

**Table 1.** Q-values and SSRS scores in the Drumcomoge catchment.

Site	Location	Q Rating	SSRS
Site 1	Gortacloona Bridge	3-4 (Slightly Polluted)	4 (At Risk)
Site 2	Rathanny	NA (Too deep to sample)	NA
Site 3	Ballycahill Bridge	3-4 (Slightly Polluted)	5.6 (At Risk)
Site 4	Kilfrush	NA (Excessive macrophytes)	NA
Site 5	D/s Knocklong	3-4 (Slightly Polluted)	7.2 (Probably at Risk)
Site 6	U/s Knocklong WWTP	3 (Moderately Polluted)	4 (At Risk)
Site 7	D/S Emly	NA (Excessive macrophytes)	NA
Site 8	Coolboy	NA (Excessive macrophytes)	NA
Site 9	Moanmore	NA (Excessive macrophytes)	NA



**Site 1. Gortnacloona Bridge.** The invertebrate community at site 1 gave an SSRS score of **4** (At Risk) and a Q-rating of **3-4** (Moderate). The river was sampled at a riffle approximately 100m upstream of the bridge.





**Site 3 Ballycahill Bridge.** The invertebrate community at Site 3 gave an SSRS score of 5.6 (At Risk) and a Q-rating of 3-4 (Moderate).



**Site 5 Downstream of Knocklong .**The invertebrate community at Site 4 gave an SSRS score of 7.2 (Stream Maybe At Risk) and a Q-rating of 3-4 (Moderate).



**Site 6 Upstream of Knocklong WWTP.** The invertebrate community at Site 6 gave an SSRS score of 4 (“At Risk”) and a Q-rating of 3 (Poor)

### **3.2 Aquatic Habitat Quality**

Ecofact was commissioned by the MRT to undertake an aquatic habitat survey of the Drumcomogue sub-catchment which was undertaken during September/October 2019. A total of 30 sites were visited to assess stream habitat and hydromorphology (**Fig. 2**). The sites were selected to cover the entire sub-catchment and to be representative of the channels present. The methodology, involving a desk study and field surveys, and detailed results of the survey are presented in **Appendix 2**. A summary is presented here.

The survey was carried out with regard to the ‘*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual: 2003 Version*’ published by the Environment Agency (EA, 2003). All the sites were assessed in terms of:

- Stream width and depth and other physical characteristics;
- Substrate type, listing substrate fractions in order of dominance, i.e. large rocks, cobble, gravel, sand, mud etc.;
- Flow type, listing percentage of riffle, glide and pool in the sampling area;
- In-stream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside;
- Estimated cover by bankside vegetation, giving percentage shade of the sampling site.

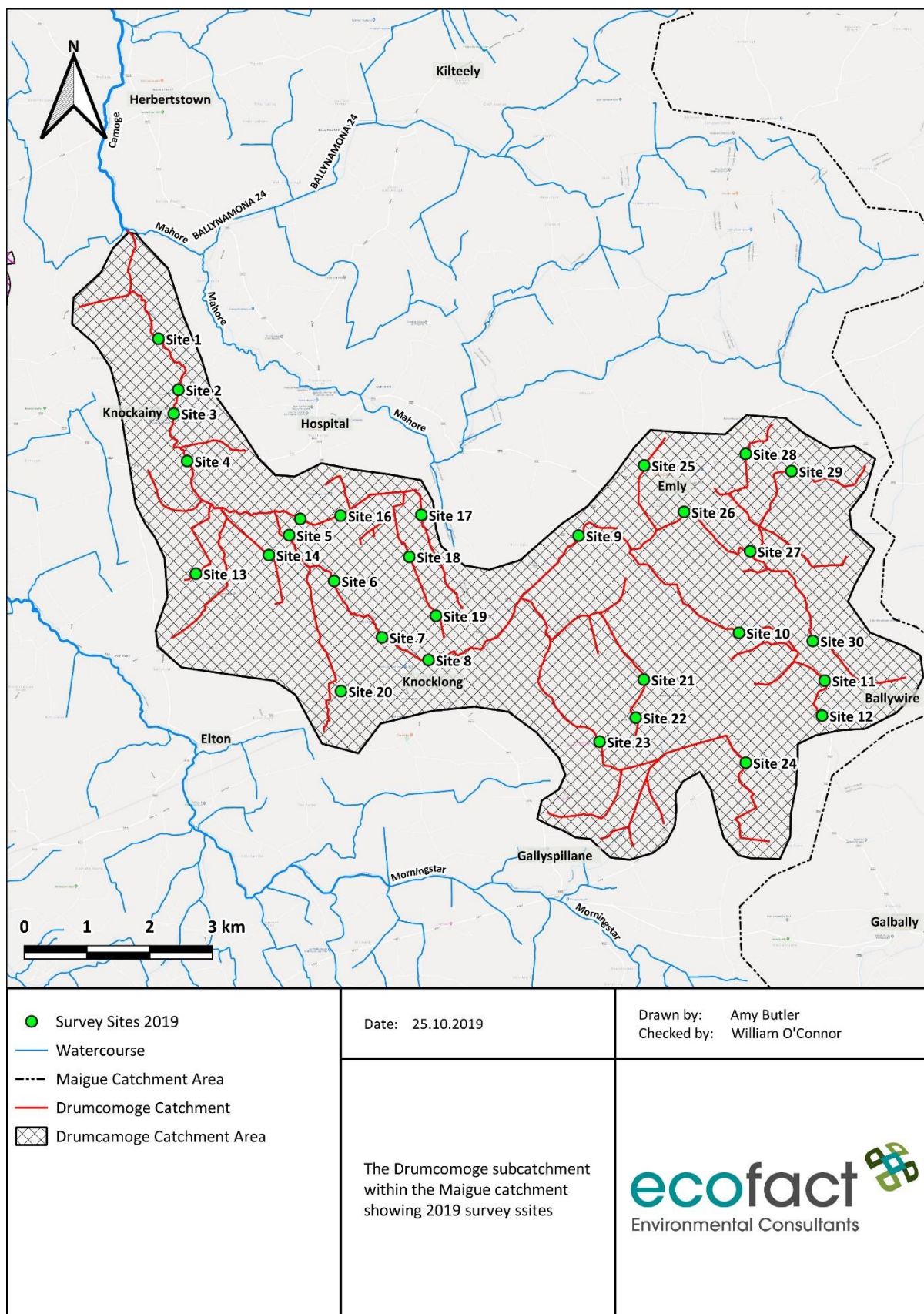
The morphological status of the watercourses surveyed was categorised on a scale of High-Good-Moderate-Poor-Bad.



Habitat class (spawning, nursery, rearing, and foraging/adult holding) for salmonids, lampreys, and other fish was also assessed at each site. The habitat classes used are defined as follows: -

- Spawning habitat is used by fish for the specific act of spawning;
- Nursery habitat is used by developing embryos and young-of-the-year (YOY);
- Rearing habitat is used by sub-adult fish other than YOY for foraging and refuge from predators; and,
- Foraging habitat is used by adult fish [for feeding or] periods between feeding events/ Adult holding is used by adult fish, which do not feed in freshwater, before spawning events (i.e. lampreys and salmon).

Habitat class at each site was rated using a habitat rating index (HRI). The index works on a scale of 1-5 where 1=Unsuitable, 2=Poor, 3=Satisfactory, 4=Good and 5=Excellent. A rating of "1" indicates that the ecologist carrying out the assessment regarded it as impossible that the stream could support salmonid fish in the relevant life stage. A rating of "1- 2" indicates that it was regarded as possible but unlikely that the stream could support salmonid fish in the relevant life stage. In addition to habitat quality, the presence of salmonids at each site would also depend on present and historical water quality and accessibility of a given site to fish. For this reason, the presence of obstacles to migration (i.e. weirs) downstream of each site was also considered.



**Fig. 2.** Dromcomoge sub-catchment showing locations of the 30 Ecofact survey sites.

### 3.2.1 Results of the Habitat Survey

The river channels of the Dromcomoge sub-catchment (**Tables 2 and 3, Appendix 2**) at all the survey sites visited have been modified/subject to arterial drainage. The majority of the survey sites in the watercourses had a low gradient. Only five sites had medium gradient and there were no high gradient areas among the 30 sites. Twenty-three of the survey sites were moderately silted, 6 had heavy siltation and one (Site 16) had normal siltation levels (**Table 3, Appendix 2**). Livestock access to the river is common throughout the sub-catchment, which leads to siltation and nutrient enrichment (**Fig. 3**)



**Fig. 3.** Livestock access point on the Drumcomoge R.

Based on the current assessment, the morphological status of the catchment is considered poor. Twenty-three of the survey sites were rated Poor, five sites rated as Moderate and just two sites rated as having Good morphological status. Eight of the sites exhibited bank erosion (**Table 4 Appendix 2**).

The biological status (estimated from visual evidence only) of the catchment is not considered 'Good'. Only one of the thirty survey sites were rated as likely to be 'Good'. Ten sites were rated as likely to be of 'Moderate' ecological status (based on visual evidence) and the remaining nineteen were estimated to be 'Poor'.

In relation to Habitat Class for salmonid spawning and nurseries (**Table 5, Appendix 2**), two sites (2 and 7) of the 30 sites surveyed were rated Good for both salmonid spawning and nursery habitat. One site (6) was rated Good for salmonid spawning and Satisfactory for salmonid nursery habitat. Two other sites (8, 16) were considered Satisfactory for both salmonid spawning habitat and nursery habitat. The remaining twenty-five survey sites were Poor or Unsuitable as salmonid spawning or nursery habitats. In relation to lamprey habitat in the catchment, there were eighteen sites identified as having potential lamprey spawning habitat and eighteen also identified as having potential lamprey nursery habitat.

Based on visual evidence only, the majority of the sites were considered to be probably 'Poor' in terms of fisheries status with two-thirds of the survey sites rated as 'Poor' and the other third considered 'Moderate'. Most of the Poor sites were in the upper sub-catchment. The best salmonid channel is the section from Site 2 to Site 8 (**Fig. 2**). This stretch of river is approximately 8km long.

This area of the river has extensive areas of habitat which are physically suitable for production of Atlantic salmon and brown trout.

## 4.0 Conclusions

The Drumcomoge sub-catchment contains some channels that have been highly modified by arterial drainage and consequently have poor hydromorphology and are unsuitable as salmonid spawning and nursery habitat. This is particularly so in the upper reaches above Site 8 (See 2.3). However, the stretch on the main channel between Site 2 and Site 8, a distance of 8 km, has extensive areas of habitat which are physically suitable for production of Atlantic salmon and Brown trout. A salmonid fry survey was planned by Inland Fisheries Ireland for late summer 2019 to establish the presence of juvenile salmonids in the sub-catchment, but could not be carried out due to high water and other commitments. This has been rescheduled for summer 2020. While the stretch contains many areas of physical habitat that are suitable for salmonid production, it is not optimal habitat throughout (see **Table 5, Appendix 2**). This stretch below Knocklong was identified by the then Shannon Regional Fisheries Board<sup>6,7</sup> as a salmon spawning stretch and advised the installation of vortex weirs to address the shallowness of the water in this section.

Extensive areas of suitable lamprey habitats also occur in this stretch; however, due to the weirs in the lower reaches of the river, only non-migratory brook lampreys (*Lampetra planeri*) are likely to occur. The stretch has ideal potential habitat for crayfish, and otters are likely to use this stretch.

Water quality is the key issue in the sub-catchment that militates against salmonid reproduction, and this is compounded by poor hydromorphology. Most of the sites visited in the Ecofact survey showed visible evidence of siltation and eutrophication. Based on results from the current survey and from the survey of Sweeney Consultancy 2018, water quality upstream of Knocklong is in the Poor WFD status category (Q3 -Moderately Polluted) and is unsuitable for salmonid reproduction. Downstream of Knocklong as far as Gortacloona Bridge the water status is Moderate (Q3-4-Slightly Polluted), but is deemed to have Suitable to Good conditions for salmonid reproduction according to the Habitat Class index used in the Ecofact survey (**Appendix 2**).

Improvements in water quality from Moderate to Good Status throughout the sub-catchment would enhance the potential of this stretch of the Drumcomoge for salmonid production. Such improvement is contingent on the success of measures being implemented in the Drumcomoge Priority Action areas as part of the River Basin Management Plan 2018-2012 and in future cycles of this plan. However, such measures may not include specific measures to improve salmonid habitat and biodiversity in general. These specific measures could include restoration of riparian habitat, and buffer zones, in-stream works to increase water flow and create pools, fencing to reduce livestock access (along with provisions of water sources for livestock), tree planting or removal where shading is excessive, specific measures to reduce erosion, siltation and run-off.

## 4.1 Future Directions

In 2020 MRT will develop the level of engagement with landowners with a view to implementing specific measures to improve aquatic habitat for salmonids as outlined above. The approach of the Trust will not be to prescribe solutions but to advise and source funding. The results of this project will form the basis for such engagement. The focus will be on the 8km stretch between Knocklong and Gortacloona.

There is reasonably good physical habitat for salmonid production along in 8km of the main channel of the Drumcomoge main channel. However, improvements in water quality to Q4 are needed to



optimise this resource. A priority therefore should be to improve water quality. However, there is a question about whether this needs to come before any physical habitat enhancements. It is our view, however that measures to improve habitat on a broad scale, such as restoration of riparian vegetation, creation of buffer zones, reduction of sources of erosion and siltation and restriction of livestock access to rivers will help to improve water quality and will support the efforts of the LAWPRO and ASSAP teams in this Priority Action Area.

The EPA will be asked to include at least one (and ideally two) Biological Monitoring Sites in this sub-catchment in their roll-over national survey. The last time that this sub-catchment was surveyed was in 1988.

The MRT will undertake water quality surveys and fish/surveys in the sub-catchment. The MRT has a developed a core volunteer group which have completed a course on the Small Stream Characterisation System developed by the Atlantic Salmon Trust. A short list of sites from the current survey could be used by the group going forward to monitor recovery in this sub-catchment. Suggested sites for long-term monitoring would be Sites 2, 4, 6, 8, 16, 27 and 23.

The current status of salmon and trout in the sub-catchment will be established through electrofishing or eDNA analysis. It is important that the deferred juvenile salmonid survey be completed in 2020.

There are no Annual Environmental Reports (AERs) in the EPA files for the Knocklong and Emly WWTPs. The last entries in the WWDA file are from 2011. Irish Water will be asked to provide updated information on the performance and monitoring of these plants. Monthly chemical and biological monitoring is required upstream and downstream of these discharges and waste assimilation capacity assessments needs to be completed.

There is also a significant density of one-off houses in the catchment. It is believed that agriculture is the main source of water pollution in this sub-catchment, but the role of nutrient pollution from domestic waste water treatment and WWTPs inputs should be investigated.

## 5.0 References

1. Environmental River Enhancement Programme (EREP) Annual Report 2013. Inland Fisheries Ireland and Office of Public Works, Dublin.
2. Kelly, F., Champ, T., McDonnell, N., Kelly- Quinn, M., Harrison, S., Arbuthnott, A., Giller, P., Joy, M., McCarthy, K., Cullen, P., Harrod, C., Jordon, P., Griffiths, D., Rosell, R. 2007. *Investigation of the relationship between fish stocks, ecological quality ratings (Q-Values), environmental factors and degree of eutrophication*. Environmental RTDI Programme 2000-2006, EPA. Dublin.  
([http://www.epa.ie/wfdstatus/rivers/RW\\_Fish\\_River\\_Methods\\_ERTDI\\_Report\\_73.pdf](http://www.epa.ie/wfdstatus/rivers/RW_Fish_River_Methods_ERTDI_Report_73.pdf)).
3. Sweeney, P. (2018). *River Maigue Instream Biodiversity, Crayfish and Otters*. Sweeney Consultancy and Maigue Rivers Trust.
4. Wetland Surveys Ireland (2019). *River Maigue Riparian Habitat Surveys*.
5. EPA Catchments Unit. 2018 Shannon South Estuary Catchment Assessment 2010-2015 (HA 24) p.4 <https://www.catchments.ie/wp->

[content/files/subcatchmentassessments/24\\_2%20DRUMCOMOGE\\_SC\\_010%20Subcatchment%20Assessment%20WFD%20Cycle%202.pdf](#)

6. Fishery Improvements to the Camogue River. Shannon Regional Fishery Board 2008.
7. River Enhancement Programmes in Ireland for Drained Channels  
[https://www.opw.ie/en/media/river-enhancement-programmes-in-ireland-for-drained-channels.pdf](#)

## Appendix 1 Results of the biological Sampling

**Table A1. Site 1 Gortacloona Bridge.** The invertebrate community gave an SSRS score of **4** (At Risk) and a Q-rating of **3-4** (Slightly polluted).

Indicator Group	Taxon	Numbers
Group A -Very Pollution Sensive	<i>Ecdyonurus</i>	2
Group B - Moderately Pollution Sensitive		
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	20
	Chironomidae	2
	<i>Baetis rhodani</i>	5
	Hydracarina	10
	Coleoptera	10
	<i>Ancylus</i>	3
Group D - Very Pollution Tolerant	<i>Asellus</i>	3
	Hirundinea	1
	<i>Potamopyrgus</i>	3
Group E - Most Pollution Tolerant.		

**Table A2. Site 3 Ballycahill Bridge.** The invertebrate community gave an SSRS score of 5.6 (At Risk) and a Q-rating of 3-4 (Slightly polluted).

Indicator Group	Taxon	Numbers
Group A -Very Pollution Sensive	<i>Ecdyonurus</i>	3
Group B - Moderately Pollution Sensitive	<i>Ephemerella</i>	5
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	15
	Chironomidae	5
	Simuliidae	12
	Hydropsychidae	2
	<i>Rhycofila</i>	1
	<i>Dicranota</i>	1
	<i>Baetis rhodani</i>	20
	Hydracarina	5
	Coleoptera	10
	<i>Ancylus</i>	1
Group D - Very Pollution Tolerant	Hirundinea	1
	<i>Potamopyrgus</i>	3

Group E - Most Pollution Tolerant.	Tubificidae	10

**Table A3. Site 5 Downstream of Knocklong.** The invertebrate community gave an SSRS score of 7.2 (Stream Probably At Risk) and a Q-rating of 3-4 (Slightly Polluted).

Indicator Group	Taxon	Numbers
Group A -Very Pollution Sensitive	<i>Ecdyonurus</i>	2
Group B - Moderately Pollution Sensitive	<i>Ephemerella</i>	6
	<i>Leuctra</i>	1
	Goeridae	3
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	50
	Chironomidae	4
	Simuliidae	10
	Hydropsychidae	3
	Polycentropidae	2
	<i>Rhyacophila</i>	7
	Tipulidae	1
	<i>Dicranota</i>	1
	<i>Baetis rhodani</i>	20
	Hydracarina	10
	Coleoptera	10
	<i>Ancylus</i>	3
Group D - Very Pollution Tolerant	<i>Asellus</i>	3
	Hirundinea	1
	<i>Potamopyrgus</i>	3
Group E - Most Pollution Tolerant.	Tubificidae	10

**Table A4. Site 6 upstream of KnockLong WWTP.** The invertebrate community gave an SSRS score of 4 ("At Risk") and a Q-rating of 3 (Moderately Polluted).

Indicator Group	Taxon	Numbers
Group A -Very Pollution Sensitive		
Group B - Moderately Pollution Sensitive	<i>Ephemerella</i>	10
Group C - Moderately Pollution Tolerant	<i>Gammarus</i>	25
	Simuliidae	15
	Hydropsychidae	2
	Goeridae	3
	Tipulidae	1



	<i>Baetis rhodani</i>	20
	Hydracarina	5
	Coleoptera	10
	<i>Ancylus</i>	1
Group D - Very Pollution Tolerant	<i>Asellus</i>	4
Group E - Most Pollution Tolerant.	Tubificidae	10

## Appendix 2

# DRUMCOMOGE SUB-CATCHMENT AQUATIC HABITAT ASSESSMENT



14<sup>th</sup> November 2019



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## 1.0 INTRODUCTION

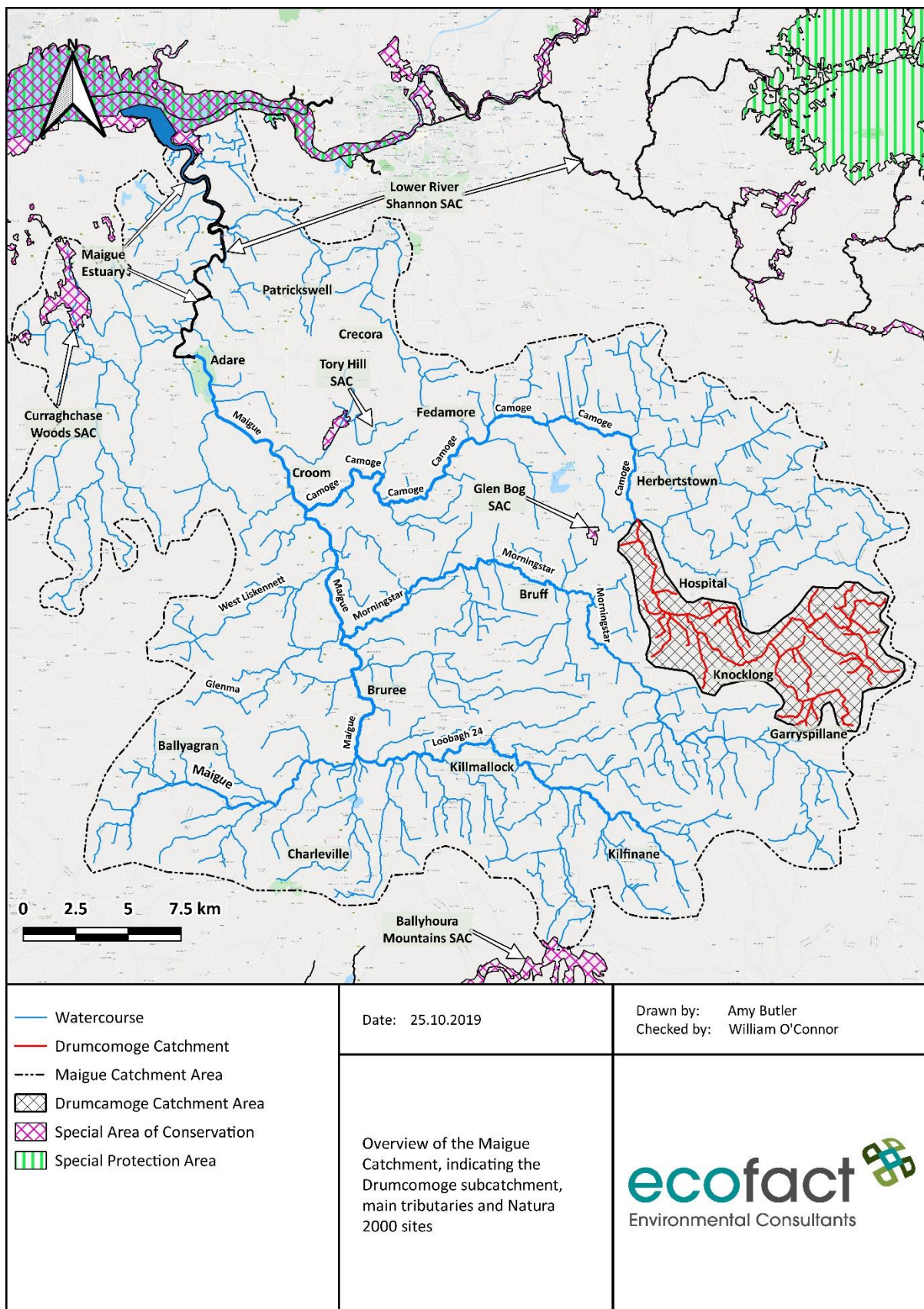
Ecofact was commissioned by the Maigue Rivers Trust to undertake an aquatic habitat survey of the Drumcomogue sub-catchment of the River Maigue. A survey of this sub-catchment was undertaken during September/October 2019. A total of 30 sites were visited to assess stream habitat and hydromorphology. The location of the Drumcomogue sub-catchment and the overall River Maigue catchment is provided in Figure 1.

The River Maigue (EPA code 24M01) rises south of Bruree and flows north through Croom and Adare in Co. Limerick into the Shannon Estuary. It is a rich limestone river and together with its tributaries, the Camoge (EPA code 24C01), the Morning Star (EPA code 24M02), and the Loobagh (24L01). The River Maigue has an overall catchment area of 1,020 km<sup>2</sup>.

The Maigue catchment (including the Camoge/Drumcomogue) was subjected to a major arterial drainage scheme in the 1970's (O' Reilly, 2004). This scheme included extensive canalisation and, despite some rehabilitation works, the hydromorphology of the river has not recovered. The catchment is also subject to ongoing "drainage maintenance" works. During the arterial drainage scheme a series of concrete weirs were installed at intervals along the lower reaches of the River Maigue. These weirs have furthermore prevented the hydromorphological recovery of the river - and also act as barriers to fish migration, especially eels and lampreys. The entire River Maigue catchment has also suffered from extensive water quality problems – mainly due to agricultural intensification since the 1970s. The River Maigue is within the known distribution range of the white-clawed crayfish *Astropotamobious pallipes*, however, has recently had an outbreak of crayfish plague.

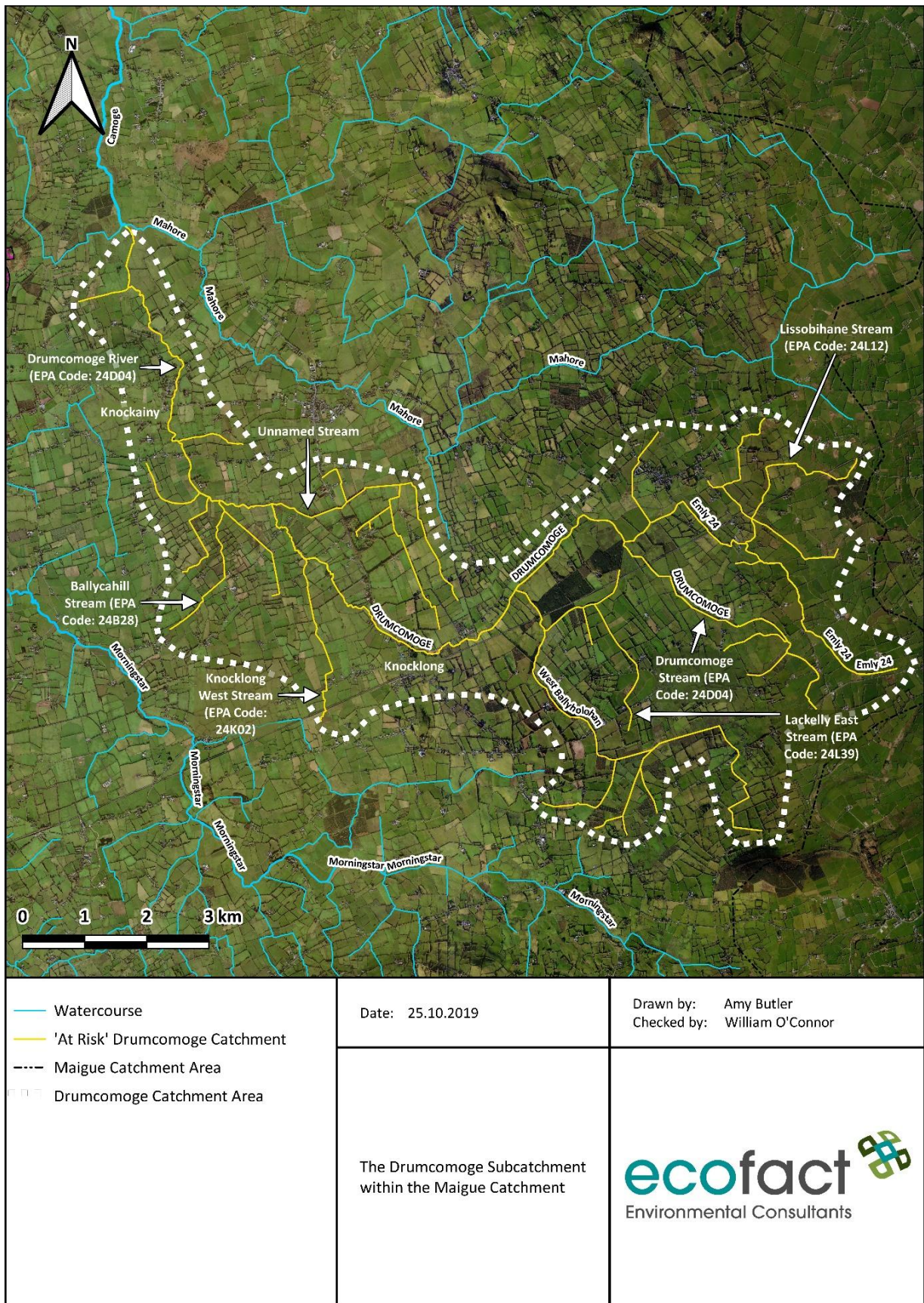
The lower reaches of the River Maigue are included as part of the Lower River Shannon Special Area of Conservation (SAC) – see Figure 1.

Habitat quality for fish, riparian bird life, mammalian wildlife, and the riparian and in-stream invertebrate and plant communities on which the fish, mammal and bird life depend, is primarily a function of 'naturalness' and diversity. The more diverse the river/stream habitat in terms of substrate, flow rate, depth, riparian vegetation, light conditions etc., the richer the biological community is likely to be. The purpose of the current assessment was therefore to look at this sub-catchment and describe it in these terms - and also make recommendations in relation to the possible future enhancement of this sub-catchment. However, water quality is perhaps an even more important influence on aquatic communities than habitat – and if a river channel is not meeting 'Good Status' then the enhancement options are limited.



**Figure 1** Overview of the Maigue catchment with the Drumcomoge sub-catchment indicated.





**Figure 2** The Drumcomoge sub-catchment.

## 2.0 METHODS

A desk study of the Drumcamoge sub-catchment was undertaken, using online resources including the websites of the National Parks and Wildlife Service ([www.npws.ie](http://www.npws.ie)), Environmental Protection Agency ([www.epa.ie](http://www.epa.ie)) and the National Biodiversity Data Centre ([www.biodiversiteireland.com](http://www.biodiversiteireland.com)).

A total of 30 sites were selected for the current survey. The sites were selected to cover the entire sub-catchment and to be representative of the channels present. The sites were selected using a Geographical Information System (GIS) based desk study with reference to EPA channel codes, aerial photography and accessibility.

Each of the 30 sites was then visited to assess stream habitat and hydromorphology. Photographs were taken at each site and habitat data was collected on data forms. The locations of the 30 selected survey sites are given in Table 1 - and also indicated in Figure 3.

The survey was carried out with regard to the '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual: 2003 Version*' published by the Environment Agency (EA, 2003). All the sites were assessed in terms of:

- Stream width and depth and other physical characteristics;
- Substrate type, listing substrate fractions in order of dominance, i.e. large rocks, cobble, gravel, sand, mud etc.;
- Flow type, listing percentage of riffle, glide and pool in the sampling area;
- Instream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside;
- Estimated cover by bankside vegetation, giving percentage shade of the sampling site.
- 

The morphological status of the watercourses surveyed was categorised on a scale of High-Good-Moderate-Poor-Bad.

Habitat suitability for salmonids was assessed using the leaflet '*The Evaluation of habitat for Salmon and Trout*' (DANI Advisory leaflet No. 1). A general assessment of lamprey habitats was made with reference to Maitland (2003).

Habitat class (spawning, nursery, rearing, and foraging/adult holding) for salmonids, lampreys, and other fish was also assessed at each site. The habitat classes used are defined as follows: -

- Spawning habitat is used by fish for the specific act of spawning;
- Nursery habitat is used by developing embryos and young-of-the-year (YOY);
- Rearing habitat is used by sub-adult fish other than YOY for foraging and refuge from predators; and,
- Foraging habitat is used by adult fish [for feeding or] periods between feeding events/ Adult holding is used by adult fish, which do not feed in freshwater, before spawning events (i.e. lampreys and salmon).

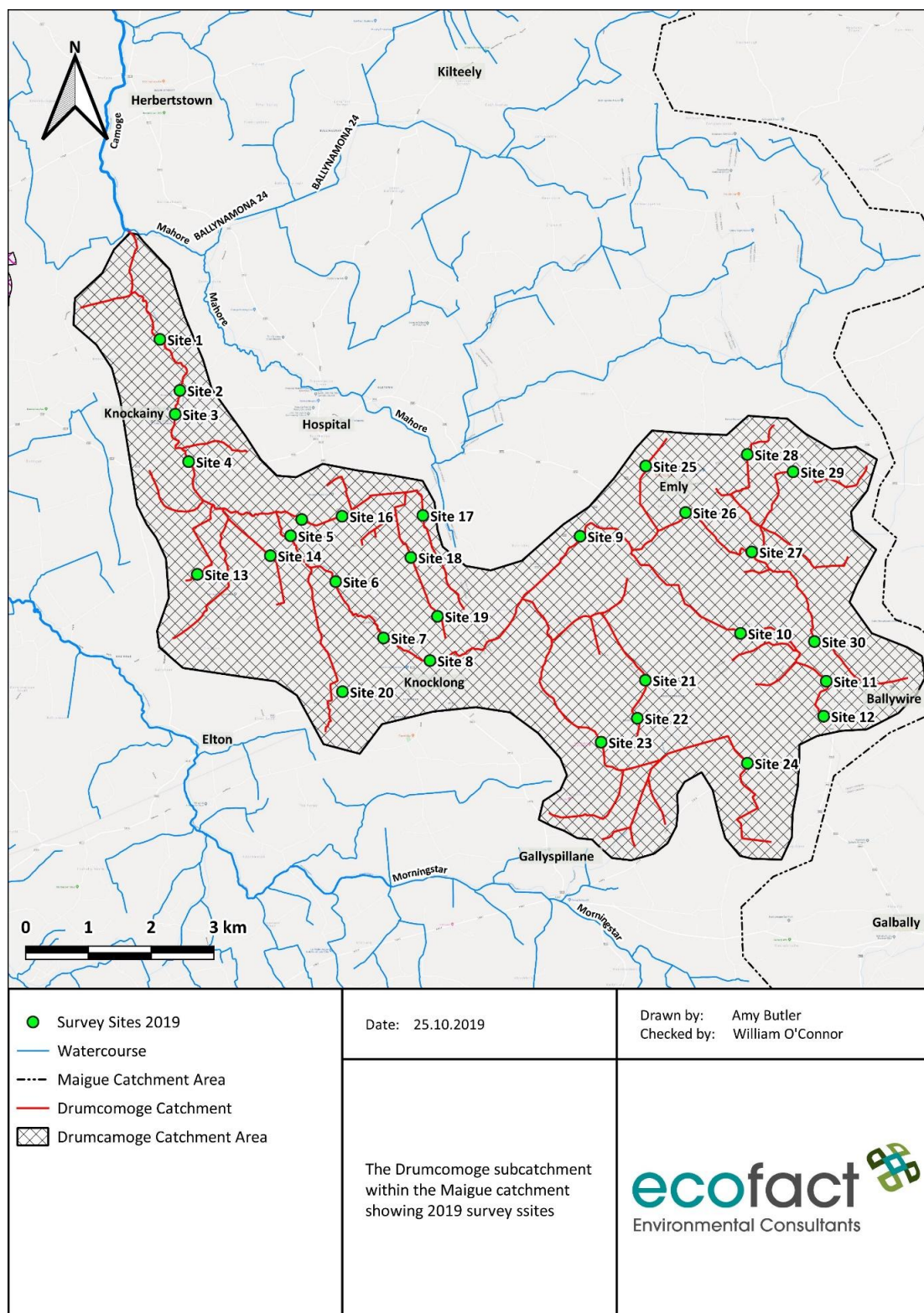


Habitat class at each site was rated using a habitat rating index (HRI). The index works on a scale of 1-5 where 1=Unsuitable, 2=Poor, 3=Satisfactory, 4=Good and 5=Excellent. A rating of “1” indicates that the ecologist carrying out the assessment regarded it as impossible that the stream could support salmonid fish in the relevant life stage. A rating of “1- 2” indicates that it was regarded as possible but unlikely that the stream could support salmonid fish in the relevant life stage. In addition to habitat quality, the presence of salmonids at each site would also depend on present and historical water quality and accessibility of a given site to fish. For this reason, the presence of obstacles to migration (i.e. weirs) downstream of each site were also considered.

Habitat has a key influence on the macroinvertebrate communities, which occur in rivers and streams. Also, individual macroinvertebrate species such as the Annex II listed white-clawed crayfish has specific habitat requirements. The habitats of aquatic areas at each site was also assessed in relation to macroinvertebrates and rated as being suitable or unsuitable for individual protected aquatic macroinvertebrates. General habitat quality for macroinvertebrate communities was rated as being Optimal, Suboptimal, Marginal or Poor with reference to a scheme developed by Barbour & Stribling (1991).

**Table 1** Location of the 30 sites visited during the current survey.

Survey Site	EPA Segment Code	X, Y Co-ordinate	Grid Reference
Site 1	24_787	168157, 137092	R68157 37092
Site 2	24_787	168467, 136272	R68467 36272
Site 3	24_787	168392, 135898	R68392 35898
Site 4	24_788	168597, 135143	R68597 35143
Site 5	24_768	170210, 133958	R70210 33958
Site 6	24_1591	170924, 133223	R70924 33223
Site 7	24_1591	171683, 132326	R71683 32326
Site 8	24_1591	172418, 131963	R72418 31963
Site 9	24_758	174813, 133924	R74813 33924
Site 10	24_1565	177357, 132371	R77357 32371
Site 11	24_239	178719, 131604	R78719 31604
Site 12	24_239	178675, 131050	R78675 31050
Site 13	24_784	168725, 133355	R68725 33355
Site 14	24_523	169891, 133644	R69891 33644
Site 15	24_766	170391, 134216	R70391 34216
Site 16	24_766	171033 134261	R71033 34261
Site 17	24_1586	172317, 134264	R72317 34264
Site 18	24_952	172121, 133603	R72121 33603
Site 19	24_952	172541, 132667	R72541 32667
Site 20	24_767	171023, 131479	R71023 31479
Site 21	24_31	175841, 131630	R75841 31630
Site 22	24_31	175707, 131031	R75707 31031
Site 23	24_1589	175132, 130654	R75132 30654
Site 24	24_1119	177457, 130311	R77457 30311
Site 25	24_761	175865, 135031	R75865 35031
Site 26	24_763	176491, 134289	R76491 34289
Site 27	24_763	177544, 133650	R77544 33650
Site 28	24_507	177479, 135205	R77479 35205
Site 29	24_1071	178203, 134926	R78203 34926
Site 30	24_1541	178530, 132235	R78530 32235



**Figure 3** The Drumcomoge sub-catchment with the location of the 30 aquatic survey sites indicated.

## 3.0 RESULTS

### 3.1 Desk Study

#### 3.1.1 Catchment overview

The Drumcomoge/Comoge catchment is a sub-catchment of the River Maigue which lies between Newcastle County Limerick and Tipperary Town in County Tipperary. The Emly 24 watercourse rises to the North of Aherlow, near Ballywire County Tipperary. The river flows north and develops into a 3<sup>rd</sup> order watercourse south of the town of Emly. The watercourse then turns west, flowing into the Drumcomoge. The river continues towards Knocklong where the 4<sup>th</sup> order river turns north. The river continues North flowing past Knockainey between Bruff (to the West) and Hospital (to the East) before joining the 5<sup>th</sup> order Comoge River to the South of Herbertstown.

#### 3.1.2 Water quality monitoring

There are several monitoring stations in the Drumcomoge Sub-catchment, however there are no recent up-to-date Q-values assigned at any of these stations. The most recent EPA assessment of the Maigue River (2019) states that; *"Of the seven stations surveyed on the Maigue, all were in an unsatisfactory Moderate ecological condition. A slight improvement from Poor to Moderate ecological conditions was noted in the upper reaches (0020) while there was an unwelcome drop in ecological quality at three stations from Good to Moderate at 0050, 0500 and 0700. Signs of enrichment were evident at the majority of stations with excessive siltation (0020, 0050, 0300, 0900) and enhanced or abundant filamentous algal growth and/or aquatic macrophyte growth noted at all surveyed stations in 2017."*

There is no recent water quality assessment of the Drumcomoge River itself. The nearest recent water quality assessment to the Drumcomoge River is less than 2 km downstream from the Drumcomoge confluence with the Camoge River, at the L1502 bridge crossing on the Camoge (RS24C010060). This site was assigned a Q-value of 3 in 2018 indicating 'Poor' water quality of the Comoge just downstream of the Drumcomoge. This part of the watercourse was also assigned a WFD Status (2010-2015) of 'Moderate' and is considered 'at risk'.

The Drumcomoge River is considered 'at risk' but has not been assigned a WFD status (2010-2015).

The lowest monitoring station on the Drumcomoge River itself is at Gortacloona Bridge (RS24D040400) where again there are no recent Q-values with the latest Q-ratings recorded in 1988. The assigned Q-value at this site was 3-4, equivalent to 'Moderate' water quality. Another water monitoring station is located on the R516 road at the Bridge North West of Rathanny House (RS24D040300). The last Q rating carried out at this station was in 1988, with a value of 3-4, corresponding to 'Moderate' water quality status. The next station upstream is at the Bridge North of Ballycahill (RS24D040250). The latest Q-rating recorded at this station was a value of 3 in 1988 which is indicative of 'Poor' water quality. The next monitoring station is at the Ballincaroona Bridge Station (RS24D040200) where there is a Q-value of 2-3 recorded in 1988 indicating 'Poor' water quality. The same value was assigned just upstream at the Drumcomoge Station – 1 km North-East of Knocklong (RS24D040100).

Further upstream in the Drumcomoge catchment there are two National Water Monitoring Stations on the Emly 24 watercourse in the upper reaches of the Drumcomoge sub-catchment. The first of which is the Bridge North-West of Ballynagrana (RS24E020070) where the latest Q-value recorded was 2-3 in 1988 equivalent to 'Poor' quality water. The second station is the Bridge downstream of Aughaclareen Bridge (RS24E020050). The last Q-value assigned for this site was a score of Q2 in 1989, corresponding to 'Bad' water quality.

### **3.1.3 Notable aquatic species**

The National Biodiversity Database have records of white-clawed crayfish in several 10 km grid squares around the Mague catchment area. The species was last recorded in the R73 grid square on 30/09/2016. This grid square covers the majority of the Drumcomoge sub-catchment, and it is therefore likely that the recording was from this watercourse. There are also recordings of Duck mussels *Anodonta anatina* from the 31/12/1993 in the R64 and R54 10 km national grid squares, which cover part of the Mague catchment. Juvenile Duck mussel *Anodonta anatina* shells of lengths c.38 mm were recorded in the Mague River by J. Lucey in 1995. No recordings later than 1995 of Duck mussels in the Mague catchment were found. There are no NBDC records of Salmon, Lampreys or Swan mussel *Anodonta cygnea* in the 10km squares where the subject sub-catchment is located – however lampreys and salmon are likely to occur.

### **3.1.4 Wastewater treatment plants**

There are two WWTP and effluent emission points in the Drumcomoge Sub-catchment; one in Knocklong, and the other in Emly. Both plants have storm water overflow points.

#### **3.1.4.1 Knocklong (A0210-01)**

Authorisation for discharges from agglomeration with a population equivalent less than 500 was granted for Knocklong WWTP on 24/03/2011. The latest EPA wastewater authorisation documentation for this plant is from 24/03/2011. The WWTP at Knocklong provides secondary treatment with a settlement tank and trickling filters. The design capacity of the facility is for a population equivalent of 468 and discharges onto the Drumcomoge\_010 river (Segment Code: 24\_1591).

According to the inspector's report from February 2011, the facility was already serving a population equivalent of 468 at the time, i.e. was at capacity. The inspectors report states that the nearest EPA water quality monitoring to this facility is 13.7km downstream from where the Q-value was recorded as Q3-4 in 2006. It was also noted in the inspector's report that the receiving water of the discharge has been identified as being of less than good status with a Q value of <4. It was stated that there may be other causes of the less than good water quality status of the watercourse and that there was not concerns of the WWTP discharges causing deterioration of the receiving water.

The necessity for identification of appropriate improvements to the facility was highlighted in the inspector's report. This was to be carried out within a year of authorisation and it was to include a "waste water treatment system necessary to ensure all discharges from the agglomeration



*contribute towards achieving at least good status in accordance with the European Communities Environmental Objectives (Surface Waters) Regulations 2009 and/or the European Communities Environmental Objectives (Groundwater) Regulations 2010". No Habitats Directive Article 6 Appropriate Assessment has been completed for this plant.*

#### **3.1.4.2 Emly (A0409-01)**

Authorisation for the discharge from agglomeration with a population equivalent of less than 500 was granted for Emly WWTP on 31/05/2011. The facility at Emly provides tertiary treatment with an active sludge membrane bio reactor system for a pre-treatment phosphorus and sludge removal. The design capacity of the facility is for a population equivalent of 1500 and discharges into the Emly 24 river (Segment Code: 24\_763) a tributary of the Drumcomoge River.

EPA inspection of the plant in 2010 reported that the agglomeration had a population equivalent of 332 at the time. The inspectors report states that the nearest EPA water quality monitoring to this facility is 17km downstream where the Q-value was recorded as Q3-4 in 2006. It was also noted in the inspector's report that the receiving water of the discharge has been identified as being of less than good status with a Q value of <4. It was stated that there may be other causes of the less than good water quality status of the watercourse.

There is a drinking water abstraction point within 10km downstream of the discharge from the facility. It is included as a condition of the authorisation of the discharge that the party responsible for the downstream water abstraction must be notified of any incidents in the agglomeration immediately. A risk assessment, addressing the identification and minimisation of risks, at a minimum, was also ordered to be carried out within a year of the authorisation, and measures to be implemented within a year thereafter. The necessity for identification of appropriate improvements to the facility was highlighted in the inspector's report. This was to be carried out within a year of authorisation and it was to include a *"waste water treatment system necessary to ensure all discharges from the agglomeration contribute towards achieving at least good status in accordance with the European Communities Environmental Objectives (Surface Waters) Regulations 2009 and/or the European Communities Environmental Objectives (Groundwater) Regulations 2010"*. No Habitats Directive Article 6 Appropriate Assessment has been completed for this plant.

## **3.2 Habitat survey results**

The results of the general physical habitat assessments at the 30 aquatic survey sites in the Drumcamoge sub-catchment is presented in Table 3. Table 4 gives the results of the River Corridor Survey (RHS) at the 30 aquatic survey sites in the Drumcamoge sub-catchment. Table 5 presents the results of the aquatic species habitat assessments at the 30 aquatic survey sites. An estimate of the WFD status at the 30 aquatic survey sites in the Drumcamoge sub-catchment is given in Table 6.

The river channels at all the survey sites visited have been modified/subject to arterial drainage. The majority of the survey sites in the watercourses had a low gradient. Only five sites had medium gradient and there were no high gradient areas across the 30 sites

Overall the catchment is moderately silted with 23 of the survey sites recorded as such. There was one survey site where the siltation was considered normal and the remaining six of the survey sites were recorded as having heavy siltation in the watercourse.

There were two sites out of the thirty surveyed which were considered to be satisfactory in terms of both salmonid spawning and salmonid nursery habitat. There were two other sites that were rated good for salmonid spawning and nursery habitat. One other site was considered a good salmonid spawning habitat with a satisfactory rating for nursery habitat. The remaining twenty-five survey sites were poor or unsuitable as salmonid spawning or nursery habitats.

In relation to lamprey habitat in the catchment, there were eighteen sites identified as having potential lamprey spawning habitat and eighteen also identified as having potential lamprey nursery habitat present.

Based on the current assessment the morphological status of the catchment is considered poor. There were twenty-three of the survey sites rated poor, there were five sites rated as moderate and just two sites rated as good morphological status.

The biological status (estimated from visual evidence only) of the catchment is not considered 'Good'. Only one of the thirty survey sites were rated as being likely to be 'Good'. There were ten sites rated as being likely to be of 'Moderate' ecological status (based on visual evidence) and the remaining nineteen were estimated to be 'Poor'.

Similarly, the majority of the sites were considered to be probably 'Poor' in terms of fisheries status with two thirds of the survey sites rated as 'Poor' and the other third considered 'Moderate'. Again, this assessment is based on the visual evidence only.

**Table 2** EPA Segment codes and river names at the 30 sites surveyed in the Drumcomoge sub-catchment.

Survey Site	EPA Segment Code	River	Tributary	Sub-tributary	2 <sup>nd</sup> Sub-tributary
Site 1	24_787	Drumcomoge_10			
Site 2	24_787	Drumcomoge_10			
Site 3	24_787	Drumcomoge_10			
Site 4	24_788	Drumcomoge_10			
Site 5	24_768	Drumcomoge_10			
Site 6	24_1591	Drumcomoge_10			
Site 7	24_1591	Drumcomoge_10			
Site 8	24_1591	Drumcomoge_10			
Site 9	24_758	Drumcomoge_10			
Site 10	24_1565	Drumcomoge_10			
Site 11	24_239	Drumcomoge_10			
Site 12	24_239	Drumcomoge_10			
Site 13	24_784	Drumcomoge_10	Rathanny 24		
Site 14	24_523	Drumcomoge_10	Knocklong		
Site 15	24_766	Drumcomoge_10	Unnamed		
Site 16	24_766	Drumcomoge_10	Unnamed		
Site 17	24_1586	Drumcomoge_10	Unnamed	Kilfrush 24	
Site 18	24_952	Drumcomoge_10	Unnamed	Unnamed	
Site 19	24_952	Drumcomoge_10	Unnamed	Unnamed	
Site 20	24_767	Drumcomoge_10	Knocklong_West		

Site 21	24_31	Drumcomoge_10	West Ballyholohan	Drumcomoge South	Lackelly East
Site 22	24_31	Drumcomoge_10	West Ballyholohan	Drumcomoge South	Lackelly East
Site 23	24_1589	Drumcomoge_10	West Ballyholohan		
Site 24	24_1119	Drumcomoge_10	West Ballyholohan		
Site 25	24_761	Drumcomoge_10	Emly 24		
Site 26	24_763	Drumcomoge_10	Emly 24		
Site 27	24_763	Drumcomoge_10	Emly 24		
Site 28	24_507	Drumcomoge_10	Emly 24	Lissobihane	Farran 24
Site 29	24_1071	Drumcomoge_10	Emly 24	Lissobihane	
Site 30	24_1541	Drumcomoge_10	Emly 24		

**Table 3** Results of the general physical habitat assessments at the 30 aquatic survey sites in the Drumcomoge sub-catchment.

Site	Segment Code	Mean Depth (cm)	Instream vegetation (%)	Bank Height (m)	Bank Cover (%)	Canopy Cover (%)	Riffle (%)	Glide (%)	Pool (%)	Rock (%)	Cobble (%)	Gravel (%)	Fine (%)	Shade (%)
Site 1	24_787	60	30	2	100	10	0	60	40	10	10	5	75	20
Site 2	24_787	25	10	1.5	90	30	40	30	30	40	20	10	30	30
Site 3	24_787	40	10	1.5	100	20	0	80	20	10	10	10	70	10
Site 4	24_788	40	30	2	100	20	0	50	50	10	20	20	50	20
Site 5	24_768	35	25	2	100	10	0	50	50	20	10	30	40	10
Site 6	24_1591	25	5	1	100	0	30	30	40	10	40	40	10	10
Site 7	24_1591	20	5	1	90	40	50	50	0	10	40	45	5	30
Site 8	24_1591	25	30	1	100	30	30	30	40	20	30	25	25	30
Site 9	24_758	50	50	2	100	10	0	80	20	10	10	10	70	20
Site 10	24_1565	30	20	1	100	30	0	100	0	20	10	10	60	30
Site 11	24_239	15	0	1	100	60	0	100	0	0	20	20	60	70
Site 12	24_239	10	100	1.5	100	30	N/A	N/A	N/A	10	10	10	70	20
Site 13	24_784	15	50	1.5	90	10	30	70	0	20	5	20	55	10
Site 14	24_523	10	70	1	100	40	30	70	0	10	5	10	65	80
Site 15	24_766	30	70	0.4	100	10	0	100	0	0	0	0	100	10
Site 16	24_766	15	5	0.35	100	30	N/A	N/A	N/A	0	0	0	100	10
Site 17	24_1586	15	0	2	90	80	N/A	N/A	N/A	0	0	0	100	90
Site 18	24_952	10	0	2	100	80	N/A	N/A	N/A	0	0	0	100	90
Site 19	24_952	15	0	0.5	100	80	N/A	N/A	N/A	0	0	0	100	90
Site 20	24_767	15	0	1.8	100	90	N/A	N/A	N/A	0	0	0	100	90
Site 21	24_31	20	20	0.6	90	50	N/A	N/A	N/A	0	0	0	100	50
Site 22	24_31	25	100	0.3	100	50	N/A	N/A	N/A	0	0	0	100	50
Site 23	24_1589	15	0	1	80	90	10	90	0	10	40	40	10	80
Site 24	24_1119	15	0	0.5	80	80	30	70	0	20	40	30	10	80
Site 25	24_761	25	30	2	80	70	N/A	N/A	N/A	0	0	0	100	60
Site 26	24_763	30	60	1.5	90	10	N/A	N/A	N/A	0	0	0	100	50
Site 27	24_763	50	80	1	100	40	N/A	N/A	N/A	0	0	0	100	60
Site 28	24_507	25	10	0.5	100	80	N/A	N/A	N/A	5	0	0	95	70
Site 29	24_1071	30	30	1	90	50	N/A	N/A	N/A	10	0	0	90	40
Site 30	24_1541	30	100	30	100	30	N/A	N/A	N/A	0	0	0	100	20

**Table 4** Results of the River Corridor Survey (RHS) at the 30 aquatic survey sites in the Drumcamoge sub-catchment.

Site	Segment code	Drained (Y/N)	Wetted width (m)	Gradient (Low/Med/High)	Siltation (Heavy/Moderate/Normal/Ere)	Filamentous algae (Y/N)	Eroding banks (Y/N)	Braided channel (Y/N)	Artificial features (Y/N)
Site 1	24_787	Y	4	Low	Moderate	Y	N	N	N
Site 2	24_787	Y	4	Med	Moderate	Y	N	N	Y
Site 3	24_787	Y	3.5	Med	Moderate	Y	N	N	N
Site 4	24_788	Y	4	Low	Moderate	Y	N	N	N
Site 5	24_768	Y	3	Low	Moderate	Y	N	N	N
Site 6	24_1591	Y	3	Med	Moderate	Y	N	N	N
Site 7	24_1591	Y	3.5	Med	Moderate	Y	Y	N	Y
Site 8	24_1591	Y	4	Med	Moderate	Y	N	N	N
Site 9	24_758	Y	3.5	Low	Moderate	Y	N	N	N
Site 10	24_1565	Y	2	Low	Heavy	Y	N	N	N
Site 11	24_239	Y	1	Low	Heavy	Y	N	N	N
Site 12	24_239	Y	0.4	Low	Heavy	N	N	N	N
Site 13	24_784	Y	0.6	Low	Moderate	N	Y	N	N
Site 14	24_523	Y	0.35	Low	Moderate	N	N	N	N
Site 15	24_766	Y	1.5	Low	Heavy	Y	N	N	N
Site 16	24_766	Y	1	Low	Normal	N	N	N	N
Site 17	24_1586	Y	0.6	Low	Moderate	N	N	N	Y
Site 18	24_952	Y	0.4	Low	Moderate	N	N	N	N
Site 19	24_952	Y	2	Low	Moderate	N	N	N	N
Site 20	24_767	Y	0.8	Low	Moderate	N	N	N	N
Site 21	24_31	Y	0.4	Low	Moderate	N	Y	N	N
Site 22	24_31	Y	0.4	Low	Moderate	N	N	N	N
Site 23	24_1589	Y	0.35	Low	Moderate	N	Y	N	N
Site 24	24_1119	Y	1	Low	Moderate	Y	Y	N	N
Site 25	24_761	Y	1.5	Low	Moderate	Y	Y	N	Y
Site 26	24_763	Y	1.3	Low	Moderate	N	Y	N	N
Site 27	24_763	Y	1.5	Low	Moderate	N	N	N	N
Site 28	24_507	Y	1.3	Low	Moderate	N	N	N	N
Site 29	24_1071	Y	1	Low	Heavy	N	Y	N	N
Site 30	24_1541	Y	2	Low	Heavy	N	N	Y	N

**Table 5** Results of the aquatic species habitat assessments at the 30 aquatic survey sites. (HRI = 1=Unsuitable, 2=Poor, 3=Satisfactory, 4=Good and 5=Excellent.)

Site	Segment code	Salmonid Spawning Habitat (HRI)	Salmonid Nursery Habitat (HRI)	Lamprey Spawning Habitat (P/A)	Lamprey Nursery Habitat (P/A)	Coarse Fish habitat (P/A)	Crayfish Habitat (P/A)	Anodonta Habitat (P/A)	Floating River Vegetation (P/A)
Site 1	24_787	2	2	P	P	P	P	P	A
Site 2	24_787	4	4	P	P	P	P	A	A
Site 3	24_787	2	2	P	P	P	P	P	A
Site 4	24_788	1	2	P	P	P	P	P	A
Site 5	24_768	2	2	P	P	P	P	P	A
Site 6	24_1591	4	3	P	P	P	P	A	A
Site 7	24_1591	4	4	P	A	P	P	A	A
Site 8	24_1591	3	3	P	P	P	P	A	A
Site 9	24_758	1	2	A	P	P	P	P	A
Site 10	24_1565	2	2	P	P	P	P	A	A
Site 11	24_239	1	1	A	A	A	A	A	A
Site 12	24_239	1	1	A	A	A	A	A	A
Site 13	24_784	1-2	1-2	P	P	P	A	A	A
Site 14	24_523	1-2	1-2	A	A	A	A	A	A
Site 15	24_766	1	1	A	A	A	A	A	A
Site 16	24_766	3	3	P	P	P	P	A	A
Site 17	24_1586	1	1	A	A	A	A	A	A
Site 18	24_952	1	1	A	A	A	A	A	A
Site 19	24_952	1	1	A	A	A	A	A	A
Site 20	24_767	1	1	A	A	A	A	A	A
Site 21	24_31	1	1	A	A	A	A	A	A
Site 22	24_31	1	1	A	A	A	A	A	A
Site 23	24_1589	1	1	A	A	A	A	A	A
Site 24	24_1119	2	2	P	P	P	P	A	A
Site 25	24_761	1	1	A	A	P	A	A	A
Site 26	24_763	1	1	A	A	P	A	A	A
Site 27	24_763	1	1	A	A	A	A	A	A
Site 28	24_507	1	1	A	A	A	A	A	A
Site 29	24_1071	1	1	A	A	A	A	A	A
Site 30	24_1541	1	1	A	A	A	A	A	A

**Table 6** Estimated WFD status at the 30 aquatic survey sites in the Drumcamoge sub-catchment.

Site	Segment code	Morphological status ( <u>H</u> igh/ <u>G</u> ood/ <u>M</u> oderate/ <u>P</u> oor/ <u>B</u> ad)	Biological status ( <u>H</u> igh/ <u>G</u> ood/ <u>M</u> oderate/ <u>P</u> oor/ <u>B</u> ad)	Fisheries status ( <u>H</u> igh/ <u>G</u> ood/ <u>M</u> oderate/ <u>P</u> oor/ <u>B</u> ad)
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Site	Segment code	Morphological status ( <u>H</u> igh/ <u>G</u> ood/ <u>M</u> oderate/ <u>P</u> oor/ <u>B</u> ad)	Biological status ( <u>H</u> igh/ <u>G</u> ood/ <u>M</u> oderate/ <u>P</u> oor/ <u>B</u> ad)	Fisheries status ( <u>H</u> igh/ <u>G</u> ood/ <u>M</u> oderate/ <u>P</u> oor/ <u>B</u> ad)
Site 1	24_787	Poor	Moderate	Moderate
Site 2	24_787	Good	Moderate	Moderate
Site 3	24_787	Poor	Moderate	Moderate
Site 4	24_788	Good	Moderate	Moderate
Site 5	24_768	Moderate	Moderate	Moderate
Site 6	24_1591	Moderate	Moderate	Moderate
Site 7	24_1591	Moderate	Moderate	Moderate
Site 8	24_1591	Moderate	Moderate	Moderate
Site 9	24_758	Poor	Moderate	Moderate
Site 10	24_1565	Poor	Moderate	Moderate
Site 11	24_239	Poor	Poor	Poor
Site 12	24_239	Poor	Poor	Poor
Site 13	24_784	Poor	Poor	Poor
Site 14	24_523	Poor	Poor	Poor
Site 15	24_766	Poor	Poor	Poor
Site 16	24_766	Moderate	Good	Poor
Site 17	24_1586	Poor	Poor	Poor
Site 18	24_952	Poor	Poor	Poor
Site 19	24_952	Poor	Poor	Poor
Site 20	24_767	Poor	Poor	Poor
Site 21	24_31	Poor	Poor	Poor
Site 22	24_31	Poor	Poor	Poor
Site 23	24_1589	Poor	Poor	Poor
Site 24	24_1119	Poor	Poor	Poor
Site 25	24_761	Poor	Poor	Poor
Site 26	24_763	Poor	Poor	Poor
Site 27	24_763	Poor	Poor	Poor
Site 28	24_507	Poor	Poor	Poor
Site 29	24_1071	Poor	Poor	Poor
Site 30	24_1541	Poor	Poor	Poor

## 4.0 DISCUSSION AND RECOMMENATIONS

The survey completed here provides an overview of aquatic habitats and hydromorphology of the Drumcamoge sub-catchment. This is a modified catchment that has been impacted by drainage works in the past and all the channels visited had been dredged and/or channelised in the past. The gradient in the catchment is also relatively low and there were no high gradient channels present. There are no high-quality salmonid channels in the sub-catchment.

The best salmonid channel is the section from Site 2 to Site 8. This stretch of river is approximately 7km long. This area of the river has extensive areas of habitat which are physically suitable for production of Atlantic salmon and brown trout. Extensive areas of suitable lamprey habitats also occur – however due to the weirs in the lower reaches of the River Maigue only non-migratory Brook Lampreys *Lampetra planeri* are likely to occur. The stretch has ideal potential habitat for crayfish, and otters are likely to use this stretch. This physical habitat along this 7km stretch is reasonable only – this is not optimal habitat (see Table 5).

The stretch of the River Drumcamoge downstream of Site 1 is deep and sluggish but this is the least modified stretch and has a well-developed riparian zone. The upper reaches of the river and the tributaries are however all very modified and degraded.

Although most of the channels are modified, water quality seems to be the key issue in this catchment with visual evidence of siltation and eutrophication recorded at almost every site visited. The predominant land use in the catchment is agriculture, but there is also some forestry. There is also a significant density of one-off houses in the catchment and there are two municipal wastewater treatment plants (WWTPs). It is likely that agriculture is the main source of water pollution in this sub-catchment – but the role of sewage inputs should be investigated.

There is no recent water quality monitoring data from this catchment with the last EPA surveys completed in the catchment in 1988 and no entries in the EPA files for the WWTPs since 2011.

Some recommendations: -

- Habitat surveys are just one part of the assessment of a river catchment. It would be important to undertake water quality surveys and fish/aquatic ecological surveys also. A short list of sites from the current survey could be used going forward to monitor recovery in this sub-catchment. Suggested sites for long-term monitoring would be Sites 2, 4, 6, 8, 16, 27 and 23.
- It would be interesting to see if salmon are still present in this catchment (likely) – and a juvenile salmonid survey of this sub-catchment could be completed in 2 days.
- There is reasonably good physical habitat along around 7km of the River Drumcomoge main channel. However, this area appears to be affected by unsatisfactory water quality. The priority here should be to restore good water quality and this needs to come before any physical habitat enhancements.
- There are no Annual Environmental Reports (AERs) in the EPA files for the Knocklong and Emly. The last entries in the WWDA file are from 2011. Irish Water should be asked to provide updated information on the performance and monitoring of these plants. Monthly

chemical and biological monitoring are required upstream and downstream of these discharges and waste assimilation capacity assessments needs to be completed.

- The EPA should be asked to include at least one (and ideally two) Biological Monitoring Sites in this sub-catchment in their roll-over national survey. The last time that this sub-catchment was surveyed was in 1988.
- Information should be provided to farmers also regarding protecting water quality. Diffuse agricultural pollution is evidently a major issue in this sub-catchment.

## 5.0 REFERENCES

Barbour, M.T. and Stribling, J.B. (1991) Use of Habitat Assessment in Evaluating the Biological Integrity of Stream Communities. In: Methods in Stream Ecology (Eds. Hauer, F.R. and Lamberti, G.A. Academic Press.

EA (2003) River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual. River Habitat Survey Manual: 2003 version, Environment Agency, Peterborough.

Fossitt, J. (2000) *A guide to habitats in Ireland*. The Heritage Council, Kilkenny.

Lucey, J. (1995) The distribution of *Anodonta cygnea* (L.) and *Anodonta Anatina* (L.) in Southern Irish rivers and streams with records from other areas. The Irish Naturalist' Journal. 25, 1, 1-8.

McGinnity, P., Gargan, P., Roche, W., Mills, P. and McGarrigle, M., (2003) Quantification of the freshwater salmon habitat asset in Ireland. Irish Freshwater Fisheries Ecology and Management Series No. 3, Central Fisheries Board, Dublin, Ireland.

Maitland PS (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

## PLATES



**Plate 1** Site 1 is located downstream of Knockainey and is the lowest survey site on the main channel of the Drumcomoge River.



**Plate 2** Site 2 on the main Drumcomoge River channel.





**Plate 3** Channelised Drumcomoge channel at Site 3.



**Plate 4** Site 4 on the main Drumcomoge channel.





**Plate 5** Site 5 on the main Drumcomoge channel.



**Plate 6** Site 6 on the main Drumcomoge River channel.





**Plate 7** Site 7 on the main channel of the Drumcomoge, downstream of Knocklong.



**Plate 8** The Drumcomoge River runs alongside the R513 road just upstream of the road crossing at Site 7.





**Plate 9** the Drumcomoge main channel at Site 8.



**Plate 10** Site 8 on the Drumcomoge River (alternative view).



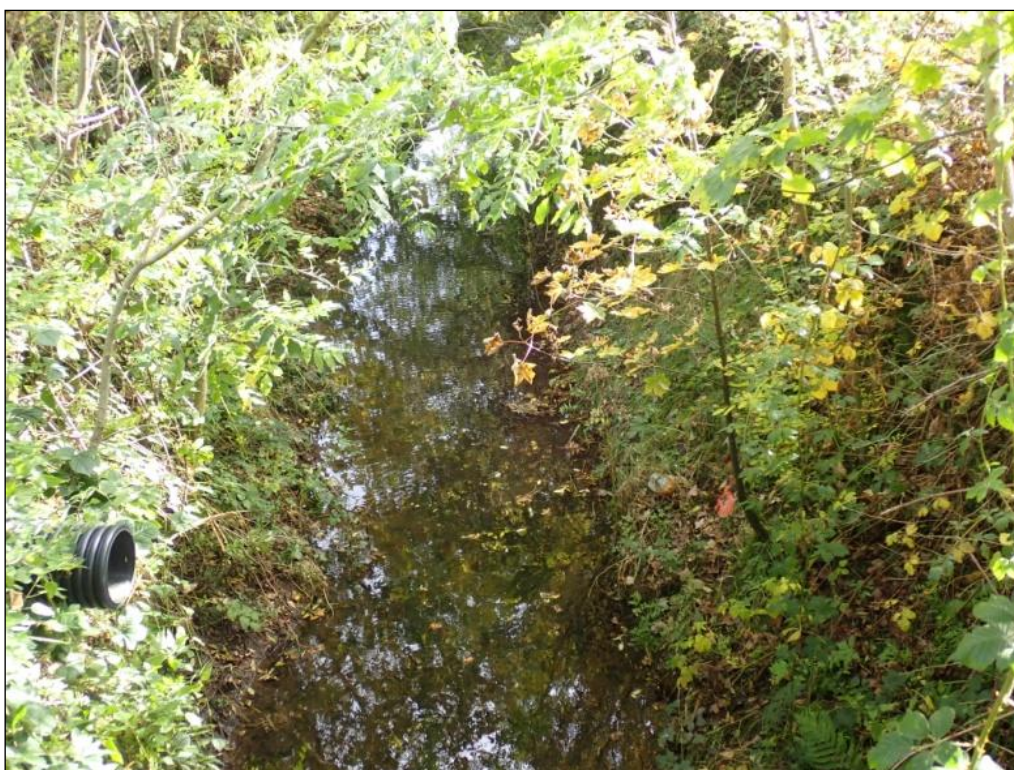


**Plate 11** Site 9 on the main Drumcomoge River channel.



**Plate 12** Site 10 of the main Drumcomoge.





**Plate 13** Site 11 on the Drumcomoge River.



**Plate 14** Little/no flow at Site 12 near the source on the main Drumcomoge River.





**Plate 15** Site 13 on the Rathanny 24 Tributary.



**Plate 16** The watercourse of the Knocklong Tributary at Site 14 is hidden by heavy overgrowth of overhanging vegetation.





**Plate 17** Watercourse at Site 14 on the Knocklong Tributary is hidden by heavy growth of briars.



**Plate 18** Watercourse is heavily encroached with instream vegetation at Site 15 on an unnamed tributary of the Drumcomoge.





**Plate 19** Site 16 is located upstream of Site 15 on the same unnamed tributary of the Drumcomoge River.



**Plate 20** Site 17 on the Kilfrush Sub-tributary of an unnamed tributary in the Drumcomoge catchment.





**Plate 21** Site 18 on an unnamed watercourse.



**Plate 22** Site 19, upstream of Site 18.





**Plate 23** The Knocklong\_West tributary is hidden with hedgerow at the perimeter of residential property at Site 20.



**Plate 24** River flows through agricultural farmlands and algal blooms are present at Site 21 on the Lackelly East Sub-tributary.



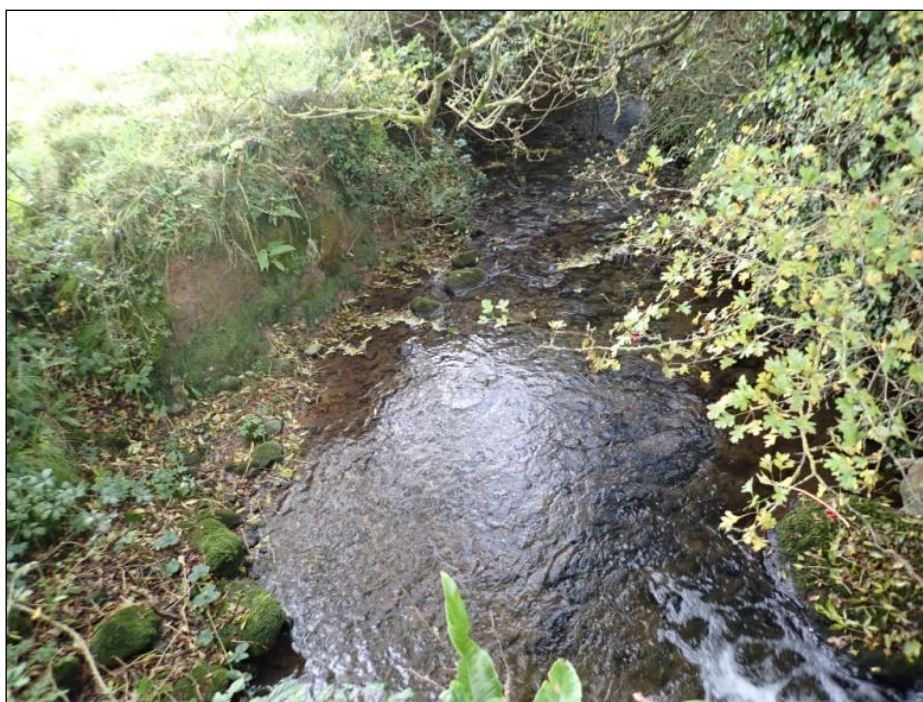


**Plate 25** Heavy vegetation overgrowth encroaching on the watercourse at Site 22, upstream of Site 21 on the Lackelly East Stream.



**Plate 26** The West Ballyholohan Stream is surrounded by heavy overhanging vegetation at Site 23.





**Plate 27** Site 24 upstream of Site 23 on the West Ballyholohan Sub-tributary.



**Plate 28** Heavy vegetation mass covering the watercourse at Site 25 on the Eml 24 Tributary.





**Plate 29** Livestock river access to the Emly 24 watercourse at Site 25.



**Plate 30** Emly Wastewater Treatment Facility which discharges into the Emly 24 near Site 26.





**Plate 31** Site 26 on the Emly 24Stream.



**Plate 32** Water silted in the Emly 24 Tributary at Site 27 and encroached by vegetation from the banks.





**Plate 33** Site 28 on the Farran 24 Stream, a sub-tributary of the Lissobihane Stream.



**Plate 34** Livestock river access at Site 29 on the Lissobihane Stream.





**Plate 35** Thick mass of vegetation smothers watercourse at Site 30 in the upper reaches of the Emly 24 Stream.



**Plate 36** Wild Fallow Deer buck seen during the surveys, October 2019.

