

# **CATCHMENT MANAGEMENT PLAN**

**for**

**TULLAGHOBEGLY AND RAY FISHERY  
2018 to 2021**



**Cloughaneely Angling Association  
in collaboration with  
Inland Fisheries Ireland**



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## ACKNOWLEDGEMENTS

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Cloughaneely Angling Association (CAA) has prepared this Catchment Management Plan substantially through its own resources and by drawing on the expertise and knowledge of its members, in particular past and present members of the CAA Committee, especially Dr Tony McNally, McNally Environmental Ltd.

CAA gratefully acknowledge the support and assistance of the IFI, Donegal County Council and the Local Authority Water and Communities Office who provided information and data, and financial support towards publication of this document.

The views expressed in this document are those of the CAA. The officers, services or agents of CAA accept no liability whatsoever for any loss or damage arising from the interpretation or use of the information, or reliance on views contained herein. This document does not purport to represent policy of any government.

**Cloughaneely Angling Association Committee**

### *A Word from Cloughaneely Angling Association*

*Cloughaneely, with its dramatic landscapes, pristine beaches and beautiful rivers and lakes provides a wonderful environment in which to live and work. It has sustained and nourished our local community for hundreds, if not thousands of years. It has given us beautiful settings for our houses, grazing and farm land for agriculture, food for our tables, tourist revenue for our businesses and rich and diverse natural surroundings in which our children can grow and learn. With all the other members of our community we want to ensure that these blessings will still be there for generations to come so that our children, and their children and grandchildren can enjoy to the full that which has been passed on to us by our forefathers.*

### *Focal ó Chumann Iascaigh Chloich Chionnaola*

*Áit ghalanta is ea Cloch Cheannfhaola le h-obriú agus le cónaí ann, lena radharcanna dramatúla, a thránna geala agus a locha agus aibhneacha áille. Chothagh sí muid leis na cianta cairbreacha. Thug sí suíomhanna breátha dúinn d'ár dtithe, talamh féaraigh agus curaíochta le bia a sholáthar, ioncam turasóireachta d'ár ngnóthaí, agus timpeallacht ilghnéitheach shaibhir a dtig lenár bpáisti fás agus forbairt inti. I dteannta le ach a'n duine sa phobal tá muid ag iarraidh go mbeidh na beannachtaí uilig seo i gcónaí ann do na glúnta atá le theacht ion's go dtiocfaidh lenár bpáistí, agus a bpáistí agus a ngarpháistí sin, sult agus tairbhe a bhaint as a bhfuil bronnta orainn ag ár n-athreacha romhainn.*

We all have a duty of care. That is what this book is about, creating a care plan for our own local environment. Our vision is for a thriving local community that uses its bountiful natural resources in a way that does not degrade or deplete them. It is only by so doing that we can have a truly sustainable future. We know that change is unavoidable and we have all witnessed significant changes in our surroundings in recent years. What we want to avoid, and in some cases may need to reverse, is change that is always in the direction of a depleted, impoverished natural environment.

Many of the childhood memories of even middle-aged residents in the parish are things of the past. Meadows that once brought such colour and sweet aroma to the landscape are rare sights. The song of the corn bunting, likened to the jangling of a bunch of keys, has disappeared since the 1990's. The curlew and the corncrake may soon follow. The many thousands of pearl mussels that covered the beds of local rivers have all but disappeared with only ageing mussels remaining in

Tá dualgas cúraim orainn uilig. Sin bunábhar an leabhair seo, plean cúraim d'ár dtimpeallacht féin a fhorbairt. 'Sé an fíís atá againn ná pobal rathúil a fhorbairt a úsáideann a acmhainní nádúrtha fairsinge ar bealach nach gnítear iad a loit ná a laghdú. Sin an t-aon bhealach amháin go dtig linn saol seasmhach sómhar a bheith againn go buan sa cheantar. Tuigeann muid nach dtig cúl a chur le h-athrú, agus is iomaí athrú suntasach atá feicthe againn le blianta beaga anuas. 'S é an dearcadh atá againn nó gur mhian linn na cineáil athruithe atá i dtólamh ag dul i dtreo timpeallachta bánaithe millte a sheachaint, agus b'fhéidir a leithéid d'athrú a leigheas má's gá.

Is trua tá go bhfuil go leor de chuimhní cinn an tsean tsaoil cailte fiú ar bhunadh meán-aosta an pharóiste. Gann go leor anois atá na pairceanna ildaite chumhra a bhí coiteann sa cheantar. Tá ceol na gealóige buachair, a chuireadh fuaim gnag eochracha I gcuimhne duit, imithe ó na nóchaidí i leith. Seans go bhfuil an crotach agus an traonach lena leanstan go luath. Bhí na mílte sliogán dhubha sna haibhneacha áitiúla in am amháin ach níl fágtha anois ach corr-cheann aosta fánach. Bhéadh seal fada le caitheamh ag

small numbers. Any hopeful watcher at the falls would now have to spend considerable time before witnessing the heroic leap of the salmon.

These changes do not have to be. We can make room for nature in our world and ensure that our activities cause no long term damage. In fact many farmers, landowners and residents are already doing so by preserving hedgerows, managing meadows for wildlife and providing boxes for birds and bats.

In this book we do a 'health check' of the Tullaghobegly and Ray Rivers, and the land and lakes that they drain. With other residents and workers in the Parish we try to identify our vision for the future and the things we are doing that might be causing problems. Finally, we make some suggestions as to what we can do to retain an environment of the highest quality in our home area and to improve matters where necessary.

an té a bhéadh ag coimhéd an easa le léim ghaisciúil an bhradáin a fheiceáil san am l láthair.

Ní gá go dtarlódh na h-athruithe seo. Thig linn spás a fhágail don nádúr i ndomhan an lae inniu agus a chinntiú nach ngnímid aon dochar buan. Leoga tá feirmeoraí, úinéirí talún agus go leor de mhuintir na h-áite ag déanamh amhlaidh cheana féin agus fála sceach á gcaomhnú acu, páirceanna fá choinne fiadhúra a gcur, agus boscaí fáire a gcrochadh fá choinne éanacha agus sciatháin leathair.

'Scrúdú sláinte' ar Aibhneacha Thullacha Bheigile agus Ráithe, agus na tailte agus na lochanna a dhraenálann siad, atá sa leabhar seo. I gcuideachta le bunadh agus lucht oibre an pharóiste tá muid ag iarraidh ár bhfís féin a chruthú don todhchaí agus na rudaí a obríonn in éadan na timpeallachta a aithint. Cuireann muid moltaí ar aghaidh maidir le rudaí a thig a dhéanamh le timpeallacht den chaighdeán is airde a choinneáil inár gceantar féin agus le rudaí a bhisiú má's gá.

We do not have all the answers and we welcome your input or comments on any aspect of this work. We hope to have continuing dialogue with all of our neighbours as we go about achieving the aims of this plan. You can contact us at

Níl na freagraí uilig againne agus cuireann muid fáilte roimh mholtaí agus tuairimí uaitse ar ghné ar bith den saothar seo. Tá súil againn tuile comhrá a bheith againn lenár gcomharsana go léir agus muid ag dul i mbun oibre ar an phlean seo. Thig leatsa teagmháil linn ag

[caamanagementplan@gmail.com](mailto:caamanagementplan@gmail.com)

or write to us at

nó scríobh ag

**CAA Catchment Management Plan**

**C/O Iain MacLean**

**Baile na Bó**

**An Fál Carrach**

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Chairman, Cloughaneely Angling Association.

Cathaoirleach, Cumann Iascaigh Chloich Chionnaola.

## Inland Fisheries Ireland

Inland Fisheries Ireland (IFI) is the agency responsible for the conservation, management, development and improvement of our inland fisheries and sea angling resources. IFI works closely with many other agencies and stakeholders in pursuing this mission. The support and collaboration of angling associations is vital to success.

In February 2009 the Northern Regional Fisheries Board, now Inland Fisheries Ireland, entered into a formal agreement with Cloughaneely Angling Association (CAA) for the management of the Ray and Tullaghobegly Fishery. This agreement puts the long standing and productive relationship between IFI and CAA in jointly caring for the Ray and Tullaghobegly catchments on an official footing. In accordance with the principles of 'Catchment Management' it sets clear objectives in terms of the protection, improvement and management of the fishery. In so doing it seeks to ensure that fishing will be conducted in a sustainable manner on both of these beautiful rivers.

IFI welcomes wholeheartedly the publication of this CATCHMENT MANAGEMENT PLAN for the TULLAGHOBEGLY AND RAY FISHERY 2018 to 2021. This comprehensive template for the future has been produced within the context of the 2009 Agreement and in consultation with IFI. The plan has been developed by CAA with extensive community input, drawing on local knowledge and experience to identify and offer solutions to important catchment pressures and issues. The production of this plan is a crucial step in the management of the fishery at a time when fish stocks are falling to critically low levels. Turning the tide of decline and ensuring that this rich Cloughaneely legacy is preserved for future generations cannot be achieved without the support of the local community. IFI is delighted that CAA has facilitated such an initiative.

IFI supports and commends the aims of this plan to manage and conserve the valuable natural resources in the Tullaghobegly and Ray catchments and in so doing to generate a positive return for the community, the local economy and the environment of Cloughaneely.

*Dr Milton Matthews*

IFI Ballyshannon

## EXECUTIVE SUMMARY

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Cloughaneely Angling Association (CAA) was founded in 1940. In common with the position nationally, the quality of angling on the Association's waters has substantially declined due to a combination of factors. In February 2009 CAA entered into a formal agreement with the Northern Regional Fisheries Board, now Inland Fisheries Ireland (IFI) for the management of the Ray and Tullaghobegly Fishery. In the context of this agreement, CAA has prepared a Strategic Plan 2017 - 2020 for management of the catchment. This present document is a Catchment Management Plan (CMP) setting out actions to support the strategic aims, and is effectively an operational plan for the Tullaghobegly and Ray catchments for the period 2018 to 2021. While the CMP is concerned with fisheries issues, these cannot be dissociated from the many other environmental and social issues relevant to, and influenced by catchment management in general. CAA has therefore consulted with other members of the Cloughaneely community to ensure that the plan is realistic, robust and implementable. Consultation will continue during plan implementation. We believe that implementation of this plan will bring numerous environmental and socio-economic benefits to Cloughaneely and will contribute to a truly sustainable future for the local community.

The characteristics of the Tullaghobegly and Ray catchments and relevant adjacent areas are described. This is essential to understanding their present status and the processes that influence environmental quality. The information gathered in this characterisation process allows us to set objectives and guides our selection of appropriate measures to prevent damaging effects on the fishery and its water resources. It also determines where these measures should be applied.

The general location and landscape of the fishery is described. Underlying geology consists of quartzites in the south and largely mudstones (pelites) to the north. Much of the higher catchment areas are covered by blanket bog while poorly draining tills dominate in lower areas. This determines many catchment activities and features including population distribution and agricultural activity, both of which are largely confined to the lowland areas although extensive commonage areas exist in the uplands.

A detailed description of the Tullaghobegly and Ray rivers and the 14 lakes in their catchments is provided. Given the geology of the region, waters are soft and generally slightly acidic. River flows are examined in some detail using flow duration curves. These reveal the 'flashy' nature of our rivers and the impact that water abstraction has had on the upper Tullaghobegly.

Water quality status as determined by the Environmental Protection Agency (EPA) is described. The basis for assigning status and some limitations of the assessment are identified. The Tullaghobegly and Ray rivers have been divided into 5 discrete water bodies for the purpose of monitoring and assessment, and one of them (the upper Tullaghobegly catchment) is at poor status. Only 4 lakes in the fishery area have been identified for future assessment by the EPA (currently none of them have been assigned status). Two coastal water bodies, one of which is at high status and the other unassigned, form the marine boundary of the catchments. A single groundwater body at good status underlies the area.

Several protected areas are present in the catchment. Lough Agher and Lough Altan are listed as drinking water sources, while two excellent designated bathing areas form the coastal fringe. Nine Natura European sites occur in, or adjacent to the fishery. Their qualifying interests (species and habitats) and risks to site integrity are tabulated. Most of the qualifying interests are dependent on water for their conservation to a significant degree. A significant population of the rare and legally protected Freshwater Pearl Mussel lives in the Tullaghobegly river.

The declining status of salmon and trout stocks in the Ray and Tullaghobegly is reviewed in the context of conservation limits, while diary records from the 1950's provide a snapshot of catch records previously enjoyed in the Ray. Issues relating to fish stock assessment are discussed, and the particular threat to wild stock presented by non-native farmed salmon and invasive species are considered.

A vital part of developing this catchment management plan is to understand the pressures impacting on water status so that measures can be identified and implemented to manage those pressures. The various risks to water bodies are reviewed and their relevance considered at the local catchment scale based on engagement with stakeholders. We have identified what we believe to be the environmental pressures adversely affecting water quality in the Ray and Tullaghobegly catchments that are most relevant to this plan. The list is not exhaustive, and other known pressures may not be included because effective measures to address them are already in place, or because they are not considered the most pressing in our catchments. Individual significant pressures are reviewed and a series of actions is identified to address each. These actions are collated here and arranged thematically.

## PRESSURES ARISING FROM WASTE WATER AND SEDIMENT LOSSES

### **BANK PROTECTION/RESTORATION MEASURES**

1. Irish Water to implement mitigation immediately to prevent impact on Ballyness SAC and ensure compliance with Urban Waste Water Treatment Directive
2. IFI to assist CAA in the identification of suitable bank protection and fisheries habitat enhancement actions including bank stabilisation and revetment measures where appropriate
3. Information provision by CAA to land owners re bank protection
4. CAA to seek landowner agreement for all proposed bank protection actions
5. CAA database of damaged and vulnerable banks
6. CAA mapping of sites for riparian vegetation establishment
7. CAA and IFI liaison to secure resources for essential works

### **LAND DRAINAGE MEASURES**

8. CAA to liaise with relevant authorities to source appropriate guidance on drainage design and management, and serve out to landowners/contractors
9. CAA to map land drainage features with potential for significant impact
10. CAA to forward data on drainage features for action as required
11. CAA to facilitate landowner discussions for agreement of all proposed actions
12. CAA to propose a Geographical Information System (GIS) based risk assessment of surface water drainage

## PRESSURES DUE TO INDUSTRIAL EMISSIONS

### INDUSTRIAL/WASTE DISCHARGES MEASURES

13. IFI to assess status of the Owenwee river as a nursery stream
14. Donegal County Council to review Section 4 Licenses in the catchment area with regard to parameters, emission limits, nature and frequency of monitoring
15. Annual Environmental Reports to be a requirement for Licensees
16. DCC to review monitoring frequency of Muckish Landfill site

## FISH STOCK MANAGEMENT ISSUES

### FISH STOCK MEASURES

17. CAA to liaise with IFI in an ethos of partnership to implement fish stock management measures
18. IFI to establish a baseline for future comparison when assessing salmon stocks
19. IFI to assess MSW stock in the catchments when available resources allow
20. CAA and IFI to liaise in prioritising critical streams for habitat assessment and possible restoration
21. IFI to consider measures for stock enhancement
22. CAA to assess the potential for development of sea trout and brown trout fisheries
23. IFI to review biosecurity measures to prevent disease spread and transgenetics
24. CAA to be consulted at early stages of catchment development planning or programmes
25. IFI to implement measures to prevent prohibited habitat manipulations
26. IFI to conduct barriers assessment surveys of both Ray and Tullaghobegley Rivers as part of national IFI barriers programme
27. IFI will continue to liaise closely with CAA with regard to local reports of suspected poaching or other illegal fishing activity with a view to maximising protection of valuable spawning stocks
28. IFI to support an assessment of predation pressures

## INVASIVE SPECIES PRESSURES

### INVASIVE ALIEN SPECIES MEASURES

28. CAA to prepare a proposal for invasive plant species mapping and pilot control project in the Ray and Tullaghobegly catchments
29. CAA with the support of IFI to seek funding for implementation of IAS pilot control project
30. CAA to raise awareness of IAS by providing identification aids and training to catchment stakeholders
31. CAA to submit IAS records to the National Biodiversity Data Centre

CAA in liaison with its IFI partners will now prioritize the proposed actions to be brought forward and will establish working groups to manage the various action programmes and develop Work Programmes. CAA will seek establishment of a Catchment Forum to facilitate review of progress, discussion of emerging issues, assessment of implementation and performance, and information trading. In the longer term, CAA advocates the establishment of a Rivers Trust for the Ballyness Bay area.

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## 1 WHY DO WE NEED A PLAN

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As anglers our ultimate aim is to have thriving fish stocks in our fishery, not just for our benefit but for generations of anglers (and non-anglers) to come. However, healthy fish stocks are only one part of a complex web of interactions between many different elements. Fish rely on good water quality, on clean river bed gravels and on sufficient food sources (in the river or at sea). They need to be able to get to spawning grounds without barriers to their migration, and to survive in rivers long enough to complete spawning and secure the next generation of fish. Looking after any fishery means safeguarding all the essential links and interactions that together ensure a healthy fish population, and this means we must take a catchment management approach.

Catchment management has traditionally used a 'top-down' approach, a 'command and control' ethos where regulators dictate standards and actions and implement legislative provisions to achieve ends. Such an approach can only achieve so much before running into the sands of micro-managing the many small issues that impact on environmental quality, in particular on water quality. While some gains have been made in restoring water quality and preventing further pollution of waters, these are not sufficient to meet Ireland's legal commitments, and more importantly, they are not sufficient to preserve our rich water heritage for the benefit of us, the people. Regulators are coming to this realisation and are now promoting a complementary 'bottom-up' approach to catchment management where all the people and organisations with an interest in a catchment are encouraged to engage in a process of stakeholder led initiatives to address catchment problems.

Looking after even relatively small catchments such as the Ray and Tullaghobegly is a complex undertaking. We need to understand the catchment and how it works before we can manage it. Many different individuals, groups and agencies have a role to play in this. Each brings their own understanding and information to the table and no one group has all the answers. We want to capture a vision in common with all who live and work in the Ray and Tullaghobegly catchments outlining objectives for our catchments in the future, and to pull together the available information and experience so that we can identify actions to achieve that vision. This will form our plan.

Cloughaneely Angling Association (CAA) was established in the 1940's. The stated aims of the founders were to maintain and stock the Ray and Tulloughabegley rivers, to improve access for anglers and to combat poaching. In the ensuing years since its foundation the Association has worked closely with a range of statutory bodies, in particular the Northern Regional Fisheries Board, now Inland Fisheries Ireland (IFI), and with local landowners to achieve its aims. The impressive range of work carried out by CAA over the years is well documented.

Inland Fisheries Ireland (IFI) has recognised the key role angling clubs play in the area of fisheries development. Indeed, the Fisheries (Amendment) Act (Ireland, 1999) makes provision to encourage, promote, organise and co-ordinate together with the inland fisheries owners, bodies and organisations for the development of inland fisheries catchment management plans. The Act also directs that a regional board shall have regard to the particular role and contribution of angling clubs and associations in the sustainable management and development of fisheries. The National Strategy for Angling Development 2015-2020 (IFI, 2015), a comprehensive national framework for the development of our angling resource, continues to promote the partnership and collaborative approach between relevant state agencies and angling associations *inter alia* to bring parties closer together in the planning and decision making process.

In February 2009 CAA entered into a formal agreement with the Northern Regional Fisheries Board (now IFI) for the management of the Ray and Tullaghobegly<sup>1</sup> Fishery (Figure 1.1). With the signing of this Management Agreement, the role of the Association entered a new and important phase. In common with the position nationally, the quality of angling on the Association's waters has substantially declined due to a combination of factors, many of which are discussed below. The Agreement provides an important basis for the Association and IFI to work closely and systematically in pursuit of our shared objectives and for the benefit of all.

Another important factor for progress has been the implementation of the EU Water Framework Directive through objectives and measures set out in the River Basin Management Plan (RBMP) for Ireland (2018 - 2021) (Department of Housing, Planning, Community and Local Government, 2017). The Environmental Protection Agency (EPA) and Department of Housing, Planning, Community and Local Government (DHPLG) acknowledge that the River Basin Management Planning process to date has not delivered as required. As a result there is a new focus on the role of local people in securing a truly sustainable future for our water resources. New structures have been put in place in water governance in Ireland, including an EPA Catchments Unit and Local Authority Waters and Community Offices, to facilitate and support active participation by local people.

It is the Association's policy to work closely with other interested parties to achieve our vision for the fishery in an ethos of integrated catchment management. Integrated Catchment Management is a process that recognises a catchment as the appropriate organising unit for understanding and managing ecosystem processes in a context that includes social, economic and political

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<sup>1</sup> Several spellings for the Tullaghobegly are in common usage. We have adopted the spelling used in the Water Framework Directive River Basin Management Plan for the remainder of this document

considerations, and guides communities towards an agreed vision of sustainable land and water resource management for their catchment.

CAA has prepared a Strategic Plan 2017 - 2020 (Appendix 1) in the context of Paragraph 2 of the Management Agreement, which requires the Association to draw up and agree with IFI annual or multi-annual plans for the management of the fishery. The plan sets out the overall aims and strategic objectives of the Association. These are

1. To restore and upgrade the Ray river as a premier angling facility with a sustainable surplus of salmonid species
2. To restore and upgrade the Tullaghobegly river as a premier angling facility with a sustainable surplus of salmonid species. To enhance and protect this riverine environment with particular emphasis on the conservation interests of its existing freshwater pearl mussel population
3. To develop loughs in the catchment area as quality angling locations
4. To incorporate and manage estuarine angling as an integral element of the fishery
5. To establish a Rivers Trust, representative of all parties with an interest in promoting a healthy environment within the catchment.

Actions required to achieve the strategic objectives are also listed and it is envisaged that the Strategic Plan is to be supported by Operational Plans as appropriate and detailed Work Programmes.

This Catchment Management Plan (CMP) is effectively an operational plan for the Tullaghobegly and Ray catchments. It supports the overall aims of protecting and restoring sustainable salmonid populations and developing to the fullest extent possible the angling potential of the waters in the Association's catchment area. The key purpose of the CMP is to identify the main issues for angling development in the catchments, and to set out a prioritised programme to protect, improve, develop and then maintain the fishery as a unit. The CMP will be implemented through development of detailed works programmes that provide method statements for individual work packages.

While the CMP is concerned with fisheries issues, these cannot be dissociated from the many other environmental and social issues relevant to, and influenced by catchment management in general. Development of this CMP has therefore involved consultation with the wider community to ensure that it is realistic, robust and implementable. Consultation will continue during implementation of the CMP. As a result, we believe that implementation of this plan will bring numerous environmental and socio-economic benefits to the Cloughaneely community and will assist in achieving the vision of sustainable land and water resource management for the Ray and Tullaghobegly catchments.

This CMP is intended to guide work package development and will cover the period to 2021 when it will be reviewed.

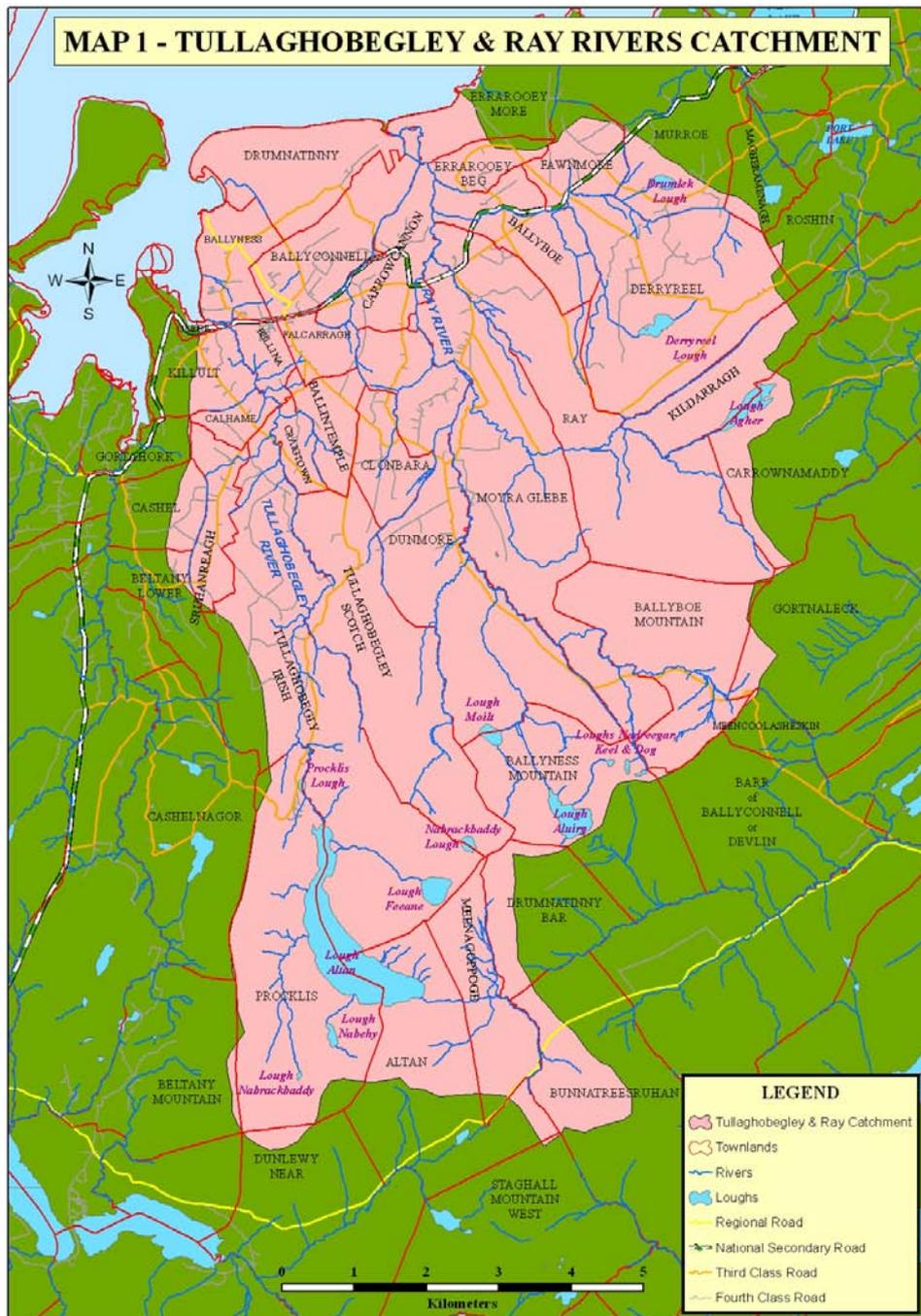


Figure 1.1 Extent of CAA Fishery - Tullaghobegly and Ray Catchments

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## 2 CATCHMENT OVERVIEW

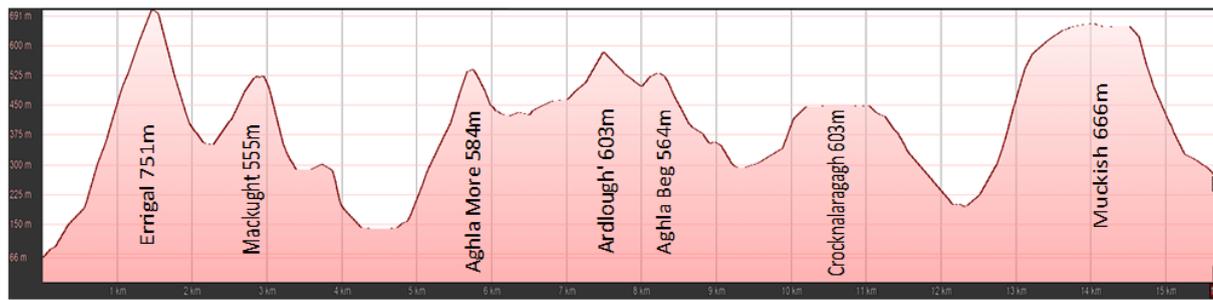
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The following sections provide an overview of the Tullaghobegly and Ray catchments and relevant adjacent areas. They are intended to describe or characterise the fishery and to allow an understanding of the present status and processes relating to important catchment attributes that influence environmental quality. Such characterisation is an essential first step in recognizing **pressure sources** within the fishery and in identifying the **receptors** (the rivers, streams and lakes, and the animals and plants that depend on them) on which those pressures may impact. This allows us to understand the **pathways** that connect the pressure sources to the receptors to enable an impact to occur. The information we gather in this characterisation process is the basis for our catchment planning. It allows us to set objectives and guides our selection of appropriate measures that may be used to prevent damaging effects on the fishery and its water resources. It also determines where these measures should be implemented.

### 2.1 Landscape of the Fishery Area

The Ray and Tullaghobegly river catchments lie side by side in northwest Donegal in Hydrometric Area 38. In Water Framework Directive (WFD) classification they are both in the recently defined Tullaghobegly\_SC\_010 WFD Subcatchment, which is within the Gweebarra-Sheephaven WFD Catchment. This latter catchment includes the northwest of the county and the large area drained by streams entering Gweebarra Bay, Sheephaven Bay and between Rossan Point and Fanad Head, draining a total area of 1,450km<sup>2</sup>. The main urban centres in this catchment are Dunglow, Glenties, Falcarragh, Dunfanaghy, Creeslough and Carrowkeel. The total population of the Gweebarra-Sheephaven catchment is approximately 28,130 with a population density of 19 people per km<sup>2</sup>. This catchment is characterised by its mountainous landscape and highly indented coastline. The relief in the catchment is dominated by the long northeast-southwest trending valley running from Lettermacaward to Glen Lough that was formed during the Caledonian Orogeny, which, as its name suggests, is called after the main geological mountain building episode in Scotland that is also dominated by valleys of a similar orientation. The central area of this valley is close to the highest part of the Derryveagh Mountains and the main rivers in the catchment radiate outwards from this central area.

The Ray and Tullaghobegly river catchments are bounded to the south by the Derryveagh Mountains where the main river channels rise on the northern flanks of the Seven Sisters, a series of quartzite peaks from Errigal in the southwest of the subcatchment to Muckish in the northeast (Figure 2.1). This line of peaks is breached by the Lough Altan valley between Aghla More and Mackught and in this area the Tullaghobegly catchment extends south east to Dooish Mountain.



**Figure 2.1 Elevation profile of the Seven Sisters**

Given their proximity both our river catchments share many similar attributes. Both rivers flow northwards a distance of about 15 kilometres in roughly parallel channels and generally within 3 kilometres of one another. Over this distance both rivers drop some 300m from source to their points of discharge. The Tullaghobegly discharges into the confined waters of Ballyness Bay immediately to the west of Falcarragh and just north of the N56 national secondary road. The Ray drains across Drumnatinny beach to the open Atlantic just east of Ballyness.



**Figure 2.2 Mouth of the Ray River at Drumnatinny Beach**

Both catchments are traversed east-west by the disused Londonderry and Lough Swilly Railway (L&LSR). The railway embankment is a prominent catchment feature. Along with an extensive network of bog roads it provides access to remote catchment areas.

The Tullaghobegly catchment is 32 square kilometres in extent. Two approximately equal sub-basins are recognized in WFD mapping. The southern sub-basin (Tullaghobegly 010) includes the upper catchment reaches and extends to a point on the main channel just downstream of the Marine

Harvest smolt facility (Figure 2.6) and close to Asnanamodan waterfall. The lowland northern section (Tullaghobegly 020) is a narrow band, less than 3 kilometres wide, running directly north between a series of low ridges and mounds.

The average elevation of the Tullaghobegly river is approximately 120m. The Ray is slightly lower at about 90m. The Tullaghobegly channel is also somewhat steeper in its upper reaches. It plunges off the granite slopes of Dooish, crossing the R251 and continuing its steep descent for a further half kilometre, then meandering along Meenagoppoge upper valley floor above Lough Altan for a kilometre before falling steeply to Altan at 143m. Altan is a major catchment feature, 132ha in area and 54m maximum depth (Figure 2.3). It is of high ecological status with regard to its fish population which includes arctic charr, brown trout and European eel (Kelly and Champ, 2005; EPA, 2016).

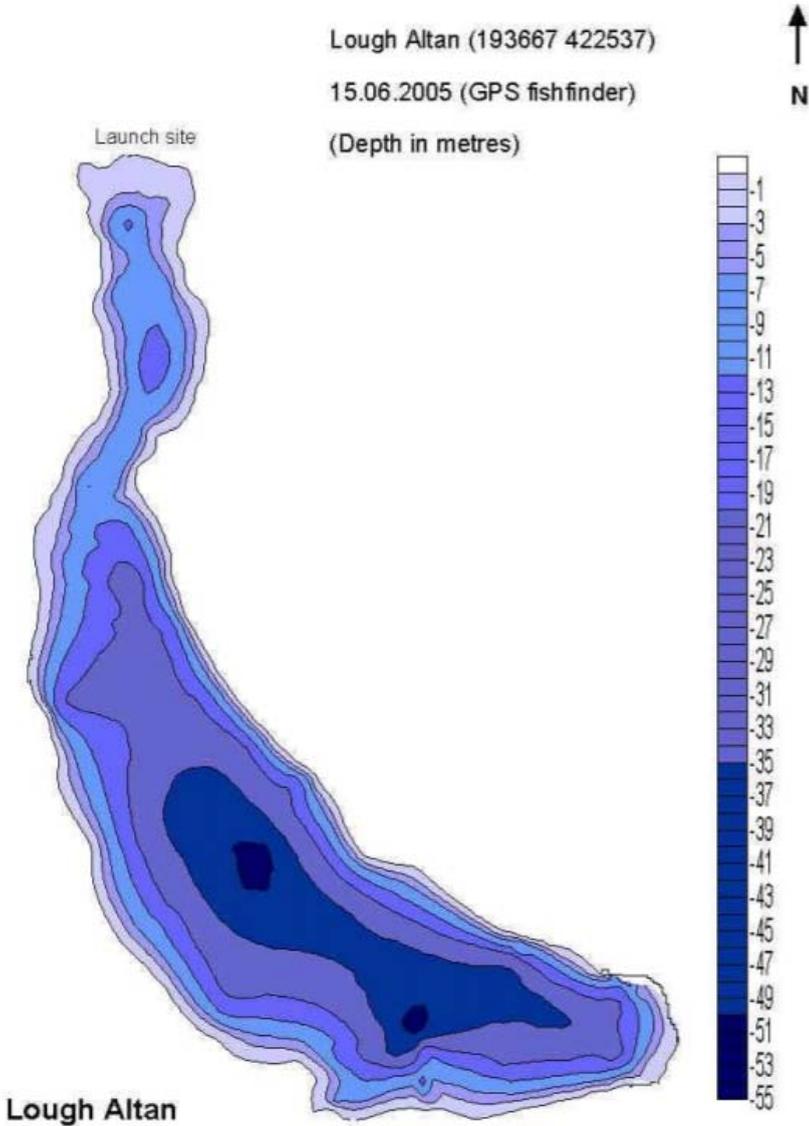
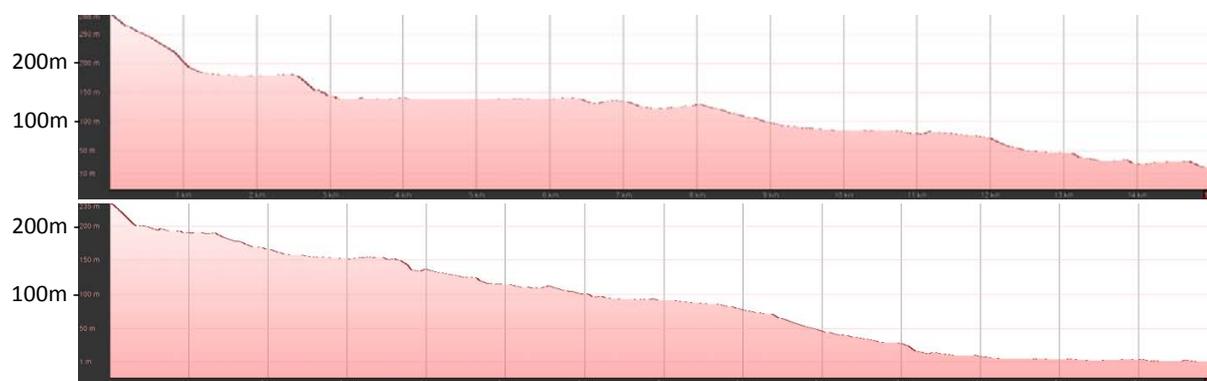


Figure 2.3 Lough Altan Bathymetry ([www.epa.ie/wfdstatus/LAKES/LK\\_Appendices\\_all\\_FK\\_8-10-2007.pdf](http://www.epa.ie/wfdstatus/LAKES/LK_Appendices_all_FK_8-10-2007.pdf))

Half a kilometre below Altan is Procklish Lake, a small shallow lake less than 1.5 ha in extent. A further series of smaller descents ending at Asnanomodan falls bring the channel to the 100m contour and the lowland section of the catchment. Thence to Ballyness Bay, a distance of about 6 km, the river flows through agricultural lands with a mixture of channel types evident including lowland meandering channel, pool-riffle-glide channel, and step-pool/cascade channel.

There are no tributaries of any significant size in the Tullaghobegly catchment. A number of small mountain tarns drain to Lough Altan in the upper catchment including Lough Nabehy, Lough Nabrackbaddy and Lough Feeane (

Table 2.1).



**Figure 2.4 Elevation profiles of the main channels of the Tullaghobegly (above) and the Ray (below)**

The Ray catchment is the larger of the two at 53 square kilometres. Three sub-basins have been distinguished. The Ray sub-basin (Ray 010) at just over 20 square kilometres includes a half dozen source streams on Aghla Beg and Crocknalaragagh and most of the main channel downstream to Drumavoghy Bridge on the N56 (Figure 2.6). About two kilometres upstream of this point a second sub-basin, the Lough Agher Stream sub-basin, joins from the east. This sub-basin is a little over 10 square kilometres in extent. It is separated from the third sub-basin to the north, the Carrowcanon catchment, by a high northeast to southwest ridge that rises to 230m and ends at Croaghtrasna. The Carrowcanon sub-basin forms the north eastern coastal fringe of the Ray catchment. The Carrowcanon River is locally known as the Yellow River (An Abhainn Bhuí).

By comparison with the Tullaghobegly, the Ray shows a more gradual drop on average throughout its course (Figure 2.4). The Ray rises as a series of converging wet seeps on the western side of Muckish Gap alongside the R256 regional road. The small channel they form initially drops steeply for a distance of about 300m to a small peaty plateau where drainage and channel straightening have been undertaken in the past. The channel then continues its descent through Barnanageeha gap

between steep banks and around rocky outcrops for a further 3km. Over this section of blanket bog and scree, it is joined by a number of small mountain streams from rills and gullies on Crocknalaragagh. The most prominent of these is Sruhanascardan draining Lough Keel and Lough Dog via a series of dramatic cascades known locally as the Scoilt.

The main channel makes a further descent through cascades off the western buttress of Muckish and drops to the 100m contour at the confluence with Owenaltderry which drains Lough Aluirg and Lough Moilt lying to the south. Agriculture and settlement make their appearance from this point on to the river mouth, a distance of 8km.

While a number of small streams drain peatlands on the western side of the catchment, the remaining significant tributaries enter from the eastern catchment. The Carrowcanon tributary drains the coastal and lowland catchment including Derryreel Lake and Drumlish Lake. The Lough Agher River drains a large portion of the eastern catchment to the north of Muckish and enters the Ray at Moyra, 5km from the sea. The lower 2km of the Lough Agher River, up to Kelsie's waterfall (a short distance downstream of the ford at the old L&LSR gatehouse) provides salmon habitat, but the catchment above that point is not accessible to migratory salmonids. In the Tullaghobegly catchment 66% of the fluvial habitat is accessible to salmon while in the Ray 70% is estimated to be accessible.



Figure 2.5 Lough Agher River in flood at Kelsie's Falls

Table 2.1 Lakes in the Ray and Tullaghobegly Catchments

RAY CATCHMENT			TULLAGHOBEGLY CATCHMENT		
Lake	Area (ha)	Elevation (m)	Lake	Area (ha)	Elevation (m)
Lough Dog	0.7	440	Lough Feeane	12.1	427
Lough Keel	1.0	440	Lough Nabrackbaddy	0.5	320
Lough Nadreega	0.7	405	Lough Nabehy	3.1	265
Nabrackbaddy Lough	3.3	405	Lough Altan	132.0	143
Lough Aluirg	21.0	285	Procklish Lough	1.3	135
Lough Moilt	5.8	197			
Lough Agher	17.1	140			
Derryreel Lake	7.9	102			
Drumlsh Lake	4.1	63			
<b>Total Area</b>	<b>61.66</b>			<b>144.04</b>	



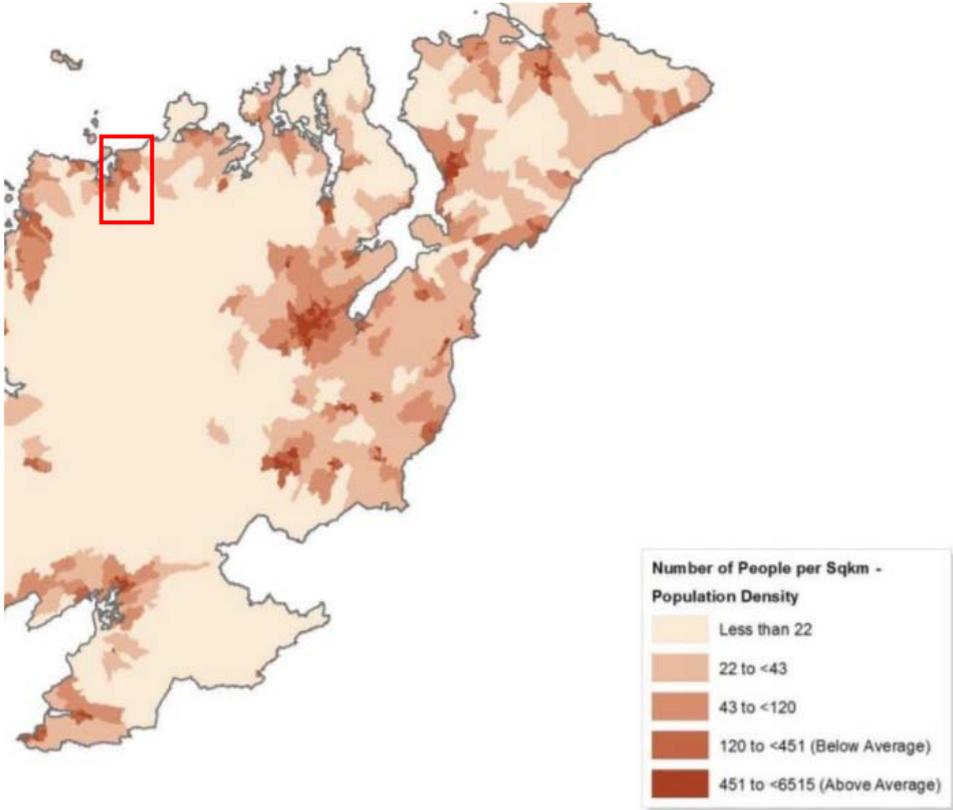
Figure 2.6 WFD Sub-basins in the Tullaghobegly and Ray catchments

## 2.2 Population Distribution

Both upper catchment areas are largely dominated by mountain and bog. The lowland areas have more habitations, including the town of Falcarragh, and are largely agricultural in character.

Population density is low throughout the fishery but the contrast between the lower catchment, with density generally between 22 and 120 persons/km<sup>2</sup>, and the upper catchment, density less than 22 persons/km<sup>2</sup>, is obvious in Figure 2.7 (adapted from Donegal Local Economic & Community Plan 2016-2022).

The Dún Lúiche and Cross Roads Electoral Divisions (EDs) correspond roughly to the Tullaghobegly and Ray catchments respectively (Figure 2.8). Although somewhat larger, the additional area in both EDs is mountainous terrain and little populated as we saw above. Therefore census data (2011) for these EDs provide a basis for understanding habitation and population in the fishery.



**Figure 2.7** Population density in Donegal. Location of CAA Fishery shown by red rectangle. (Adapted from The Donegal Local Economic & Community Plan 2016-2022 Appendix 1)

The Dún Lúiche ED (viz Tullaghobegly) had an estimated 445 households in 2011 (including 156 vacant households), and a population of 769. The larger Cross Roads ED (viz Ray) had 1,318 households (including 451 vacant), and a population of 2,149. Therefore the entire fishery area had a total combined population approaching 2,900 in 2011.

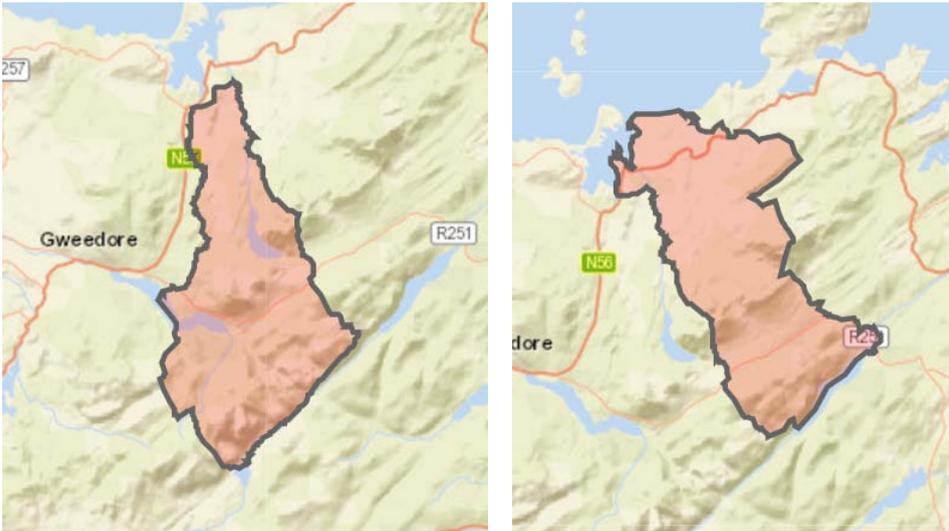


Figure 2.8 Dún Lúiche (left) and Cross Roads (right) Electoral Divisions (CSO Census 2011)

The only significant town in the fishery is Falcarragh (Figure 2.9). The total population in this settlement was 860 in 2011. Therefore about 30% of the population in the fishery area are town residents and serviced by an urban wastewater system. The remaining 70%, comprised of some 1,240 households (of which 448 were vacant), are dispersed in the rural environment and reliant on on-site wastewater treatment.

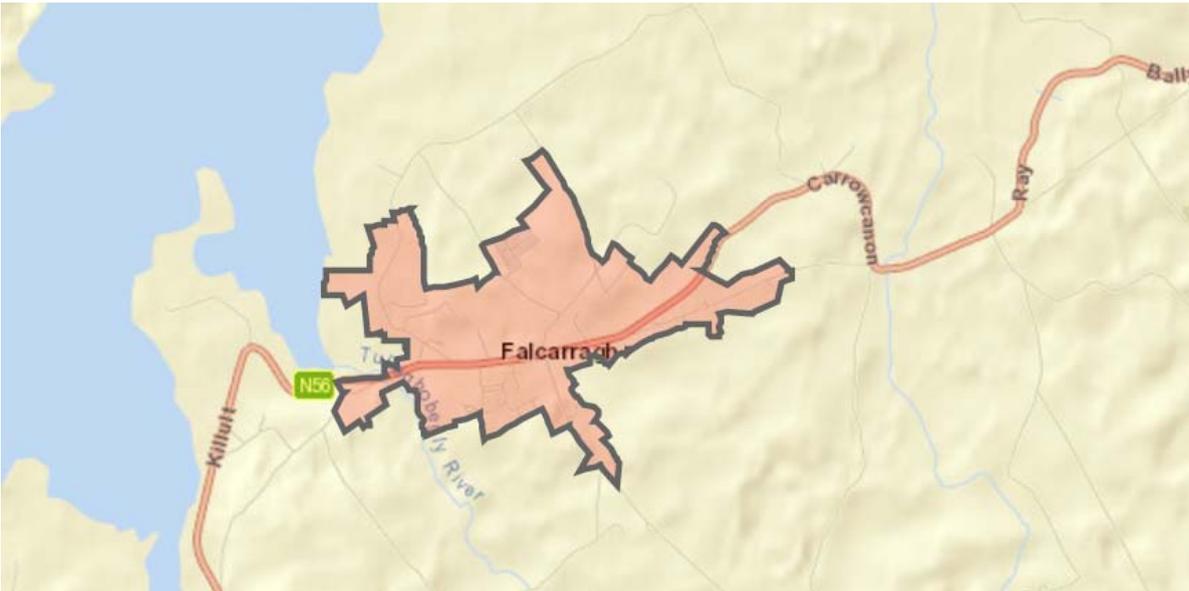


Figure 2.9 Falcarragh at the outfall of the Tullaghobegly catchment

## 2.3 Climate

The closest synoptic weather station to the fishery is some 50km to the northeast at Malin Head and the 30 year (1961-1990) average data from this station are displayed in Table 2.2 Malin Head Weather Records. Mean annual rainfall is about 1060 mm. The mean daily air temperature at this station is 9.2°C, ranging from a mean low of 5.2 °C in February to 14.0 °C in August. Mean monthly wind speeds range between 13.2 - 19.0 knots (15 - 22 miles per hour). There is an annual average of 25 days with sleet or snow recorded.

**Table 2.2 Malin Head Weather Records**

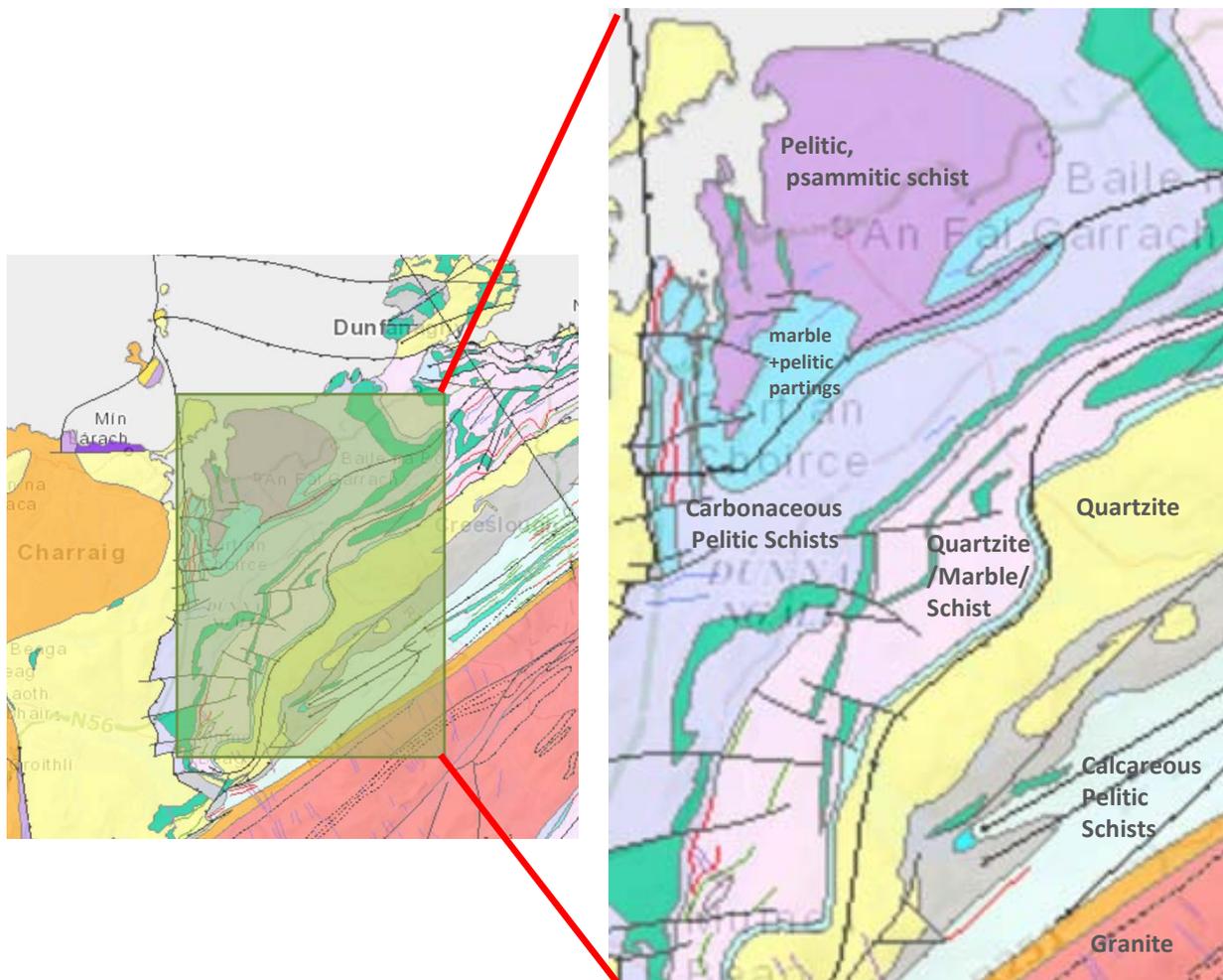
<b>MALIN HEAD</b>													
<b>monthly and annual mean and extreme values</b>													
<b>1961-1990</b>													
<b>TEMPERATURE (degrees Celsius)</b>	<b>jan</b>	<b>feb</b>	<b>mar</b>	<b>apr</b>	<b>may</b>	<b>jun</b>	<b>jul</b>	<b>aug</b>	<b>sep</b>	<b>oct</b>	<b>nov</b>	<b>dec</b>	<b>year</b>
<i>mean daily max.</i>	7.6	7.5	8.7	10.3	12.7	15	16.2	16.6	15.3	13	9.8	8.4	<b>11.8</b>
<i>mean daily min.</i>	3.2	2.9	3.7	5	7.1	9.6	11.4	11.4	10.1	8.3	5.2	4.2	<b>6.8</b>
<i>mean</i>	5.4	5.2	6.2	7.6	9.9	12.3	13.8	14	12.7	10.7	7.5	6.3	<b>9.3</b>
<i>absolute max.</i>	13.9	13.8	19	19.5	24.7	25	27	25.3	23.2	19.6	16	15.1	<b>27</b>
<i>absolute min.</i>	-6.2	-6.2	-4.4	-1.8	-0.5	2.6	5.6	5.2	2	1	-2.5	-5.5	<b>-6.2</b>
<i>mean no. of days with air frost</i>	3.4	3.3	1.6	0.4	0	0	0	0	0	0	0.4	1.8	<b>11</b>
<i>mean no. of days with ground frost</i>	9.6	9.8	7.4	4.3	1	0	0	0	0.1	0.3	3.7	6.7	<b>42.9</b>
<b>RELATIVE HUMIDITY (%)</b>													
<i>mean at 0900UTC</i>	83	82	81	79	79	81	84	84	83	83	82	83	<b>82</b>
<i>mean at 1500UTC</i>	80	77	76	76	76	78	80	79	78	78	79	81	<b>78</b>
<b>SUNSHINE (hours)</b>													
<i>mean daily duration</i>	1.2	2.2	3.1	5.1	6.2	5.7	4.3	4.3	3.5	2.4	1.5	0.9	<b>3.4</b>
<i>greatest daily duration</i>	7.5	9.2	11.1	14.1	15.5	16.2	16.1	14.8	11.9	9.4	7.6	6.7	<b>16.2</b>
<i>mean no. of days with no sun</i>	11	7	6	3	2	2	3	3	4	6	8	12	<b>67</b>
<b>RAINFALL (mm)</b>													
<i>mean monthly total</i>	114.4	76.3	85.9	58.4	59.2	64.4	72.4	91.3	102.1	118	114.9	103.2	<b>1060.6</b>
<i>greatest daily total</i>	36.9	24.1	26.3	36.1	29.8	32.5	26.2	41.5	53.5	63.2	56.1	33.5	<b>63.2</b>
<i>mean no. of days with &gt;= 0.2mm</i>	22	17	21	17	17	18	19	20	21	22	22	23	<b>237</b>
<i>mean no. of days with &gt;= 1.0mm</i>	19	13	16	12	12	13	13	15	16	18	18	18	<b>182</b>
<i>mean no. of days with &gt;= 5.0mm</i>	9	6	7	4	4	4	5	6	7	8	8	7	<b>76</b>
<b>WIND (knots)</b>													
<i>mean monthly speed</i>	19	18.4	17.9	15.1	14.2	13.2	13.2	13.2	15.7	17.5	18.3	19	<b>16.3</b>
<i>max. gust</i>	91	86	90	69	71	74	74	67	98	76	76	88	<b>98</b>
<i>max. mean 10-minute speed</i>	64	57	67	47	49	52	55	45	66	57	56	59	<b>67</b>
<i>mean no. of days with gales</i>	11.2	8.6	8	3.4	2.3	1.3	0.8	1.5	3.8	6.7	8.7	9.7	<b>66</b>
<b>WEATHER (mean no. of days with...)</b>													
<i>snow or sleet</i>	6.6	6	4.6	2.4	0.2	0	0	0	0	0.1	1.9	3.9	<b>25.8</b>
<i>snow lying at 0900UTC</i>	0.9	1	0.5	0.1	0	0	0	0	0	0	0	0.8	<b>3.3</b>
<i>hail</i>	8.6	5.8	7.9	4.7	1.9	0.4	0.1	0.1	0.6	3.1	7.9	7.3	<b>48.4</b>
<i>thunder</i>	0.6	0.4	0.4	0.3	0.4	0.8	0.6	0.4	0.4	0.6	0.6	0.6	<b>5.9</b>
<i>fog</i>	0.4	0.5	0.7	1.9	1	2	2.2	1.3	0.6	0.4	0.2	0.4	<b>11.8</b>

Source: Met Eireann

## 2.4 Geology

The underlying geology of the area is complex and has many fractures or faults. These features generally trend north-east to south-west (Figure 2.10) so that moving south to north through the fishery the river channels cross a series of formations in broadly parallel bands.

The dominant features in the area are the dramatic quartzite peaks of the Seven Sisters mentioned above that rise to over 700 m at Errigal, and form almost the entire southern boundary of the fishery. Where the Lough Altan valley breaches this line of peaks, the Tullaghobegly catchment extends south to the Main Donegal Granite formation at Dooish Mountain (Figure 2.10).



**Figure 2.10 Catchment geology. The left panel shows the location of the fishery (shaded rectangle) which is detailed in the right panel (based on GSI Bedrock Mapping, 2017)**

The Precambrian Ards Quartzite Formation of the Seven Sisters consists predominantly of well-bedded and massive feldspathic quartzites of variable grain size. Pebble beds and lenses with clasts of opalescent vein quartz, feldspar and quartzite are fairly common (GSI Bedrock Seamless Bedrock 1:100k Mapping 2017 Edition). Much of the upland area of the fishery to the north of this formation is overlain by the Sessiagh-Clonmass Formation of quartzite, dolomitic marble and schist. The

lowland catchment is mostly pelitic schists (Lower and Upper Falcarragh Pelite Formations) with a smaller area of banded, medium to dark grey or bluish-grey marble with pelitic or semi-pelitic partings and thin cherty bands (Falcarragh Limestone Formation).

## 2.5 Soils

The upper catchment consists of large areas of exposed outcropping bedrock, quartzite till and very extensive blanket bog areas which also extend over the middle catchment (Teagasc Soil Map Figure 2.11). Mineral soils in the catchments are largely poorly drained acidic tills. Metamorphic tills dominate in the lower catchment although some small areas of alluvium are present along the lower channels in both catchments. Beach sands and gravels form a wide band across the seaward boundary of the fishery.

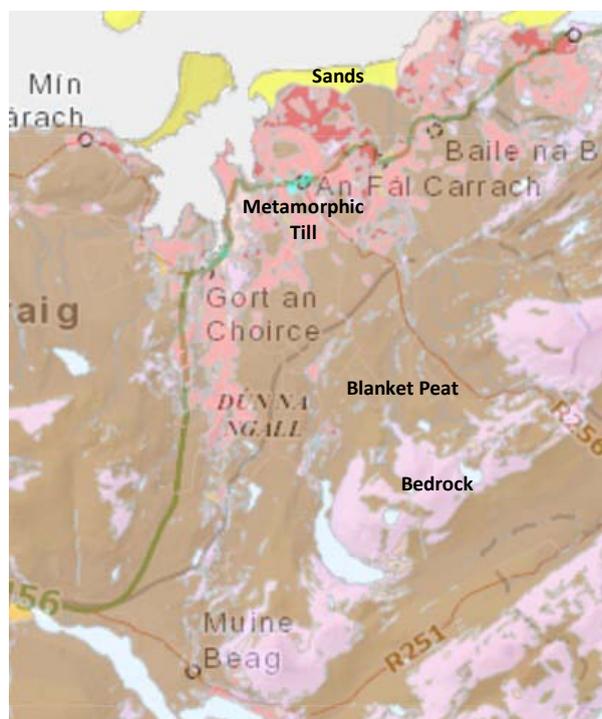


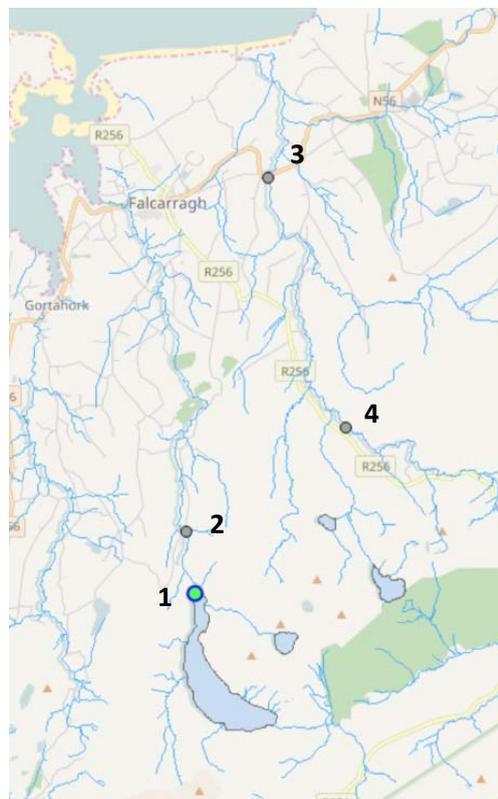
Figure 2.11 Soils in the fishery area

## 2.6 Hydrology - Water Flows

Flow in the Tullaghobegly and Ray rivers has been measured at a number of gauging stations. Figure 2.12 shows the locations of four surface water gauging stations in the National Hydrometric Register that lie within the fishery. Only the Lough Altan station is currently active although some historical data is available for the other stations.

The Lough Altan and Salmon Hatchery (Marine Harvest smolt facility) gauges (Stations 1 and 2 respectively) only measure discharge in the upper Tullaghobegly catchment (48% and 53% of the total catchment by area respectively). The Drumavoghy station measures discharge from 62% of the Ray catchment. Summary information relating to the gauging station catchments is presented in Table 2.3. While the Lough Altan records are reasonably long and complete, the other datasets are small and fragmentary. The remaining station on the register at Duvowen on the Ray has so little data as to be unusable.

The available data has been used to construct flow duration curves (FDC) (Figure 2.13) and to derive FDC indices characterising flow (Table 2.3). The FDC shows the frequency or percentage of time that the amount of flow in a stream is likely to equal or exceed some specified value of interest. Caution must be exercised in interpreting these curves due to the sparse and fragmentary nature of some of the datasets.



**Figure 2.12 Locations of flow gauges  
(Numbers as in Table 2.3)**

Based upon the FDC and indices developed for the gauging stations (Table 2.3), all gauged catchments are characterised as “flashy”, as indicated by the curve slopes and significant difference between high and mid-level flows, and the Q5/Q95 ratio, frequently used as a metric of runoff flashiness (Jordan et al., 2005) and showing that they respond quickly to rainfall. The Q5/Q95 ratio for the Altan station is extremely high ( $Q5/Q95 = 190$ ), suggesting a very flashy system.

Notwithstanding the small datasets, Figure 2.13 clearly shows the similarity of FDCs for the Hatchery and Drumavoghy catchments. This is not unexpected given their proximity and similar topography/geology etc. However it is also apparent that the FDC for the Altan catchment is quite distinctive and indicates a much flashier flow regime. Given that the Altan gauged catchment is nested within the Hatchery catchment (the latter is only 2 km<sup>2</sup> larger) this seems anomalous. However water abstraction at Lough Altan for flow through water at the salmon hatchery disrupts natural flows, particularly in the Tullaghobegly channel between the lake and the discharge point of the Hatchery. At this discharge point water abstracted upstream is returned to the channel.

**Table 2.3 Summary characteristics of gauging stations and measured flows**

	1. Lough Altan	2. Salmon Hatchery	3. Drumavoghy	4. Duvowen
Area (km <sup>2</sup> )	15.2	17.0	33.1	n/a
% Total Catchment	48	53	62	n/a
Period Covered	1982 to 2017	1990 to 2000	1979 to 1999	n/a
No. Values (n)	9,620	37	69	n/a
Q5 (5%ile) High Flow (m <sup>3</sup> /s)	1.9	2.03	3.28	n/a
Q10 (10%ile) (m <sup>3</sup> /s)	1.4	1.92	3.08	n/a
Q50 (50%ile) Median Flow (m <sup>3</sup> /s)	0.28	0.66	0.63	n/a
Q90 (90%ile) (m <sup>3</sup> /s)	0.02	0.32	0.24	n/a
Q95 (95%ile) Low Flow (m <sup>3</sup> /s)	0.01	0.26	0.18	n/a
Q5/Q95	190	7.8	18.2	n/a
Q5/Q50	6.8	3.1	5.2	n/a

The Lough Altan data are presented again in Figure 2.14. On this occasion the data are presented as previously in a single dataset, and then separated into two time periods before and after the establishment of the salmon hatchery (first licensed in 1986). The Altan FDC prior to commencement of the hatchery abstraction resembles the Drumavoghy and Hatchery FDCs. This can be taken to represent more 'natural' flows. However, the FDC for the period when the hatchery abstraction has been operating shows a very significant increase in the frequency of low flows. This is illustrated by the indices in Table 2.4, dramatically so by the Q5/Q95 ratio which is 20 for the pre hatchery period, and rises to 458 after hatchery establishment.

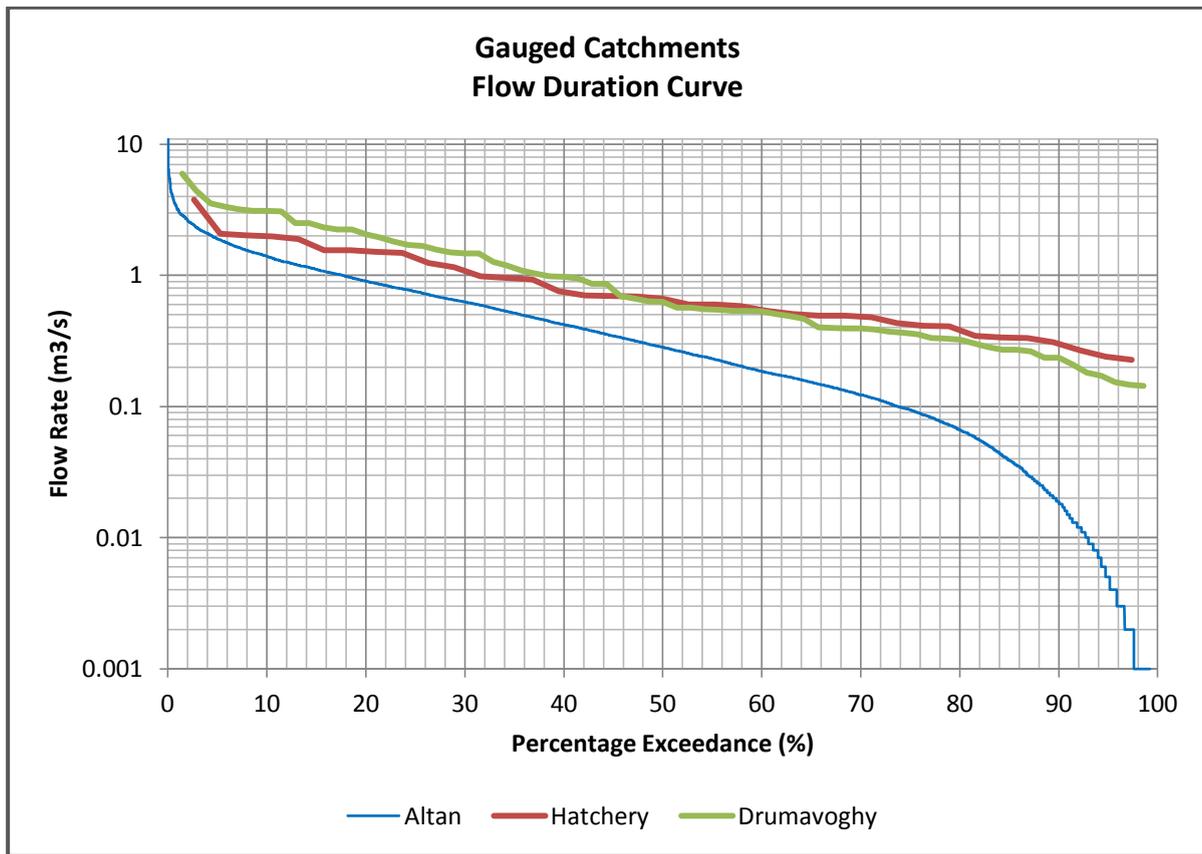


Figure 2.13 Flow Duration Curves for three gauged catchments

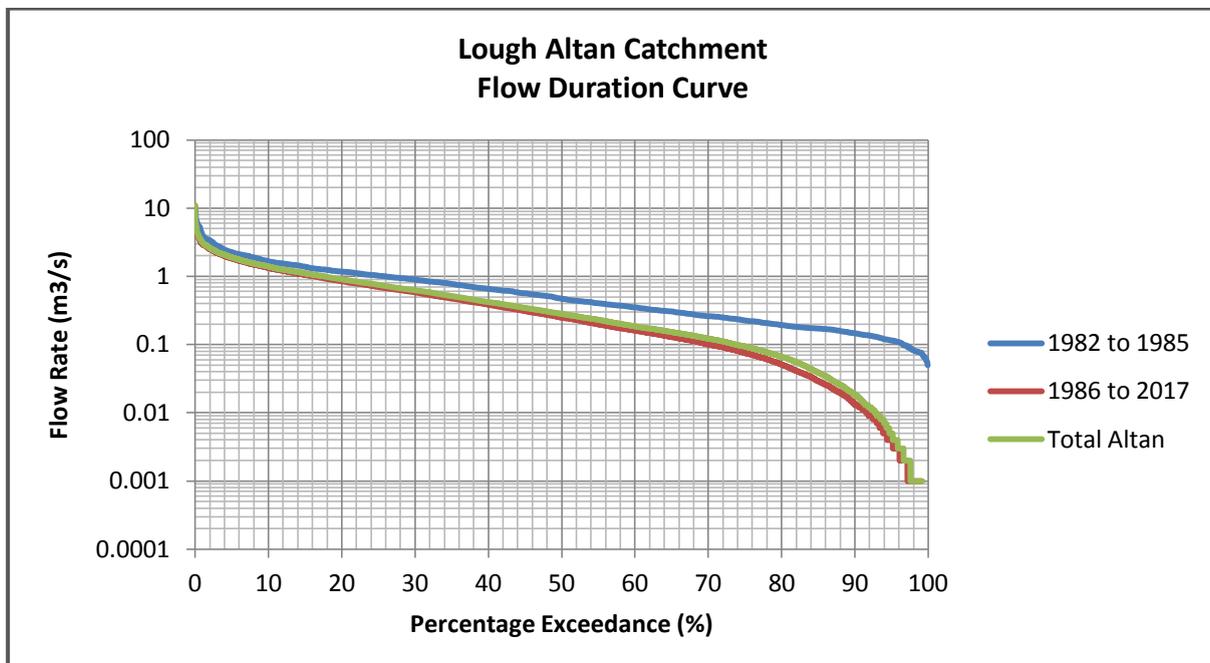


Figure 2.14 FDC for Lough Altan gauged catchment and segregated into two time periods

The trade effluent discharge licence issued to Marine Harvest for the Lough Altan Smolt and Hatchery Unit (Donegal County Council Lwat26) allows for a discharge of 400 L/s from the facility. The actual discharge volume is closely correlated to the volume abstracted from the lake since all waters abstracted are ultimately returned to the river (save for small losses due to leakage to groundwater or water incorporated into fish biomass which are negligible in the timeframes of water retention within the facility). The FDCs for the Lough Altan station (Figure 2.14) show that flows were below 400 L/s for 45% of the time in the period before the fish farm was established and for 60% of the time in the interval since then. An abstraction of 400 L/s would therefore be expected to result in zero flows in the Tullaghobegly River below Lough Altan for 45-60% of the time. The trade effluent discharge licence does stipulate that if minimum recorded flows fall below 58 L/s (5000 m<sup>3</sup>/day) then compensation water must be provided by the licensee. Such compensation flows are based on an estimated dry weather flow of 60 L/s but they represent less than half the Q95 flow for the river pre-establishment of the fish farm and a significant deviation from natural flow conditions.

The implications of such changes and possible mitigation are discussed in chapter 3 **Catchment Pressures and Actions**.

**Table 2.4 FDC indices for the Lough Altan catchment before and after hatchery establishment**

	Lough Altan Pre 1986	Lough Altan Post 1986
Area (km <sup>2</sup> )	15.2	15.2
% Total Catchment	48	48
Period Covered	1982 to 1986	1986 to 2017
No. Values (n)	1,323	8,297
Q5 (5%ile) High Flow (m <sup>3</sup> /s)	2.27	1.83
Q10 (10%ile) (m <sup>3</sup> /s)	1.66	1.33
Q50 (50%ile) Median Flow (m <sup>3</sup> /s)	0.47	0.25
Q90 (90%ile) (m <sup>3</sup> /s)	0.15	0.01
Q95 (95%ile) Low Flow (m <sup>3</sup> /s)	0.12	0.004
Q5/Q95	20	458
Q5/Q50	5	7

Other hydrological factors that are of relevance in the fishery area relate to Ballyness Bay and groundwater bodies. The general oceanography of Ballyness Bay is typical of a shallow coastal bay. The tidal currents are particularly strong at the bay entrance and become negligible towards the head. The shallow bathymetry and moderate tidal ranges result in almost complete emptying of the bay waters. The tidal volumes are estimated at 12 million cubic metres on spring tides, and 6 million cubic metres on neaps.

The fishery lies in the Northwest Donegal groundwater body and is comprised of poorly productive bedrock. Therefore groundwater flows are relatively small and focus will be on the predominant surface water pathways in this area when considering how pressure sources act on receptors.

## 2.7 Land Use

Land use (Figure 2.15) is determined very largely by the soils and subsoils throughout the fishery. The most elevated catchment areas are bare rock or sparsely vegetated, and there are some areas of natural acid grassland, for example on the slopes to the north of Lough Aluig. Some of the drier mountain slopes support areas of heath and moor, most notably on the northern slopes of Muckish. The predominant feature of the catchment is the extensive blanket bog coverage. Peat harvesting and associated drainage is widespread throughout these areas.

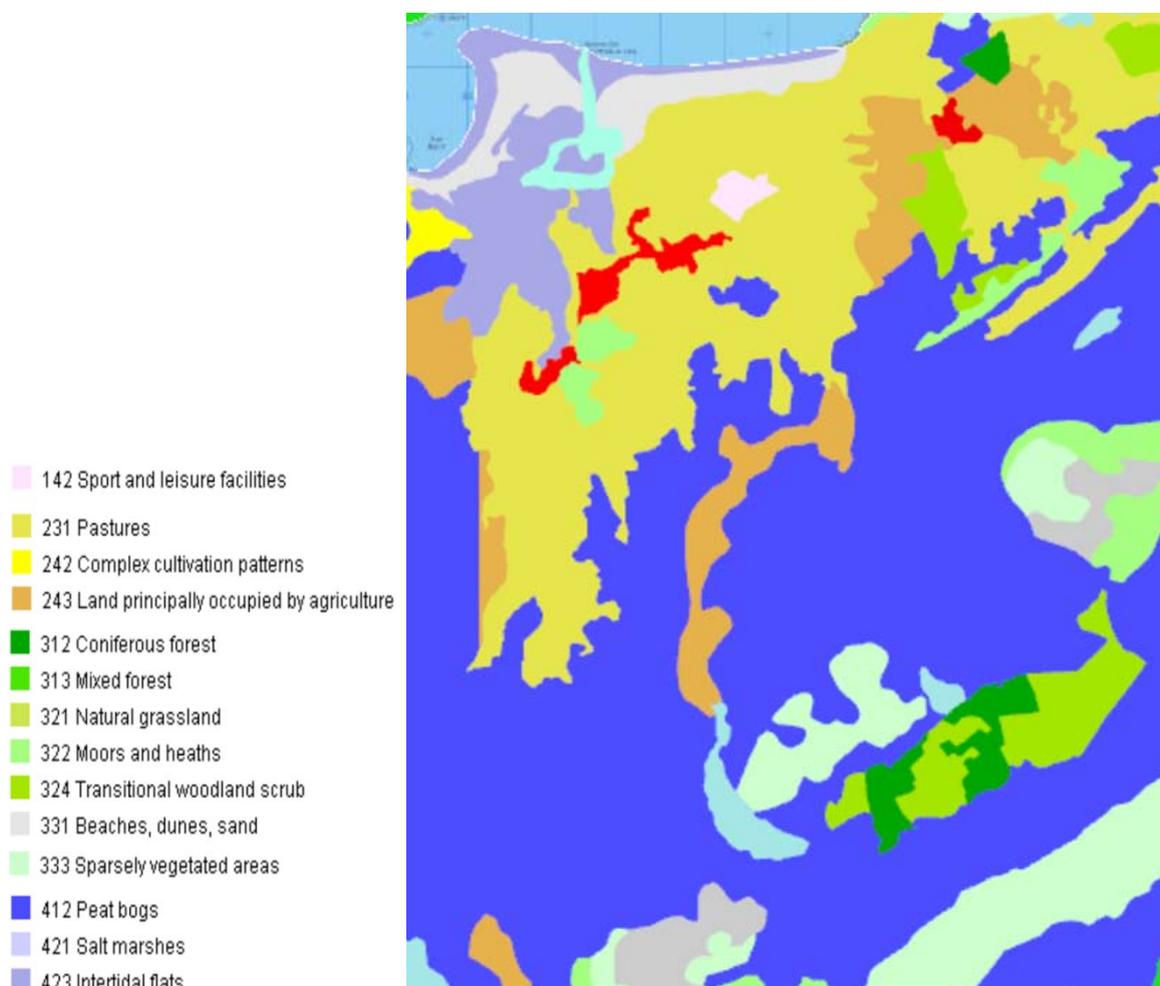
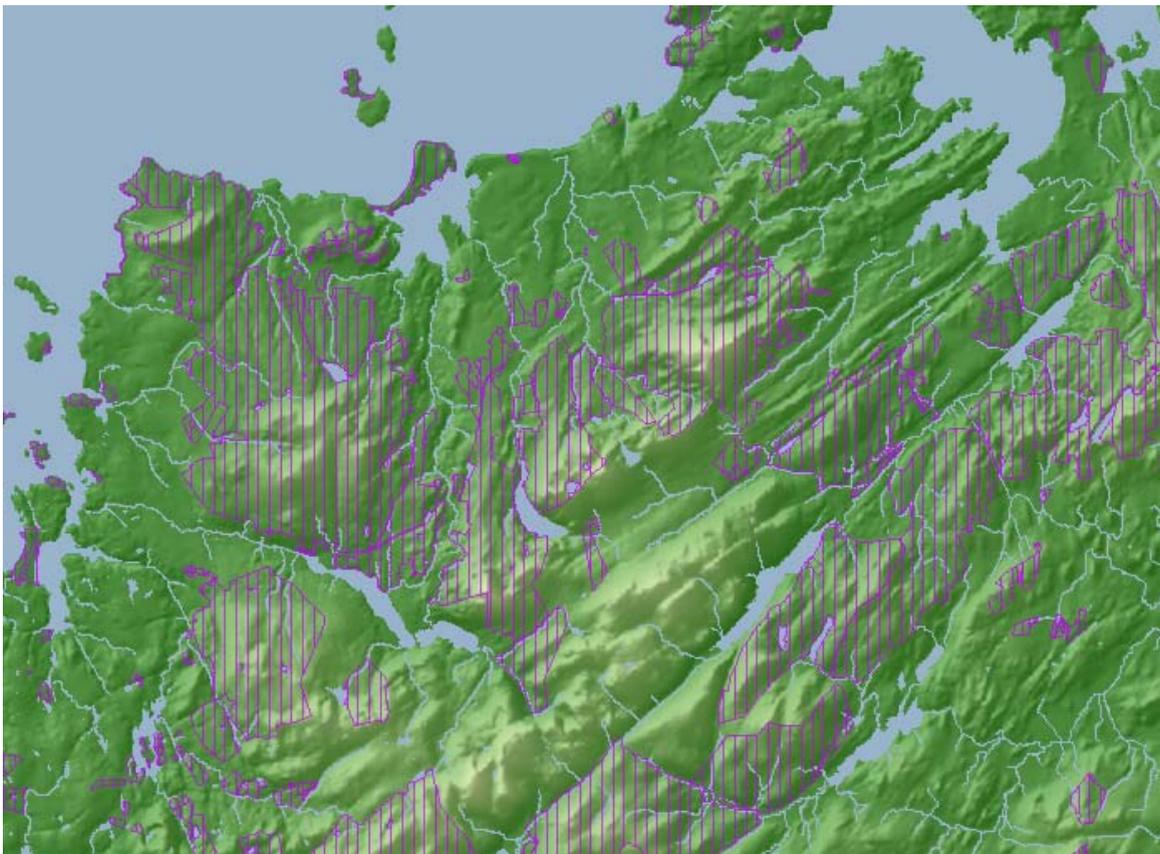


Figure 2.15 Land use in the fishery area (Corine 2012)

Agriculture in the catchment is predominantly rough grazing with some more productive grassland areas in valley floors on alluvial deposits, where drainage is better or where calcareous geology

influences soil fertility. Farming in upland areas is restricted to sheep grazing and extensive areas of commonage are present (Figure 2.16) although some coniferous forestry (Sitka spruce) occurs. These forests are at various stages of the management cycle, ranging from recently felled to mature crops. The most notable afforested areas are in Ballyboes townland in the Carrowcanon sub-basin of the Ray (approximately 90ha), and in the riparian zone of the Tullaghobegly river upstream of Oldtown (a combined area of just over 20ha). Small patches of transitional woodland scrub occur, particularly on steep slopes on mineral soils as at Killult, and remnants of riparian woodland line some stretches especially along the Tullaghobegly channel. In a few places such as the Owenaltderry valley, vestiges of ancient oakwoods remain, with stunted sessile oaks, holly and honeysuckle as prominent features of the vegetation.



**Figure 2.16 Areas of Commonage in the Tullaghobegly and Ray Catchments.**  
(National Biodiversity Data Centre © Ordnance Survey of Ireland Government of Ireland. Licence No EN 0059214)

The upper catchment areas that are on mineral soils in the river valleys below the blanket bog support low intensity farming mixed with areas of natural vegetation and scrub. As the catchments drop to the coastal fringe, pastures dominate with grasslands managed for silage production. Stocking density is generally low at less than 1 Livestock Unit/ha compared to the national average which is 1.2 LU/ha. Fertiliser application rates are also below the national average. Nitrogen fertiliser usage is about 46kg/ha (national average 92kg/ha) and phosphorus usage is about 4.4 kg/ha (national average 9.7 kg/ha). A limited amount of tillage, in particular potato cultivation, occurs in the fishery area. Some grasslands in protected areas (SPA 004149 Falcarragh to Meenlaragh) are managed as meadows for conservation of the corncrake (see 2.9.3 Natura 2000 Sites).

The coastal fringe of the fishery is dominated by the extensive dune system and sands of Drumnatinny beach which forms the seaward boundary of the Ray catchment, and by the intertidal flats of Ballyness Bay into which the Tullaghobegly discharges. These areas are popular tourist and recreational attractions and some aquaculture (oyster cultivation) and wild shellfish harvesting occurs in Ballyness Bay.

## **2.8 Water Framework Directive Status**

### **2.8.1 Background**

The WFD establishes a framework for the protection of all waters including rivers, lakes, estuaries, coastal waters and groundwater, and their dependent wildlife/habitats. The directive requires objectives to be set for waters in River Basin Management Plans and is linked to a number of other EU directives in seeking to achieve those objectives. The key objectives are that all waters will achieve 'good status' as a minimum, and where 'high' and 'good status' already exist that they will be retained.

The EPA plays a key role in this process and undertakes extensive monitoring programmes to assess the ecological and chemical status of our water resource and determine whether WFD objectives are being met. Other agencies are responsible for essential elements of monitoring. Of particular relevance here, the responsibility for monitoring fish for the WFD has been assigned to Inland Fisheries Ireland (previously the Central and Regional Fisheries Boards) who monitor more than 300 sites encompassing lakes, rivers and transitional waters (estuaries) on a three year rolling programme. The following commentary draws on the results of WFD monitoring programmes and data as served out through the EPA's WebGIS geoportal browser (<http://gis.epa.ie/Home>).

Ecological status of surface waters is based on a number of different quality elements. These include biological elements and supporting physico-chemical elements, and in the case of assigning 'high status', it also includes hydromorphological quality.

For rivers the biological elements to be considered are aquatic flora, benthic invertebrate fauna and fish populations. In the case of lakes and transitional waters phytoplankton is an additional element to those above for rivers.

Physico-chemical elements refer to attributes such as water acidity, temperature, transparency, dissolved oxygen levels, salinity and nutrient levels. They also include specific pollutants that are listed in the Surface Water Regulations (Ireland, 2009).

Hydromorphology refers to river flows, depth and width, river bed and riparian zone attributes, and connection to groundwater. In the case of lakes it also includes water retention time and for transitional waters, tidal regime and intertidal zone attributes.

Surface water bodies are assigned to one of five classes (high, good, moderate, poor or bad). The status assigned is determined by the status of the poorest quality element.

It is important to understand that river water body boundaries have been revised on several occasions. The latest revision dates to 2017 in which water bodies originate from a defining monitoring station that is used to generate a watershed (sub basin) immediately upstream. The rivers and streams within this watershed together make the river water body unit. These changes have implications for water body status as reported over successive monitoring periods and need to be considered when interpreting results and trends, or proposing measures. It is also important to remember that status determined at the monitoring station is assigned to all rivers and streams in the water body and in some instances this may lead to inappropriate status being assigned to some waters. These limitations are a function of the scale or resolution of the water monitoring grid. Detailed investigative monitoring within water body units will allow some of these issues to be resolved and true status within a water body to be determined accurately.

Groundwater status is based on its quantitative status and its chemical status. Quantitative status is assessed based on groundwater conductivity and indicators of saline intrusions in water bodies that are being over abstracted so that their use is impaired. Quantitative depletion of groundwater contributions to rivers and lakes may also result in impact on these surface water systems or on groundwater dependent terrestrial systems (e.g. bogs, fens, dune slacks) and protected areas. Chemical status of groundwater may be affected due to the presence of pollutants such as nutrients, metals, pesticides or organic chemicals above stipulated threshold levels.

A summary of the status of all water bodies in the area covered by this plan is provided in Table 2.5. The table also indicates whether the water body is at risk of failing to achieve the WFD objectives set for it in the River Basin Management Plan. Where relevant, the potential source of the risk as determined by the EPA in consultation with Donegal County Council is also indicated. Individual water bodies are discussed in the following sections.

Table 2.5 Summary of Water Bodies in the Catchment Area

Type of Water Body	Water Body Name	Code	Risk	Source of Risk	Status
Groundwater	Northwest Donegal	IE_NW_G_049	Review	-	GOOD
River	Tullaghobegly_010	IE_NW_38T010100	At Risk	Nutrient and Organic Pollution from Industry	POOR
River	Tullaghobegly_020	IE_NW_38T010400	Not at Risk	-	GOOD
River	Ray_010	IE_NW_38R010200	Not at Risk	-	GOOD
River	Lough Agher Stream_010	IE_NW_38L020200	At Risk	Peat Extraction, Illegal Dumping, Anthropogenic Pressures, possibly Water Abstraction	GOOD
River	An Cheathrú Cheanainn_010	IE_NW_38C180660	Review	Peat Extraction, Land Drainage, Quarrying	UNASSIGNED
Lake	Altan	IE_NW_38_19	Not at Risk	-	UNASSIGNED
Lake	Feeane	IE_NW_38_530	Not at Risk	-	UNASSIGNED
Lake	Aluirg	IE_NW_38_33	Not at Risk	-	UNASSIGNED
Lake	Moilt	IE_NW_38_526	Not at Risk	-	UNASSIGNED
Coastal	Ballyness Bay	IE_NW_170_0000	Not at Risk	-	UNASSIGNED
Coastal	Northwestern Atlantic Seaboard (HAs 37;38)	IE_NW_100_0000	Not at Risk	-	HIGH

### 2.8.2 Tullaghobegly Waterbodies

The Tullaghobegly catchment is comprised of two water bodies, Tullaghobegly\_010 and Tullaghobegly\_020. The location of monitoring stations used to most recently classify their status is shown in Figure 2.17. One station (EPA site code RS38T010400) is near the mouth of the river between the Baawan pool and the N56 Bellina Bridge and the second station (EPA site code RS38T010100) is about 1.5 km below Lough Altan, just downstream of the Marine Harvest smolt production facility.

Rivers and streams in Tullaghobegly\_010 (upper catchment) are currently classified at poor status. This includes all waters upstream of the monitoring point near the fish farm; the feeder streams above Lough Altan and the main channel. The poor status reflects extensive weed growth at the monitoring site (100% cover), and the lack of any of the pollution-sensitive invertebrate species that would be expected at a site such as this. Previous assessments in 2007-2009 and 2010-2012 indicated moderate status. Status has therefore deteriorated in recent times and trend analysis indicates that nutrient levels are trending upwards. Orthophosphate increased from a mean annual concentration of 0.01 mg/l P in 2012 to 0.08 mg/l P in 2015; total ammonia from 0.216 mg/l N to 0.64

mg/l over the same interval. Total oxidised nitrogen showed a more modest rate of increase from 0.069 to 0.10 mg/l N between 2012 and 2013.

The effluent stream from the Marine Harvest fish farm discharges to the river immediately upstream of the monitoring site. At the time of establishment of the fish farm (1986) this monitoring site was classified at high status based on a macro-invertebrate value of Q5<sup>2</sup>. The fish farm effluent is high in nutrient concentration and causes the Tullaghobegly to be one of the rivers with the highest annual average molybdate reactive phosphorus (MRP or orthophosphate) concentrations in Donegal (>0.035mg P/l). For rivers to achieve good status (the minimum status required legally) the average MRP must be less than 0.035mg P/L (SI 272 of 2009).



**Figure 2.17 Water quality monitoring stations (red spots) and associated waterbodies in the Tullaghobegly and Ray catchments. River quality status is indicated by colours as per the key inset.**

<sup>2</sup> The Q system is based on the presence or absence of pollution tolerant and pollution sensitive species of invertebrates (insects, snails, worms, crustaceans...). It goes from Q1 (Seriously Polluted) to Q5 (Unpolluted).

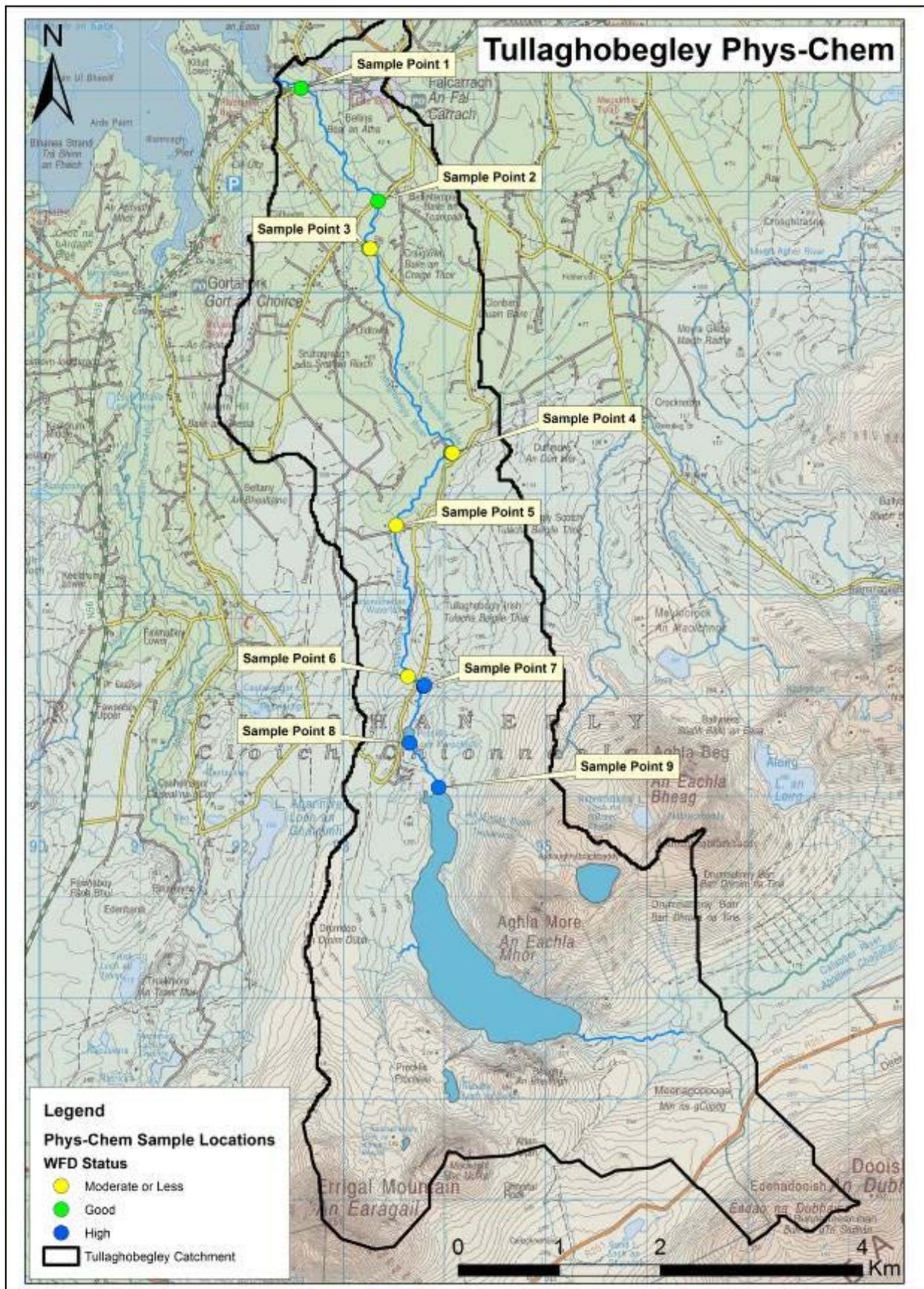
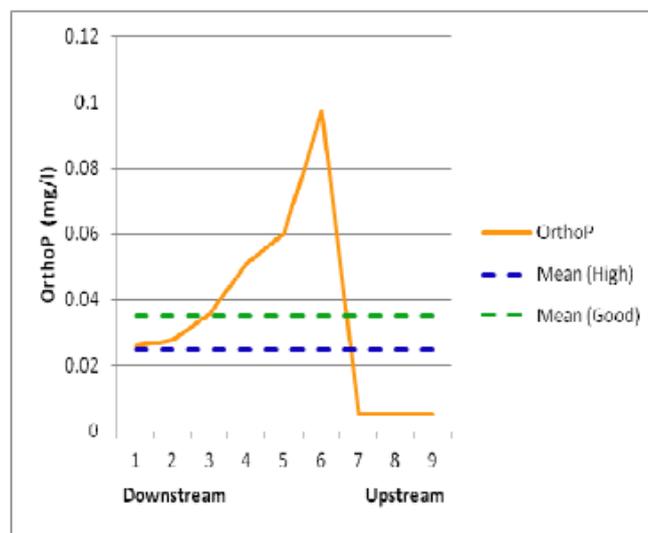


Figure 2.18 Locations on the Tullaghobegly River sampled in 2013 and water quality based on chemical analyses.

Nine sites along the Tullaghobegly were sampled in June, August and September of 2013 for physico-chemical assessment (Marine Harvest and Donegal County Council, 2014). The sampling locations are shown in Figure 2.18. The mean orthophosphate concentration for each site is shown in Figure 2.19. The fish farm effluent enters between site 7 (upstream of the discharge) and site 6 (downstream of the discharge). The impact on receiving waters in the Tullaghobegly is apparent. Results indicate that the uppermost sites 7 to 9 are at high physico-chemical status particularly with respect to orthophosphate levels. Orthophosphate is below the limit of detection at these upstream sites, but the mean orthophosphate concentration rises to 0.097 mg P/l at site six. Similar pronounced impacts are apparent with regard to total ammonia and nitrate levels arising from the discharge.



**Figure 2.19 Mean orthophosphate concentrations at 9 sites along the Tullaghobegly**

It is clear therefore that the fish farm discharge has significant impact on the receiving waters of the Tullaghobegly although some recovery occurs downstream. It is also clear that this heavily impacted monitoring site (RS38T010100) is not representative of upstream waters due to the proximity of the pressure source i.e. Marine Harvest smolt facility. Assigning poor status to all of the Tullaghobegly\_010 water body does not reflect actual conditions throughout much of this relatively pristine section of the catchment. This is also borne out by previous EPA monitoring (1990 to 2006) at a site just upstream of the fish farm outfall (EPA site code RS38T010090) which assigned high or good status based on invertebrate Q values.

A further implication of this inappropriate classification is the lack of a realistic assessment of the impact of the Marine Harvest discharge on the Tullaghobegly\_020 water body downstream. The Tullaghobegly\_020 water body (lower catchment) is classified at good status based on monitoring results near the mouth of the river (site RS38T010400). Previous EPA monitoring at additional sites in

the water body and other studies confirm that good status applies to the water body in general. However, downstream impacts of the discharge from Marine Harvest have been demonstrated (Figure 2.19) and the effects of such impacts on status in the Tullaghobegly\_020 water body must be considered and reflected in monitoring programmes. This may require reconsideration of the location of monitoring points and/or the redrafting of water body boundaries.

The discussion above relates to nutrient pollution. However, it must be remembered that the Marine Harvest facility also abstracts water from Lough Altan upstream and the implications of this abstraction on flows in the Tullaghobegly between Lough Altan and the fish farm discharge point have been outlined in section 2.6 Hydrology - Water Flows. The Tullaghobegly\_010 water body is considered to be at risk of not achieving its WFD objectives due to nutrient and organic pollution from the fish farm industrial source.

### 2.8.3 Ray Waterbodies

The Ray catchment is divided into three waterbodies, Ray\_010, Lough Agher Stream\_010 and An Cheathrú Cheanainn\_010. The monitoring stations are shown in Figure 2.17. The Ray\_010 station (EPA site code RS38R010200) is at Drumavoghy Bridge on the N56. The Lough Agher Stream\_010 monitoring point (EPA site code RS38L020200) is at the bridge at Carraig an Fhia about 0.5km upstream of its confluence with the Ray.

Both the Ray\_010 and Lough Agher Stream\_010 waterbodies are currently classified at good status. However, the Lough Agher Stream water body was at high status in previous 2007-2009 and 2010-2012 assessments. Status has therefore declined recently and the water body is considered to be at risk of not achieving its WFD objective of good status. The risk factors are considered to be peat extraction, illegal dumping, anthropogenic pressures (possibly drinking water abstraction). By contrast the Ray water body has improved from moderate to good status in the most recent assessments. The biological status, supporting physico-chemical status, and nutrient status are all good. Orthophosphate and total ammonia levels are trending downwards. Total oxidized nitrogen is trending upwards, but only very slightly and from currently low levels. Therefore the water body is considered not to be at risk.

No monitoring point has been designated for An Cheathrú Cheanainn\_010 water body, and streams in this coastal fringe remain unclassified as yet. The EPA assessment has determined that the water body needs to be reviewed but has flagged peat extraction, land drainage, and quarrying as risk factors in this water body.

#### 2.8.4 Lake Waterbodies

WFD assessment of Irish lakes included all lakes greater than 0.5 km<sup>2</sup> (50ha) and lakes less than 0.5 km<sup>2</sup> if they were located in protected areas (e.g. in Special Areas of Conservation, or if they were used for water abstraction for drinking purposes). There are fourteen lakes in the Ray and Tullaghobegly catchments (Table 2.1). Only four of these are included in WFD lakes assessments i.e. Lough Altan, Lough Feeane, Loch Aluairg and Lough Moilt. Status has not been assigned to any of these lakes, but risk assessment considered that none of them were at risk in terms of achieving WFD objectives.

Lough Altan was surveyed by IFI in 2005 for WFD fish parameters. Species found present at that time were Arctic charr, brown trout and European eel. Based on this survey the draft fish ecological status of Lough Altan was assigned as high.

#### 2.8.5 Coastal Waterbodies

Although not designated as part of the fishery in the CAA Management agreement, Ballyness Bay and adjacent coastal waters are of critical importance to the health of the fishery and form a key part of CAA's Strategic Plan. Migrating fish pass through these waters to enter the fishery and they provide feeding areas for sea trout populations.

The Tullaghobegly river discharges into the Ballyness Bay water body. No WFD status has been assigned to this water body but it is not considered to be at risk of achieving its WFD objectives.

The Ray discharges into the Northwestern Atlantic Seaboard coastal water body which is at high ecological status. It is not at risk when considering WFD objectives.

#### 2.8.6 Groundwater Body

The Ray and Tullaghobegly catchments lie in the Northwest Donegal groundwater body which is comprised largely of poorly productive bedrock. Therefore groundwater flows are relatively small and surface water pathways predominate in this area.

The WFD classification of groundwater quality is based on its quantitative status and its chemical status. These are rated as 'good' or 'poor' status. The Northwest Donegal Groundwater Body is rated as being at good status.

## 2.9 Protected Areas / Species

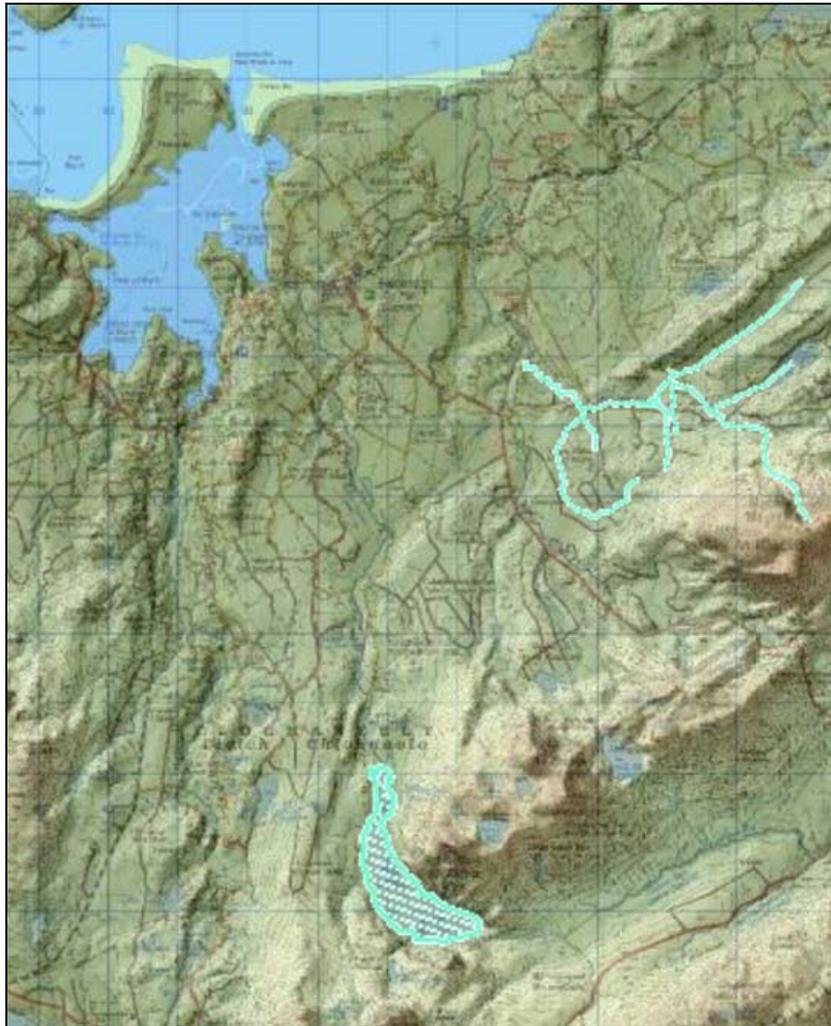
There are a number of protected areas and species within the Tullaghobegly and Ray catchments. Protected areas are areas designated by legislation for a variety of purposes. Protected areas of relevance here include drinking water sources, bathing waters, special areas of conservation and special protected areas.

### 2.9.1 Drinking Water Sources

Drinking water is derived primarily from surface waters in this area as the underlying geology gives rise to poorly productive aquifers for the most part. Two surface water sources identified in the WFD Register of Protected Areas - September 2016 database for abstraction of drinking water occur in the fishery area, Lough Agher/Muckish Stream in the Ray catchment and Lough Altan in the Tullaghobegly catchment. The Lough Agher/Muckish Stream source supplies the Creeslough Scheme and serves a population of over 4000 people. Construction of a new water treatment plant at Creeslough will provide capacity for treating 2,500 m<sup>3</sup>/d (29 L/s). Flow data are not available for the Lough Agher Stream.

The source waters are soft (total hardness is 20mg/l Ca CO<sub>3</sub> on average, and mean conductivity 104µS/cm) and about neutral in pH (average pH 7.1). Treatment includes pressure filtration followed by chlorination, fluoridation and pH correction. Treatment occurs outside the Fishery catchments and there are no concerns therefore relating to water treatment discharges or impacts on receiving water quality in the Ray catchment.

Although identified as a drinking water source, no water for drinking water production is currently abstracted from Lough Altan. As discussed above (2.6 Hydrology - Water Flows) the Lough Altan Marine Harvest smolt facility abstracts process water from the lake at licensed levels up to 400 L/s (34,560 m<sup>3</sup>/day). Although this water is returned as effluent further downstream there are serious implications for flows in the upper Tullaghobegly River and the flow regime throughout the catchment. The Lough Altan water is similar in chemical composition to the Lough Agher/Muckish source i.e. soft (total hardness is about 20mg/l Ca CO<sub>3</sub> on average, and mean conductivity is about 80µS/cm) and slightly acidic (average pH 6.9).



**Figure 2.20 Drinking Water Sources in the Fishery Catchment area**

### 2.9.2 Bathing Waters

Bathing waters have been designated in accordance with the requirements of the Bathing Water Quality Regulations (Ireland, 2008). Two designated bathing areas occur in the area, Drumnatiny and Magheroarty beaches. Magheroarty, although nearby, is outside the immediate catchment area. It is on a spit of land with the Atlantic Ocean to the West and Ballyness Bay to the East, and the contributing catchment consists of only a small part of the dune structure with no designated river water bodies. It is not relevant to this catchment management plan.

Drumnatiny Beach is approximately 3 km from the town of Falcarragh (Figure 2.21). It is located in the Northwestern Atlantic Seaboard Coastal water body (NW\_100\_0000). The designated bathing area is approx. 1.32 km<sup>2</sup> and the extent along the water is approximately 4250 m. The beach consists of a long sandy north facing beach; confined by Ballyness Bay to the West and by Crockagarran and a small series of headlands to the East. The Ray river discharges across the central part of the beach.



**Figure 2.21 Drumnatinny Bathing Water Beach**

Activities at Drumnatinny include swimming, kayaking, boating, surfing, windsurfing, sailing, power boating and other land based activities on the beach with the majority of users walking along the long shore. Maximum visitor numbers in high season are estimated at about 200, with approximately 5,000 visitors throughout the summer season.

Tidal ranges are in the mesotidal range (2-4m) in normal tidal conditions. The beach is exposed and experiences large swells. The bathing water quality monitoring carried out at Drumnatinny Beach since 2003 has shown consistently good water quality. Since 2010 Drumnatinny has achieved good water quality status and complied with EU guide and mandatory values as set out in the Bathing Water Directive (2006/76/EC) and the Bathing Water Quality Regulations (S.I. No. 79 of 2008). In the four year assessment period from 2012 to 2015 the annual bathing water quality rating has been classified as 'Excellent Quality' i.e. the levels of bacteria in the water are regularly low with an *E. coli* 95%ile of 52.2 and Enterococci 95%ile of 32.5 based on log transformed bacterial abundance data.

### **2.9.3 Natura 2000 Sites**

The EU Habitats Directive (92/443/EEC) promotes the maintenance of biodiversity, recognising that in the European territory of the Member States natural habitats are continuing to deteriorate and an increasing number of wild species are seriously threatened. In order to ensure the restoration or maintenance of natural habitats and species of Community interest at a favourable conservation status, special areas of conservation have been designated to create a coherent European ecological network based on criteria set out in the Directive. The network of sites is referred to as Natura 2000 and includes Special Areas of Conservation (SACs including candidate SACs) and Special Protection Areas (SPAs including proposed SPAs). These are prime wildlife conservation areas of national and European significance.

SACs are selected for the conservation of habitats listed in Annex I of the Habitats Directive, and for species of animals (other than birds) and plants listed in Annex II. SPAs are selected for the conservation of birds listed in Annex I of the Birds Directive (EC, 2009) and other regularly occurring migratory birds and their habitats. The annexed habitats and species for which each site has been selected are the qualifying interests of the sites, and the conservation objectives of the site are based on these qualifying interests.

The Natura sites in the area of the Tullaghobegly and Ray catchments are listed in Table 2.6 along with their qualifying interests, conservation objectives and threats to site integrity. They are also shown in Figure 2.22. Although not within the catchment boundary, the Inishbofin, Inishdooney & Inishbeg SPA has been retained in the table due to its proximity, hydrological connectivity and particularly due to the use of Ballyness Bay by many of the qualifying interests of this SPA. Similarly, Fawnboy Bog/Lough Nacung SAC, although outside the fishery catchment area, is retained since it is drained in part by the Glenna River to Ballyness Bay.

It is noteworthy that most of the qualifying interests for which the Natura sites listed in Table 2.6 have been designated are dependent on water for their conservation to a significant degree. They rely on soil hydrology conditions, water level and flows, and water quality to various extents e.g. habitats such as wet heaths, blanket bog, dune slacks, oligotrophic lakes, and species including slender naiad, otter, salmon, and Geyer's whorl snail.

Table 2.6 Natura 2000 Sites in the Fishery Catchment area

Site code	SAC Site name	Qualifying interests	Conservation objectives	Threats to site integrity
001090	<b>Ballyness Bay</b>	1013 Greyer's whorl Snail <i>Vertigo geyeri</i> 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) 2190 Humid dune slacks	To maintain or restore the favourable conservation condition of the Qualifying Interests for which the SAC has been selected which are defined by the list of attributes and targets in the site-specific conservation objectives (NPWS (2014) Conservation Objectives: Ballyness Bay SAC 001090. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht), and in relevant supporting documentation.	Water quality/pollution; development of marinas and ports; disturbance of marine mammals; dumping at sea; direct loss of habitat to development; recreational/amenity use; agricultural improvements/reclamation; drainage/changes in local hydrology including water abstraction; erosion (natural and anthropogenic); agricultural abandonment; overgrazing/undergrazing; bracken & scrub encroachment; amenity/recreation use; tourism-related development. Introduction of alien invasive species Illegal Dumping Burning Quarrying/removal of sand Aquaculture
001179	<b>Muckish Mountain</b>	4060 Alpine and Boreal heaths 8220 Siliceous rocky slopes with chasmophytic vegetation	To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (NPWS (2016) Conservation objectives for Muckish Mountain SAC [001179]. Generic Version 5.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs).	Changes in local hydrology including drainage; peat extraction; overgrazing; forestry; burning; direct loss of habitat to development; arterial drainage/water abstraction/lowering of the regional water table; agricultural reclamation. Introduction of alien invasive species Illegal Dumping Felling/Removal of Trees

002047	<b>Cloghernagore Bog &amp; Glenveagh National Park</b>	<p>3110 Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflora</i>)</p> <p>3260 Water courses of plain to montane levels with the <i>Ranunculus fluitans</i> and <i>Callitriche-Batrachion</i> vegetation</p> <p>4010 Northern Atlantic wet heaths with <i>Erica tetralix</i></p> <p>4030 European dry heaths</p> <p>4060 Alpine and Boreal heaths</p> <p>6410 <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)</p> <p>7130 Blanket bogs (* if active bog)</p> <p>7150 Depressions on peat substrates of the Rhynchosporion</p> <p>91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles *</p> <p>1029 Freshwater Pearl Mussel <i>Margaritifera margaritifera</i></p> <p>1106 Salmon <i>Salmo salar</i></p> <p>1355 Otter <i>Lutra lutra</i></p> <p>1421 Killarney Fern <i>Trichomanes speciosum</i></p>	<p>To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (NPWS (2017) Conservation Objectives: Cloghernagore Bog and Glenveagh National Park SAC 002047. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs).</p>	<p>Changes in local hydrology including drainage; peat extraction; overgrazing; forestry; burning; direct loss of habitat to development; arterial drainage/water abstraction/lowering of the regional water table; agricultural reclamation.</p> <p>Introduction of alien invasive species</p> <p>Illegal Dumping</p> <p>Increased pollution/reduction in water quality</p> <p>Felling/Removal of Trees</p> <p>Persecution (Poisoning)</p> <p>Potential threats to Freshwater Pearl Mussel</p>
000147	<b>Horn Head &amp; Rinclevan</b>	<p>1013 Geyer's Whorl Snail <i>Vertigo geyeri</i></p> <p>1364 Grey seal <i>Halichoerus grypus</i></p> <p>1395 Petalwort <i>Petalophyllum ralfsii</i></p> <p>1833 Slender Naiad <i>Najas flexilis</i></p> <p>2110 Embryonic shifting dunes</p> <p>2120 Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)</p> <p>2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)*</p> <p>2170 Dunes with <i>Salix repens ssp. argentea</i> (<i>Salicion arenariae</i>)</p> <p>2190 Humid dune slacks</p> <p>21A0 Machairs (* in Ireland)</p>	<p>To maintain or restore the favourable conservation condition of the Qualifying Interests for which the SAC has been selected which are defined by the list of attributes and targets in the site-specific conservation objectives (NPWS (2014) Conservation Objectives: Horn Head and Rinclevan SAC 000147. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht), and in relevant supporting documentation.</p>	<p>Agricultural improvements/reclamation; drainage/changes in local hydrology including water abstraction; erosion (natural and anthropogenic); water quality/pollution; agricultural abandonment; overgrazing/undergrazing; direct loss of habitat to development; bracken &amp; scrub encroachment; amenity/recreation use; tourism-related development.</p> <p>Introduction of alien invasive species</p> <p>Illegal Dumping</p> <p>Burning</p> <p>Quarrying/removal of sand</p> <p>Aquaculture</p>

000140	<b>Fawnboy Bog/Lough Nacung</b>	1029 Freshwater Pearl Mussel <i>Margaritifera margaritifera</i> 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> 7130 Blanket bogs (* if active bog) 7150 Depressions on peat substrates of the Rhynchosporion	To maintain or restore the favourable conservation condition of the Qualifying Interests for which the SAC has been selected which are defined by the list of attributes and targets in the site-specific conservation objectives (NPWS (2016) Conservation Objectives: Fawnboy Bog/Lough Nacung SAC 000140. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs), and in relevant supporting documentation.	Changes in local hydrology including drainage; water quality/pollution; peat extraction; overgrazing; forestry; burning; direct loss of habitat to development; arterial drainage/water abstraction/lowering of the regional water table; agricultural reclamation. Introduction of alien invasive species Illegal Dumping
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Site code	SPA Site name	Qualifying interests	Conservation objectives	Threats to site integrity
004149	<b>Falcarragh to Meenlaragh</b>	A122 Corncrake <i>Crex crex</i>	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (NPWS (2016) Conservation objectives for Falcarragh to Meenlaragh SPA [004149]. Generic Version 5.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs).	Cultivation; mowing/cutting grassland; grazing Discontinuous urbanisation.
004039	<b>Glenveagh National Park (Derryveagh &amp; Glendowan Mountains)</b>	A001 Red-throated Diver <i>Gavia stellata</i> A098 Merlin <i>Falco columbarius</i> A103 Peregrine <i>Falco peregrinus</i> A140 Golden Plover <i>Pluvialis apricaria</i> A466 Dunlin <i>Calidris alpina schinzii</i>	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (NPWS (2016) Conservation objectives for Derryveagh and Glendowan Mountains SPA [004039]. Generic Version 5.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs).	Direct & indirect impacts to the habitats of the bird species of conservation interests (loss of habitat); direct loss of habitat to development; water quality/pollution; disturbance including recreation/amenity use. Introduction of alien invasive species Illegal Dumping Persecution (Poisoning) Disturbance from Recreational/amenity use Inappropriate land management

004194	<b>Horn Head to Fanad Head</b>	A009 Fulmar <i>Fulmarus glacialis</i> A017 Cormorant <i>Phalacrocorax carbo</i> A018 Shag <i>Phalacrocorax aristotelis</i> A045 Barnacle Goose <i>Branta leucopsis</i> A103 Peregrine <i>Falco peregrinus</i> A188 Kittiwake <i>Rissa tridactyla</i> A199 Guillemot <i>Uria aalge</i> A200 Razorbill <i>Alca torda</i>	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (NPWS (2016) Conservation objectives for Horn Head to Fanad Head SPA [004194]. Generic Version 5.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs).	Direct & indirect impacts to the habitats of the bird species of conservation interests (loss of habitat); direct loss of habitat to development; water quality/pollution; disturbance including recreation/amenity use. Introduction of alien invasive species Illegal Dumping Disturbance from Recreational/amenity use Inappropriate land management
004083	<b>Inishbofin, Inishdooley &amp; Inishbeg</b>	A045 Barnacle Goose <i>Branta leucopsis</i> A122 Corncrake <i>Crex crex</i> A182 Common Gull <i>Larus canus</i> A183 Lesser Black-backed Gull <i>Larus fuscus</i> A194 Arctic Tern <i>Sterna paradisaea</i>	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (NPWS (2016) Conservation objectives for Inishbofin, Inishdooley and Inishbeg SPA [004083]. Generic Version 5.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs).	Direct & indirect impacts to the habitats of the bird species of conservation interests (loss of habitat); direct loss of habitat to development; water quality/pollution; disturbance including recreation/amenity use. Introduction of alien invasive species Illegal Dumping Disturbance from Recreational/amenity use Inappropriate land management

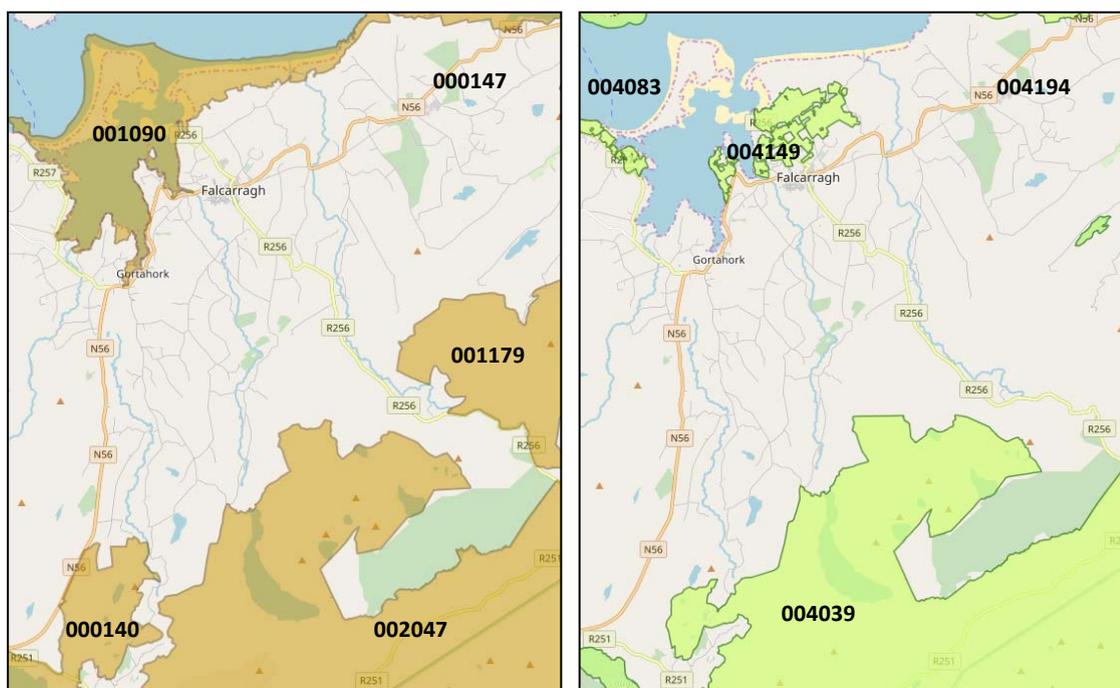


Figure 2.22 Natura 2000 Sites in the Fishery catchment area. Numbers as in Table 2.6

In addition to the Natura sites, Fawnboy Bog/Lough Nacung, Horn Head and Rinclevan, Inishbofin, Muckish Mountain, and Cloghernagore Bog and Glenveagh are Proposed National Heritage Areas.

#### 2.9.4 Freshwater Pearl Mussel

One species is of particular importance in considering protected status and catchment management requirements. The Freshwater Pearl Mussel (FPM), a rare and endangered species, is a qualifying interest of Cloghernagore Bog & Glenveagh National Park where it occurs in the Glaskeelan and Owencarrow Rivers. The FPM also occurs in the Tullaghobegly River although this site is not designated as an SAC. The population of mussels in the Tullaghobegly has recently (2013) been estimated at about 550 individuals and it is distributed throughout the main channel in the lower catchment.

The pearl mussel (*Margaritifera margaritifera*) is protected under several tiers of national and international legislation:

- The Wildlife Act, 1976 and Wildlife (Amendment) Act, 2000 confers protected faunal species status under The Wildlife Act, 1976 (Protection of Wild Animals) Regulations, 1990, S.I. No. 112, 1990)
- The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) as transposed by the European Communities (Natural Habitats)

Regulations, S.I. 94/1997, as amended by S.I. 233/1998 and S.I. 378/2005. The pearl mussel is listed on Annex II and Annex V to the Directive

- Bern Convention Appendix 3

The FPM is also on the following red data lists:

- IUCN Red Data List as Endangered (IUCN, 1996)
- Red Data (Ireland) as Critically Endangered (Byrne *et al.*, 2009).

FPM is very demanding in terms of environmental conditions necessary for its survival. It requires very high water quality and also clean gravels and sands in which to anchor itself without excessive plant or algal growth. River bed sediment conditions are particularly important for juvenile mussels that remain buried in them for up to 5 years before they are large enough to emerge at the surface of the river bed. The sediments must be free of fine silt that can prevent water and oxygen circulation within the river bed and result in death of juvenile mussels. The continued presence of pearl mussels in the Tullaghobegly reflects the generally good quality of the habitat, but juvenile mussels are absent and the population is not sustaining itself.

FPM has an unusual life cycle in that the very young mussels (glochidia) have a parasitic stage when they attach to the gills of salmon or trout. Therefore a healthy host fish population is also essential for survival of the mussel.

## 2.10 Fish Stocks

A number of fish species have been recorded in the Ray and Tullaghobegly catchments (Table 2.7). For freshwaters these include salmon, trout (sea and brown trout), arctic charr and eel. Flounder also occurs in the river estuaries and bottom reaches of the rivers, and minnow has been recorded in the lower Tullaghobegly.

The catchments are poorly productive and the relatively small rivers do not support any significant population of resident brown trout. However, large populations of small trout are present in most of the mountain lakes. A number of lakes in the area have been stocked in the past, sometimes with local indigenous trout but occasionally with fish of unknown provenance. Lakes in the Ray catchment known to hold trout include Lough Aluirg, Lough Moilt, Lough Agher, Nabrackbaddy Lough, Derryreel Lake and Drumlish Lake. The remaining lakes (Lough Keel, Lough Dog and Lough Nadreega) have been fished by CAA members but have yielded no trout. In the Tullaghobegly catchment all lakes except Lough Nabehy are known to contain trout, and of course Lough Altan has a population of Arctic charr.

**Table 2.7 Fish species recorded in the Ray and Tullaghobegly freshwater catchments**

Species	Common Name	Source
<i>Salmo salar</i>	Atlantic Salmon	IFI
<i>Salmo trutta</i>	Brown/Sea Trout	IFI
<i>Salvelinus alpinus</i>	Arctic Charr	IFI
<i>Phoxinus phoxinus</i>	Minnow	EPA
<i>Anguilla anguilla</i>	European Eel	IFI
<i>Platichthys flesus</i>	Flounder/Fluke	CAA

### 2.10.1 Salmon and Trout Stocks

The Tullaghobegly and Ray rivers have traditionally had salmon and sea trout runs that sustainably supported a vibrant local tourist and angling industry over many years. Commercial licences for salmon fishing by draft netting (ring netting) also previously operated at the mouth of the Tullaghobegly in Ballyness Bay. In line with national and international trends, our catchments have seen substantial reduction in salmonid populations. Despite management measures aimed at reducing exploitation in recent years and considerable reductions in catches following the closure of the mixed stock fishery at sea in 2007, only 50% of Ireland's 89 assessed salmon rivers are currently estimated to be at good population status (i.e. meeting biologically based Conservation Limits in 2016). Atlantic salmon is listed in the Habitats Directive (92/43/EEC - Annex II and V) which requires that special areas of conservation are designated for the species and that it is managed in a way that is compatible with it achieving favourable conservation status. Article 17 of the Directive requires Member States to report every 6 years on the conservation status of habitats and species, including salmon stocks. The most recent report (The Status of EU Protected Habitats and Species in Ireland: NPWS, 2013) states that the salmon population is still low in comparison to previous decades and so, in the absence of a recovery, the Overall Status is assessed as Inadequate.

Many factors are implicated in declining stocks including marine survival, changes in oceanic conditions, quality of freshwater environment, diseases and parasites, marine pollution, availability of prey, predator populations, over-fishing and climate change. Presently, there is insufficient empirical information on many of these factors to direct focussed interventions. However this should not be an excuse for delay. Action is required immediately and the more the effects of each individual factor can be reduced the more salmon will return to our coasts and rivers.

The Standing Scientific Committee on Salmon (SSCS), as established under Section 7.5 (a) and (b) of the 2010 Inland Fisheries Act, provides IFI with the technical and scientific information on Irish salmon stocks, the current status of these stocks relative to the objective of meeting biologically

referenced “Conservation Limits”, and the catch advice which will allow for a sustainable harvest of salmon in the forthcoming fishing season and into the future. Their 2017 report (SSCS, 2017), outlines the scientific process leading to the formulation and presentation of the catch advice for the 2017 season.

The Conservation Limit (CL) applied by the SSCS to establish the status of individual stocks is the “maximum sustainable yield” (MSY) i.e. the stock level that maximizes the long-term average surplus, as defined and used by the International Council for the Exploration of the Sea (ICES) and the North Atlantic Salmon Conservation Organisation (NASCO). Appendix V of the report sets out the manner in which river specific Conservation Limits are calculated based on estimates of fecundity, average weights, sex and age ratio for Irish index rivers, and catchment wetted areas.

River-specific fisheries advice is provided based on a forecast of the abundance of salmon which will return to each river in that year, comparison of the estimated abundance to the river-specific Conservation Limit, and determination of harvest of salmon which could be made while allowing a high probability (at least 75% recommended) that the Conservation Limit (CL) would be met.

Nationally 44 rivers were deemed to have a harvestable surplus as they are exceeding their CLs; a further 27 rivers were likely to achieve 65% of their CL and opened on a catch and release only basis; 72 rivers were failing to meet 65% of their CL or data was lacking.

For the 2017 season the Tullaghobegly river had a specific CL of 223 grilse and a predicted deficit of 83 i.e. it is estimated to be achieving only 63% of its CL. The Ray had a specific CL of 435 grilse and a predicted deficit of 187 i.e. it is estimated to be achieving only 57% of its CL. On the basis of these figures, in 2017 the Tullaghobegly and the Ray were closed for salmon fishing. Notwithstanding these restrictions, anglers were able to avail of sea trout fishing in both rivers, and Ballyness Bay provides significant opportunity for development of this resource.

While fish counters or traps allow accurate estimates of salmon returning to rivers they are only present on a small proportion of rivers. In their absence there is significant uncertainty in estimates of the numbers of returning fish. Rod catch data can assist with stock assessment by using appropriate exploitation rates. However, electrofishing of juveniles presents an alternative source of population information as the numbers of juveniles should be a good reflection of the number of adults which produced them and the relative productive capacity of that river. Currently a catchment wide index of 17 salmon fry or more per 5 minute of standardised electrofishing is used by the SSCS as the threshold value distinguishing systems where the stock is evidently below Conservation Limits, and those rivers exceeding the threshold where it is more likely that the stock is

meeting the CL. If the fry index is above the threshold, catch and release fishing only in the following year is advised.

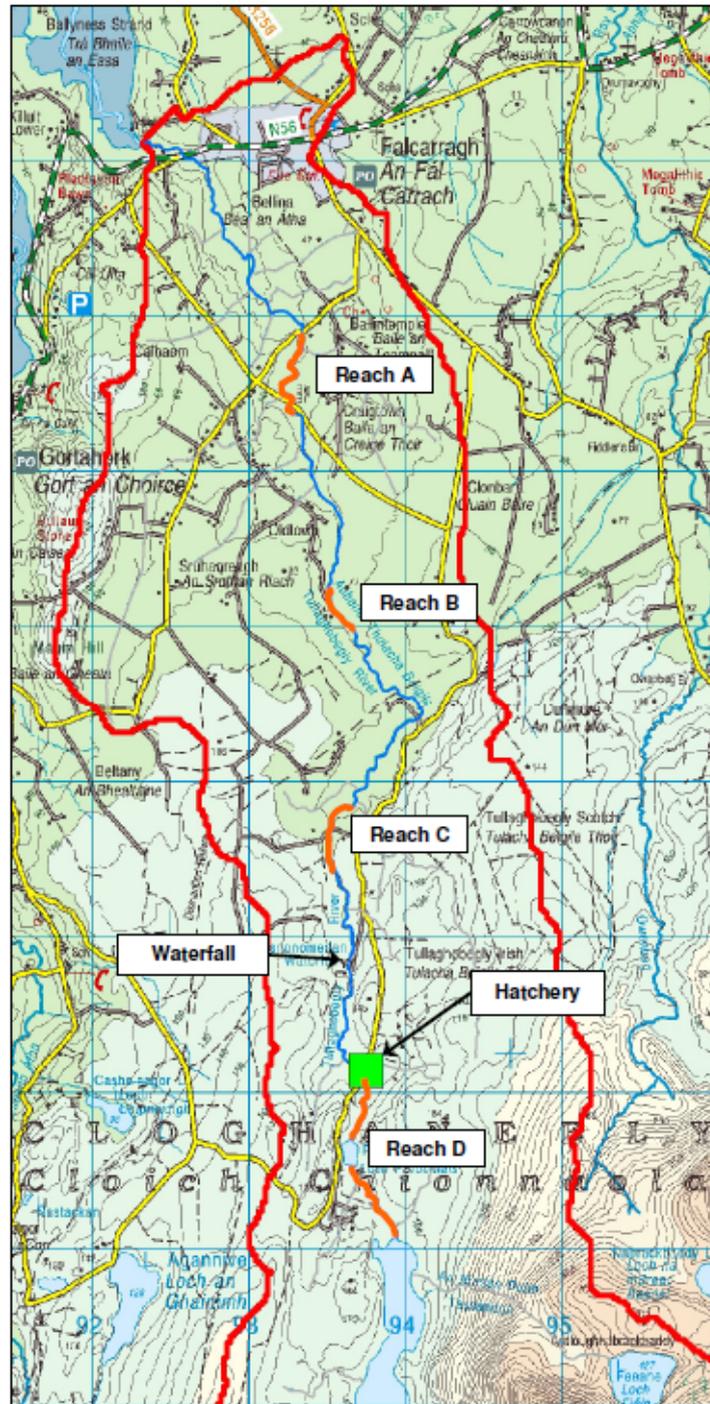


Figure 2.23 Map of Tullaghobegly catchment indicating fish sampling reaches A-D,

It is noteworthy that electrofishing was undertaken in four separate reaches of the Tullaghobegly in 2013 (Figure 2.23) (Marine Harvest and Donegal County Council, 2014). Although the methodology employed to capture fish for this study was not intended to provide quantitative estimates of fish abundance, some general conclusions on stock levels were drawn. A total of 474 fish were captured from seven sampling sites, comprising 295 trout (62.2%) and 179 salmon (37.8%). The juvenile

salmon population was found to be equivalent to Good/Excellent stock density in Reaches A and B, but Poor at all other upstream locations. This infers significant spawning in Reaches A and B, with sparse spawning in upstream reaches. Juvenile trout were more evenly distributed with Moderate/Good stock density throughout, and a tendency towards higher density in downstream Reaches A and B. However, trout stock level was equivalent to Excellent at one site near the Salmon Hatchery. Asnanomedan waterfall (labelled Waterfall in Figure 2.23), although passable, is a significant challenge to migrating fish. Downstream of the waterfall salmon formed 57.7% of the catch, whilst upstream only 6.0% of the catch were salmon.

The SSCS recommends that information on known barriers to fish migration should be obtained to allow a stock assessment or index of stock status. Barriers to migration may be passable or impassable. They include natural and man-made falls and weirs. However, bridge aprons and over-widening of channels can reduce water depth and create barriers. An increase in frequency of low flow conditions particularly at peak times of fish runs can also reduce access to spawning areas. Other structures that may impede fish passage include culverts where inverts may be inappropriately designed and man-made fords where river beds have been altered or raised. Natural obstacles may also arise due to accumulation of woody debris. However, in many instances these are beneficial and can provide habitat protection during potentially damaging flood events and can also provide sanctuary areas for young fish. While examples of most of these barriers are evident in the Ray and Tullaghobegly catchments, there has been no systematic mapping of such features. Notwithstanding this IFI estimate that 66% of the fluvial habitat area of the Tullaghobegly is accessible to salmon, and 71% of the Ray fluvial habitat.

To give an indication of previous angling potential and timing of fish runs in the Ray River records from a diary of catches kept by John 'The Station' Gallagher for the 1953 and 1956 seasons have been abstracted. The records primarily relate to fish caught by John who was an almost daily presence on the river, but also by his brother Domhna. Angling was by fly and worm and mostly in the upper river above Drumavoghy Bridge. A total of 85 fish were recorded in 1953 and average estimated weight was 5lbs (2.3kg), and 138 fish in 1956 with an average estimated weight of 4lbs 11oz (2.1kg). Seven of these fish were over 9lbs (4kg) in weight and the heaviest fish was estimated at 10lb 8oz (4.8kg). Catches are also plotted in Figure 2.24 and show that then as now fishing was most successful in the upper Ray from late July through to mid August in both years. While not rigorously scientific, and possibly not complete records, the diary is a useful barometer of previous salmon yields and the potential of this small river.

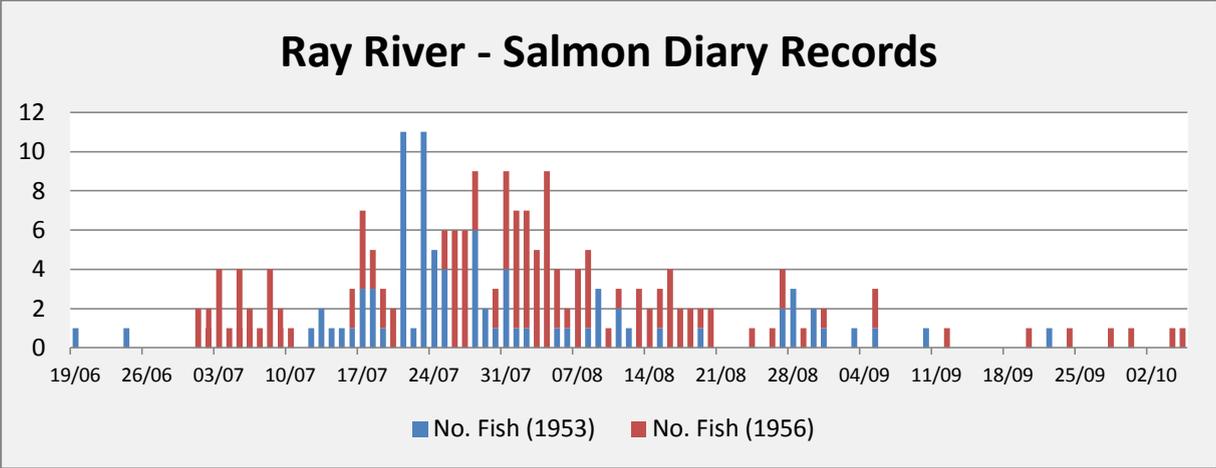


Figure 2.24 Diary records of salmon catches for two angling seasons (combined total)

2.10.2 Fish Genetics

In the 2013 study mentioned above (Marine Harvest and Donegal County Council, 2014), 179 salmon and 209 trout were sampled for genetic screening. This produced clear evidence for population genetic differences within the trout stock of the Tullaghobegly River. Fish from upstream and downstream of Asnanomedan Waterfall were the most genetically divergent. This suggests that the waterfall is an effective barrier and limits genetic mixing of these two distinct groups. However, the downstream samples also indicated two genetically distinct subgroups of trout in Reach A and Reach C. It is likely that the downstream stock is comprised of migratory and non-migratory components i.e. sea trout and brown trout, whilst the upstream stock is non-migratory. The existence of significant levels of genetic variation in trout populations within the Tullaghobegly River merits special attention from both management and conservation viewpoints.

A study by the Central Fisheries Board in 1985 showed that salmon were present in the upper Tullaghobegly before the salmon hatchery was operating, and therefore able to pass Asnanomedan Waterfall. As in the 2013 study, salmon were found to be more abundant in the lower river whilst trout were considerably more abundant above the waterfall. The escape of Norwegian salmon from the hatchery to the Tullaghobegly has motivated genetic study of the river's salmon stock. Escaped juvenile salmon have been shown to complete their life cycle, breed and interbreed with native fish upon their return to the river (Clifford et al, 1998), homing accurately to the area adjacent to the hatchery outflow in the upper reach of the river.

At the time of preparation of this plan Inland Fisheries Ireland has issued a Non-Native Fish Species Alert relating to the Pacific Pink Salmon (*Oncorhynchus gorbuscha*) that has been captured in both rod and net fisheries in North East England, Scotland and Ireland. Pink salmon have been taken in the Crana and Lackagh rivers (James Curran, Secretary Dunfanaghy Anglers Association, pers. comm.)

in Donegal in 2017 and could potentially already be in the Ray and Tullaghobegly rivers. Non-native species have the potential to disturb the natural balance of our environment and introduce new parasites and diseases to our native fish species. Significant numbers of pink salmon have been stocked in the White Sea region of northern Russia and the Kola Peninsula from the 1950's until 2003 to develop a commercial net fishery. The species has now established self-sustaining populations in a number of rivers in Russia, Finland and northern Norway. This is the most likely origin of the pink salmon recently caught in the UK and Ireland. Because pink salmon have a two year life cycle they fall into 'odd' and 'even' year stocks. Russian/Norwegian fish are odd-year stocks. It is therefore possible, and likely, that the progeny of these fish will appear again in 2019. IFI have appealed to anglers and the general public to remain vigilant and report the presence of any Pacific pink salmon in Irish river systems, and never to return to the river any pink salmon caught.

### 3 CATCHMENT PRESSURES AND ACTIONS

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A vital part of developing this catchment management plan is to understand the pressures impacting on water status so that measures can be identified and implemented to manage those pressures. The previous chapter set out the catchment characterisation based on previous monitoring and available data. It facilitates understanding of the processes operating within the catchment area and potential activities or land uses that could result in pressure leading to impact on water quality. However, much of the data is at a relatively large spatial scale and this limits its application in identifying specific issues of significance and precise locations for implementation of measures. Aquatic ecosystems can be damaged by a wide variety of environmental pressures which arise either from human activities undertaken in specific locations (point sources of pollution such as farm yards, wastewater treatment plants, septic tank systems), or widely dispersed human activities (diffuse sources such as land-spreading of fertilisers and surface run-off in urban areas). Therefore, it is essential to consult many local stakeholders in the process of identifying specific pressures and impacts on water quality in the catchments, and areas of interest for further investigation or characterisation.

#### 3.1 Water Bodies at Risk

A summary of the EPA's risk assessment for water bodies in the Catchment Management Plan area is presented first. This process is not definitive and is intended only to provide focus for more detailed appraisals and resource application. With some revision based on local catchment knowledge it can provide a starting point for significant pressures identification.

The risk being assessed is the risk that the water body will not achieve the WFD objectives set for it in the River Basin Management Plan. The objective for the Ray and Tullaghobegly river water bodies is to retain good status where it currently exists, or in the case of Tullaghobegly\_010, to achieve good status since it is currently less than good. The objective for Northwestern Atlantic Seaboard (HAs 37;38) is to retain its currently high status. In cases where status has not yet been assigned to water bodies, the minimum objective applying to them remains to achieve good status.

A review of available evidence on pressures in the catchment has resulted in the EPA determining that eight water bodies are 'Not at Risk' of meeting the objective of good status or better (Table 2.5). Two water bodies are listed for 'Review' to make a reliable determination of risk (An Cheathrú Cheanainn\_010 river water body, and Northwest Donegal groundwater body), and two more (Tullaghobegly\_010 and Lough Agher Stream\_010 river water bodies) are deemed to be at risk.

Based as it is on information at a large spatial scale, the risk assessment is consequently limited in its ability to resolve issues at a pragmatic operational scale. The Tullaghobegly assessment is distorted by the fact that a significant pressure in the upper catchment is situated immediately upstream of the monitoring point. The potential for impact therefore lies in the lower, and not in the upper catchment. A realistic appraisal would reverse the outcomes i.e. Tullaghobegly\_010 is considered to be 'Not at Risk' while Tullaghobegly\_020 is 'At Risk'.

### 3.2 The Views of Locals

CAA recognise that significant and relevant detailed information resides with catchment residents and stakeholders and that any plan must represent their vision and knowledge. Capturing such information is an essential step towards identifying significant pressures and the areas in which they are impacting. Key catchment players are regularly consulted through a number of informal processes, including ad hoc meetings and catchment walk-overs, and when directing works in the catchment. Through these processes, information relayed by landowners, and their own extensive familiarity with the catchments, CAA members have assembled substantial details of pressures and impacts throughout the area.

With the support of the Local Authority Waters and Communities Office, CAA will engage in more structured exchanges of views and information to feed into the emerging plan and work programmes. Groups with whom engagement will be sought include:-

- Farmers, Land Owners and Peat Cutters
- (IFA / Hill Sheep Farmers)
- Angling Interests
- Local Chamber of Commerce and Business Interests
- Community and Social Groups
- Recreational and Tourist Interests
- Educational Interests
- Local and Regional Authorities

Based on our earlier review of the catchment characteristics and initial discussions with the groups mentioned above, we have identified what we believe to be the environmental pressures adversely affecting water quality in the Ray and Tullaghobegly catchments that are most relevant to this plan. This is not an exhaustive list of catchment pressures. Other known pressures may not be included below because effective measures are already in place to address them and are being implemented by other agencies, or because they are not considered the most pressing in our catchment. Examples include septic tanks which are being monitored by Donegal County Council; and nutrient losses from agriculture which data suggest are not a priority issue in these catchments with less intensive agriculture. It is not intended to dismiss the potential impact of such pressures, but rather to focus in

our plan on issues that are not being adequately addressed and that we believe CAA and the local community can make a material contribution towards their resolution in the timeframe of this plan.

The measures requiring further investigation and action are outlined below with a brief indication of measures proposed to address them.

### 3.3 Urban Wastewater Discharges

Waste water treatment is essential to protect our rivers, lakes and coastal waters. Aquatic ecosystems and human health can come under threat when waste water is not adequately collected and treated. Waste water continues to be one of the principal pressures on water quality in Ireland.

Falcarragh sewage treatment works discharges into Ballyness Bay at the mouth of the Tullaghobegly River. The works was constructed in 1959 to serve a population of 1,225. There is no sewage treatment provided in the Falcarragh works. The flow discharge is now continuous at all tidal stages. This means that raw sewage can move into the mouth of the Tullaghobegly at the Bawaan pool on rising tides. The Bawaan Pool is a sanctuary area, regularly holding numbers of salmon awaiting suitable flows to pass the falls and move up the river. The discharge has also had an impact on shellfish harvested within Ballyness Bay in the past.

There are four pumping stations within the Falcarragh sewerage system. The pumping station at Carrowcannon is connected to a storm overflow that discharges to the Ray River. All four pumping stations also have emergency overflow pipelines that discharge to local streams flowing into the Ray and Tullaghobegly rivers. Pump failures on the Bellina Housing Estate tank and chronic overflows to the Tullaghobegly have been reported by CAA. The Falcarragh treatment plant is only manned part time and there are no composite samplers or continuous flow monitoring devices in place on the existing system. Response times are therefore inadequate which results in protracted discharges of raw sewage to the Tullaghobegly River.

In the most recent report on Urban Wastewater Treatment, the EPA reports that despite progress in some areas, there are still long delays in building many of the treatment plants needed to eliminate discharges of untreated waste water, including Falcarragh. These delays mean that 31 areas are likely to continue discharging raw sewage into 2021. Many of the projects to provide treatment are running three years behind schedule. In response to the delays in carrying out this essential work, the EPA has started legal action against Irish Water for continuing to discharge untreated waste water into the environment. While we acknowledge that commitments have been made to upgrade

the Urban Wastewater Treatment Plant at Falcarragh, it should be emphasised that such commitments have been made in numerous previous investment programmes without delivery.

Additional wastewater discharges into Ballyness Bay at Gortahork may also lead to cumulative pressures on the Ballyness Bay SAC and adequate mitigation is required. In this regard it should be noted that in a Natura Impact Statement prepared as part of an Appropriate Assessment for the Falcarragh Agglomeration by Irish Water (Natura Impact Statement as part of the Falcarragh Waste Water Discharge Licence Application: D0343-01. 2014) a conclusion of 'No Impact' relies on proposed future mitigation in the form of an upgrade to the Falcarragh Works. It is essential that Irish Water sets out a timescale and identifies the mechanisms through which the mitigation measures will be secured, implemented and monitored.

### **3.4 Sediment and Silt Loads**

There is a growing understanding of the significance of the effects of sediment erosion on rivers. It is now believed to be the second most important factor nationally impacting on water quality after nutrient enrichment. Erosion also represents a significant loss of soil resource to farmers.

Fine sediment, both mineral sediment and eroding peat, can seriously affect the river system in a number of ways. When sediment enters the river it settles on the river bed and can clog clean gravels and reduce water and oxygen flow through them. This makes them unsuitable for spawning fish, and for the invertebrates that live in them. Oxygen conditions in the river bed gravels of the Tullaghobegly river have been measured (Marine Harvest and Donegal County Council, 2014). The percentage reduction in redox potential is used as an indicator of oxygen status. For gravels to be suitable for young pearl mussels to survive there should be no more than a 20% reduction in redox potential at a depth of 5cm in the gravels. Over 40% of the Tullaghobegly samples failed this standard, and at sites just downstream of the salmon smolt facility, the average reduction in redox potential was 34% (maximum value recorded was 40.9%).



**Figure 3.1** Eroded peat hag on Crocknalaragagh

When sediment settles on the river bed it also provides a medium in which plants can root. Fine sediment can also contain nutrients, in particular phosphorus, and this exacerbates the problem. The combination of nutrients and sediment means aquatic plants can increase, promoting further sediment deposition and reducing water flows and choking channels. Heavy weed growth is now a feature of the upper Tullaghobegly.

Therefore there is *prima facie* evidence of sediment impact in the catchments. Several important sources of sediment are identified and discussed below.

### **3.4.1 Bank Erosion**

Bank erosion is a significant issue along stretches of the Ray and Tullaghobegly rivers (Figure 3.2). A number of stretches of eroding and collapsing bank have already been identified and they are significant contributors to the river's sediment load. Damage is occurring in areas with erodible soils (relatively sandy and peaty soils), where trampling by animals occurs on steep banks, where hard rock armour has been put in place and the changed dynamics of stream direction and velocity is creating new pressures and undercutting banks. At some locations boulders have been removed from in-stream positions and placed at eroding sites as bank armour. Some stretches have rock armour that was installed two or three decades ago and perhaps longer.



**Figure 3.2 Examples of bank collapse on the Tullaghobegly (left) and Ray (right)**

It is important to state that rivers are dynamic entities. Sporadic flooding, bank erosion and resultant deposition of gravel and other materials are a natural phenomena which play an integral part in the development and maintenance of fish spawning and nursery areas. Fisheries habitat enhancement and restoration work can be utilised to maximise fisheries recruitment and subsequent survival where appropriately located and designed. Very often these works are required to reverse or mitigate against adverse catchment issues such as severe erosion, over grazing, inappropriate drainage or other unauthorised instream works.

CAA will liaise with land owners and IFI to identify areas of eroding bank or banks at risk of erosion and agree a coordinated approach to bank protection. As a general measure to prevent damage to banks, CAA will actively promote good land and stock management practices in its regular meetings and dealings with farmers. This will include emphasis on the need for exclusion of stock from rivers to prevent trampling of banks and use of fencing to create adequate buffers.

Further consultation with land owners and river walks to map critical locations will be undertaken. This will be largely done by CAA members using agreed criteria and with training support as required. Geo-referenced photographs documenting bank erosion will be collated to create a database of impacted sites. The extent and vulnerability of these sites, their proximity to sensitive stretches, their potential to deliver fine sediment, and to form barriers through over-widening will form the basis of a prioritized action list. Any actions will be agreed fully with land owners in advance and will only take place with their full co-operation and support. Any measures identified on the Tullaghobegly River should be cognisant of the possible presence of Freshwater Pearl Mussel populations downstream of any proposed bank protection.

A sustainable solution in many cases could entail protection through planting of exposed banks at some sites to establish vegetated riparian buffers. Dimensions and uses of buffer areas will vary and

enhancement of their vegetation cover will need to reflect such differences. To help to inform selection of appropriate species CAA will map known pools where ongoing angling access is to be managed. Stretches which do not hold fish and where banks are vulnerable to impact will also be identified. The latter areas are particularly suitable for establishing native woody perennial shrubs and trees such as willow and alder. Other species may also be considered to maximise biodiversity benefits, and CAA may seek support under Coillte's Native Woodland Scheme for specific planting projects at key sites where land owner agreement is forthcoming and sufficient land is available. Narrow linear sites where land availability is heavily constrained will be promoted for bank-side willow planting.

Rock armour is only seen as an interim measure to be accompanied by energy dissipating mechanisms (e.g. deflectors, Christmas tree fenders) in the phased re-establishment of stable vegetated banks. However, replacement of in-stream boulders should be considered in some circumstances. CAA will liaise with IFI to direct resources to required bank restoration/protection measures and preparation of method statements in advance of individual works. Necessary works will be the responsibility of IFI in its role as statutory Fishery Manager.

#### **UWWT and BANK PROTECTION/RESTORATION MEASURES**

- Irish Water to implement mitigation immediately to prevent impact on SAC and ensure compliance with Urban Waste Water Treatment Directive
- IFI to assist CAA in the identification of suitable bank protection and fisheries habitat enhancement actions including bank stabilisation and revetment measures where appropriate
- Information provision by CAA to land owners re bank protection
- CAA to seek landowner agreement for all proposed bank protection actions
- CAA database of damaged and vulnerable banks
- CAA mapping of sites for riparian vegetation establishment
- CAA and IFI liaison to secure resources for essential works

#### **3.4.2 Drainage**

The extent of land drainage for agriculture and forestry, and peat cutting has increased significantly in recent decades facilitated to some extent by ready access to diggers and promoted through financial drivers of intensification. Drainage may be by open ditches (shucks or dykes) or by tile

drainage. Both systems result in rapid transport routes for drainage water and sediment to receiving streams/ivers and can therefore increase sediment loads.

Road drainage and urban runoff may also deliver sediments and pollutants to streams. While this is not believed to be a major problem in our catchment areas, instances of diversion of road drains into sensitive streams without mitigation or proper consideration of receiving waters have occurred. A preliminary desk-based risk assessment of urban areas, surface water drainage and river crossings using geographic information systems (GIS) will be advocated to the relevant roads and local authorities.

Appropriate ditch design and management can provide opportunities for sediment to settle before reaching sensitive rivers. Examples include simple measures such as terminating ditches before they reach the stream and leaving a buffer across which drainage water can diffuse, or creating in-ditch or end-of-ditch sumps for settlement. To improve sediment retention during ditch management works only the bed of ditches should be cleaned and the banks left vegetated, and ditches should not be over-deepened.

CAA will liaise with relevant authorities (including DCC, IFI, DAFM, Teagasc, Forest Service, NPWS) to source guidance on best ditch management practices and to identify methods and opportunities for making such guidance available to local landowners and contractors involved in drainage.

While undertaking river walks, CAA will identify land drainage features with potential for delivering significant sediment loads to streams. These will be mapped and provided to the relevant agency for implementation of appropriate measures where feasible.

#### **LAND DRAINAGE MEASURES**

- CAA to liaise with relevant authorities to source appropriate guidance on drainage design and management, and serve out to landowners/contractors
- CAA to map land drainage features with potential for significant impact
- CAA to forward data on drainage features for action as required
- CAA to facilitate landowner discussions for agreement of all proposed actions
- CAA to propose GIS based risk assessment of surface water drainage

### 3.4.3 Industrial/Waste Discharges

There are two commercial ventures in the Ray and Tullaghobegly catchment areas that discharge trade effluent to rivers under licence issued by Donegal County Council under Section 4 of the Local Government (Water Pollution) Act, 1977 as amended. These are the quarry operated by Cassidy Brothers, and the Marine Harvest Smolt Facility. The latter also operates under an aquaculture licence issued by the Department of Agriculture, Food and the Marine (DAFM). This licence has conditions attached and site inspections would be normal procedure for conditions compliance. An EPA waste licence has also been issued for the management of the Landfill Site at Muckish.

Cassidy Brothers Concrete Products (Falcarragh) Ltd is a substantial quarrying and concrete products manufacturing venture set up in 1974. It operates at Fawnmore and the current revision of the discharge licence (Lwat6 issued in 2012) permits discharge of up to 25 m<sup>3</sup> per day of quarry water to the Ray River via the Owenwee tributary. The Owenwee has traditionally been known as an important nursery stream for sea trout and its present status should be assessed.

Marine Harvest operate the Altan Smolt and Hatchery Unit at Procklis in the upper Tullaghobegly catchment. The latest revision of their discharge licence (Lwat26 issued in November 2017) permits the discharge of up to 400l/s of effluent on average. The issues relating to this abstraction and discharge of large volumes of effluent containing nutrients and solids have been discussed above.

Conditions are set in licences in relation to quality and volumes of emissions, and the monitoring regime required to assess compliance. However in the case of both Cassidy Brothers and Marine Harvest monitoring is based on grab or sometimes composite sampling taken at extremely low frequencies (monthly, quarterly or even annually). Such sampling is not capable of assessing compliance in a meaningful environmental way that offers real protection to receiving waters. Episodic pollution events will not be detected and may be of extreme and long lasting environmental consequence. For example damaging deposition of sediments on stream beds from episodic release events cannot be detected by annual sampling of suspended solids in the receiving water column. This is particularly critical in the context of sensitive habitats and species in receiving waters such as spawning beds in nursery streams and the Freshwater Pearl Mussel.

There is a need for immediate review of these licences in relation to the range of parameters specified for monitoring, limit values for some parameters, and in particular in relation to frequency of monitoring requirements. It is not sufficient to state in discharge licences that no deterioration in the quality of receiving waters shall occur. Effluent emission limit values set by Donegal County Council are required to support achievement of good status water quality, and must not result in a deterioration in status or impair achieving Water Framework Directive objectives. In particular,

quality standards set for the Marine Harvest discharge need to consider the lack of dilution available in receiving waters since most of the Tullaghobegly flow is abstracted before discharge back to the river. The requirement for recirculating aquaculture systems should be considered.

Sampling regimes should be proportionate and adequate in light of risks posed. Realistic, robust and transparent monitoring regimes that offer adequate protection to receiving waters must be implemented. Given the scale of operations and the resources of the licensed entities, BATNEEC principles suggest that appropriate monitoring should at a minimum be based on real time continuous turbidity and flow monitoring at points upstream and downstream of discharges. A review of compensation flows and their measurement in the case of the Marine Harvest operation should also be undertaken considering the hydrological implications discussed above. Consideration should also be given to a requirement for licensees to prepare an annual environmental report (AER) detailing activities carried out at the facilities, summary report on quantities and composition of all discharges, summary of results and interpretation of environmental monitoring, incidents and complaints summaries, and any other items or material of relevance to the receiving environment.

The EPA Waste Licence WO126-01 granted to Donegal County Council in 2001 and amended in 2013, provides for the orderly closure, capping and restoration of the landfill site at Muckish Gap. The site is in the headwater catchment of the Ray. Capping and restoration are complete and the site is now in a phase of monitoring. Frequency of monitoring may not be compliant with licence conditions and should be reviewed.

#### **INDUSTRIAL/WASTE DISCHARGES MEASURES**

- IFI to assess status of the Owenwee river as a nursery stream
- Donegal County Council to review Section 4 Licenses in the catchment area with regard to parameters, emission limits, nature and frequency of monitoring
- AER to be a requirement for Licensees
- DCC to review monitoring frequency of Muckish Landfill site

#### **3.4.4 Fisheries Management Issues**

IFI is the statutory agency with responsibility for fisheries management. However, CAA has entered a formal partnership agreement with IFI to cooperate in the joint management of the Tullaghobegly

and Ray Fishery. CAA, through their intimate knowledge of the area and their relationship with other catchment stakeholders, will facilitate, augment and help to inform measures required for management of fish stocks.

It is critical that a robust baseline is established to allow assessment of future stocks and the effectiveness of measures being implemented. CAA will support IFI in determining/implementing appropriate management targets based on conservation limits, stock diversity (e.g. genetics, age composition, run-timing, etc.). The following issues are identified as areas requiring attention and inclusion in IFI work programmes.

While there is no substantial spring fishing tradition in the catchments, spring fish have been taken in the past. An assessment of MSW (multi-sea-winter) stock would add to the data for assessment of conservation limits and help to inform a management programme.

Understandably much of the resource available is applied to main channels in the catchments. Many small streams (and some larger channels such as the Lough Agher River) provide important spawning and nursery habitat and a programme to assess them should be prepared.

Given the size of many of these streams even small scale pressures and morphological changes can result in significant local impact. In such cases restoration works may be required and should be prioritized based on fisheries criteria including consideration of genetic diversity. CAA will liaise with IFI partners in informing the focus of resources for improving and restoring degraded salmon habitat in prioritised catchment areas by agreement.

Where habitat enhancement or water quality improvement measures have failed to reverse declines in fish stocks, it may be necessary to consider stock enhancement through measures such as increased protection, or novel approaches such as fry relocation to upstream sanctuary or high status areas. However, fry relocation which is a preferable measure to stocking of artificially reared fry, is only proposed where locally high salmon fry densities are found with a view to better dispersal of natural spawned fry. This is unlikely to be the case in either the Ray or the Tullaghobegly where overall salmon numbers have declined significantly over recent years

A general review of biosecurity measures and contingencies to prevent the introduction or spread of disease and non-native salmon should be undertaken. This is particularly relevant to smolt rearing at the Marine Harvest facility.

Protocols should be established with the Planning Authority and Agencies with a role in environmental assessments to ensure that CAA is afforded the opportunity to comment on all catchment development plans and programmes at an early stage in the process. Activities of relevance include road upgrades/widening, bridge repairs, industrial developments or afforestation.

Unauthorised or illegal habitat manipulations occur in the catchment (gravel extraction/channel alterations/deepening). Protocols should be established to address these issues through dissemination of information on prohibited activities in the first instance. This could be addressed along with providing information on other issues mentioned above such as drainage and drainage maintenance works, and prevention of impacts on salmon habitat through creating barriers to fish migration and interrupting river connectivity.

CAA is rooted in the local community and hears much anecdotal evidence of poaching activity. Physical evidence in the form of nets is also often encountered and IFI have taken prosecutions for illegal sale of wild salmon. The Ray and Tullaghobegly are small rivers without many large deep pools or lakes in the catchment accessible to fish. Fish stocks are therefore particularly vulnerable to illegal catching. Given the conservation limits and stock deficits estimated, the number of fish running in the catchment is roughly 250 in the Ray and 140 in the Tullaghobegly (less than 400 fish in both catchments combined). In the context of such small stock numbers even low levels of poaching will have profound impacts. An evidence based assessment of the extent of poaching activity and unreported/illegal catch should be undertaken.

Structures or systems should be put in place that will ensure good communication and co-operation between fisheries partners and stakeholders (Inland Fisheries Ireland, angling clubs / fishery owners) which can help identify enforcement issues. Public awareness material should be prepared highlighting the precarious nature of salmon stocks in the catchments, and advocating reporting of poaching or sale of 'wild salmon' with appropriate IFI contact numbers.

Finally some assessment of predation pressures should be undertaken. Resident predators include harbour seals, cormorants, otter, and mink. If possible the study should identify potential measures to minimize predation while the precarious position of stock continues.

## FISH STOCK MEASURES

- CAA to liaise with IFI in an ethos of partnership to implement fish stock management measures
- IFI to establish a baseline for future comparison when assessing salmon stocks
- IFI to assess MSW stock in the catchments when available resources allow
- CAA and IFI to liaise in prioritising critical streams for habitat assessment and possible restoration
- IFI to consider measures for stock enhancement
- CAA to assess the potential for development of sea trout and brown trout fisheries
- IFI to review biosecurity measures to prevent disease spread and transgenetics
- CAA to be consulted at early stages of catchment development planning or programmes
- IFI to implement measures to prevent prohibited habitat manipulations
- IFI to conduct barriers assessment surveys of both Ray and Tullaghobegly Rivers as part of national IFI barriers programme
- IFI will continue to liaise closely with CAA with regard to local reports of suspected poaching or other illegal fishing activity with a view to maximising protection of valuable spawning stocks
- IFI to support an assessment of predation pressures

### 3.4.5 Invasive Alien Species

CAA is very aware of the fundamental importance of biodiversity in maintaining robust and sustainable ecosystems. In recent years the Association and its members have noted a growing threat from invasive alien species in our catchments. In particular Himalayan balsam (*Impatiens glandulifera*), Japanese Knotweed (*Fallopia japonica*) and Himalayan Knotweed (*Persicaria wallichii*) occur widely and are spreading vigorously. All these species are listed in the Third Schedule of the Birds and Natural Habitats Regulations 2011 (Non-native species subject to restrictions under *Regulations 49 and 50*) which prohibits their introduction and dispersal.

The importance of the threat posed by invasive species is reflected in a suite of international, European and national policy and legislation. These include:-

- Convention on Biological Diversity
- EU Biodiversity Strategy to 2020

- Regulation of the European Parliament and of the Council on the prevention and management of the introduction and spread of invasive alien species
- Actions for Biodiversity 2011-2016, Ireland's 2nd National Biodiversity Plan
- European Communities (Birds and Natural Habitats) Regulations 2011

Apart from direct displacement of native species, Himalayan balsam is resulting in exposure and destabilisation of river banks. The consequences of increased erosion that results has been discussed in Section 3.4 above. Both Japanese and Himalayan knotweed also damage native riparian communities by reducing light availability, and alteration of the soil environment, decreasing soil bulk density and increasing organic matter content, water content and nutrient levels. Knotweed can affect trophic levels and has the potential to cause serious disruption to fisheries habitats. The reduction of suitable riparian habitat for invertebrates also impacts on food chains.

Himalayan balsam and both Japanese and Himalayan Knotweed are now widely distributed in the Ray and Tullaghobegly catchments, particularly in the lower catchments (Figure 3.3). They can all spread rapidly; balsam through abundant seed production, and knotweed by dispersal of rhizomes and stems. Early intervention and control is essential for effective management and this requires mapping of their distribution. CAA will prepare a proposal for an invasive plant species mapping and pilot control project in the Ray and Tullaghobegly catchments and seek funding for implementation. CAA will provide training in relevant species identification to its members and other catchment stakeholders as part of the project to raise awareness of the issue, and to allow early detection to prevent further introduction and spread.



**Figure 3.3 Invasive plant species in our catchments. Clockwise from top left: Japanese Knotweed; Himalayan Balsam; Himalayan Knotweed; Bank Erosion under knotweed.**

### **INVASIVE ALIEN SPECIES MEASURES**

- CAA to prepare a proposal for invasive plant species mapping and pilot control project in the Ray and Tullaghobegly catchments
- CAA with the support of IFI to seek funding for implementation of IAS pilot control project
- CAA to raise awareness of IAS by providing identification aids and training to catchment stakeholders
- CAA to submit IAS records to the National Biodiversity Data Centre

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## 4 NEXT STEPS

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This plan sets out a range of actions and initiatives to improve the water environment and fish stocks in our catchments. It is a starting point and requires establishment of support structures if it is to be brought to action stage. CAA in liaison with its IFI partners will now prioritize the proposed actions to be brought forward and will establish working groups with responsibility for managing the various action programmes. They will develop Work Programmes for each prioritized area, and liaise with relevant stakeholders. The working groups will be key to driving action programmes, reviewing works, and identifying opportunities for measures implementation.

A catchment forum should be established to allow regular review of progress, discussion of emerging issues, assessment of implementation and performance, and information trading. The recently established Local Authority Waters and Communities Offices could provide support for such an initiative. The forum must be representative of all stakeholder sectors with regular meetings in the catchment, and provide real opportunities for input to planning and implementation. Suggested attendees include CAA, IFI, Farming/Forestry representatives, DCC, local Tourist and Traders Association, local schools and educational Institutions, and representatives from local industries.

In the longer term, CAA advocates the establishment of a Rivers Trust for the area. The Rivers Trust ethos aligns closely with the aspirations and vision of CAA. Rivers trusts are charities, established by local people to look after, protect and improve rivers, streams and lakes in a particular river catchment or an area comprising many river catchments. An increasing number have been established in Ireland and CAA will engage with the All-Ireland Development Officer for the Rivers Trust to explore the possibility of establishing a Rivers Trust for our catchment area.

There is a compelling logic to including the Glenna River (also known locally as the Bedlam) in the fisheries management agreement with CAA, and in the area within the remit of any future Rivers Trust. The Tullaghobegly and the Glenna comprise the major freshwater inflows to Ballyness Bay. Ballyness Bay also hosts mixed salmon and sea trout stocks for both rivers. The Ray, Tullaghobegly and Glenna are contiguous catchments with similar land use, similar pressures operate and similar management solutions apply. The holistic approach to integrated catchment management promotes a natural catchments management methodology. Integrating the Glenna with the CAA fishery is in keeping with this pragmatic and resource efficient approach.

Through implementing this catchment management plan, and by working with other partners and stakeholders in Cloughaneely, CAA hopes to play a key role in helping to secure the future of Cloughaneely's heritage for the benefit of present and future generations.

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## 5 GLOSSARY

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**Acid Grassland** - grassland on thin, peaty, infertile soils and restricted to sheep-grazed, steep slopes at higher altitudes than the other grassland communities.

**Afforestation** - Establishment of a new forest by planting of non-forested land

**Ammonia (NH<sub>3</sub>)** - A simple form of nitrogen primarily originating in waste discharges. It can be toxic to fish under certain circumstances and is a source of nitrogen for plants and algae

**Anthropogenic** - Produced as a result of human activities

**Aquifer** - A rock unit that will yield water in a usable quantity to a well or spring. A geological formation through which water can percolate, sometimes very slowly for long distances

**Attenuation** - The reduction in magnitude/intensity/concentration of a substance dispersed in a gaseous or liquid medium

**Bathymetry** - the measurement of depth of water in oceans, seas, or lakes

**BATNEEC** means 'the best available technology not entailing excessive costs'. The technology in question should be Best at preventing pollution and Available in the sense that it is procurable by the industry concerned. Technology itself is taken as the techniques and the use of the techniques, including training and maintenance etc. NEEC addresses the balance between environmental benefit and financial expense

**Benthic Organism** (benthos) - An organism that lives on or near the bottom of a river, lake or ocean

**Biochemical Oxygen Demand (BOD)** - A measure of the potential oxygen consumption of decaying organic matter in water. It is a widely used measure of organic pollution in rivers and in effluents discharged to water

**Biodiversity** - Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part

**Biomass** - The weight of biological matter. Standing crop is the amount of biomass (e.g. algae) in a waterbody

**Biota** - The flora and fauna of an area

**Blanket Bog** - An area, often very extensive, of acid peatland, found in constantly wet climates, characteristic of broad flat upland areas, which develops where drainage is impeded and the soil is acid

**Carbon Sequestration** - The uptake of carbon containing substances, in particular carbon dioxide

**Catchment Area** - The area from which a major river system or lake derives its water (i.e., the area drained by a river system)

**Chert** - a crystalline sedimentary rock material composed of silicon dioxide (SiO<sub>2</sub>)

**Clasts** - chunks and smaller grains of rock broken off other rocks by physical weathering

**Diffuse Source Pollution** - Pollution that arises from diffuse areas in a catchment such as fields adjacent to a river or stream during heavy rainfall when surface runoff occurs

**Dissolved Oxygen (DO)** - A measure of the concentration of oxygen in a liquid, such as water or wastewater, usually expressed in mg/l or per cent saturation

**E.coli** - Full name Escherichia coli. E. coli is a rod shaped bacterium that is commonly found in the lower intestines of warm-blooded animals. Most types are harmless but some can cause food poisoning. E. coli is present in faecal material in great numbers and is therefore used to indicate if water has been contaminated by sewage or sewage effluent.

**Ecosystem** - A community of interdependent organisms together with the environment they inhabit and with which they interact, and which is distinct from adjacent communities and environments

**Eco-Tourism** - Eco-tourism is responsible travel to fragile, pristine and usually protected areas that strives to be low impact and (usually) small scale. It helps educate the traveller, provides funds for conservation, directly benefits the economic development and political empowerment of local communities and fosters respect for different cultures and human rights

**Effluent** - Liquid wastes

**Enterococci** - A group of bacteria which are normally found in the intestine of mammals and birds. They are also opportunistic pathogens and may cause human and animal infections. Their presence may be used to indicate if water has been contaminated by faecal material

**Environmental Assessment** - The preparation of an environmental report, the carrying out of consultations, the taking into account of the environmental report and the results of the consultations in decision-making

**Erosion** - Wearing away of earth or rock by the effects of rain, wind, sea or rivers or by the action of toxic substances

**Eutrophic** - Greek for well nourished. Applied to waterbodies with high nutrient concentrations leading to large algal standing crops.

**Eutrophication** - The enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned

**Evapotranspiration** - The combined processes of evaporation and transpiration. It can be defined as the sum of water used by vegetation and water lost by evaporation

**Fauna** - Animals

**Feldspar** - a name given to a group of minerals distinguished by the presence of alumina and silica (SiO<sub>2</sub>) in their chemistry. It is the single most abundant mineral group on Earth

**Flora** - Plants

**Fluvial** - associated with rivers and streams

**Fry** - young salmon that no longer have a yolk-sack and are capable of feeding themselves

**Geographical Information System (GIS)** - A set of integrated techniques for storing, retrieving, transforming and displaying spatially referenced thematic data in map form

**Geomorphology** - The study of the form and development of the Earth, and especially of its surface and physical features, and of the relationship between these features and the geological structures beneath

**Glochidia** - The glochidium (plural glochidia) is a microscopic larval stage of some freshwater mussels, including the freshwater pearl mussel

**Groundwater** - Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material

**Habitat** - The dwelling place of a species or community, providing a particular set of environmental conditions (e.g. forest floor, sea shore)

**Invertebrates** - Animals which do not possess a backbone

**Limit Value** - A level fixed on the basis of scientific knowledge, with the aim of avoiding preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained

**Macroinvertebrates** - Larger invertebrates, e.g. worms, snails and insects

**Macrophytes** - Large plants which in water include rooted and floating species

**Municipal Waste** - Defined in the Waste Management Act 1996 as household waste as well as commercial or other waste which, because of its nature and composition, is similar to household waste

**Nitrate (NO<sub>3</sub>)** - A salt of nitric acid (HNO<sub>3</sub>)

**Nutrient** - Element or chemical essential for growth, e.g. phosphorus, nitrogen, silica, oxygen and carbon

**Oligotrophic** - Applied to water bodies which are poorly nourished, unproductive

**Pathogen** - Biologically hazardous organisms such as viruses, bacteria or parasites that may give rise to illness in humans or animals

**Pelite** - a sediment or sedimentary rock composed of very fine clay or mud particles

**Pesticide** - A general term for any chemical agent which is used in order to kill unwanted plants ('weeds'), animal pests, or disease causing fungi

**pH** - The measure of the acidity or alkalinity of a substance

**Phosphate (PO<sub>4</sub>)** - The commonly occurring form of phosphorus taken up by plants in the aquatic environment and essential for their growth

**Point Source Pollution** - Pollution that arises from a well defined point typically the end of a discharge pipe but may include farmyard sources

**Precambrian** - the earliest of the geologic ages, which are marked by different layers of sedimentary rock

**Pressures** - Any activity in a catchment that has the potential to impact on the quality of the environment

**Quartz** - a mineral composed of silicon and oxygen atoms (SiO<sub>2</sub>). Quartz is the second most abundant mineral in Earth's continental crust, behind feldspar

**Quartzite** - metamorphic rock which was originally pure quartz sandstone. Sandstone is converted into quartzite through heating and pressure usually related to tectonic compression

**Redox** An oxidation-reduction (redox) reaction is a type of chemical reaction that involves a transfer of electrons between two substances. Redox reactions are common and vital to some of the basic functions of life including respiration

**Riparian Vegetation** - Vegetation growing close to a watercourse, lake, wetland, or spring that is generally critical for wildlife cover, fish food organisms, stream nutrients and large organic debris, and for streambank stability

**Salmonid** - Any species in the salmon family including salmon, trout and charr

**Sewage** - Liquid wastes from communities, conveyed in sewers. Sewage may be a mixture of domestic sewage effluents from residential areas and industrial liquid waste

**Schist** - a metamorphic rock with medium to large, flat, sheet-like grains in one dominant orientation, often finely interleaved with quartz and feldspar

**Source-Pathway-Receptor** - A concept to help in understanding how a pollution pressure can travel along a pathway or route to reach and affect some sensitive receptor

**Stream Morphology** - The form and pattern of streambeds and stream channels

**Sustainable Development** - Defined by the Bruntland Commission (1987) as 'development that meets the needs of the present without compromising the ability of the future generations to meet their own needs'

**Sustainable Tourism** - Sustainable tourism development should meet the needs of present tourists and host regions while protecting and enhancing opportunity for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems. Sustainable tourism products are products, which are operated in harmony with the local environment, community and cultures, so that these become the permanent beneficiaries not the victims of tourism development

**Till** - unsorted glacial sediment that may consist of clay, sand, gravel, and boulders

**Wetland** - An area covered permanently, occasionally, or periodically by fresh or salt water (e.g. flooded pasture land, marshland, inland lakes, rivers and their estuaries); also includes bogs

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## 7 APPENDIX 1

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### CLOUGHANEELY ANGLING ASSOCIATION

#### STRATEGIC PLAN 2017– 2020

##### INTRODUCTION

Cloughaneely Angling Association was established in the late nineteen forties. The stated aims of the founders were to maintain and stock the Ray and Tulloughabegley rivers, to improve access for anglers and to combat poaching. In the ensuing years since its foundation the Association has worked closely with a range of statutory bodies, in particular the Northern Regional Fisheries Board, now Inland Fisheries Ireland, to achieve its aims. The range of work carried out over the years is well documented and is truly impressive.

With the signing of a Management Agreement between the Association and IFI, the role of the Association entered a new and important phase. In common with the position nationally, the quality of angling on the Association's waters has significantly declined due to a combination of factors, including a deterioration in water quality, inadequate resourcing of the facilities and deficiencies in monitoring activities which have had a negative effect on the rivers. These latter include poaching and some commercial/industrial activities. The Agreement provides an important basis for the Association and IFI to work closely and systematically in pursuit of our shared objectives and for the benefit of all. Another important factor for progress will be the implementation of the EU Water Framework Directive in the North Western International River Basin District. It is the Association's policy to work closely with the relevant parties in respect of that implementation.

This document is presented in the context of Paragraph 2 of the Management Agreement, which requires the Association to draw up and agree with IFI annual or multi-annual plans for the management of the fishery. It will be supported by Operational Plans as appropriate. The measurement of the success or otherwise of the Agreement and the Plans will be the extent to which they result in real and observable improvement in the quality of the fishery and of the angling experience for locals and visitors alike. The challenge facing the parties to the Agreement is considerable but achievable, especially when tackled in partnership.

Ní neart go cur le chéile.

**OVERALL AIMS**

To protect and promote the welfare of salmon and sea trout, in particular, in the catchment area with a view to restoring them to the sustainable population previously associated with the catchment waters.

To develop to the fullest extent possible the angling potential of the waters in the Association's catchment area for the benefit of local and visiting anglers and the community as a whole, having regard for the priority consideration of the welfare of the salmonoid species.

**STRATEGIC OBJECTIVES**

- 1 To restore and upgrade the Ray river as a premier angling facility with a sustainable surplus of salmonoid species.
- 2 To restore and upgrade the Tullaghobegley river as a premier angling facility with a sustainable surplus of salmonoid species. To enhance and protect this riverine environment with particular emphasis on the conservation interests of its existing freshwater pearl mussel population.
- 3 To develop loughs in the catchment area as quality angling locations.
- 4 To incorporate and manage estuarine angling as an integral element of the fishery.
- 5 To establish a Rivers Trust, representative of all parties with an interest in promoting a healthy environment within the catchment.

**STRATEGIC OBJECTIVE 1****To restore and upgrade the Ray river as a premier angling facility.****ACTIONS.**

- 1 Agree with IFI and DCC an Operational Plan for the catchment works required.
- 2 Liaise with Udarás na Gaeltachta re the continuing support of the Scéim Soisialta Tuaithe work team.
- 3 Work with IFI/Udarás/DCC in implementing the plan.
- 4 Communicate with riparian owners to secure cooperation with the plan.
- 5 Put in place a monitored and recorded maintenance programme.  
Promote cooperation and community support for sectoral best practice to mitigate negative effects on river water quality.

**KEY PERFORMANCE INDICATORS**

- 1 Specified and measurable riparian improvements carried out.
- 2 Riparian access completed from Drumavogie bridge to Station House.
- 3 End of year report detailing works completed.
- 4 Successful prosecution of poachers and reduction in incidents.

**STRATEGIC OBJECTIVE 2**

**To maintain and upgrade the Tullaghobegly river as a premier angling facility.**

**To enhance and protect this riverine environment as a home for the freshwater pearl mussel.**

**ACTIONS.**

- 1 Agree with IFI and DCC an Operational Plan for the work required.
- 2 Liase with Udarás na Gaeltachta re the continuing support of the Scéim Soisialta Tuaithe work team.
- 3 Work with IFI/Udarás/DCC in implementing the plan.
- 4 Communicate with riparian owners to secure cooperation with the plan.
- 5 Put in place a monitored and recorded maintenance programme.
- 6 Promote cooperation and community support for sectoral best practice to mitigate negative effects on river water quality.
- 8 Engage with NPWS, DCC and other sectoral stakeholder interests to promote best practice guidance for achieving freshwater pearl mussel favourable conservation status in this catchment.

**KEY PERFORMANCE INDICATORS**

- 1 Specified and measurable riparian improvements carried out.
- 2 End of year report detailing works completed.
- 3 Implementation of measures to improve the status of the freshwater pearl mussel population.
- 4 Successful prosecution of poachers and reduction in incidents.

**STRATEGIC OBJECTIVE 3****To develop headwaters where possible as quality angling locations.****ACTIONS**

- 1 Survey potential development locations.
- 2 Establish position re riparian ownership and access.
- 3 Draw up Operational Plan and detailed Works Programme.
- 4 Carry out improvement works at Drumlish Lough, in particular weed clearance and restocking.

**KEY PERFORMANCE INDICATORS**

- 1 Survey of locations completed.
- 2 Comprehensive information gathered on ownership and access issues.
- 3 Operational Plan and Works Programme agreed.
- 4 Works at Drumlish completed.

**STRATEGIC OBJECTIVE 4****To incorporate and manage estuarine angling as an integral element of the fishery.****ACTIONS**

- 1 Establish position re ownership.
- 2 Clarify legal position of CAA and IFI.
- 3 Agree tactical plan with IFI.
- 4 Consult with NPWS and all other relevant bodies in relation to Ballyness Bay SAC and its conservation objectives.
- 5 Include information on estuarine sea trout fishing in CAA promotional material.

**KEY PERFORMANCE INDICATORS**

- 1 Ownership and legal status of all parties clearly established.
- 2 Tactical plan agreed with IFI.

**STRATEGIC OBJECTIVE 5**

To establish a Rivers Trust, representative of all parties with an interest in promoting a healthy environment within the catchment area.

**ACTIONS**

- 1 Carry out a detailed study of where this approach is being implemented and identify any ways in which that experience could be applied in our catchment.
- 2 Initiate discussions with key parties in the catchment area.
- 3 Engage in a process of information/education for all key parties, including briefings and site visits.
- 4 Establish an organisational structure to support the sustained formal engagement of key parties in promoting the environmental health of the catchment area.

**KEY PERFORMANCE INDICATORS**

- 1 A comprehensive information database formed re river trusts and their functioning. Working contacts established with these trusts.
- 2 Meetings held with key parties in the catchment area, with minuted outcomes.
- 3 Programme of briefings, visits, information dissemination initiated and sustained.
- 4 Establishment of organisational structure as agreed by all key parties.

