Draft Plan for Forests & Freshwater Pearl Mussel in Ireland

SEA Environmental Report

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Non-Technical Summary

Background & SEA Process

This Environmental Report was prepared by McCarthy Keville O'Sullivan as part of the Strategic Environmental Assessment (SEA) process for the draft Plan for Forestry and Freshwater Pearl Mussel (FPM) in Ireland. The key role of the SEA is to identify, describe and assess the likely significant effects on the environment of implementation of the Plan for Forestry and FPM in Ireland, which applies only to the 27 no. FPM catchments around the country. The main stages of the SEA process are:

- Screening: determining whether or not SEA is required;
- Scoping: determining the range of environmental issues to be covered by the SEA – includes consultation with statutory consultees;
- Identification, evaluation and mitigation of potential impacts and preparation of the Environmental Report;
- Consultation, revision and post-adoption activities, including:
    - Public consultation on the Draft Plan/Programme and associated Environmental Report;
    - Integration of environmental considerations into the final Plan/Programme;
    - Issuing the SEA Statement: describes the rationale for decisions taken and extent to which environmental considerations and consultation have been integrated into the final Plan/Programme

Freshwater Pearl Mussel

The Freshwater Pearl Mussel (FPM) is a bivalve mollusc (shellfish) that lives in clean, fast-flowing streams and rivers. It is Ireland's oldest living animal, with individuals reaching up to 120 years of age. It is also characterised by a complex lifecycle that involves a larvae stage which depends on the presence of young salmonid (salmon, trout) within the river, and an early growth stage during which young mussels remain hidden within gravel stream beds. In order to survive and to reproduce successfully, FPM requires pristine, well-oxygenated water with low levels of nutrients and siltation. As such, it is a key indicator species, with its status reflecting the quality of both water and the aquatic habitat in Ireland's streams, rivers and lakes. As a result of historical exploitation and destruction by pearling of once-abundant populations, FPM became legally protected under the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000, and was also protected under the Habitats Directive.

Forestry

Forests now account for 10.8% of Ireland's land area. The national forest estate is now approximately 700,000 ha, of which, approximately 45% is in private ownership and 55% in the ownership of Coillte. Between 2016 and 2046 it is anticipated that approximately 15,000 hectares will be afforested each year nationwide, with the overall aim of having approximately 18% if Ireland's land area under forestry. The Department of Agriculture, Food and the Marine (DAFM) recognises that inappropriately sited forests and poorly managed forest operations can potentially impact water quality and aquatic habitats and species such as salmonids and Freshwater Pearl Mussel, particularly in terms of sedimentation and nutrient runoff. As such, the protection of water forms a key component of its assessment of all applications for forestry licences and grants. However, DAFM and the wider forest sector also highlight the significant role that properly sited and managed woodlands and forests can play in protecting water and aquatic habitats and species, through the delivery of a range of water-related ecosystem services. As the national forest authority, the Forest Service of Department of Agriculture, Food & the Marine (FS-DAFM) has numerous responsibilities in relation to forest activity in Ireland.

Principally, it regulates key forest activities undertaken within both the private sector and by Coillte Teoranta (The Irish Forestry Board), regarding afforestation and forest road construction, thinning & felling / replanting and aerial fertilisation.

The Plan

The objective of the proposed Plan is to eliminate, reduce or mitigate diffuse and point sources of sediment and nutrients, and the disruption of the natural hydrological regime, arising from forest activities undertaken within the Plan's area, to ensure that these activities do not threaten the achievement of the conservation objectives for the SACs involved. In developing the plan for forestry and FPM in Ireland the FS-DAFM used the existing scientific knowledge as a basis, and compiled a plan specifically for implementation in the 27 catchments in Ireland. One of the most significant challenges facing the plan was the creation of an implementation strategy that would allow an effective fulfilment of the plan aim, while remaining financially viable for the forestry industry.

A key component of the Plan is the use of the Forestry & FPM Forest Management Framework. This Framework replaces Forest & FPM Requirements (2008) and is applied to all forest activities regulated by DAFM under the Forestry Act 2014, with or without grant aid (i.e. afforestation, forest road construction, felling and aerial fertilisation), where overlap with a FPM catchment occurs. The function of the Framework is to enable Applicants and Registered Foresters to evaluate the degree of sensitivity regarding FPM, and to select the most appropriate approach regarding the operation in question. This results in applications appropriately tailored to the sensitivities regarding FPM, which then enter the DAFM evaluation process. The Framework also operates within the context of the strategy for awareness raising and training and monitoring set out in support of this draft Plan.

A number of potential practical measures (which can be revised based on the most up to date research) will enable natural ground vegetation and natural drainage conditions to return, thereby creating fringe wetlands and semi-natural woodland that will deliver a wide range of ecosystem services regarding the protection and enhancement of water quality and aquatic habitats, and the protection of FPM and other aquatic species. In some areas, forestry can have a positive role in the protection of FPM through several methods including the designation of protection forests or woodland areas where appropriate, the creation of functional buffer zones which may slow the flow of sediment and nutrients, and the blocking of drains in forests planted pre-guidelines. As the FS-DAFM can only act within their legislative remit, it cannot compel landowner or forest owners to undertake activities, and must await the submission of applications for forestry activities, before it can act.

A regime of during- and post-operation inspections by the Forest Service will take place on the site of the forestry works, along with the catchment-level monitoring of overall progress towards achieving appropriate forest restructuring brought about by this approach.

DAFM will instigate a campaign to promote awareness amongst foresters, contractors and forest owners, via circulars to the trade, articles in relevant publications and a tailored information brochure.

SEA Environmental Assessment

This SEA environmental report is designed to ensure an adequate assessment of the Plan for Forestry and Freshwater Mussel in Ireland. As part of this, the SEA deals with all the potential environmental consequences of implementing the plan. While

the SEA does not deal with this on a site-specific/project level, it does use objectives, targets and indicators to achieve a more broad-scale assessment.

In order to make the assessment process simpler, this report uses broad themes which cover the main environmental topics to be considered when approaching the assessment. These themes which are based on the SEA Directive environmental topics are:

- Biodiversity, Flora and Fauna
- Population and Human Health
- Soils and Geology
- Hydrology
- Air Quality and Climate (including Noise and Vibration)
- Cultural Heritage
- Landscape
- Material Assets

There is often a relationship between the draft plan, and existing other plans, programmes and policies (at national and European scales). These can fall under a variety of headings including Forestry, Biodiversity, Flooding, Air & Climate, Energy, Spatial Planning and Landscape.

Baseline Environmental Data

The process of the SEA views and assesses the baseline environmental data in a very broad manner. As the name suggests, it carries out a strategic level assessment, so it does not require site or project level baseline data to be described.

The EPA produces a national State of the Environment report every four years, which addresses the health of Ireland's environment as a whole. The most recent EPA State of the Environment report was produced in 2016. In general, it found that Ireland is fortunate enough to have a generally good environment, and it states that overall Ireland is a clean and safe environment to live in. This overall 'good' environmental quality in Ireland does however face many challenges in the short-term and long-term future. Such challenges include issues such as water pollution, air quality, noise and odours. Although national level reports and surveys can mask many issues with these, it is noted in the EPA report that localised conditions may have severe impacts not only on the health and wellbeing of people in small areas, but also on the wider environment.

The current state of each of the main environmental topics (listed above) is addressed.

<u>Biodiversity, Flora & Fauna</u>

There are numerous threats and pressures on Biodiversity, Flora and Fauna in the Irish environment. Among the most significant of these are agriculture and the development of build land. The intensification of agriculture and forestry over the recent decades has resulted in an increase in excess nutrients in watercourses around the country. Furthermore, the increasing population and underinvestment in waste water treatment systems means that many are discharging wastewater that has not been fully treated into watercourses. The intensification of land drainage, along with excessive stocking densities (causing poaching) has resulted high rates of siltation. The intensive growth of monoculture crops in both agriculture and forestry has reduced structural habitat diversity and food diversity, thereby negatively impacting local biodiversity in general. The reclamation of wetlands for agriculture or

development is also having localised negative impacts on flora and fauna. Although built land is not one of the largest landcover types, it's growth has accelerated in recent years (with urban sprawl, road construction, etc.), which increases the threat caused by it to biodiversity.

Population and Human Health

Currently, there are a number of environmental problems facing Population and Human Health. Water pollution threatens not only the biodiversity of aquatic habitats (and the associated impact on ecosystem services), but also the quality of water for the distribution network. The water quality threats come from a variety of sources including both point source (e.g. waste water discharge points, waste landfills, river fords) and diffuse source (e.g. agriculture and forestry runoff containing excess nutrients, septic tanks).

Intensive and industrial human activity such as quarrying, mining, peat harvesting (including turf cutting), intensive agriculture and commercial forestry can all have negative impacts on the FPM populations, causing problems including sedimentation, nutrient enrichment and contamination of watercourses. This impact is worsened when these activities occur on sites with steep slopes and soft soils, adjacent to watercourses. River fords which are used for vehicular and animal crossings can cause significant levels of sedimentation downstream.

Land, Soils and Geology

There are a number of existing threats and pressures for Land, Soils and Geology in the 27 no. catchments. These mostly relate to the intensive agricultural practices such as overgrazing and excessive stocking densities which can lead to localised soil erosion, particularly on steeply sloped sites, where the soil type is peat or other soft material. Soil erosion is also a concern for commercial forestry, where significant erosion can occur, mostly during planting (with associated drainage) and harvesting stages. This soil erosion can cause an increased nutrient loading and sedimentation for the receiving watercourses, which will have a negative impact on FPM if present.

Hydrology and Hydrogeology

There are numerous impacts associate with Hydrology and Hydrogeology in the 27 no. FPM catchments. Intensive agricultural activities such as overstocking causing poaching, application of fertiliser/slurry, and land drainage can all contribute to nutrient enrichment and excessive siltation in watercourses, thereby impacting negatively on FPM. Forestry activities such as harvesting, drainage and fertiliser application can all have similar impacts. Discharges from waste water treatment plants and septic tanks can cause significant problems with nutrient enrichment, causing a deterioration in water quality, and having a negative impact on FPM.

Air Quality and Climate

On a broad scale, the predicted impacts of climate change are likely to have a negative impact on hydrology, particularly in relation to rainfall patterns. There are very few issues with air quality in the 27 no. FPM catchments due to their mostly rural settings, however, some localised threats may exist. Air quality (including odour), dust, noise and vibration may cause an issue adjacent to industrial sites (including waste treatment), or beside construction works. This may have negative impacts on watercourses in terms of habitat disturbance and sedimentation.

Cultural Heritage

There are numerous threats to the existing cultural heritage resource throughout Ireland. The landscape setting of the individual sites is one such impact, with cumulative impact being an important factor. Afforestation with commercial

monocultures can significantly alter the landscape setting of individual archaeological sites. Direct damage to archaeological sites is also a notable threat, particularly when the sites are undocumented.

Landscape

The primary pressure relating to Landscape from forestry related activities is visual amenity. Where forestry has been planted in locations and patterns that are unsympathetic to the surrounding environment, this can have a negative impact on landscape.

Material Assets

The expansion of urban areas, and built services (including water treatment and distribution, and wastewater systems) may be putting pressures locally on sensitive environmental receptors. Waste water discharge points can cause nutrient enrichment downstream, particularly where the treatment plants are operated above their capacity.

Environmental Protection Objectives and SEA Framework

When determining the objectives for this SEA process, there were three objective types found: objectives of the plan, objectives for the environment (from a local to a national level), and the objectives to test the effects of the Plan for Forestry and Freshwater Pearl Mussel in Ireland on the whole environment (these are known as SEA objectives).

- Objective 1: Biodiversity, Flora & Fauna: To protect, maintain and (where necessary) restore the EU designated habitats and species, particularly the Freshwater Pearl Mussel and its associated habitats
- Objective 2: Population & Human Health: To contribute to better quality water supplies for human consumption, while also promoting sustainable development of rural areas
- Objective 3: Soils & Geology: To avoid damage to the function and quality of the geology and soil resource
- Objective 4: Hydrology: To protect, maintain and (where necessary) restore water quality in surface and ground water bodies
- Objective 5: Air Quality: Minimise emissions of pollutants and greenhouse gases to atmosphere.
- Objective 6: Cultural Heritage: To ensure the protection of historical monuments, buildings and landscapes
- Objective 7: Landscape: To protect and maintain Irish landscape character and visual amenity
- Objective 8: Material Assets: To support sustainable activities without conflicting with the other objectives listed above

Consideration of Alternatives

In order to ensure a robust assessment, some reasonable alternatives should be assessed as part of the process, and these should be as realistic, practical and constructive as possible, and should incorporate as best as possible the objectives of the plan. There were a number of reasonable alternatives considered throughout the SEA process for this plan. As with the proposed plan, the alternatives were based on the same strategic level and broad scale.

The following three scenarios were considered as part of the SEA for the Plan for Forestry and Freshwater Pearl Mussel in Ireland.

- Scenario 1: Continue with the current forestry regulations that are already in place for the 27 no. FPM catchments
- Scenario 2: Apply additional measures to only the 8 no. FPM catchments which have the best FPM population viability to protect aquatic habitats and FPM, with commercial forestry to be allowed only in low risk sites. The remaining 19 no. FPM catchments would continue with the current forestry regulations that are already in place
- Scenario 3: Apply additional measures to all 27 no. FPM catchments to protect aquatic habitats and FPM, with commercial forestry to be allowed only in low risk sites

Scenario 3 above is likely to have the most beneficial impact on FPM populations in the 27 no. catchments and is considered the Preferred Approach. There will be direct and indirect benefits for Biodiversity, Flora and Fauna, Population and Human Health, Land, Soils and Geology, Hydrology, Landscape and Material Assets associated with this option.

Detailed Assessment of Preferred Scenario

A number of issue areas have been identified for which a variety of measures have been compiled to ensure that the plan does not cause any negative impacts. These measures are:

- A new FPM Management Framework (consenting system)
- A proposed water management Model to be employed
- Awareness Raising &Training
- Monitoring

Management Framework

The implementation of the management framework is expected to have a positive impact on Biodiversity, Flora and Fauna, Population and Human Health, Land Soils and Geology, Hydrology and Hydrogeology, Cultural Heritage, Landscape and material Assets. The improved and more detailed site risk assessment and mitigation measures will further reduce risk of soil erosion and sedimentation of watercourses, and it will reduce the potential for nutrient enrichment and acidification in the watercourses. These factors have a consequential positive impact on water quality, aquatic habitats, and the biodiversity that exists within these watercourses, including positive impacts for the FPM.

Proposed Model

Some of the potential practical measures which could be used on any forestry site include:

- Water Setback
- Continuous Cover Forestry Zone
- Commercial Forest Zone (or other)
- Natural vegetation within the water setback
- Tree cover within the water setback

This is not an exhaustive list, and there is scope to change the measures which can be used, depending on the most current research at any time.

Implementing measures such as the water setback, Continuous Cover Forestry Zone, natural vegetation zone and tree cover are, in general, expected to have positive impacts of various types on Biodiversity, Flora and Fauna, Land, Soil and Geology,

Hydrology and Hydrogeology, Material Assets, Population and Human Health, Cultural Heritage and Landscape. These measures would allow, for example, improved botanical (and structural) diversity alongside watercourses, reduced sedimentation and nutrient enrichment of watercourses, and reduced dramatic landscape changes.

Incorporating areas of commercial forest zones into the low risk sites may would have a positive impact on Air Quality and Climate, and Material Assets, due to increased timber production and associated increased carbon fixation with the faster growing commercial crop. However, the use of areas of monoculture type commercial forestry would result in a negative impact on Hydrology and Hydrogeology, Biodiversity, Flora and Fauna, Landscape and Cultural Heritage. The commercial forest zones are expected to have a neutral impact on Population and Human Health and Land, Soils and Geology.

Using sediment and nutrient controls and drain treatment methodologies such as blocking or slow water damming will reduce the water velocity, and therefore reduce erosion of soil in the area. This has a positive impact on Land, Soils and Geology. The reduced sediment loading of the watercourses has positive impacts on hydrology and the consequential improvements in the downstream water quality and aquatic ecosystems have a positive impact on Biodiversity, Flora and Fauna and Material Assets (for any water abstraction points). The impacts on Population and human Health, Air Quality and Climate, Cultural Heritage and Landscape are expected to be neutral.

Awareness Raising & Training

The proposed training will have potentially positive impact on Biodiversity, Flora and Fauna, Hydrology and Hydrogeology, Land, Soils and Geology, Population and human Health and Material Assets (for any water abstraction points), as it will increase the quality of work carried out throughout the process. The impacts on Air Quality and Climate, Cultural Heritage and Landscape are expected to be neutral.

The measure to increase awareness will apply to everyone involved, including local statutory personnel who can positively influence landowners through their own interaction on-the-ground. This will also help ensure that responses received from the various statutory bodies, following referral by DAFM, are framed within the context of the overall Plan. Therefore, it will have a potentially positive environmental impact.

Monitoring

The proposed monitoring regime will have potentially positive impact on Biodiversity, Flora and Fauna, Hydrology and Hydrogeology, Land, Soils and Geology, Population and human Health and Material Assets (for any water abstraction points), as it will increase the quality of work carried out, and will allow any potential problems to be noticed and dealt with quickly. The impacts on Air Quality and Climate, Cultural Heritage and Landscape are expected to be neutral.

Cumulative Impacts

There is a general possibility of cumulative impacts occurring between different measures within the draft plan, as well as the possibility of cumulative impacts with other related plans and policies. The benefits associated with the draft plan are envisaged to occur in the years following its implementation, with the positivity of the impacts increasing over time. Due to the long rotation times involved with forestry

plantations, and the slow growth rate of FPM, these positive impacts are unlikely to be measurable in the immediate or short term.

Implementation Strategy

Although the proposed plan would come into effect on a specific date, it would only be implemented on individual forestry sites at times of activity as they go through their natural cycles (i.e. afforestation/reforestation, thinning, forest road construction, felling, fertilisation, etc.). This means that the proposed plan would in effect have a gradual implementation in all 27 no. FPM catchments.

Mitigation and Monitoring

As with any plan for change, DAFM must monitor the implementation of the draft Plan, to track and record progress, to identify and eliminate deficiencies, and where required, apply appropriate measures to ensure consistency and compliance, to ensure that forest activity undertaken within each catchment does not threaten the achievement of the conservation objectives for the SACs involved, namely "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.". This system builds on existing controls whereby compliance with conditions attached to any licence, arising from the AAP, referrals and other pre-approval procedures, is checked through follow-up DAFM inspections.

The Plan was drawn up specifically to address any existing potential negative impacts associated with forestry in each of the 27 no. FPM catchments. The plan is itself a mitigation measure for forestry and forestry activities in the 27 no. FPM catchments in Ireland and the proposed measures within the Plan are based on current scientific knowledge in relation to management of forestry activities with a view to maintaining water quality and morphology.

While the plan was being drafted, there was regular consultation with the team carrying out the SEA and AA procedure, and this fed into the plan itself, so that almost all of the mitigation measures proposed for the plan have already been incorporated into it.

Next Steps

There are numerous tasks and steps to be carried out before the draft Plan is finalised and adopted. This includes:

- Publication of draft Plan
- Consultation period for the draft plan
- Review of submissions and proposed amendments for the plan
- Adoption and publication of the final plan

There are also several steps remaining on the SEA/AA process for the plan. These steps include:

- Publication of the SEA Environmental report and AA documents
- Consultation period
- Preparation of SEA statement
- Publication of SEA statement

1 INTRODUCTION

1.1 Purpose of this Report

This Environmental Report was prepared by McCarthy Keville O'Sullivan as part of the Strategic Environmental Assessment (SEA) process for the draft Plan for Forestry and Freshwater Pearl Mussel (FPM) in Ireland, hereafter referred to as 'the Plan'. The key role of the SEA is to identify, describe and assess the likely significant effects on the environment of implementation of the Plan. The Plan applies to the hydrological catchment of 26 SACs designed for FPM, plus the hydrological catchment of the Owentaraglin catchment within the Munster Blackwater Catchment (27 Catchments) (Figure 1.1). The SEA will provide information that will help to ensure that any environmental concerns arising from implementation of the Plan are adequately addressed prior to finalisation of the Plan.

1.2 Overview of the Freshwater Pearl Mussel

1.2.1 Ecology and status

The Freshwater Pearl Mussel (FPM) is a bivalve mollusc (shellfish) that lives in clean, fast-flowing streams and rivers. It is Ireland's oldest living animal, with individuals reaching up to 120 years of age. It is also characterised by a complex lifecycle that involves a larvae stage which depends on the presence of young salmonid (salmon, trout) within the river, and an early growth stage during which young mussels remain hidden within gravel stream beds. In order to survive and to reproduce successfully, FPM requires pristine, well-oxygenated water with low levels of nutrients and siltation. As such, it is a key indicator species, with its status reflecting the quality of both water and the aquatic habitat in Ireland's streams, rivers and lakes.

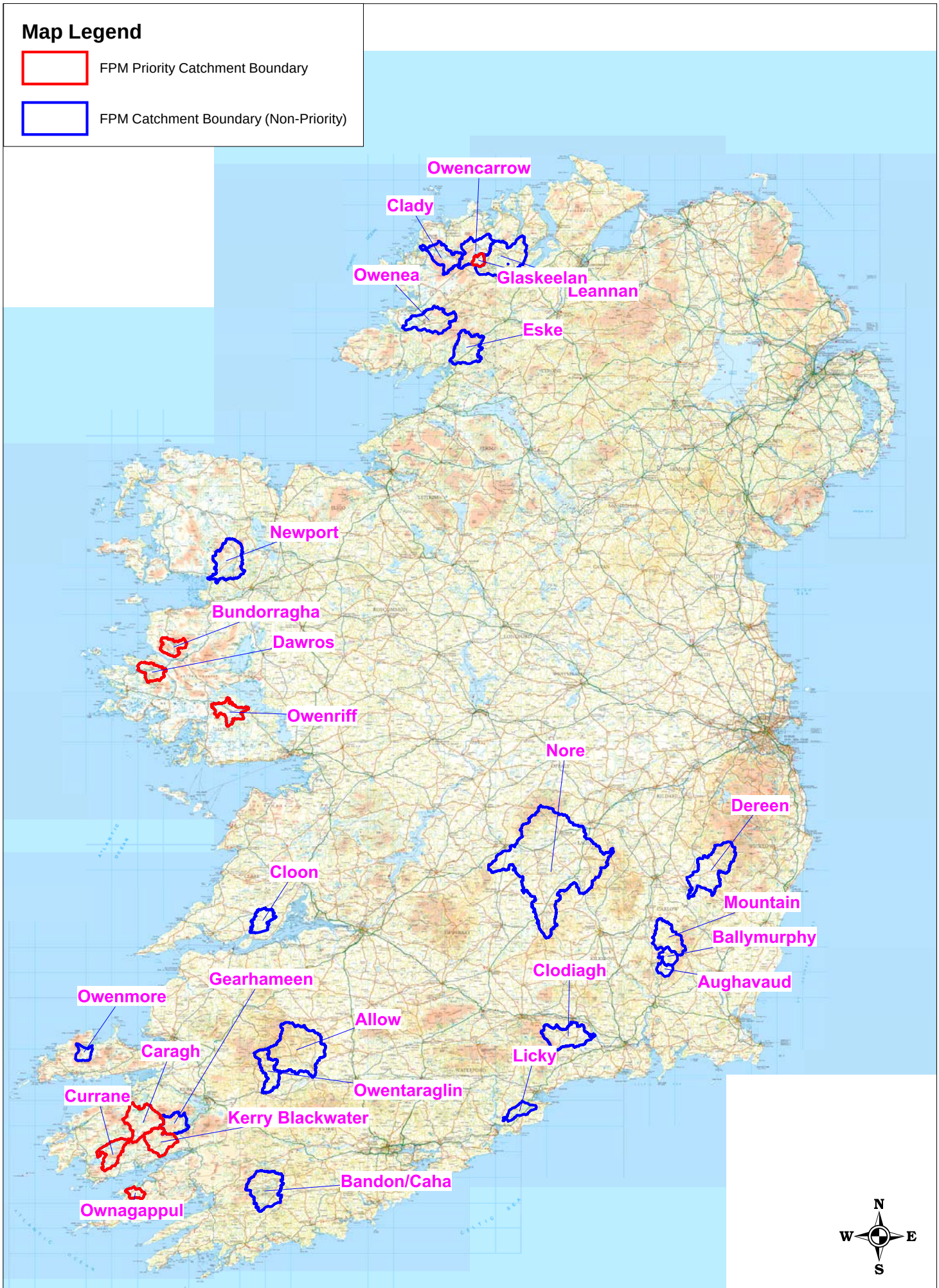
Ireland has two species of FPM: Margaritifera margaritifera, which occurs throughout Ireland but in serious decline throughout its range; and the closely-related M. durrovensis, which is limited to the River Nore in the south-east, and in imminent danger of extinction in the wild.

According to Ireland's Habitat Directive Article 17 report for 2013, M. margaritifera occurs in more than 160 rivers and a handful of associated lakes, with an estimated national population of 10.99 million adults (National Parks and Wildlife Service, 2013). Individual populations range from very small relict populations with a few remaining older mussels that have not successfully recruited for 50 years, to some of the largest populations in the world. The national population estimate represent approximately 46% of the total population of the European Union. The species is considered extinct or approaching extinction within most EU countries, with only a few (Scotland, Finland and Sweden) hosting populations with varying levels of juvenile recruitment. Overall, the species is endangered worldwide and in serious decline throughout its range. The population of M. durrovensis in the River Nore represents the sole remaining endemic population in the entire world.

It is clear, therefore, that Ireland has a very significant international responsibility for the conservation of the species.

1.2.2 Current Status

As set out in Ireland's Habitats Directive Article 17 report for 2013, entitled 'The Status of EU Protected Habitats and Species in Ireland' (NPWS, 2013), the current



Source: National Park & Wildlife Service
NPWS www.npws.ie

MAP TITLE: **FPM Plan Implementation Area**	MAP NO.: **Figure 1.1**	SCALE: **1:1,900,000**	
PROJECT TITLE: **FS-DAFM FPM SEA AA**		DATE: **28-06-2018**	
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population of FPM is estimated at 10.99 million adults, and its distribution in more than 160 rivers in Ireland is considered widespread. However, FPM is in severe decline nationally, with the above population estimate representing a fall of 8% since 2007. This reflects the ongoing chronic decline throughout recent decades, since national scientific monitoring of the species commenced.

The 2013 Habitats Directive Article 17 report assessment summary regarding the conservation status of FPM (with results for 2007, for comparison) (NPWS, 2013). Note, regarding 'Future Prospects', prospects may improve for this species, in part due to the various initiatives, including the development of Catchment Forest Management Plans.

The causes behind this chronic decline are many and varied, but central drivers are changes to river morphology and diffuse sources of siltation and nutrients associated with agriculture, forestry and onsite wastewater treatment facilities (typically, septic tanks associated with dwellings) within individual FPM catchments. Subsequent impacts on FPM are summarised in the literature review undertaken to inform the development of the Sub-Basin Management Plans required for the 27 populations:

> *"The loss of pearl mussel populations mostly occurs from continuous failure to produce a new generation of mussels due to loss of clean gravel beds, which have become infiltrated by fine sediment. This blocks the required levels of oxygen from reaching young mussels. Juvenile mussels spend their first five years buried within the river bed substrate.*
>
> *Other losses that lead to unsustainable populations are from untimely deaths of adult mussels through kills from major pollution incidents, such as toxic poisoning (e.g. from sheep dip), eutrophication [i.e. nutrient enrichment of the aquatic habitat] (through smothering of adult mussels by filamentous algae or macrophyte [rooted plants] growth)." (RPS, 2010)*

In summary, while FPM populations are generally widespread in Ireland, the vast majority comprise limited and declining populations dominated by older adult mussels, with little or no recruitment of juvenile mussels to reproducing adults in recent decades. Therefore, as the current adult populations die off, FPM in Ireland is facing effective extinction in the wild over the coming decades, unless significant improvement in water quality and the aquatic habitat is secured to enable sufficient breeding and recruitment. As set out in Ireland's 2013 Article 17 report, this must involve close coordination and cooperation between different land use sectors:

> *"Ensuring the long-term future of the freshwater pearl mussel requires significant, integrated catchment management to prevent direct impacts and to reduce losses of sediment and nutrients from all indirect sources." (NPWS, 2013)*

Improving the status of FPM is identified as a clear priority within Ireland's current Prioritised Action Framework for Financing NATURA 2000 (NPWS, 2013), a document required by the European Commission to identify key national conservation priorities, in order to promote greater coordination regarding the uptake of EU funds for the management of sites within the NATURA 2000 network.

1.2.3 Legal Protection

As a result of historical exploitation and destruction by pearling of once-abundant populations, FPM became legally protected under the Wildlife Act 1976 and the

Wildlife (Amendment) Act 2000, from injury or from disturbance or damage to their breeding or resting place, wherever they occur. Due to the European and international significance of Ireland's FPM population, the species was also included under Annex II and Annex V of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive), transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2001 (S.I. No. 477 of 2011).

The overall aim of the European Habitats Directive (Council Directive 92/43/EEC) is to maintain or restore the favourable conservation status of habitats and species that are threatened throughout Europe and deemed highly sensitive to change. These habitats and species are listed in the Habitats Directive and the Birds Directive (Directive 2009/147/EC). Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) – which collectively form the EU-wide NATURA 2000 Network – are designated to afford protection to the most vulnerable of these habitats and species.

There are 27 SAC-designated populations of Freshwater Pearl Mussel (FPM) in Ireland, almost all of which are at Unfavourable Conservation Status (the Bundorragha population was recently classified as favourable, as determined by NPWS).

The National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht is the national body responsible for the protection and conservation of Ireland's natural heritage and biodiversity. It manages the nature conservation responsibilities of the Irish State under various national and European policies and legislation, with a particular responsibility regarding the designation and protection of Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs). Regulatory bodies overseeing particular landuses (agriculture, forestry, windfarms, roads, housing development, etc.) also have clearly defined responsibilities regarding nature conservation, under both national and EU policies and legislation.

Note in relation to the Munster Blackwater population, following communication from NPWS, this Plan focuses on the Owentaraglin catchment only.

1.2.4 Strategy for Conservation of the Freshwater Pearl Mussel

The Strategy for Conservation of the Freshwater Pearl Mussel (NPWS, 2011) prioritises the conservation of FPM populations within eight sub-basin catchments, and aims to achieve maximum conservation outputs for the restoration effort in terms of numbers of mussels and populations conserved and protected over the long term. These eight sub-basin catchments, listed below, represents 80% of the total population and include those with the best chance of recovery.

- Bundorragha (HA32) (Co. Mayo)
- Dawros (HA32) (Co. Galway)
- Ownagappul (HA21) (Co. Cork)
- Leannan-Glaskeelan (HA39) (Co. Donegal))
- Cummeragh-Currane (HA21) (Co. Kerry)
- Caragh(HA22) (Co. Kerry)
- Kerry Blackwater (HA21) (Co. Kerry)
- Corrib-Owenriff (HA30) (Co. Galway)

These eight catchments comprise 28 river water bodies, all of which are assigned the High Ecological Status (HES) objective within the Water Framework Directive. Of

these, 12 (43%) met this objective in the 2013-2015 monitoring cycle. However, 15 are 'at risk' of decline, with forestry deemed to be a significant risk (either alone or in combination with other pressures) in seven.

1.3 Overview of Forestry in Ireland

At EU level, the Forest Europe 2015 Report states forest area amounts to 215 million hectares in Europe, accounting for 33.5% of total land area. In comparison to other regions in the world, only South America has a higher percentage of forest cover (49%) than Europe. 45% of European forests are predominantly coniferous, 36% are predominantly broadleaved, and the rest are mixed, while around 80% of the forest area is available for wood supply. The report adds that forest area has continuously increased since 1990, and the rate of increase is fairly stable at the European level and within the regions that are analysed in the report. The forest area is expanding according to the defined targets in the countries with low forest cover.

Forests now account for 10.8% of Ireland's land area. The national forest estate is now approximately 700,000 ha, of which, approximately 45% is in private ownership and 55% in the ownership of Coillte. The 2014 document from DAFM entitled *Ireland's forest policy – A renewed vision* details the long term plan for forestry up to 2046 which details the planned rate of forest expansion. Between 2016 and 2046 it is anticipated that approximately 15,000 hectares will be afforested each year nationwide, with the overall aim of having approximately 18% if Ireland's land area under forestry.

Just over half (56%) of the national forest estate is less than 20 years old, a decrease from almost two thirds (63%) in 2007; reflecting the growing maturity of the national forest estate. Over one quarter of the forest estate contains broadleaf tree species.

According to the 2017 Forestry Statistics in Ireland document (DOAFM, 2018), sitka spruce is the most common species, occupying 52.4% of the forest area (Table 1.1. Over one quarter of the forest estate contains broadleaves. Of the broadleaves 33.9% are 'Other broadleaf species' (both long living and short living), of which over half are willow. The next largest broadleaf species group was birch species (22.7%), ash (12.5%), followed by oak (10.2%). Conifers occupy 472,830ha while broadleaved species cover 164,310ha. The interpretation of stocked areas of individual species presented in Table 1.1 needs to be carefully considered since many forests contain an intimate mixture of species.

Table 1.1 Tree species composition (NFI, 2012)

Species	%
Conifers	
Sitka spruce	52.4
Norway spruce	4.1
Scots pine	1.3
Other pine spp.	9.7
Douglas fir	1.6
Larch Spp.	4.4
Other conifers	0.6
Broadleaf	
Pedunculate and sessile oak	2.6
Beech	1.5
Ash	3.2

Sycamore	1.5
Birch spp.	5.9
Alder spp.	2.4
Other short living broadleaves	7.3
Other long living broadleaves	1.4
Total	100

Forestry supports a vibrant export-oriented forest products sector. In 2010, the overall forest sector supported an estimated 12,000 jobs, the majority rural-based, and contributed c.€2.2 billion to the economy. Reaching the 15,000 ha per year level of afforestation would result in the creation of an estimated further 490 jobs in planting, managing, harvesting and processing. Through appropriate site selection, design and management, forests and woodlands contribute to farming incomes, rural development and downstream employment. Forests and woodlands also deliver a wide range of essential eco-system services and public goods, including climate change mitigation, the provision of renewable energy, the protection of water quality and biodiversity, the enhancement of landscape, and the creation of opportunities for outdoor recreation.

Nearly 4 million cubic metres of round wood are harvested each year, providing valuable rural incomes and supporting a significant processing sector involving sawn timber, panel boards and other products. This will more than double to 8 million cubic metres by 2035.

Non-timber benefits are also significant and wide-ranging, from biodiversity and carbon sequestration to the provision of amenity and recreation. Inappropriately sited forests and poorly managed forest operations can create a risk to the environment, including water. However, woodlands and forests that are suitably located and managed can have a significant role in protecting and enhancing water quality and aquatic habitats and species.

Forests' contribution to climate change mitigation through carbon sequestration forms an important element of the national climate change strategy. Total mitigation contribution from Irish forests and solid wood products is about 4.3m tonnes of carbon dioxide equivalent per year. It is estimated that Irish Kyoto-eligible forests will sequester about 4.8 million tonnes of carbon dioxide (CO2) in 2020, representing between 40% and 60% of distance to target.

Well-sited, designed and management woodlands and forests also support biodiversity, enhance the landscape, and provide for outdoor recreation and associated tourism and public health benefits, and this ecosystem-focused role is recognised. For example, as set out in Forests, products and people: Ireland's forest policy – a renewed vision (2014), afforestation, the management of existing forests and the development of the forest sector must be undertaken in a manner that ensures compliance with environmental requirements and objectives and enhances their contribution to the environment and their capacity for the provision of public goods and services. A key element in this regard is water.

DAFM recognises that inappropriately sited forests and poorly managed forest operations can potentially impact water quality and aquatic habitats and species such as salmonids and Freshwater Pearl Mussel, particularly in terms of sedimentation and nutrient runoff but also in terms of river morphology as a result of increased sediment and drainage rates. As such, the protection of water forms a key component

of its assessment of all applications for forestry licences and grants. However, DAFM and the wider forest sector also highlight the significant role that properly sited and managed woodlands and forests can play in protecting water and aquatic habitats and species, through the delivery of a range of water-related ecosystem services.

The overall approach is therefore to safeguard water during all forestry operations, to restructure existing forests to reflect water sensitivities, and to situate and design new woodlands and forests in a way that protects and where possible, enhances water quality and river morphology by maintaining a more natural hydrological regime. The ultimate vision is to ensure that forests in Ireland become recognised as a key element of the landscape that protects our waters and associated aquatic ecosystems.

Particular opportunities exist under the Afforestation Scheme (which offers grants and premiums for a wide range of forest types, including native woodland and agro-forestry) and also at the clearfelling / replanting stage, where significant restructuring around water can be undertaken, particularly in relation to older forestry plantations established pre-1990, before the introduction of forestry and water guidelines and mandatory water setbacks.

The forestry act of 1946 resulted in the licensing procedures for carrying out forest activity such as felling, thinning and afforestation/replanting. The recent Forestry Act 2014 combines all the earlier legislation for each forestry activity, and contains stronger provisions for the protection of the environment (including ecology and hydrology).

Mid-twentieth century afforestation policy was to locate the activity on peatland sites. This has meant that there are large areas of unsuitable land which have forestry cover. The unsuitability of the soils (among other factors including slope) of some of these sites means that as the sites are currently being harvested, a decision must be made about the future of these sites (i.e. replanting or restoration). A significant number of the plantation sites on upland peat are of poor production potential (Tierney, 2007).

In the period from 2014-2015, the following activities were carried out through the FS-DAFM licensing system:

- 12,449 ha of new forests were planted on 1,981 sites (21% broadleaves and 79% conifers, with each site having 15% open space/retained habitat, and at least 10% broadleaves)
- 4,908 Felling Licences were issued, covering 32,929 ha of thinning and 23,595 ha of clearfell
- 326 km of new forest roads were constructed

1.4 The Role of the FS-DAFM

As the national forest authority, the Forest Service of Department of Agriculture, Food & the Marine (FS-DAFM) has numerous responsibilities in relation to forest activity in Ireland. Principally, it regulates key forest activities undertaken within both the private sector and by Coillte Teoranta (The Irish Forestry Board), via new regulations enacting forestry act 2014 (SI No. 191 of 2017, which came into force in May 2017) regarding afforestation and forest road construction, thinning & felling / replanting and aerial fertilisation). The Forest Service also has a direct role under the

Birds & Habitats Directives (transposed under S.I.477/2011), the Water Framework Directive (transposed principally under S.I.722/2003), climate change commitments, etc.

Another key role of the Forest Service is the promotion of appropriate and sustainable forestry, and this is achieved through various grant schemes operated by the Forest Service for afforestation, native woodland establishment, forest road construction, tending and thinning, and forest recreational development under the current State-funded Forestry programme 2014-2020. The Forest Service also undertakes the National Forest Inventory, to record and assess the composition and condition of the entire forest estate, both public and private, at national level, in order to provide information to monitor Sustainable Forest Management (SFM) and data to support forest policy, specifically in relation to volume, biomass/carbon, forest area, species composition and forest structure, forest biodiversity, and forest health and vitality. The Forest Service also plays a central role in relation to forest protection and forest reproductive material.

Throughout its regulatory and promotional role, the Forest Service is guided by the principles of Sustainable Forest Management, defined in 1993 at the pan-European Ministerial Conference on the Protection of Forests in Europe (MCPFE) as:

> *"The stewardship and use of forest lands in a way and at a rate that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil now and in the future relevant ecological, economic and social functions at local, national and global levels and that does not cause damage to other ecosystems."*

1.4.1 Forest Service Responsibilities Regarding Freshwater Pearl Mussel

When assessing an individual application for consent (with or without grant aid) or licensing for any forestry-related activities, the Forest Service undertakes a detailed assessment of the project and (*inter alia*) its potential impact on the environment.

This entails a combination of field inspection and GIS-based desk assessment, EIA Screening (and EIA, if required), AA Screening (and Appropriate Assessment, if required), public consultation, referral to various statutory consultees, and an objector's appeals system. Any activity that subsequently receives consent or licensing must adhere to the Code of Best Forest Practice – Ireland, a suite of mandatory environmental 'guidelines' relating to (*inter alia*) water quality, biodiversity and harvesting, and all relevant scheme requirements. In particular areas, other specific procedures, protocols and requirements may also apply, including implementation of the existing FPM Requirements document. Finally, project-specific conditions may also be attached to the consent or licence issued.

Details of the Forest Service Appropriate Assessment Procedure are set out in Section 20 and Appendices 20-22 of the Forestry Standards Manual (November 2015), at www.agriculture.gov.ie/forestservice/grantsandpremiumschemes2015/.

The Forest Service undertakes various post-activity checks to ensure that all conditions attached to a particular consent or licence have been satisfied. Failure in this regard can result in various sanctions such as the withholding or recouping of any grants and premiums paid, penalty reductions in the Single Farm Payment, and / or legal prosecution.

As the consenting authority for key forestry activities, the Forest Service has direct responsibilities under the Habitats Directive and the Water Framework Directive in relation to (*inter alia*) the protection of FPM and its habitat. These responsibilities provide the underlying basis for the development of the *Plan for Forestry and Freshwater Pearl Mussel in Ireland* by the FS-DAFM as part of the national strategy for the conservation of FPM in Ireland.

2 OVERVIEW OF THE PROPOSED PLAN

2.1 A vision for Woodlands and Forests within Freshwater Pearl Mussel Catchments

The objective of the proposed Plan is to eliminate, reduce or mitigate diffuse and point sources of sediments and nutrients, and the disruption of the natural hydrological regime arising from forest activities undertaken within the Plan's area, to ensure that these activities do not threaten the achievement of the conservation objectives for the SACs involved, namely "*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.*"

Throughout its regulatory and promotional role, the Forest Service is guided by the principles of Sustainable Forest Management (SFM) as described in Section 1.4 above. A key component of SFM is the protection of water quality and of aquatic species and habitats, and where possible, the realisation of the proactive role woodlands and forests can play in this regard.

2.2 Approach adopted in developing the plan

In developing the plan, the FS-DAFM used the existing scientific knowledge as a basis, and compiled a plan specifically for implementation in the 27 catchments in Ireland. One of the most significant challenges facing the plan was the creation of an implementation strategy that would allow an effective fulfilment of the plan aim, while remaining financially viable for the forestry industry.

2.2.1 Vision and structure of the plan

A key component of the Plan is the development of a new Forestry & FPM Forest Management Framework. This new Framework will replace the existing system for regulating forestry activities in the FPM catchments i.e. the Forest & FPM Requirements (2008) document. The new system will apply to all forest activities regulated by DAFM under the Forestry Act 2014, without or without grant aid (i.e. afforestation, forest road construction, felling and aerial fertilisation), where overlap with a FPM catchment occurs.

The Framework applies to forestry applications within all 27 no. FPM hydrological catchments. This replaces the 6 km zone that formed part of the Forestry & FPM Requirements (2008).

The function of the new Framework is to enable Applicants and Registered Foresters to evaluate the degree of sensitivity regarding FPM, and to select the most appropriate approach regarding the operation in question. This will result in applications appropriately tailored to the sensitivities regarding FPM, which then enter the DAFM evaluation process and Appropriate Assessment Screening.

Licence applications within FPM catchments will, under the new Framework, be subjected to a higher level of site inspection by DAFM. Any application for consent which includes works to an area described as Moderate or High Risk sites will be subject to a site inspection by FS-DAFM. Factors affecting the risk profile of a site will include operation type and scale, distance from EPA aquatic zones (less than or equal to 100 metres), slope (greater than or equal to 15%) and soil (peaty soil and non-peaty

soils), and the level of recent, current and planned activity in that area (an evaluation assisted by the recent inclusion of felling on iFORIS).

A key component of Forest Management Framework is the DAFM's Appropriate Assessment Procedure (AAP). The AAP represents the primary mechanism for ensuring that all forestry operations are consistent with the protection of FPM within each of the 27 FPM Catchments.

Subsequently, the project can only be licensed by DAFM if it has ascertained(*), either at screening or at appropriate assessment, that the project – alone and in combination with other plans and projects and with regard to potential impacts throughout its lifetime – does not threaten the achievement of the conservation objectives for the SACs involved, namely "To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species [including FPM] for which the SAC has been selected." (* alongside other legal responsibilities, e.g. Annex I habitats outside SACs, WFD objectives.)

The new Framework will be applied within the context of, and is in addition to, the enhanced baseline protection for water, as set out in the DAFM document Forests & Water: Achieving the Objectives under Ireland's *River Basin Management Plan 2018-2021 - Programme of Measures for Forestry to Protect & Enhance Water* (2018).

Regulatory and promotional measures of particular relevance are: Forestry Act 2014, Land Types for Afforestation, Environmental Requirements for Afforestation, Felling & Reforestation Policy, Reforestation Objectives system, Native Woodland Scheme funding package and proposed Environmental Enhancement of Forests Scheme, and the FS-DAFM approval process itself (as set out in Section 7 of Forests & Water).

The Framework will also operate within the context of the strategy for awareness raising and training and monitoring set out in the draft Plan.

The objective of the proposed Plan is to eliminate, reduce or mitigate diffuse and point sources of sediment and nutrients, and the disruption of the natural hydrological regime, arising from forest activities undertaken within the Plan's area, to ensure that these activities do not threaten the achievement of the conservation objectives for the Natura 2000 sites involved. However, the plan does allow and encourage a proactive approach to be pursued, where possible.

The strategy of the plan is to realise a basic configuration of features (such as a water setback and an appropriate continuous cover forestry zone (typically, but not exclusively, native woodland) between the watercourse and the adjoining (upslope) land use, which may include agriculture, commercial forestry, or other) in order to improve environmental protection. A schematic diagram showing some suggested features of these can be seen in Figure 2.1. Configurations such as this will enable natural ground vegetation and natural drainage conditions to return, thereby creating fringe wetlands and semi-natural woodland that will deliver a wide range of ecosystem services regarding the protection and enhancement of water quality and aquatic habitats, and the protection of FPM and other aquatic species. These ecosystem services include:

- Reduction in sediment mobilization & runoff into watercourses
- Interception of nutrient runoff into watercourses
- Bank stabilization
- Food input into the aquatic ecosystem

- Shading / cooling
- Regulation of floodwater
- Mitigating acidification

In some areas, forestry can have a positive role in the protection of FPM through the designation of protection forests or woodland areas where appropriate, the creation of functional buffer zones which may slow the flow of water, sediment and nutrients, blocking of drains in forests planted pre guidelines, perhaps at felling/reforestation stage, use of alternative silvicultural systems such as continuous cover, brash removal at harvesting or whole tree harvesting, use of cable systems for extraction, grass seeding post clearfell and pollarding retain broadleaves where there may be a risk of windblow.

The water setback directly adjoins the watercourse itself and is aimed at separating the watercourse from forest operations and to intercept sediment and nutrient runoff into receiving waters. It is an undisturbed area of natural ground vegetation positioned between defined water features and the forest crop and associated operations, within which forestry operations and trafficking are excluded, in order to protect water quality and aquatic ecosystems from possible sediment and nutrient runoff from the site at all times during the forest rotation.

The Continuous Cover Forestry (CCF) Zone will typically comprise native woodland, created at either afforestation stage or at reforestation using the NWS Conservation approach to achieve the most appropriate native woodland type via planting and / or natural regeneration with native species (birch, oak, Scots pine, etc.). The CCF Zone, together with tree cover within the water setback itself (see Feature 1 below), is intended to deliver various water-related ecosystem services.

The draft Plan will be implemented through the development of a new internal system within the Forest Service to be known as the Forest Management Framework (FMF). The FMF applies to all catchments shown in Figure 1.1. The FMF will be applied to all forest activities licensed by FS-DAFM under the Forestry Act 2014, without or without grant aid – afforestation, forest road construction, felling / reforestation, and aerial fertilisation, replacing the existing consenting system which is informed by the Forest & FPM Requirements (2008) document, and includes the 6km zones associated with it.

At a site level, the framework will identify the level of risk arising from the nature of both the site and the activity, and the appropriate response and measures that apply. The schematic presented in Figure 2.1 will form the basic model for the primary activities of afforestation and final crop felling, with the extent of realisation based on the identified risk.

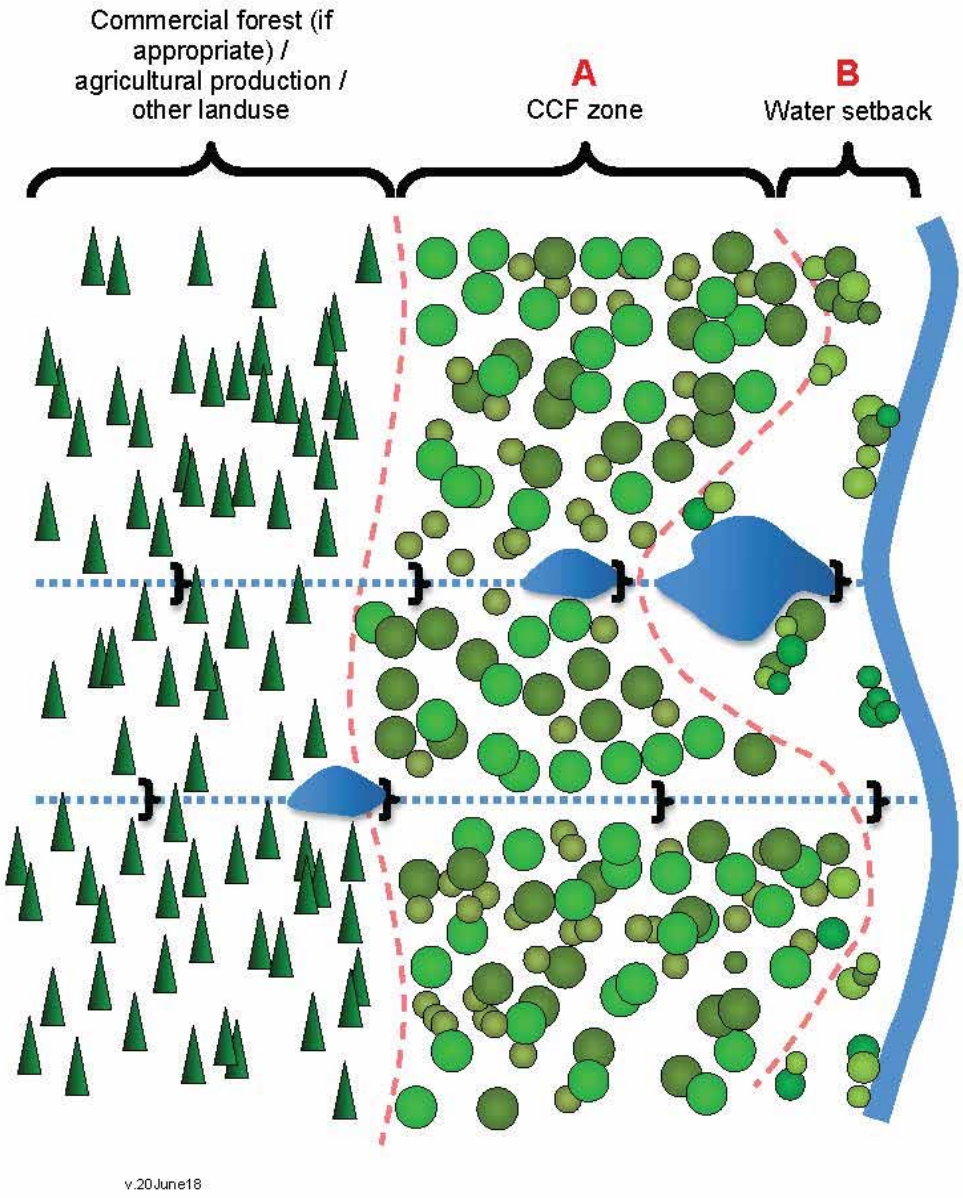


Figure 2.1 Schematic diagram of the proposed forest structure adjacent to watercourses.

2.2.2 Research

The plan was formulated based on the best available scientific knowledge on the topic. There have been several research projects carried out on similar and related subjects, some of which are still ongoing. These included KerryLIFE, the INTERREG Freshwater Pearl Mussel Project, FORMMAR, CROW, HYDROFOR, Woodland for Water, and the Pearl Mussel Project. Each of these are discussed in further detail in the plan itself, as are any findings/recommendation that have been made as a result of the research, but a brief summary of each is also given below:

KerryLIFE

KerryLIFE is an EU co-funded project focusing on the sustainable land use management for the conservation of FPM. The project is based on the Caragh and Kerry Blackwater catchments in the southwest, which together host the two largest populations of FPM in Ireland, each supporting in excess of 2.75 million adults. Currently, the recruitment is insufficient to maintain the adult populations into the future, and both catchments are classified as being in unfavourable condition. The objectives of KerryLIFE are to:

- demonstrate effective conservation measures that will restore FPM to favourable conservation condition in the Caragh and Blackwater catchments;
- enhance awareness and understanding of FPM amongst local stakeholders;
- demonstrate sustainable management techniques for farming and forestry in FPM catchments; and to
- provide guidance for farming and forestry practices that support the conservation of FPM.

The project has a significant potential to inform future policy decisions on best practice regarding forestry in FPM catchments. KerryLIFE is a partnership project involving National Parks & Wildlife Service , the Forest Service (DAFM), Nitrates, Biodiversity & Engineering Division (DAFM), Coillte, Teagasc and the community-based South Kerry Development Partnership, and will focus heavily on securing ownership of the project amongst the local community within the project area. KerryLIFE will run from July 2014 to December 2019, with an overall budget of almost €6 million. Almost half of the €0.5 million commitment by the Forest Service (DAFM) to this project is for native woodland creation under the Conservation and Establishment elements of the Native Woodland Scheme.

Ongoing activities undertaken under the project, including forest drain assessment, site-sensitive clearfelling, halo thinning, firebreak management and the reseeding of a recent clearfell site, are being closely observed by the FS-DAFM with a view to wider application elsewhere.

The Teagasc Walsh Fellowship Scheme is funding a PhD project that will employ sediment provenance and flux methods within representative sub-catchments to further the understanding of the effect of land use on sediment dynamics in an example of extensively managed Irish catchments with significant populations of freshwater pearl mussels in Co. Kerry. The study is part of the KerryLIFE project, and is being conducted in three sub-catchments within the Kerry Blackwater and Caragh SACs, i.e. the Kealduff, the Owenroe and the Bridia (Upper Caragh). The main aims are as follows: To assess the annual sediment yields and load flux of three rural sub-catchments with FPM. This will develop understanding of the effect of land management on sediment dynamics; To identify the critical source areas (CSAs) of sediment in study catchments through in depth soil analysis and sediment

fingerprinting, and; To investigate historical trends in sediment yields in catchments dominated by extensive agriculture and forestry.

INTERREG Freshwater Pearl Mussel Project
The INTERREG Freshwater Pearl Mussel Project was aimed at helping to secure the conservation of the species, in light of its continuing mostly unfavourable conservation status and possible extinction in the near future as a result of recruitment failure. The project was carried out by Donegal County Council in partnership with the Northern Ireland Environment Agency. The project had three main aims:

- preparation of management plans for a number of FPM catchments
- trialling of a suite of agricultural, forestry and septic tank-related measures within selected catchments to protect FPM
- drafting of technical codes of practice to assist agencies, local authorities, public authorities and key stakeholders in relation to proposed developments, works and activities within FPM catchments

The Freshwater Pearl Mussel Project hosted an end-of-project conference in Belfast in June 2014 to outline its results and findings, and the various codes of practice are currently being finalised.

FORMMAR
A research project studying Forest Management for the Freshwater Pearl Mussel Margaritifera margaritifera (FORMMAR) was completed under the FIRM / RSF / CoFoRD 2011 Research Call (Moorkens et al., 2013). The study, primarily desk-based in nature, was undertaken to assess Irish and international research and best practice and to identify appropriate (within the Irish context) site and catchment-level forest management measures to advance the conservation of FPM.

CROW
The Combined Research on Riparian Woodland (CROW) inter-institutional co-operative project (2010-2014) explored the relationships between aquatic buffer zones (ABZs) in forests. The ultimate objectives of the project was to construct a knowledge base derived from research in NW Europe, to: assess the condition of ABZs in commercial forest plantations; to explore key ecological interactions between the ABZs and the aquatic zone, and; to make specific recommendations with regard to their future management arising from manipulations conducted at selected sites. Key recommendations from the CROW project are as follows:

- ABZs in commercial forests should be widened to at least the minimum required, i.e. 10m to 25m, to maximise aquatic zone protection, with scope for widening the ABZ further into areas of preferential flow, especially in vulnerable sections of the ABZ
- Manual harvesting/sensitive extraction is a recommended only in very sensitive sites/catchments, especially in steep headwaters, e.g. high water status catchment (such as Freshwater Pearl Mussel (FPM) and salmonid SACs).
- Premature clearfelling should be carried out on susceptible soils where small crowns resulting in low brash volume pertains, resulting in insufficient brash paths. Thinning is an option in upper catchments on stable slopes via manual felling to a small harvester, followed by forwarding to the roadside
- Natural regeneration is the most effective and rapid means of re-establishment in harvested ABZs. Tree planting is an option in very sensitive,

high water status catchments (FPM and salmonid SACs) in order to supplement natural regeneration and to counteract grazing pressure from deer and/or livestock. It is also an option on peat soils to control stream temperatures (mitigate future climate change) and on mineral soils where the ABZ is isolated from seed sources of native tree species.

- Planting (with protection) will accelerate development of diverse vegetation communities, stabilise banks and increase instream productivity. Deciduous native trees species (planted and/or via natural regeneration) will increase carbon to streams and also provide the preferred pollen for adult stoneflies. Planting mixtures should match site type and should comprise primarily willow, birch and alder
- Improving the retention of coarse organic matter is desirable as it would enhance invertebrate production. However, there is a requirement to improve instream retention to allow terrestrial carbon to be conditioned.
- A guidance note on the management of ABZs in plantation forests would contribute to the Sustainable Forest Management policy of the Forest Service.

HYDROFOR

The HYDROFOR Project was a 7-year (2008-2014 inclusive) inter-institutional (UCD, UCC and NUIG) co-operative project investigating the relationships between conifer forests, forestry operations, and surface water quality and ecology in Irish rivers and lakes. The final report of the project was published and released in July 2016. Policy recommendations presented by the authors are as follows:

- Sediment release to water courses during felling and replanting may be reduced by careful onsite management of felling and windrowing operations, installation of silt traps and greater application and oversight of best practice guidelines.
- A combination of several sediment traps may be more effective at trapping a range of sediment particle sizes than single isolated traps.
- Retention of phosphorus requires attention, as it is more challenging on peat soils and will depend on the occurrence of mineral content in riparian soils or installation of mineral barriers.
- Based on the suite of impacts from planting to harvesting, including elevated DOC, nutrient and sediment release, and aquatic biodiversity concerns, cessation of afforestation on peat soils in acid-sensitive headwater catchments is recommended by the project team. In relation to reforestation of sites in such catchments, there are serious concerns with respect to the aforementioned impacts. Where replanting is considered, the design should be hydrologically informed and demonstrate empirically on a site-specific basis that it can mitigate impacts on water quality and aquatic biodiversity through the forest management cycle, as highlighted in this report. A number of mitigation measures (riparian buffer zones and sediment traps) were investigated in this study, and the research evidence highlighted their ability to reduce some pollutant inputs. Their effectiveness is likely to be site specific and other measures, not investigated in this project, e.g. reduced catchment tree cover, minimising drainage and soil disturbance, may reduce impact, but these remain to be validated by further research.

Woodland for Water

In April 2018, the Minister of State at the Department of Agriculture, Food and the Marine with responsibility for forestry, Andrew Doyle launched the new initiative *Woodland for Water: Creating new native woodlands to protect and enhance Ireland's*

waters. This is a document which describes proposed measures that combines new native woodland (under NWS Establishment) and an undisturbed water setback, specifically to deliver ecosystem services that protect and enhance water quality and aquatic ecosystems. This document uses research carried out in Ireland, the UK and elsewhere, and discusses the ecosystem services that can be gained from the establishment of such native woodlands with large waterway buffers.

While the Woodland for Water model is not presented as a 'one-size-fits-all' solution for sites within FPM catchments, it does have an application, and the research review undertake in support of it has direct relevant to the Plan. The plan lists a number of research publications that were used to form the basis of this project.

A key publication by Nisbet et al. (2011) entitled "*Woodland for Water: Woodland Measures for Meeting WFD Objectives*", also reviews research in this area, and found that a range of buffer widths (see Figure 2.2) are reported in the literature as being required for the adequate performance of specific buffer functions.

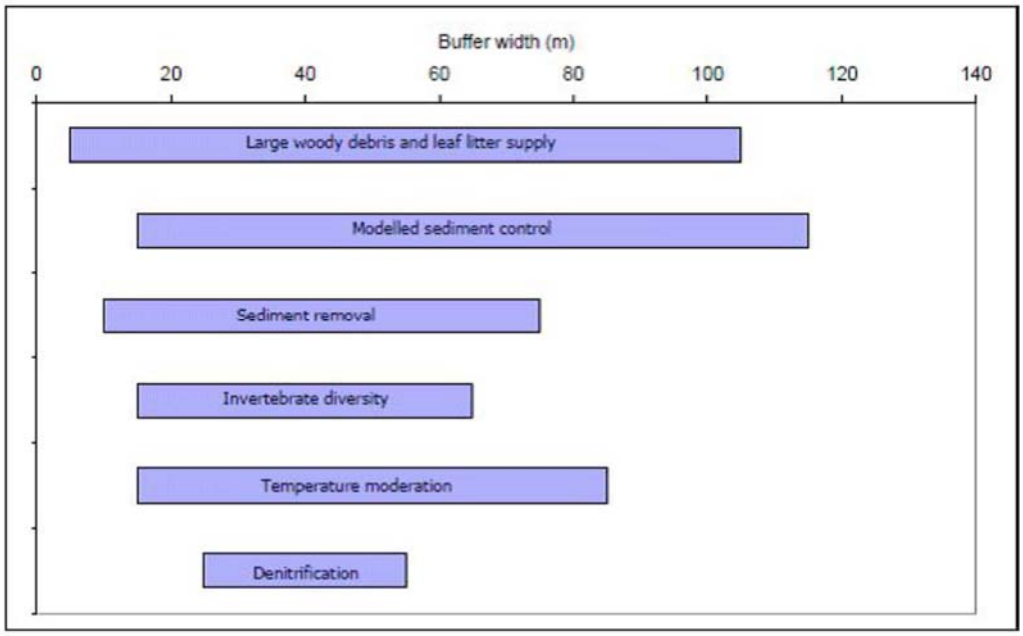


Figure 2.2 The range of buffer widths reported in the literature as being required for the adequate performance of specific buffer functions according to Nisbet et. al. (2011).

Pearl Mussel Project

The Pearl Mussel Project aims to establish a voluntary results based agri-environmental scheme for farmers in eligible areas. The overall aim of the scheme is to promote farm management tailored to maintaining and improving the local environment with a view to securing the long term conservation of freshwater pearl mussel (Margaritifera margaritifera) in Ireland. This will be achieved by rewarding farmers for improving the quality of habitats on their lands. A catchment wide approach will be taken because activities on the lands have a direct influence on conditions in the rivers to which they drain. Maintaining natural habitats (such as wetlands, grasslands, and bogs) will enhance the conditions of freshwater pearl mussel rivers while also providing a range of wider environmental benefits.

The scheme is being designed by the project team with input from various stakeholders including; farmers, researchers, and advisors. It is foreseen that the scheme will be based around the following concepts:

- Results based approach. This relates to the achievement of a defined environmental result, and the farmer has flexibility to choose the most appropriate management to achieve that result. Higher payments will be given for better results.
- Flexible and adaptable. The scheme will be adaptable to suit the needs of individual farmers in each catchment. Farmers will be afforded flexibility to manage their lands in a way that achieves the best environmental result for their local situation.
- Five year duration. During the initial year (2018-19) the scheme will be tested on a selection of pilot farms. Following this, the final scheme will be open to eligible applicants to join on a phased basis for a period of five years. Acceptance onto the scheme may be subject to certain criteria being met.
- Payment for results. There is likely to be varying levels of payment, where the level of payment reflects the environmental results achieved.
- Payment for actions. Complementary actions are once-off investments to help deliver, or increase the quality, of environmental targets. These payments are referred to as Non Productive Investments (NPIs)

The six year project, with a total budget of €10 million, commenced in May 2018 and is currently in the design stage. The project will include the following elements:

- A results based agri-environmental scheme
- Community outreach
- Promoting innovative agriculture
- Develop market opportunities
- Research and development

Management Strategies for the Protection of High Status Water Bodies
Research undertaken under the EPA-administered STRIVE (Science, Technology, Research and Innovation for the Environment) Programme 2007–2013, in response to the decline in high ecological quality river sites, which are indicators of largely undisturbed conditions and reflect natural background status or only minor distortion by anthropogenic influences. The aim of the research was to: review existing legislation relevant to the protection and management of high status sites; review international best practice on protecting these sites; and; recommend new approaches to ensuring that high status water bodies remain at high status.

As set out in Ní Chatháin et al. (2013), the study highlighted five key issues: planning and development in high status catchments is an environmental issue; high status catchments provide valuable ecosystem services; high status catchments have little to no capacity for further intensification; high status catchments and protected areas require similar protection strategies; and County Development Plans and all land use plans and policies should reflect the sensitivity of high status water bodies.

The study proposed 10 separate strategies to protect and manage high status waters, with four (designated by '*') regarded as priority:

- High status catchment delineation and prioritisation for protection measures*
- Establishment of a spatial network of high status waters*

- Establishment of a 'blue dot' monitoring system by the EPA
- Potential additional measures under the WFD over and above European Directive requirements
- Assessment of potential impacts, and consideration of the risk of failing to meet high status*
- Planning/Licensing control and assessment of cumulative impacts
- Centralised GIS database, or activities database
- Integrated monitoring and protection*
- Unregulated activities – where control mechanisms are required and
- Public awareness campaigns

Holistic Land Use Analysis: A Temporal Analysis of Water Quality Outcomes
Water quality outcomes are influenced by a variety of land use activities, including agriculture, forestry and waste water disposal. This research, involving NUIG and Teagasc (Duffy et al., 2017), examines the main drivers of water quality outcomes (agriculture, forestry and septic tank density) at a national level over a period of 20 years. It allows, for the first time, the analysis of impacts of afforestation and forest cover on water quality outcomes relative to other land uses at the national level, within a meaningful time period. The study utilises the following sources of data: datasets derived from the EPA water quality monitoring stations; the Irish census of agriculture; the Forest Inventory Planning System (FIPS); and the Irish Forest Soils layer. The research allows an examination of the impacts of afforestation and forest cover on water quality outcomes, and the potential impacts of a decrease in agricultural production with a corresponding increase in forest cover.

PESFOR-W COST Action (CA15206)
The aim of this COST Action – Payments for Ecosystem Services Forests for Water – is to improve Europe's capacity to use Payments for Ecosystem Services (PES) to achieve WFD targets and other policy objectives through incentives for planting woodlands to reduce agricultural diffuse pollution to watercourses. The action will run until 2020. It's specific objectives are to:

- characterise and evaluate governance models;
- evaluate environmental effectiveness of targeted woodland planting;
- explore cost-effectiveness of woodland planting for reducing diffuse pollution;
- create an European PES repository of case studies; and
- develop user guidance on suitability of pollutant, ecosystem service & catchment scale models to quantify the effectiveness of tree planting to reduce diffuse pollution.

Microsoft / Natural Capital Partners / Green Belt initiative
An innovative project is now operating in Ireland, involving the computer multi-national Microsoft, the UK-based Forest Carbon Ltd., Natural Capital Partners and Green Belt Ltd. Under the project, Microsoft is funding the payment of €1,000/ha to supplement the grant available under NWS Est., to further encourage farmers to enter that scheme. While farmers retain ownership of their land, trees and the resulting timber, Microsoft is focused on the environmental benefits of the woodlands in order to support Ireland's forest creation goals and demonstrate its commitment to the country's environmental targets.

Phase 1 of the project involves a target to plant 136 ha in the Spring 2017 and 2017 / 2018 planting seasons, in Counties Cork, Kerry, Galway and Mayo. To date, 50 ha have been planted, the remaining area is on course for completion. Microsoft is evaluating

future phases of the native woodland programme that will expand and accelerate the achievement of Ireland's native woodland goals.

Carbon sequestration has been and will continue to be a key focus of the programme. For example, planting under Phase 1 will sequester an estimated 35,600 tonnes of carbon dioxide over 40 years. As part of the evaluation of extending the programme, Microsoft is exploring how to align the native woodland programme with Ireland's focus on broader ecosystem services with a particular focus on water-related ecosystem services, as set out in the Woodland for Water document.

This project has a significant potential to inform the development of the DAFM's Woodland Fund, as proposed under the mid-term review of the Forestry Programme. Also, critically, through coordination between the project partners, Microsoft and Green Belt, the EPA, the Regional Operations Committees, LAWCO and Woodlands of Ireland, specific areas where new native woodland would play a particular role in water protection can be identified, and outreach services provided to encourage the engagement of the landowner with the NWS Est., supplemented by the additional Microsoft payment.

INTERREG VA Source to Tap Project
Source to Tap is an EU INTERREG funded project delivered by a partnership led by Northern Ireland Water and including Irish Water, Agri-Food and Biosciences Institute (AFBI), East Border Region, Ulster University and The Rivers Trust. The project aims are as follows:

- Produce a Sustainable Catchment Area Management Plan (SCAMP) for the Erne and Derg cross border catchments.
- Prevent pollution of raw water used for drinking water abstraction from pesticides and sediment pollution.
- Learning and outreach strategy to engage with local communities on importance of protecting drinking water resources.
- Forestry best practice pilot to prevent sediment run-off causing colour and turbidity issues in raw water.
- Peat restoration of former afforested land along river banks.
- Pilot land incentive scheme to change land management practices by farmers.
- Benefits analysis to determine cost effectiveness of removal of pollutants at source, compared with treatment processes.

Source to Tap was officially launched in December 2017, and DAFM participates on the External Advisory Group. Forestry measures are to be trialled within properties owned and managed by the Northern Ireland Forest Service (north) and Coillte (south).

2.2.3 Implementation of the Framework via consenting system

The FS-DAFM must act within its regulatory remit, and therefore has a defined ability to control and influence. It cannot compel land owners to undertake afforestation or felling aimed at protecting water quality and FPM. Instead, it can regulate key forestry activity through the Forestry Act 2014 and S.I.191 of 2017, in relation to applications received for afforestation, forest road works, felling and aerial fertilisation. Under the Forestry Programme, the FS-DAFM can also operate schemes that encourage certain types of forest activity, such as the Native Woodland Conservation Scheme. Within this context, the FS-DAFM can encourage applications and following assessment, can attach conditions to any licence issued, to ensure

protection of the environment or (in the case of the Native Woodland Scheme package and Environmental Enhancement of Forests Scheme) to deliver targeted ecosystem service delivery, in partnership with owners and others.

2.3 The current application / assessment process and environmental requirements for all catchments

Background

The long-term strategy for forestry in Ireland is to increase the forested area in accordance with sustainable forest management (SFM) in order to promote a long-term Irish timber supply, and to support the associated jobs and economic activity of the timber industry. The FS-DAFM must ensure that while this strategy is pursued, there are no significant environmental repercussions to the increase in forestry. A document entitled "Environmental Requirements for Afforestation" published by the DAFM in December 2016 provides the environmental restrictions that are currently in place for the process of afforestation in any part of Ireland. The process is summarised below.

Overview of Application Process

Under the Forestry Regulations 2017 (S.I. 191 of 2017), all applications for licences for afforestation, forest road construction projects, whether grant-aided or not, and for aerial fertilisation and tree felling operations, require the prior written approval of the Minister for Agriculture, Food and the Marine. Before the Minister can grant approval for any of the above, s/he must first determine if the project is likely to have a significant environmental effect.

DAFM assesses applications for licensing in relation to afforestation, tree felling, forest road works and the aerial fertilisation of forests (the latter, to permit the treatment of nutrient deficient forest land by air). These activities were previously regulated under S.I.558 of 2010 (as amended), the Forestry Act 1946 and S.I.125 of 2012, but are now regulated under the Forestry Act 2014 and associated Forestry Regulations 2017 (S.I.191 of 2017).

Many of these applications also represent applications for support under the various grant schemes operated by the DAFM under the Forestry Programme 2014-2020, e.g. Afforestation Grant & Premium Scheme, Forest Road Scheme, Woodland Improvement (Tending & Thinning) Scheme, Native Woodland Conservation Scheme, NeighbourWood Scheme.

When assessing an individual application for licensing (with or without grant aid) for any of the above activities, the DAFM undertakes a detailed assessment of the project and (inter alia) its potential impact on the environment, including water. The various interconnected components of the process, are listed as follows:

- Pre-approval assessment
- Other inspection processes
- Land Types for Afforestation
- Environmental Requirements for Afforestation and other 'guidelines'
- Felling & Reforestation Policy
- iFORIS
- Referral process
- Public consultation
- Acid Sensitivity Protocol

- Appropriate Assessment Procedure
- Assessment to Determine EIA Requirement
- Requirements and mandatory 'guidelines'
- Licensing conditions
- Sanctions
- Training for Registered Foresters

Background checks
During the pre-application design stage, the Registered Forester assesses the site and carries out various checks, and subsequently designs the afforestation proposal in a way that addresses the various environmental features and sensitivities identified. The forester can obtain information relating to the site from a number of sources and from dialogue with the applicant.

2.3.1 Basic requirements for the design stage

The following should be noted in relation to the basic design stage:

- On particularly sensitive sites, the forester may propose measures above and beyond the minimum requirements set out in the "Environmental Requirements for Afforestation" document. This may include, for example, a wider than normal water setback distance near an SAC.
- A relevant expert, such as a hydrologist or ecologist, can be engaged early in the design process to ensure that the proposed mitigation measures are sufficient for the protection of any sensitive receptor. This may reduce delays in the application process such as the issuing of requests for further information.
- Some areas (either full sites or part thereof) may be found to be suitable for the production of forestry, but may be environmentally unsuitable. Such sites should not be brought to the application stage.

The basic design requirements in relation to water, biodiversity, archaeology and landscape are described in detail in the "Environmental Requirements for Afforestation" document, and are briefly summarised below:

In relation to water, the forester must assess the likelihood of either nutrient runoff or sediment discharge into local receiving waterbodies at any stage of the forest rotation. Factors including soil type, slope, proximity to downstream designated waterbodies, and the status objective of the waterbody itself will all be considered in this assessment. A water setback (previously known as an aquatic buffer zone) of a defined width is used adjacent to watercourses. Site drainage is often necessary to allow the establishment of forestry on the site. Forest drains should be constructed using the least impacting techniques, should maintain a low water velocity, and may not enter the water setback area (with an exception of difficult to drain sites), but must instead terminate using sediment traps outside the setback area. Water crossings should be kept to a minimum, but where necessary, there are a number of requirements that must e adhered to. These include constructing between May and September, the minimising of impacts to the bank and fish passage, and ensuring the crossing can cater for the 25 year flood event. Full design details of any crossings should be submitted with the application.

Biodiversity can be significantly impacted locally from forestry-related activities. Applicants are encouraged to obtain ecological advice at an early stage in the process to avoid wasted time during the application process, and to ensure the least

ecological impact on the site. Areas for Biodiversity Enhancement must cover approximately 10-15% of the site area, be an integral part of the site and can include environmental setback areas, retained habitats and future operational areas.

It is important that any forestry-related activities do not have any direct or indirect adverse impacts on archaeological monuments (composed of either designated sites/monuments, designated buildings or non-designated built heritage structures. A number of measures are available for use to remove, reduce or mitigate archaeological impacts.

In order to ensure that any forestry-related developments are visually acceptable and in-keeping with landscape sensitivities, there are some key factors to consider. These factors include shape (regarding the forest outline), margins (between forestry and open ground, or between forest types/species), and diversity (of tree species and of the layout/formation of the forest).

Environmental Setbacks
There are a number of types of water feature concerning the water setback distance. These are:

- Aquatic zone (permanent or seasonal river stream or lake shown on an OS 6-inch map)
- Relevant watercourse (watercourse not shown on OS 6-inch map which is connected to an aquatic zone and has the potential to carry significant amounts of sediments/nutrients or has signs of erosion/deposition. These are often artificial, but not all watercourses are relevant)
- Hotspot (area having potential for sediment/nutrient loss during forestry-related activities, such as soft wet ground, flushes, etc.)
- Water abstraction point (surface water, borehole, spring or well where water is abstracted for human consumption)

Table 2.1 shows the minimum water setback distances for forestry development in relation to aquatic zones. For relevant watercourses and hotspots the minimum distance is 5 metres, while for drinking water abstraction points the minimum distance is 20 metres.

Table 2.1 Minimum water setback distances for forestry

Slope leading to the aquatic zone	Setback width	Setback with for peat soils and/or high status objective waterbodies
Moderate (0-15%)	10m	20m
Steep (15-30%)	15m	25m
Very Steep (>30%)	20m	25m

If the forestry works are within a catchment of a high status objective waterbody, the 25 metre setback (as mentioned in Table 2.1) can be reduced by 10 metres (on the forestry side) if a 10 metre wide plot of GPC9 or GPC10 (native woodland scheme) is used to replace this 10 metre reduction. These native woodland scheme areas comprise native species only including oak, scots pine and willow

2.3.2 Site Works

The site technical approval may in some circumstances stipulate that works (either over the full site or part thereof) need to be supervised by a suitably qualified

specialist, such as an independent archaeologist. This specialist will have the authority to stop works at any time if they feel there is a risk to the receptor, and must submit a report after works are complete.

Site works should have a contingency plan prepared in advance of the works taking place. This plan should detail what to do and who to contact in the event of an unexpected event that poses a risk to the environment.

The registered forester must ensure that all site personnel are aware of the required environmental setbacks, as failure to adhere to them can incur significant penalties. Table 2.2 shows information relating to the water and habitat setbacks for forestry works.

Table 2.2 Environmental requirements for water and habitat setbacks

		Water Setback	Habitat Setback
Operation	Forest edge planting	Encouraged	Encouraged
	Environmental setback planting	Encouraged	Excluded
	Demarcation fencing	Not required	Not required
	Machine traffic	Excluded	Excluded
	Cultivation / drainage	Excluded – New drains not allowed into the water setback, or to discharge directly to a watercourse / aquatic zone	Excluded
	Fertiliser application / vegetation management	Permitted if required to establish setback planting (only non-herbicidal methods permitted, and only slow-release fertiliser to be applied manually into planting pit)	Excluded
	Temporary onsite storage of fertiliser, fuel, etc. for works	Excluded	Excluded

Forest edge planting involves the use/planting of native species in belts or groups along the edge of the forestry plantation, so that the native species screen the commercial conifer species within. This is a requirement where the forestry plot adjoins a public road, or a residential property. Forest edge planting does not extend into the environmental setback.

Environmental setback planting comprises small groups, irregular belts and single native trees within the environmental setback, but this should not exceed 20% of the setback area. The strategic use of this can enhance the purpose of the water setback (and other environmental setbacks). Benefits can include improved bank stability, food drop and shading. Agreement may need to be made with Inland fisheries Ireland and the NPWS in advance of the works.

2.3.3 Operational Safeguards

All forestry-related works have a number of mandatory operational safeguards that must be used on site to ensure there is no increased risk to the environment.

Drainage and cultivation

One of the most important safeguards in relation to maintaining waterbody water quality in the wider area is the avoidance of sediment and nutrient discharge into the aquatic zone from any forestry site. This can be adhered to using several key points:

- Selection of suitable sites
- Ensuring slow water flow in all drains on site at all times of the forest rotation, to avoid introducing a high silt load to the water.
- Adhere to the approved drainage and cultivation plans for the site
- Use of suitable machinery in relation to the site conditions, and ensuring that machinery is not used in the environmental setback area
- All drains must end in a sediment trap, with none of these drains or traps located within the environmental setback area, or discharging directly into the aquatic zone (with an exception in flat/difficult to drain sites which may need to link directly to the aquatic zone)
- Collector drains must be correctly spaced (<80m) and meet certain specifications (<1-in-30 slope; <15cm depth below mound drains)
- Sediment trap design much be adequate to carry out their job through the forest rotation
- Drainage and cultivation operations must stop during periods of rainfall when there is a risk of mobilising sediment
- If there are any signs that the drainage network (including sediment traps) is under pressure or failing, measures must be taken to deal with it, and a specialist (e.g. hydrologist) employed as necessary

In addition to the above, the following measures can be employed on-site to reduce the likelihood of environmental impacts to the aquatic zone:

- Use of small v-shaped dams to slow water flow in drains
- Installation of large settlement ponds may be required into which site drains can discharge
- Native and species-rich forestry is favoured adjoining water setback areas
- Design of site drainage network from the outset to easily allow for future rotation works
- Develop windfirm edges within the site to prevent windthrow

Fertiliser application

In order to reduce the risk of fertiliser run-off during application on forestry sites, the following points should be noted:

- Use the correct fertiliser type and application method/rate for each site
- Avoid using fertiliser within the water setback area (or within 20m of the aquatic zone – whichever is greatest).
- Only manual application methods should be used up to 50m from the aquatic zone. Manual application is the preferred application method in all locations.
- Fertiliser should not be applied during/before times of heavy rainfall
- The use of slow release granules is preferred

Vegetation management

Although vegetation management at the afforestation stage typically uses herbicides, the following points should be noted in relation to the use of both herbicides and pesticides:

- Users of both herbicides and pesticides must adhere to the Sustainable use of Pesticides Regulations 2012
- Only a registered profession may apply pesticides which are authorised for professional use. These professional must follow the Principles of Good Plant Protection Practice
- Any product used must be approved for use in Ireland

In order to reduce the likelihood of the movement of any herbicide or pesticide into the aquatic zone, the following guidelines should be adhered to:

- Aim to use the least amount of herbicide or pesticide as possible in order to achieve a successful outcome, and do not use them if they are not required
- Do not apply during/before times of heavy rainfall
- Fully adhere to manufacturers guidelines
- Do not apply these within a water setback area, or within 20m of an aquatic zone (whichever is greatest), within permitted distances of water abstraction points according to S.I. 155/2012, within a residential building setback, or within 15m of a feature indicating vulnerable groundwater (e.g. karst)
- They cannot be used within an SAC or an SPA without completion of a risk assessment, with preference given to low risk methods/products if their use is unavoidable

Preparation, storage and use of potentially hazardous material
Wherever materials such as fertilisers, herbicides/pesticides and fuel/oil are used and stored on site, there is an inherent risk to the environment associated with this. In order to reduce this risk as much as possible, the following points should apply in relation to these materials:

- Minimise storage and preparation onsite, but if unavoidable, store/prepare on dry and elevated part of the site at least 50 metres from the nearest aquatic zone, and 20 metres from other water features. The same distances apply to cleaning equipment
- Do not discharge any substance into an aquatic zone, or drainage feature, etc.
- Do not rinse containers onsite
- Remove all empty substance packages/containers and general refuse from site
- Collect spent machine oil and remove from site for correct disposal

2.3.4 Ongoing Site management after planting

In the first 15 years after planting, there are generally no major site works required. Maintenance of site fences, fire breaks, stocking levels, and fertiliser application must be carried out appropriately to prevent environmental impacts. The site should be monitored to ensure compliance with requirements and to ensure the correct functioning of site drainage features (most notably sediment traps). Drainage features onsite should be annually checked, and during/after periods of heavy rainfall. In the event that sediment traps are filling up, they should be cleaned out, with the sediment being disposed of several metres away. If there is evidence that the sediment traps (or site drains) are failing or under pressure, additional works (such as the installation of further sediment traps) may need to be carried out. A hydrologist may be required to ensure the modifications will suffice.

In relation to fertiliser application, foliage analysis should be carried out to ensure the correct dosage is undertaken. If aerial fertilisation is required over large areas, an aerial fertilisation licence must be obtained from the Forest Service.

Setback areas may require some management throughout the forest rotation. This may involve the removal of woody material/growth for the sake of visual amenity, view or fire prevention. Trees comprising the forest edge planting or environmental setback planting should be maintained until they have no grazing pressure. Natural should be maintained, but the colonisation of any invasive species should be prevented, and treated if found during site inspections. If treatment best practice involves the use of herbicides, consult with Inland Fisheries Ireland in advance of works.

2.3.5 Additional existing measures for catchments containing Freshwater Pearl Mussel

A 2008 document from the Department of Agriculture, Fisheries and Food entitled "Forestry and Freshwater Pearl Mussel Requirements; Site Assessment and Mitigation Measures" describes the additional measures which should be adhered to for certain forestry sites located within 6km of a downstream population of FPM. There are certain situations that allow sites to not adhere to the Forestry and FPM requirements, even within 6km distance of a downstream population of FPM. Table 2.3 describes the screening to decide if a site must adhere to the forestry and FPM requirements or the above Forest Service guidelines.

Table 2.3 Screening for Forestry and Freshwater Pearl Mussel Requirements

Distance from nearest downstream FPM population (Note 1)		Soil (Note 2)	Requirements
Within 6km of FPM	Site adjoins population	Erodable	FPM Requirements
		Peaty	FPM Requirements
		Mineral	FPM Requirements
	Site contains or adjoins aquatic zone	Erodable	FPM Requirements
		Peaty	FPM Requirements
		Mineral	FPM Requirements
	Site does not contain or adjoin aquatic zone	Erodable	FPM Requirements
		Peaty	FPM Requirements
		Mineral	FS Guidelines*
Greater than 6km of FPM		Erodable	FS Guidelines*
		Peaty	FS Guidelines*

*FS Guidelines apply except in the following situations where the Forestry and FPM Requirements apply:

- >10% of catchment (Note 3)
- Afforestation >50ha (Note 4)

- Clearfelling >25ha (Note 4)

Notes:

1. Distance is measured along the shortest hydrological distance from the nearest point of the site of application to the nearest known FPM population downstream.
2. Soil: Soil types are those as defined in this document (e.g. Table 3 Page 11, glossary).
3. Cumulative Effect: If the application increases the total cumulative area of an operation in a three year period to more than 10% of the FMP catchment, then FPM Requirements apply.
4. Area of Individual Operation refers to the area of an individual site (e.g. felling coupe, afforestation site).

If Table 2.3 above identifies that the Forest Service Guidelines are the mitigation measures to be applied then the site assessment form need not be completed. The identification of the correct mitigation measures is an essential element of the Requirements. The proper completion of Form A (FPM Site Assessment/Site Description) will identify the sensitivities on each site. Once the sensitivities and risks associated with the proposed activity have been established the appropriate mitigation measures can be selected and reported on using FORM B (FPM Site Assessment Mitigation Measures).

If mitigation is required as part of the site design, there are a number of possible mitigation strategies listed in the forestry and FPM requirements document. They are described in detail in this document, but are listed below. These mitigation include:

- Limiting the area of the site/catchment for forestry operations in any year
- Creation of effective buffer zones
- Installation of sediment control measures
- Brash Management
- Correct/suitable timing of operations
- Use of appropriate and minimal drainage patterns
- Use of low impact cultivation/planting methods
- Minimal use of suitable fertiliser
- Minimal use of pesticides and herbicides
- Only use appropriate machinery for operational works (e.g. harvesting)
- Appropriate design and construction techniques for new (and upgraded) roads
- Low Impact Silvicultural Systems to be used where appropriate
- Using a variety of techniques for highly sensitive sites, depending on the site requirements. These include:
    - For afforestation
        - Native woodland use
        - Wide buffer zones (>25m)
        - Manual planting
        - No afforestation
    - For clearfelling
        - Habitat restoration
        - Wider buffer zones (>25m)
        - Low impact regeneration
        - Extended timeframe for replanting
        - Change of tree species and/or use of broadleaves
        - Creation of felling coupe and buffer strips

The site works and the above mitigation would be preceded and followed by monitoring (onsite and offsite) to establish the baseline, and any subsequent changes post-works.

2.4 Implementing the Proposed Plan

The application and assessment process for forestry activities within the FPM SAC catchments will change once the proposed Plan is adopted.

All of the baseline levels of protection and assessment as set out above in Sections 2.3 with the exception of the process described in Section 2.3.5 will continue to apply where relevant.

The proposed Plan will be implemented by amending the existing consenting system and implementing a detailed awareness and training programme once adopted. The measures will be implemented with the support of other policies, legislation, and other measures, including:

- Forestry Act 2014 and accompanying Forestry Regulations 2017 (S.I.191 of 2017)
- Licence application process (including referrals and AAP)
- Land Types for Afforestation
- Environmental Requirements for Afforestation
- Felling & Reforestation Policy and accompanying Reforestation Objectives system
- Native Woodland Scheme Package and Environmental Enhancement of Forests Scheme
- Recent and ongoing research and initiatives

The plan provides a schematic diagram to visually show the plan, but this does not include all forestry activities, and is not exhaustive with providing restructuring options.

As set out in the Felling and Reforestation Policy document, the option of complete forest removal at a site is available in particularly sensitive sites where there are no other practical options or where forestry is incompatible with the conservation objectives of the designated site. This will be decided on a case-by-case basis.

As discussed in Section 2.3, water setback areas are also a main feature of this plan. Operational safeguards as described in Section 2.3.3 above should be employed as part of this plan. The existing regulations/consenting process allows for a water setback area of up to 25m in width, while the proposed Plan for Forestry and Freshwater Pearl Mussel proposes a water setback area of up to 50m in width, which would depend on the sensitivity of the site. It is envisaged that this width would vary onsite, depending on any areas of particular sensitivity (which may require input from a hydrologist).

A Continuous Cover Forestry (CCF) zone should be incorporated alongside water setback zones. This CCF zone would typically comprise native tree species, and can be planted at the afforestation or reforestation stages. The use of these CCF zones is designed to carry out several important ecosystem services, as described in Section 2.2.2 above.

Further information on the vision for the plan is given in Section 2.2.2 above.

2.4.1 New Management Framework - The Process

2.4.1.1 Step 1: Assessing Site Risk

It is planed that a Site Risk Form will be used for the first step of an application to the FS-DAFM for any forestry-related activities (e.g afforestation, clearfelling,, etc.). An example of this Site Risk Form is included in Appendix A of the Plan. This will be an additional step that will be carried out only in the 27 catchments that are associated with SAC's designated for the presence of FPM The aim of this site risk assessment is to aid the applicant and the forester to identify any risks onsite (in relation to the protection of catchment SACs), and to select the most appropriate options and (if necessary) mitigation measures required for the completion of the forestry activity. Proximity of the forest site to populations of FPM is excluded as a consideration for the risk assessment.

2.4.1.2 Step 2: Identifying Appropriate Options

Once the site risks (and their level) have been identified using the risk assessment form, the most appropriate options relating to the relevant forestry activity must be selected to remove or mitigate against that risk. This step is also over and above the standard practice which would be carried out for forestry sites located outside the 27 FPM catchments.

A Site Operation Form will be used to guide the forester and applicant through the process of selecting the best option(s) from the Forestry Operation Tables (which can be seen as Appendix A of the Plan).

These tables contain a wide range of options ranging from standard forestry practice to practices for high risk sites, and they are separated in to several categories:

- Afforestation and thicket stage
- Thinning and clearfell
- Post-clearfell, including reforestation
- Forest access (including forest roading)
- Sediment and nutrient control
- Control of deer, fire and invasive species
- Monitoring and contingency planning

The main categories from above are intended to be flexible and modular in nature, and different options can be applied to certain zones/areas of a site. All of the options are focused on FPM, and although it is recognised that consideration will have to be given to other factors (such as site stability and quality, cost, other qualifying interests of local designated sites, etc.), the Forest Service can only permit an activity if they are satisfied that it will not threaten the achievement of designated site conservation objectives (alone or in combination with other activities).

Some considerations for the selection of the preferred option(s) are discussed below:

Afforestation & thicket stage

On high sensitivity sites within any of the 27 FPM catchments, it is envisaged that afforestation will be either not permitted or restricted to native woodland only.

Although the thicket stage of forestry rotation is generally characterised to be a period of non-intervention, but various options can be pursued to restructure existing thicket stage forests, to minimise future risks to the FPM.

Thinning and clearfelling
Site assessments will need to be carried out for areas proposed for thinning, and a plan put in place. While some cases may require a restricted or no thinning policy (if conditions increase the risk of sediment release), standard thinning plans and techniques are likely to be useable in most sites. The most sensitive parts of sites may use techniques such as manual felling and cable extraction.

Post-clearfelling (and reforestation)
For reforestation, the same principles (e.g. use of wide water setbacks, CCF zones, and where applicable areas for commercial conifer forestry) apply as are used for afforestation. Natural regeneration should be encouraged and managed where suitable and viable. Consideration should also be given to the option of leaving some areas free of replanting, or for marginal fertility soils, low density planting in lieu of fertiliser application.

2.4.1.3 Step 3: Submission to the Forest Service and subsequent assessment

The application is made to the FS-DAFM including the Site Risk Form and the Site Operation Form for assessment. This assessment includes:

- GIS-based desk survey
- Site inspection
- Referral to bodies such as NPWS, Inland Fisheries Ireland, etc. (if required)
- Application of FS-DAFM AA procedure and EIA screening

All applications will undergo AA screening with the FS-DAFM, and this process will ensure that the site activities will not have any significant negative impacts. A project (or site works) can have a significant impact on a Natura 2000 if:

- It reduces the area of an Annex I habitat, the area of a habitat supporting an Annex II species or the area of the overall Natura 2000 site
- It damages the quality of the environment within the Natura 2000 site
- It causes ongoing or serious disturbance to the species and/or habitats for which the Natura 2000 site is selected
- It directly or indirectly damages the size, characteristics or reproductive ability of populations within the Natura 2000 site
- It interferes with mitigation measures used for other plans or projects

Where there is uncertainty as to whether the development will cause a significant effect (either alone or in combination with other plans and/or projects) as described above, either as a result of insufficient information or a complex site, then the project/works must undergo appropriate assessment, meaning that a Natura Impact Statement (NIS) must be prepared. This assessment is carried out by a FS district inspector, and it is based on a site inspection and referral to the FS ecologist as required. The project will only be granted if, following this assessment, the FS is satisfied that the project (either alone or in combination with other plans and/or projects) will not prevent the maintenance or restoration of the favourable conservation condition of the habitats or species (including FPM) for which the site has been designated.

Licence applications within FPM catchments will, under the new Framework, be subjected to a higher level of site inspection by DAFM. Any application for consent which includes works to an area described as Moderate or High Risk sites will be subject to a site inspection by FS-DAFM.

2.4.2 Proposed Forestry Model

The proposed Draft Plan is simplified in the form of a schematic diagram (Figure 2.1) which illustrates the model upon which the Plan is based. The features which can be employed on any site are not limited to the following list, but instead, the features are given in the plan as examples of what can be used to protect the watercourses. The features described in the plan for FPM in Ireland are:

- Water setback
- Continuous Cover Forestry Zone
- Commercial Forest Zone (or other)
- Drain treatment
- Natural vegetation within the water setback
- Tree cover within the water setback

Water Setback

The water setback directly adjoining the watercourse itself and is aimed at separating the watercourse from forest operations and to intercept sediment and nutrient runoff into receiving waters. This feature is described in the Woodland for Water document (within the context of the afforestation, but also applicable to reforestation). In summary, the purpose of the water setback is to create at the outset, a buffer of natural ground vegetation positioned between defined water features (Aquatic zones, relevant watercourses, hotspots and water abstraction points) and the forest crop and associated operations, in order to protect water quality and aquatic ecosystems from possible sediment and nutrient runoff from the site as well as slowing the flow at afforestation (or reforestation) and throughout the remainder of the forest rotation. The water setback is incorporated during afforestation, and also at reforestation stage on existing forest land, where the existing forest was previously planted up to the water's edge.

At afforestation stage, the water setback must not be crossed by new drains. At reforestation stage, the introduction of the water setback may be accompanied by hydrologically-informed slow-water damming within existing drains and other potential pathways, to reinstate natural wet conditions. In both cases, this enables ponding and the filtering out of sediments / nutrients, before the flow enters into the receiving waters.

The required width of the water setback at afforestation is set out in Table 5 of the Environmental Requirements for Afforestation. Note, however, that wider water setbacks of up to 50 metres or greater may be sought under the Forest & FPM Management Framework set out in this draft Plan, depending on site sensitivities.
Adopting this requirement as the minimum width, the actual width of the water setback on-the-ground can then be increased at various points along its length, to increase the degree of safeguard at specific locations onsite, as informed by site-level hydrology. For example, the Environmental Requirements for Afforestation stipulate the following:

- Widen the water setback at various points along its length, to include adjoining wet hollows and other low-lying areas where water gravitates towards as it drains from the land.

- Based on the immediate landform / topography, vary the setback to avoid artificial lines and to create a naturally undulating forest edge.

Varying the width of the water setback (particularly in relation to sunlight) will also increase the biodiversity 'edge effect' between the (predominantly) open habitat within the water setback and the adjoining Low Impact Silvicultural Zone (see below).

Continuous Cover Forestry Zone

The Continuous Cover Forestry (CCF) Zone will typically comprise native woodland, created at either afforestation or reforestation, using the Native Woodland Scheme Package, to realise the most appropriate native woodland type for the site. The resulting native woodland canopy will be subject to low impact silviculture systems, (i.e. shelterwood, selection or coppicing). The CCF zone could also be realised through gradual transformation from a single-aged canopy (if stable), using CCF silviculture, with possible support from the proposed CCF Scheme under the Forestry programme).

In all of the above approached, recent publications entitled Management Guidelines for Ireland's Native Woodlands (Cross & Collins, 2017) and Pro Silva Silviculture: Guidelines on Continuous Cover Forestry / Close to Nature Forestry Management Practices (Sanchez, 2017) will be highly relevant. The CCF Zone, together with the water setback (including 'setback planting' (*) – see Figure 2.1), are intended to deliver various water-related ecosystem services outlined in the Woodland for Water document.

Other options may exist, including the long-term retention of the existing crop and reforestation with non-native species suited to CCF management. Where sought by the owner as a co-objective and where appropriate to the site (in relation to soil conditions, fertility, slope, overall water sensitivity, etc.), this zone may be subjected to wood production under CCF conditions and using appropriate extraction systems. However, the key focus will remain on low impact operations to complement the water setback and to protect the watercourse itself. The minimum width of the CCF Zone will be 20 m. However, depending on the outcome of the Forest & FPM Management Framework, the actual width may be 100 m or greater

Commercial Forest Zone (or other)

In low risk areas of the site disconnected from the watercourse, appropriate afforestation or reforestation (as relevant) with commercial forest species and subsequent commercial forest management, can be pursued, but with ongoing cognisant of the position of the site within the FPM Catchment.

Drain Treatment

In the case of reforestation sites, existing forest drains will be treated in order to disrupt direct pathways to the watercourse. This may include drain blocking or slow-water damming. Such treatment will be applied strategically outside (i.e. upslope) of the water setback, to disconnect historic forest drains from receiving waters and to prevent direct discharge into the aquatic zone. Water percolates overland from the point of the blockage, resulting in silt and nutrient capture. Drain blocking / slow-water damming will slow water and reduce possible nutrient and sediment inputs into watercourses. It will result in the reinstatement of natural draining conditions and may result in the creation of pocket wetlands, which will act as settlement ponds and aid in silt and nutrient capture.

Drain blocking and slow-water damming within main and feeder drains can be achieved through various methods, e.g. direct drain blocking using soil or logs positioned directly into sections of the drain, or a combination of fabric dams and silt traps. This operation must be hydrologically-informed, to achieve the intended aim and to avoid unforeseen consequences such as canopy instability and the creation of unwanted pathways for water to flow from source to receptor. Similar treatment may also be applied to existing land drains in the case of afforestation. However, where existing drains are well-vegetated and stable, the above treatment is not envisaged.

Natural Vegetation Within the Water Setback

The treatment of the water setback is set out in the Woodland for Water document. Natural vegetation will be allowed to develop undisturbed within the water setback, complimented by setback planting with single or small groups of native tree species. Over time, a mosaic of mixed natural habitats will emerge, typically comprising native riparian scrub, single trees, marsh, wet grassland, pocket wetland and other natural habitats and plant communities. This requires ongoing monitoring and possible interventions, in agreement with the relevant statutory bodies, to control unwanted invasives (e.g. regenerating conifers, rhododendron) and to prevent excessive tunnelling of the watercourse by native trees, and to enable access for anglers (where relevant).

Tree cover within the water setback

Tree cover within the water setback can include:

- Existing native broadleaf trees onsite. In the case of reforestation, these may be retained from the previous rotation, but may require pollarding to prevent windblow (which may give rise to sediment release from upturned root plates so close to the watercourse, or direct disruption of the watercourse by the falling tree). In the case of afforestation, these may be trees already present onsite. In both cases, these act as important seed sources.
- As set out in the Woodland for Water document, setback planting may be undertaken, whereby individual or groups of appropriate native riparian species (e.g. alder, willow, birch, rowan, oak) are strategically planted within the water setback to form 10-20% tree cover, in order to deliver direct instream benefits (e.g. bank stabilisation, cooling / shading, food input into the aquatic ecosystem).

2.4.3 Awareness Raising and Training

Once the draft Plan is finalised, DAFM will instigate a campaign to promote awareness amongst foresters, contractors and forest owners, via circulars to the trade, articles in relevant publications and a tailored information brochure. The overall aims of this awareness-raising are as follows:

- To increase awareness amongst the forestry sector of FPM and its rarity, and the significance of Ireland's population at the European level. The link between the species' presence and the high quality nature of the catchment's streams, rivers and lakes, will be highlighted.
- To outline the species' extreme sensitivity to potential impacts arising from forests and forestry activity, particularly in relation to nutrients and siltation running of sites into receiving waters.
- To outline the beneficial role woodlands and forests can play in protecting water quality and conserving the species. The Woodlands for Water approach and the model outlined in Section 2.2.2 of this draft Plan, will be central to this message.

- To outline the scope and objectives of the Plan, i.e. to ensure that forestry and forest-related activities within the catchment do not impact negatively on FPM, and where possible, are deployed proactively as a tool to protect and enhance water quality.
- To outline the key mechanisms involved in realising this, i.e. the Forestry & FPM Management Framework and the availability of support under the NWS package, the incoming Environmental Enhancement of Forests Scheme, and the proposed Continuous Cover Forestry Scheme.
- To promote awareness of the range of appropriate forestry practices on various sites, ranging from high risk sites (e.g. native woodland creation through natural regeneration) to low risk sites (e.g. commercial forestry, with enhanced safeguards).

The DAFM will host training events for Forestry Inspectors, Registered Foresters and Forestry Companies and key forest contractors operating within each FPM catchment. Training events undertaken in 2017 in relation to Annex 1 habitats and environmental setbacks on afforestation sites, demonstrate the effectiveness of this approach. Preparation for training will include the production of a guidance document focused on presenting case studies and examples of good (and bad) practice, and this document will be further refined and re-issued, as the training programme progresses.

Training for Registered Foresters and contractors will be practical in nature, and will focus on the following:

- the extreme sensitivity of FPM to nutrient enrichment, siltation, pollution and hydrological change;
- inappropriate forestry practices that can impact severely on the species, and appropriate practices that are compatible and proactive regarding FPM conservation and the protection and enhancement of water quality;
- the use of the Forest & FPM Management Framework as the key decision-making tool for forest management within the catchments;
- the use, under the framework, of the . SITE RISK & OPERATIONS FORM and the Options Table, to guide risk assessment and the selection of the most appropriate forest management option(s), based on site sensitivity;
- basic training ref. water monitoring (equipment, interpretation) and mitigation measures; and
- the various regulatory and promotional tools to realise change, including licence conditions and the availability of funding under the Native Woodland Scheme (see Part B of the *Forests & Water* document).

The model set out in Section 5 of the Plan will form a central part of this training, by highlighting the required outcome of the Plan whereby all forests within each catchment will be accompanied by permanent, semi-natural buffer along aquatic zones, designed and managed to protect water quality and FPM.

These training events will stress the need to tailor applications ***before*** submission to DAFM, and the mechanisms that will otherwise be deployed, e.g. the potential requirement for a NATURA Impact Statement (NIS).

These training events will take place at a suitable location based on FPM catchment clusters, and may incorporate a field element.

Further training events are also envisaged in the medium to long term, using sites that have undergone appropriate treatment in relation to FPM, including demonstration sites treated under the KerryLIFE project.

2.4.4 Monitoring

A regime of during- and post-operation inspections by the Forest Service will take place on the site of the forestry works, along with the catchment-level monitoring of overall progress towards achieving appropriate forest restructuring brought about by this approach.

It is proposed that this would be carried out by three levels of monitoring:

- Onsite monitoring by the Applicant
- Onsite monitoring by the FS-DAFM
- Overall monitoring of the forestry & FPM plan

Onsite monitoring

Monitoring will regularly be carried out by applicants onsite, and will reflect the risk involved with the activity. Such monitoring will be specified as necessary via the site licensing process. Other measures that can be utilised in this process include the presence of an onsite clerk of works and the use of toolbox talks to ensure all onsite workers are aware of the risks, preventative measures, etc.

The FS-DAFM will undertake onsite spot check inspections during operations/works to ensure compliance with the conditions given in the license, or may review the monitoring data submitted by the applicant (e.g. Surface water monitoring results). Should any exceedances be identified, then a response will be initiated from the FS-DAFM, which could include the halting of works onsite, implementation of suitable mitigation measures and/or the input of a FPM ecologist if required. Post works inspections will also be carried out to ensure mitigation measures have been installed correctly. All FS-DAFM field inspections will be unannounced, and will initially be of a high number, particularly in high risk areas (in relation to watercourse proximity, soil and slope. Lower risk sites will have a lower inspection frequency/intensity, and inspections may be adjusted based on findings (e.g. high risk sites with good compliance levels will have a reduced inspection intensity).

Should non-compliance be an issue onsite, there are a number of options available to the FS-DAFM, including:

- Revoking of licenses
- Withholding of grants and premiums until remedial works are carried out
- Financial penalties
- Established sanctions via FS registered forester system (e.g. increased inspection intensity)
- Legal action/prosecution

2.4.5 Overall monitoring of the Plan

Existing sections (forestry inspectorate, felling section and the approvals section) of the FS will have key roles in the oversight and monitoring of the overall plan. Forest Service personnel will be assigned to the following roles:

- Organise the roll-out and awareness raising for the FPM Management Framework
- Internal co-ordination for the plan in the FS and other divisions of the DAFM

- Coordination with relevant bodies (e.g. NPWS, Inland Fisheries Ireland, etc.)
- Ensure engagement of FPM ecologist and hydrologist to aid the inspectorate
- Provide ongoing support to forestry inspectors, administration, registered foresters and forest owners
- Provide progress updates on implementing the plan
- Quality control through all stages of the process
- Monitoring for progress

It is envisaged that direct monitoring of FPM population will take place to monitor the effects of implementing the plan. In addition, there are a number of indicators that will be monitored to track progress within each catchment. These indicators include:

- The area of new native woodland established on both greenfield sites adjoining watercourses and through reforestation of former conifer forest
- Length and area of new water setbacks installed both during forest rotations and also at reforestation stage
- Area of former conifer forest converted from clearfell system to CCF system
- Area of conifer forest converted to widely-spaced pine forest
- Area of conifer forest that is deforested to open habitats

The above monitoring will feed back to refine and improve the FPM Management Framework.

3 THE SEA PROCESS

3.1 SEA Methodology

SEA is the formal, systematic evaluation of the likely significant environmental effects of implementing a Plan or Programme, or modification to a Plan or Programme, before a decision is made to adopt it. The European Directive (2001/42/EC) on the Assessment of the Effects of Certain Plans and Programmes on the Environment (the SEA Directive) was transposed into Irish legislation by the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. 435/2004) and the Planning and Development (Strategic Environmental Assessment) Regulations 2004 (S.I. 436/2004), both of which were amended in 2011 under S.I. 200/2011 and S.I. 201/2011.

Under the requirements of the SEA Directive, certain Plans or Programmes are subject to SEA prior to their adoption and implementation. The SEA process also gives statutory consultees and other interested parties an opportunity to comment on the environmental impacts of the proposed Plan or Programme and to be kept informed during the decision-making process.

3.1.1 SEA Stages

The main stages of the SEA process are:

- Screening: determining whether or not SEA is required;
- Scoping: determining the range of environmental issues to be covered by the SEA – includes consultation with statutory consultees;
- Identification, evaluation and mitigation of potential impacts and preparation of the Environmental Report;
- Consultation, revision and post-adoption activities, including:
    - Public consultation on the Draft Plan/Programme and associated Environmental Report;
    - Integration of environmental considerations into the final Plan/Programme;
    - Issuing the SEA Statement: describes the rationale for decisions taken and extent to which environmental considerations and consultation have been integrated into the final Plan/Programme.

Further details on each stage are provided below.

3.1.1.1 Screening

The screening stage establishes whether or not a particular Plan or Programme must undergo SEA. SEA is mandatory for plans/programmes which are:

- Prepared for agriculture, forestry, fisheries, energy, industry, transport, waste / water management, telecommunications, tourism, town & country planning or land use and which set the framework for future development consent of projects listed in the Environmental Impact Assessment (EIA) Directive.

Or

- Have been determined to require a Stage 2 Appropriate Assessment under the Habitats Directive.

Screening of this plan has been carried out by the Department of Agriculture, Food and the Marine, and it has been determined that SEA is required.

3.1.1.2 Scoping

The scoping stage entails consultation with the statutory consultees on the content and level of detail of the information to be included in the Environmental Report. Scoping ensures that the relevant key environmental issues are identified so that they can be addressed in the assessment. In Ireland the designated statutory consultees for SEA are:

- Environmental Protection Agency,
- Department of the Environment, Community and Local Government,
- Department of Arts, Heritage and the Gaeltacht,
- Department of Agriculture, Food and the Marine,
- Department of Communications, Energy and Natural Resources, and
- Northern Ireland Environment Agency (for transboundary assessments)

3.1.1.3 Environmental Assessment and Preparation of Environmental Report

In accordance with Article 2 of the SEA Directive, the SEA process must result in an Environmental Report, which identifies, describes and evaluates the likely significant effects on the environment of implementing the Plan or Programme. Specific information will be provided in the report, including:

- An outline of the contents and main objectives of the Plan, and of its relationship with other relevant plans and programmes.
- Description of current environmental characteristics/conditions (baseline environment).
- A list of strategic environmental objectives relevant to the Plan and description of how they have been considered in the Plan.
- Description of the likely significant effects on the environment.
- Measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment caused by implementing the Plan.
- Reasons for selection of alternatives considered.
- Description of proposed monitoring measures.
- Non-technical summary.

The information contained in the Environmental Report will meet the requirements of Schedule 2B of the Planning and Development Regulations 2001 – 2011 (as inserted by Article 12 of the Planning and Development SEA Regulations 2004).

3.1.1.4 Consultation, Revision and Post-Adoption Activities

As part of the SEA process, environmental authorities and the public (organisations and individuals) must be given early and effective opportunity to make submissions of the Draft Plan and the accompanying Environmental Report before any final decision is made on the Plan. The Environmental Report will be put on public display along with the Draft Plan and sent to the prescribed authorities. Written submissions will be invited on the report as well as the Plan.

The Draft Plan and Draft SEA Environmental Report will be made available to statutory consultees, interested bodies and the general public.

3.1.2 Spatial and Temporal Scope

The assessment is based within the Republic of Ireland, specifically within the 27 no. river catchments that are known to contain populations of Freshwater Pearl Mussel. Any transboundary impacts (which would be of particular relevance to ecology, air & climate, water and landscape) have been incorporated into the assessment, as required by the SEA Directive.

The proposed plan is planned to be implemented for the foreseeable future.

3.2 Scoping

Scoping is the process of determining the content, depth and extent of topics to be covered in the proposed plan. This process is conducted by contacting the relevant authorities and Non-Governmental Organisations (NGOs) with interest in the specific aspects of the environment likely to be affected by the proposed plan. These organisations are invited to submit comments on the scope of the plan and the specific standards of information they require. Comprehensive and timely scoping helps ensure that the plan refers to all relevant aspects of the proposed plan and its potential effects on the environment and provides initial feedback in the early stages of the project, when alterations are still easily incorporated into the design.

A Scoping Document, providing details of the proposed plan and the proposed scope of the Environmental Report, and inviting the comments and input of consultees, was prepared by McCarthy Keville O'Sullivan (MKO). Scoping consultation was carried out between December 2015 and January 2016 for the initial draft of the Plan for Forestry and Freshwater Pearl Mussel in Ireland. As required by the SEA Directive, this was carried out with the relevant statutory consultees, who were sent the above-mentioned scoping document. Those bodies included in the consultation were:

- Environmental Protection Agency (EPA)
- Department of Communication, Energy, and Natural Resources (DCENR)
- Department of Agriculture, Food and Marine (DAFM)
- Department of the Environment, Community and Local Government (DECLG)
- Department of Arts, Heritage and the Gaeltacht (DAU-DAHG)
- Northern Ireland Environment Agency (NIEA)

3.2.1 Scoping Consultation Responses

Table 3.1 presents a summary of consultee responses. Copies of all scoping responses are included in Appendix 2-1 of this SEA. The recommendations of the consultees have informed the plan preparation process and the contents of both the plan and the SEA, as described in Table 3.1.

Table 3.1 Scoping Response Summary

No.	Consultee	Scoping Response Received
1	Environmental Protection Agency	Reply received 05/02/16
2	Department of Agriculture, Food and Marine	Reply received 18/01/16
3	Department of Arts, Heritage and the Gaeltacht	Reply received 05/02/16
4	Department of the Environment, Community and Local Government	No response received to date

No.	Consultee	Scoping Response Received
5	Department of Communications, Energy and Natural Resources	No response received to date
6	Northern Ireland Environment Agency	Reply received 05/02/16
7	Loughs Agency	Reply received 15/02/16

Appendix 2-2 presents the key points from the scoping responses which have been received at the time of writing this document (9th July 2018), and notes where they have been addressed in this SEA and the Environmental Report. If further responses are received, the comments of the consultees will be considered in the implementation of the plan.

3.3 SEA Environmental Assessment

This SEA environmental report is designed to ensure an adequate assessment of the Plan for Forestry and Freshwater Mussel in Ireland. As part of this, the SEA deals with all the potential environmental consequences of implementing the plan. While the SEA does not deal with this on a site-specific/project level, it does use objectives, targets and indicators to achieve a more broad-scale assessment.

In order to make the assessment process simpler, this report uses broad themes which cover the main environmental topics to be considered when approaching the assessment. These themes which are based on the SEA Directive environmental topics are:

- Biodiversity, Flora and Fauna
- Population and Human Health
- Soils and Geology
- Hydrology
- Air Quality and Climate (including Noise and Vibration)
- Cultural Heritage
- Landscape
- Material Assets

The same themes have been used to create the SEA objectives for this report, along with the associated targets and indicators. Table 3.2 also describes the assessment which is used through this process, which is both quantitative and qualitative, and also includes expert opinion.

Table 3.2 SEA Environmental Assessment themes, with associated available information

Environmental Assessment Theme	Information available
Biodiversity, Flora & Fauna	There are numerous national datasets relating to biodiversity, flora & fauna, from designated sites to species distribution. The large scale of the plan area means that a large number of designated sites are to be included for consideration.
Population & Human Health	National datasets are available for data relating to population and the distribution/statistics relating to the population.

Soils & Geology	National datasets and maps relating to soil properties and geological properties are available.
Hydrology	Hydrological and hydrogeological maps and datasets are available for the entire country, covering all of the river catchments associated with the plan for Forestry and Freshwater Pearl Mussel in Ireland.
Air Quality & Climate	Air quality is monitored at a network of monitoring stations around Ireland, with station reports available for some locations. The widespread distribution of these stations ensures that relevant air quality data is available for all river catchments associated with the plan. Climate data is available from a nationwide network of met Éireann stations.
Cultural Heritage	A record and map of archaeological features and monuments are available for the entire country.
Landscape	Landscape Character Area and Type maps are available on a county-by-county basis. The information available relating to landscape may therefore vary slightly on a national scale.
Material Assets	There are a variety of datasets and distribution maps available relating to material assets, including commercial forestry, transport, water treatment and waste water disposal

The SEA requirements are listed in Table 3.3, along with information on where each of these requirements are addressed in this ER. Also as required by the SEA Directive, impacts have been considered in long, medium and short term in this ER. Although the Plan for Forestry and Freshwater Pearl Mussel is set on a national scale, it applies only to certain water catchments, and this ER reflects this nationwide, but catchment specific, distribution.

Table 3.3 Requirements of the SEA Directive, and the associated section of this SEA Environmental Report

SEA Requirement	ER Section
An outline of the contents and main objectives of the plan or programme, or modification to a plan or programme, and relationship with other relevant plans or programmes;	Sections 2 and 4
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme, or modification to a plan or programme,	Section 5
The environmental characteristics of areas likely to be significantly affected	Section 5
Any existing environmental problems which are relevant to the plan or programme, or modification to a plan or programme, including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to the Birds Directive or the Habitats Directive	Section 5
The environmental protection objectives, established at international, European Union or national level, which are relevant to the plan or programme, or modification to a plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation	Section 6
The likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors	Section 6, 8
The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme, or modification to a plan or programme	Section 9
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information	Section 3, 7
A description of the measures envisaged concerning monitoring of the significant environmental effects of implementation of the plan or programme, or modification to a plan or programme	Section 9
A non-technical summary of the information provided under the above headings	Non-Technical Summary

3.4 Links with Appropriate Assessment

Where a plan or project is likely to have a significant effect upon a European site (either individually or in-combination with other projects) an appropriate assessment (AA) is required under article 6(3) of the Habitats Directive. The AA process is

designed to protect any Natura 2000 site, and the habitat or species they were designated to protect. All designated sites are shown in Figure 3.1.

Although there are very clear links between an SEA and AA process, they are separate (though parallel). In general, an AA is more focused on the protection of the Natura 2000 sites, and involves quite specific tests/methods. Both processes make a valuable contribution to the successful implementation of any plans that could impact on the environment.

The relationship between SEA and AA are:

- SEA uses AA as a tool to investigate environmental issues that may result in an impact on Natura 200 sites
- SEA uses AA as a means of assessing alternatives, in relation to Natura 2000 sites
- Both AA and SEA process, when carried out in parallel, allow for an efficient use of expertise and resources

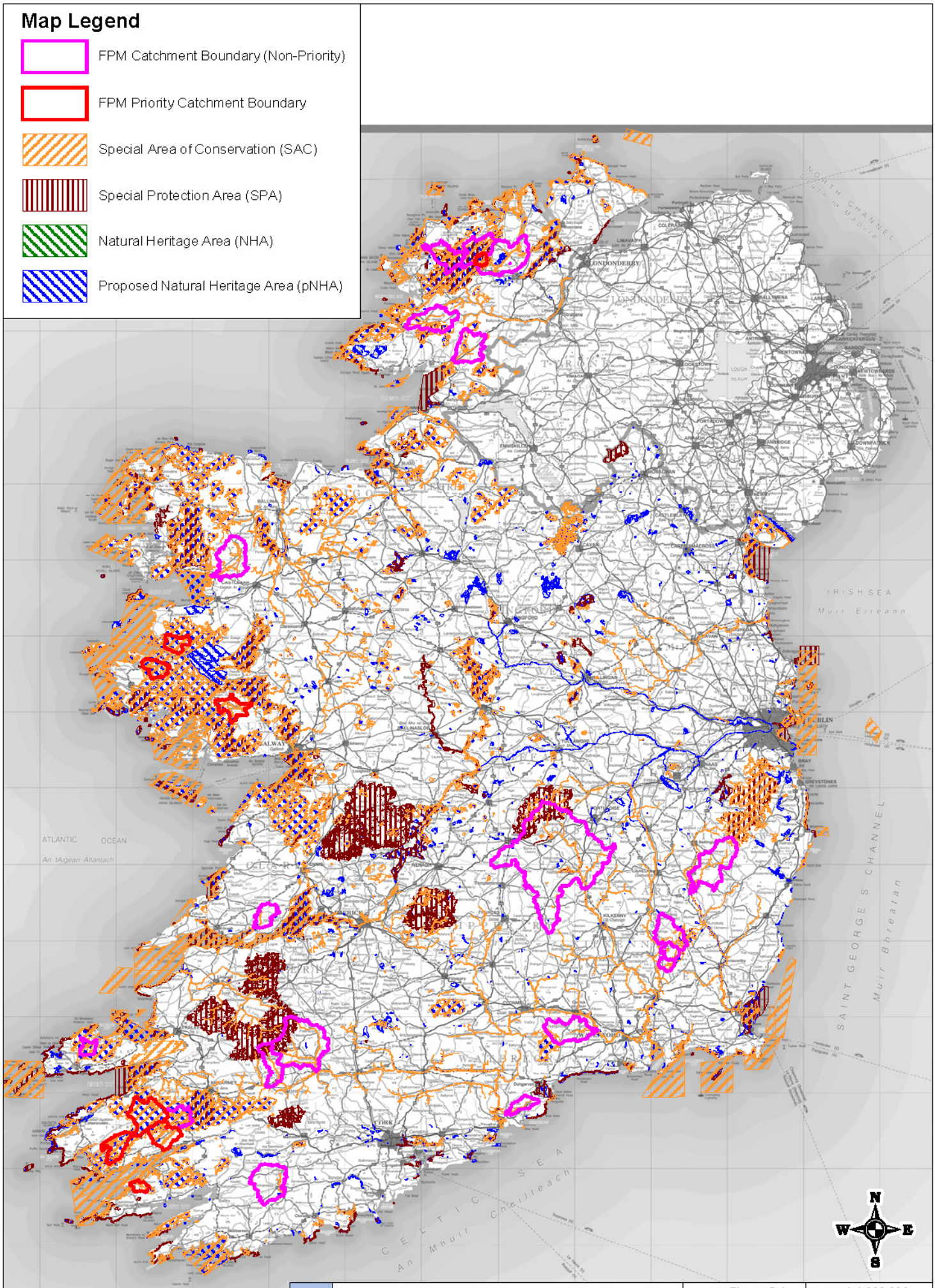
The AA is being carried out alongside the SEA of this *Plan for Forestry and Freshwater Pearl Mussel in Ireland*.

3.5 Links with Water Framework Directive and the Habitats Directive

The main aim of the plan is to ensure that forestry does not prevent (either alone or in combination with other factors) the achievement of favourable status by the FPM species in Ireland. This plan hopes to achieve these aims by ensuring that forestry does not contribute as a diffuse source to water quality in each catchment not achieving good status, and where possible or feasible, it is hoped that forestry will contribute toward the improvement of water quality, and ultimately the achievement of good status in all 27 water catchments containing FPM around Ireland.

The Water Framework Directive primarily aims to ensure that the water quality in all water bodies achieves and/or maintains good status. Where there are water bodies to which multiple standards and objectives are applicable, then the most stringent will apply.

There are many water-dependent Natura 2000 sites designated under the Habitats Directive and Birds Directive. These sites can be dependent on either groundwater or surface water, and may be designated as a result of Annex I habitats or Annex II Species from the Habitats Directive, or due to the use of the site by Annex I bird species from the Birds Directive (which may be water birds or migratory birds). The implementation of the plan will contribute to the maintenance, and possibly the improvement of water conditions within the designated sites with water dependent Qualifying Interests. Those Natura 2000 sites that are designated as Special Areas of Conservation due to the presence of FPM have the potential to benefit from the plan.



Source: National Parks & Wildlife Service (NPWS) www.npws.ie

MAP TITLE: **Designated Sites**		MAP NO.: **Figure 3.1**	SCALE: **1:1,900,000**
PROJECT TITLE: **FS-DAFM FPM SEA AA**			DATE: **28-06-2018**
DRAWING BY: **John Staunton**	CHECKED BY: **Michael Watson**		ISSUE NO.: **150913-2018.06.28-D1**

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3.6 Uncertainties, Data Gaps and Technical Deficiencies

There were numerous difficulties encountered through the SEA process for the plan. These included:

- Lack or absence of digitised national data for certain datasets (e.g. landscape, groundwater flow, etc.)
- Restricted availability of data for the location of FPM populations
- Variation in environmental parameters within each catchment which would alter the effectiveness of specific actions of the plan
- The broad and strategic nature of the plan, combined with the abovementioned variation between catchments, means that quantitative impact assessment is difficult

3.7 SEA Statement

The SEA Statement will be produced at the end of a process which identifies how any consultation and environmental considerations are incorporated into the Plan for Forestry and Freshwater Pearl Mussel in Ireland.

4 RELEVANT PLANS, PROGRAMMES AND POLICIES

4.1 Introduction

This SEA Environmental Report is designed to take existing plans, programmes and policies into account when assessing the current draft plan. A number of statutory and non-statutory plans programmes and policies which are relevant to the draft plan were considered as part of this SEA.

In Article 5(1) of Annex 1 of the SEA Directive, it is stated that an environmental assessment much identify and highlight "the environmental protection objectives, established at International, European Union or national level, which are relevant to the plan or programme, or modification to the plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation". In addition to listing the main objectives of the plan for forestry an freshwater pearl mussel in Ireland, the SEA environmental report must also include those of other relevant plans, programmes and policies.

As the plan for Forestry and Freshwater Pearl Mussel in Ireland relates to 27 catchments spread across many parts of the country (though focusing on the west and south), the most relevant other plans, programmes and policies are at national and European level, rather than at a more local or regional level. This chapter aims to show how the plan for Forestry and Freshwater Pearl Mussel in Ireland will interact with these relevant plans, programmes and policies, and their associated environmental objectives.

4.2 Methodology

This SEA process identified at an early stage key environmental plans, programmes and policies to be considered for the assessment of the plan. It was important to ensure that the objectives and targets/indicators for these plans, programmes and policies would not be negatively affected by the implementation of the plan. Headings divided into a variety of subject areas are used to discuss the objectives and targets/indicators of these plans and projects. The discussion also aims to discover if the plan will contribute to the achievement of any objectives listed in the plans, programmes and policies, and if so, to what extent a contribution will be made. Cognisance will be had of comments received from the statutory consultees during the SEA scoping stage.

4.3 Relationship between this plan and other plans, programmes and policies

The following sections discuss the relationship between the plan, and existing other plans, programmes and policies (at national and European scales) under a variety of headings.

4.3.1 Forestry

There are a number of plans, policies and schemes which deal with forestry that have the potential to interact with the plan. These include:

- Environmental Requirements for Afforestation
- Ireland's Forestry Programme 2014-2020
- Forests, Products and People: Ireland's forest policy - a renewed vision

- A Strategy for Native Woodlands in Ireland 2016-2020
- Felling and Reforestation Policy
- Native Woodland Scheme Package
- Environmental Enhancement of Forests Scheme
- Aerial Fertilisation Requirements 2015
- Forest Roads Scheme 2014-2020
- Forest Harvesting and the Environment Guidelines
- Land types for Afforestation
- Forests & Water: Achieving the objectives under Ireland's river basin management plan 2018-2021: Programme of measures for forestry to protect & enhance water

Forests, products and people: Ireland's forest policy – a renewed vision

The document *Forests, products and people: Ireland's forest policy – a renewed vision* (DAFM, 2014) sets out an updated national forest policy strategy that takes account of the substantial changes that have occurred in Irish forestry since the publication of its forerunner Growing for the Future in 1996. This updated policy, developed by the DAFM with input from the Forest Policy Review Group, aims to steer and guide the expansion of the forest sector out to 2046 in a sustainable and cost-efficient manner. The document entitled Forestry Programme 2014-2020: IRELAND Submitted in accordance with European Union Guidelines on State aid for agriculture and forestry and in rural areas 2014 to 2020 (DAFM, 2015) sets out Ireland's proposals for 100% State aid funding for the Forestry Programme for the period 2014-2020 using measures that are consistent with the forest policy framework set out in *Forests, products and people: Ireland's forest policy – a renewed vision*, addressing a number of sectoral needs:

- increase on a permanent basis, Ireland's forest cover to capture carbon, produce wood
- and help mitigation;
- increase and sustain the production of forest-based biomass to meet renewable energy
- targets;
- support forest holders to actively manage their plantations; and
- optimise the environmental and social benefits of new and existing forests.

Forestry Programme 2014-2020

The Forestry Programme 2014-2020 and the Forests, Products and People document detail the planned expansion of forestry in Ireland, to increase the national forestry cover to 18% of the national land area (or to afforest approximately 10,000 hectares per annum). This will ensure a long term sustainable supply of Roundwood timber in the order of approximately 7-8 million cubic metres annually. While the documents acknowledge that all afforestation sites will need to comply with any environmental legislation, there is also a need to ensure that any suitable lands are afforested in order to achieve the afforestation targets. In the case of FPM catchments, it is important that any forestry which is compatible with the conservation of the designated sites, and in particular with the conservation of the FPM, is retained and encouraged. The document refers to scientific evidence to show that the use of native woodlands on suitable sites can help to improve the water quality in a catchment. The use of these native woodlands, combined with adhering to all forestry mitigation measures will ensure a symbiotic relationship between forestry and the FPM in Ireland. The use of conifer plantations which require more intensive use of fertilisers should be avoided in the FPM catchments to minimise the risk of any nutrient runoff.

Mid-term review of the Forestry Programme 2014-2020 is currently approaching completion, following consultation. The MTR proposals remain firmly anchored to the original targets and objectives set out in the Forestry Programme, and aim to redistribute available funds to (inter alia) address parts of the programme where set targets have not been achieved.

Felling & Reforestation Policy

The DAFM document Felling & Reforestation Policy, published in May 2017 to coincide with the commencement of the Forestry Act 2014 under S.I.191 of 2017, categorises reforestation into Reforestation Objectives, each with associated applications and prescription. Two of these objectives - 'Reforestation for Continuous Cover Forest' and 'Reforestation for Biodiversity & Water Protection' - have a particular application in relation to the site-specific restructuring of existing forests, to protect water. The same document also clarifies situations where permanent tree removal may be acceptable in relation to protected habitats, species and water.

A forest owner wishing to apply for a Felling Licence is required to include in the application form and the accompanying map, the Reforestation Objective(s) s/he is proposing to pursue for all or parts of the site for the next rotation, to a scale of 0.1 ha. As part of its assessment of the application, DAFM then evaluates the suitability of those Reforestation Objective(s) for the site, informing decisions surrounding referrals, AA Screening, etc. Reforestation Objectives can be combined on individual sites, for example, to differentiate between areas where commercial softwood production is being pursued, and areas where semi-nature and permanent woodland cover is required, for water protection, landscape, etc.

The Reforestation Objectives relate primarily to the silvicultural management to be applied on the site, in order to create a forest capable of 'delivering' particular products and services, e.g. commercial sawlog, enhanced biodiversity, landscape amelioration, water protection, amenity. The follow lists the Reforestation Objectives, as set out in the Felling & Reforestation Policy document:

- Conifer forest predominantly for wood production (abbreviated as 'CF')
- Broadleaf forest predominantly for wood production (BF)
- Mixed forest predominantly for wood production (MF)
- Continuous Cover Forestry (CCF)
- Reforestation for biodiversity (Bio)
- Other (as specified in application) (Other)
- Forest removal (Defor)

The Reforestation Objectives 'Reforestation for Continuous Cover Forestry' (CCF), 'Reforestation for Biodiversity & water Protection' (BIO) and 'Forest Removal' (DEFOR) have particular relevance in relation to the protection and enhancement of water quality and aquatic habitats and species.

Reforestation for Continuous Cover Forest (CCF) applies to situations where reforestation of the clearfelled site is intended to create permanent forest cover (as opposed to a subsequent rotation ending in another clearfell). Reforestation species can be conifer and / or broadleaved. Any mixtures used must be silviculturally compatible. This objective is generally suitable for sites where timber production will be sought but where other forest objectives (e.g. amenity, biodiversity, water protection, landscape) favour a continuous cover approach. This objective may be suitable where reforestation is aimed at replacing an even aged conifer plantation with high forest native woodland, for example, where water sensitivities are high (e.g.

within freshwater pearl mussel catchments or alongside high status objective waterbodies at risk of decline due to forestry, under the Water Framework Directive).

Reforestation for Biodiversity and Water Protection (BIO) applies to situations where the objective is to create a mixture of native woodland and open habitat, predominantly for biodiversity or water protection. This objective involves the creation of woodland cover comprising native broadleaf species and Scots pine, through planting; planting supplemented by natural regeneration, or; natural regeneration alone. This objective is generally limited to plots no greater than 1 ha in size, and can be used adjoining unplanted setbacks installed alongside watercourses, in order to reinforce the protection of water. However, it can be applied at a larger scale in situations where water sensitivities are high (e.g. within freshwater pearl mussel catchments or alongside high status objective waterbodies at risk of decline due to forestry, under the Water Framework Directive). In general, wood production is not a management objective under BIO. However, small scale wood production may be appropriate, e.g. the occasional felling of individual trees by chainsaw, for domestic firewood use. Objective BIO may be pursued where specific case-by-case justification is presented to, and accepted by, the Forest Service.

The DAFM document Felling & Reforestation Policy sets out the current policy regarding felling and reforestation in Ireland. As a general policy, in the interests of maintaining and expanding Ireland's forest base, replanting – either on the felled land (typically) or on alternative land – is a standard condition of any Felling Licence issued. However, Section 5 of the document sets out scenarios where permanent tree removal may be considered, and this includes a scenario relating to protected habitats, species and water. Felling licence applications proposing the permanent removal of trees and forests are assessed on a case-by-case basis and considered on their own individual merit.

Native Woodland Scheme Package

The Native Woodland Scheme package provides funding to undertake potentially significant works utilising native woodland to deliver water-related ecosystem services to protect water quality and aquatic habitats and species. The DAFM package, launched in 2000 and now available under the Forestry Programme 2014-2020, comprises two separate schemes:

- The Native Woodland Establishment Scheme (NWS Est.) (as represented by Grant & Premium Categories (GPCs) 9 and 10 under the general Afforestation Grant & Premium Scheme) funds the establishment of new native woodland on open greenfield sites. NWS Est. can be used to create stand-alone native woodland, or to incorporate a native woodland component into a conventional afforestation project, to address a specific environmental sensitivity. This scheme has the potential to deliver water-related ecosystem services, as set out in the Woodland for Water document (see below).
- The Native Woodland Conservation Scheme (NWS Cons.) funds the appropriate restoration of existing native woodland, and the conversion from conifer forest to native woodland, primarily for native woodland biodiversity but also to deliver water-related ecosystem services. The scheme incorporates specific eligibility criteria to focus available funding on (inter alia) water-sensitive sites.

In addition to native woodland biodiversity and wider habitat connectivity, these schemes are designed to deliver various ecosystem services in relation to (inter alia)

the protection of water quality and aquatic habitats and species. The proposed Plan is neatly aligned with this scheme.

The Native Woodland Scheme package of measures has evolved since its initial launch in 2000, under an ongoing partnership with Woodlands of Ireland, National Parks & Wildlife Service, Heritage Council, Inland Fisheries Ireland and other native woodland stakeholders. It is underpinned by agreed ecological principles regarding key topics such as 'target' native woodland types, species composition, site inputs and compatible wood production. The EPA has also engaged within the context of the Forest Service / COFORD / EPA Acid Sensitivity Protocol, to facilitate the creation of new native woodlands in areas where surface water is deemed to be vulnerable to acidification.

Various publications have also been developed in support of the Native Woodland Scheme package. These include the WoI Native Woodland Information Note No. 4, entitled Native Riparian Woodlands – A Guide to Identification, Design, Establishment and Management. It provides background information on native riparian woodland in Ireland, and reviews the ecological and protective functions such woodland play vis-à-vis the aquatic system and water quality. Recent publications highly relevant to the Native Woodland Scheme package includes the joint NPWS / Forest Service publication Management Guidelines for Ireland's Native Woodlands (Cross & Collins, 2017) and Pro Silva Silviculture: Guidelines on Continuous Cover Forestry / Close to Nature Forestry Management Practices (Sanchez, 2017).

Environmental Enhancement of Forests Scheme

A funding measure referred to as the 'Environmental Enhancement of Forests Scheme' is included under Measure 5 (Investments Improving the Resilience and Environmental Value of Forestry) of the Forestry Programme 2014-2020. The aim of the proposed scheme is to support various actions within existing forests, which bring about structural changes that will proactively protect and enhance water quality, important habitats and species, archaeological sites, sensitive landscapes and other environmental features. Through the mechanism, funding will be provided to forest owners to undertake particular actions and to achieve structural changes within existing forests and during current rotations, to improve the environmental 'footprint' of those forests regarding impacts on water quality, habitats and species, archaeological sites, landscape and other environmental sensitivities. A clear example in relation to water is the retrofitting of a water setback and slow-flow damming of forest drains, within a wind-firm plantation adjoining a sensitive watercourse. This would introduce a protective buffer during the rotation itself, which will be fully established and functioning whenever future thinning and clearfell take place. Similarly, heightened measures for water protection required on particularly water-sensitive sites during forestry operations including thinning and clearfelling, may be considered eligible under the scheme.

Land Types for Afforestation

The DAFM *Land Types for Afforestation* document (2016 & reissued in 2017) sets out the potential eligibility of land for support under the Afforestation Grant & Premium Scheme, based on the capability of that land to produce a sustainable commercial crop of timber. The productivity requirement under the Afforestation Scheme is that land must be capable of growing to full rotation a commercial timber crop of Sitka spruce of yield class 14 or greater, based on one standard application of phosphorus at establishment. (Sitka spruce is used as an indicator species, regardless of which species are being proposed.) The system scores ground vegetation to assess timber productivity, based on the Ellenberg indicator values system (which utilising the

parameters R (Reaction) and N (Nitrogen)) and Irish-based research linking scores to Sitka spruce productivity.

Regarding the potential eligibility of land for support under the Afforestation Scheme, three separate land types apply:

- Suitable Land: GPC(*) 2-12
- Suitable Land: GPC 1
- Unsuitable Land

(* 'GPC' stands for Grant & Premium Category. Twelve separate GPCs are available under the current Afforestation Grant & Premium Scheme. Each GPC is designed to promote a certain type of forest cover (e.g. GPC3 supports Sitka spruce + 10% diverse conifers / broadleaves, GPC9 supports certain types of native woodland, GPC11 supports agro-forestry). Each GPC has attached to it a particular grant and premium level and GPC rules.)

The Land Types for Afforestation document includes numerous photographs of sites deemed suitable and unsuitable on productivity grounds, to illustrate to landowners and Registered Foresters the likely outcome of the scoring procedure.

The land type 'Unsuitable Land' is described in Section 4 of the Land Types for Afforestation document. This land type excludes a range of sites from the Afforestation Scheme on timber productivity grounds, due to infertile conditions (as indicated by vegetation) and / or other inhibiting site factors. This overlaps with many habitats (including Annex 1 habitats, particularly wet and dry heath and blanket and raised bog) and landscapes that are highly sensitive from a water perspective, effectively excluding afforestation as a land use from these areas.

Environmental Requirements for Afforestation

The Environmental Requirements for Afforestation, released in December 2016, incorporate more recent developments in relation to environmental regulation, research and changes in forest practices, and consolidate into one single coherent document those measures and safeguards relating to afforestation which were previously contained within the following Forest Service Environmental 'Guidelines': Forestry & Water Quality Guidelines, Forestry & Archaeology Guidelines, Forestry & the Landscape Guidelines and Forest Biodiversity Guidelines. The use of the word 'requirements' in the title was selected over 'guidelines', in order to underline the mandatory nature of the measures therein.

The overall aim of the Environmental Requirements for Afforestation is to ensure that the establishment of forests is carried out in a way that is compatible with the protection and enhancement of the environment, in regard to water quality, biodiversity, archaeology, landscape and other environmental receptors. In relation to water, the focus is on reducing and eliminating sources of pollution, and preventing the creation of pathways to receiving waters. The Requirements provide an enhanced 'baseline' level of protection regarding afforestation and water, with the water setback representing an important feature. They will also support the Plan for Forestry & Freshwater Pearl Mussel in Ireland, by providing an enhanced baseline level of protection regarding afforestation and water.

The Environmental Requirements for Afforestation are set out in three stages that reflect the project development process, i.e. pre-application design, site works, and ongoing site management. While some overlap exists, these three stages reflect the

typical sequence of activities undertaken by an Applicant and her / his Registered Forester, and the corresponding sequence of mandatory environmental measures that apply, throughout afforestation up until the end of the premium period (or 15 years, for non-grant aided forests).

Although many historical issues do still exist on forestry plantations, such as sedimentation, acidification and shading, these issues are now being designed out of the industry, with any sites being afforested or reforested having to adhere to modern mitigation measures. The phasing out of the old forestry site designs is a slow process due to the slow growing nature of the crop, and the associated slow forest rotation. The proposed plan will be implemented by the Forest Service through the issuing of forest licences for afforestation, thinning, felling, reforestation and construction of forest roads. These licences will be issued as each forestry site comes to the relevant part of its rotation, and forestry owners will not be asked to carry out the works immediately to bring each site in line with the plan.

4.3.2 Biodiversity

There are numerous plans, policies and legislative documents relating to biodiversity which apply to the 27 FPM catchments and may have the potential to interact with the Plan. These include:

- Habitats Directive [92/43/EEC]
- Water Framework Directive[2000/60/EC]
- Birds Directive [79/409/EEC as amended 2009/147/EC]
- National Peatlands Strategy
- Environmental Requirements for Afforestation
- Conservation objectives for individual designated sites
- National Biodiversity Action Plan 2017-2021
- Wildlife Act 1976
- Forestry and Water Quality Guidelines
- Forest Biodiversity Guidelines
- Forestry and Kerry Slug Guidelines
- Forestry and Otter Guidelines

The overall aim of the Habitats Directive (92/43/EEC) is to maintain or restore the favourable conservation status of habitats and species of Community interest. These habitats and species are listed in the Habitats Directive and the Birds Directive (2009/147/EC), and Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are designated to afford protection to the most vulnerable of these. These two designations are collectively known as the 'Natura 2000 network'.

Since 2000, water management in the EU has been directed by the Water Framework Directive (WFD). The WFD runs in six year cycles, where the first cycle ran from 2009-2015, and the second cycle runs from 2016-2021. The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by the end of the cycle. Water bodies comprise both surface and groundwater bodies, and the achievement of 'Good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programmes of measures to achieve the objectives of the WFD have either been completed or are ongoing.

The Environmental Protection Agency (EPA) are required when classifying surface waters in accordance with the ecological objectives approach of the Water

Framework Directive, to assign a status of "less than good ecological status" where FPM is found to be in unfavourable conservation status under the Habitats Directive structure. This would trigger further actions within the context of Ireland's implementation of the WFD, as waters classified as such must be restored to at least "good ecological status" within a prescribed time frame. Therefore, the fulfilment of the WFD in Ireland is dependant on the successful achievement of the aims of the Plan for Forestry and Freshwater Pearl Mussel in Ireland.

The National Peatlands Strategy vision statement states that it aims to provide a long-term framework within which all of the peatlands within the State can be managed responsibly in order to optimise their social, environmental and economic contribution to the well-being of this and future generations. Peat extraction activities can be associated with a number of elevated parameters in watercourses which are located hydrologically downgradient of these activities. These parameters include turbidity, acidity, aluminium, ammonia, iron and mercury. The successful implementation of the National Peatlands Strategy will reduce the impact of peat extraction on waterbodies, and therefore have consequential beneficial effects for FPM.

According to the National Biodiversity Action Plan 2017-2021, the vision for Ireland's biodiversity is *"that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally"*. The National Biodiversity Action Plan has 7 no. objectives to achieve this:

1. Mainstream biodiversity into decision-making across all sectors
2. Strengthen the knowledge base for conservation, management and sustainable use of biodiversity
3. Increase awareness and appreciation of biodiversity and ecosystems services
4. Conserve and restore biodiversity and ecosystem services in the wider countryside
5. Conserve and restore biodiversity and ecosystem services in the marine environment
6. Expand and improve management of protected areas and species
7. Strengthen international governance for biodiversity and ecosystem services

These objectives are generally aligned with the aims of the Plan for Forestry and Freshwater Pearl Mussel in Ireland.

4.3.2.1 Freshwater Pearl Mussel

Regarding the FPM, there are a number of specific documents that are important, and have the potential to have interactions with the Plan. These are:

- Forestry and Freshwater Pearl Mussel Requirements
- Freshwater Pearl Mussel Sub-Basin Management Plans
- Conservation objectives for individual designated sites (which are designated for the presence of FPM)
- The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009

4.3.3 Flooding

There are several flood-related plans and policies and pieces of legislation which cover the 27 FPM catchments which have the potential to interact with the Plan. These include:

- EU Foods Directive
- The role of forests in protecting Ireland's water
- Catchment Flood Risk Assessment and Management (CFRAM) studies for each River Basin District

4.3.4 Air & Climate, and Energy

Forestry is known to help combat the increasing levels of atmospheric carbon dioxide, which is one of the primary causes of climate change, mainly through carbon sequestration in organic matter. Furthermore, forestry can be used as a sustainable source of fuel for biomass energy production, and Coillte (the body managing state owned forestry) are a major provider of wind energy from wind turbines located on various forestry sites around the country. Forestry does therefore have the potential to interact with the following air and climate related plans and policies:

- Draft Bioenergy Plan
- Irelands National Renewable Energy Action Plan

The Draft Bioenergy Plan was released in 2014, with the overall objective of ensuring secure and sustainable supplies of competitively priced energy to all consumers in Ireland, in a way that is fully aligned with the energy policies of the EU, and the international targets for decarbonisation. The document states that cost-effective harnessing of sustainable, indigenous, renewable energy resources is crucial to reducing our dependence on expensive fossil fuel imports, improving our national competitiveness over time, reducing harmful emissions and delivering growth and jobs in the green economy.

Bioenergy will be an essential element in contributing to Ireland's future energy needs, and has the potential to provide significant economic and environmental benefits. According to the plan, our available resource – derived from forests, wood processing by-products, purpose grown energy crops, animal by-products, and waste – can rapidly increase through supportive policies and actions across energy; forestry; agriculture; waste recovery; and research, development and deployment. The plan has three high level goals based on sustainable development:

- To harness the market opportunities presented by bioenergy in order to achieve economic development, growth and jobs
- To increase awareness of the value, opportunities and societal benefits of developing bioenergy
- To ensure that bioenergy developments do not adversely impact the environment and its living and non-living resources

The end product of bioenergy production has the potential to replace other fertiliser sources and, used in accordance with a nutrient management plan, can assist in meeting the objectives of the EU (Good Agricultural Practice for Protection of Waters) Regulations, 2014.

4.3.5 Spatial Planning, Landscape, Human Beings and Economics

It is important that local authorities are aware of the need to develop the forest/timber industry sustainably. Some important plans which may interact with the Plan for Forestry and Freshwater Pearl Mussel are:

- County Development Plans which cover FPM catchments
- Local Area Development Plans which cover FPM catchments
- Forestry and the Landscape Guidelines
- National Landscape Strategy for Ireland 2015-2025

Forestry and the Landscape Guidelines

Forests should be planned and managed in a way which enhances the landscape. Given the impact of forestry on the landscape, in terms of aesthetics, environment and culture, measures are required which ensure overall positive results and avoidance of damage. The objectives of the Forestry and the Landscape Guidelines are as follows:

- To ensure a positive relationship between the forest and the character of a given landscape as a whole - to achieve balance of landcover.
- To optimise aesthetic effect through the integration of forests with landscape – to complement landscape integrity.
- To minimise visual conflict and the loss of characteristics - to retain and/or increase existing character and diversity.
- To mitigate adverse impacts of forest operations, including harvesting - to mitigate visual conflict.

While the Forestry and the Landscape Guidelines set out a wide range of measures forest owners can employ in relation to the landscape, it is recognised that some may be impractical for individual forests, due to land ownership pattern, location and other set factors. However, where a degree of flexibility exists, forest owners are required to implement those landscape measures which can be applied effectively to their property

National Landscape Strategy for Ireland 2015-2025

The Strategy will inform and assist in the resolution of challenges arising from competing priorities in the landscape – for example: infrastructural provision versus landscape protection, or local versus national objectives. By understanding landscape and its dynamic interactive characteristics, it may allow us to deal with competing objectives while improving the decision-making process.

The objectives of the National Landscape Strategy are to:

- implement the European Landscape Convention by integrating landscape into our approach to sustainable development;
- establish and embed a public process of gathering, sharing and interpreting scientific, technical and cultural information in order to carry out evidence-based identification and description of the character, resources and processes of the landscape;
- provide a policy framework, which will put in place measures at national, sectoral - including agriculture, tourism, energy, transport and marine - and local level, together with civil society, to protect, manage and properly plan through high quality design for the sustainable stewardship of our landscape;

- ensure that we take advantage of opportunities to implement policies relating to landscape use that are complementary and mutually reinforcing and that conflicting policy objectives are avoided in as far as possible.

The Strategy is committed to meeting the provisions and requirements of the Water Framework Directive, the Floods Directive and the Birds and Habitats Directives, and all the applicable provisions of EU and national law. It is also committed to the management of the Natura Network and other important areas for wildlife including Natural Heritage Areas, proposed Natural Heritage Areas, National Parks, nature reserves, refuges for fauna, and landscape features necessary for the coherence of the Natura Network.

The implementation of the National Landscape Strategy will involve six core objectives with associated actions derived from the European Landscape Convention. These will ensure that landscape is integrated in our collective decision-making processes and that all landscapes are recognised in this regard.

5 BASELINE ENVIRONMENTAL DATA

5.1 Introduction

The process of the SEA views and assesses the baseline environmental data in a very broad manner. As the name suggests, it carries out a strategic level assessment, so it does not require site or project level baseline data to be described. In order to complete this assessment, an overview of the current state of the environment should be provided.

This section of the Environmental Report addresses the current state of each of the main environmental topics:

- Biodiversity, Flora and Fauna
- Population and Human Health
- Land, Geology and Soils
- Hydrology and hydrogeology
- Air and Climate
- Landscape and Visual Amenity
- Material Assets
- Cultural Heritage

5.2 State of the Environment – National Overview

The EPA produces a national State of the Environment report every four years, which addresses the health of Ireland's environment as a whole. The most recent EPA State of the Environment report was produced in 2016. In general, it found that Ireland is fortunate enough to have a generally good environment, and it states that overall Ireland is a clean and safe environment to live in. This overall 'good' environmental quality in Ireland does however face many challenges in the short-term and long-term future. Such challenges include issues such as water pollution, air quality, noise and odours. Although national level reports and surveys can mask many issues with these, it is noted in the EPA report that localised conditions may have severe impacts not only on the health and wellbeing of people in small areas, but also on the wider environment.

The EPA State of the Environment report (2016) acknowledges that water protection measures are required to ensure we meet the requirements of the Water Framework Directive. There was no improvement of water quality over the first river basin cycle (2009-2015), and so the target of a 13.6% improvement was not met. Approximately 50% of waters (rivers, lakes and estuaries) where water quality pressures or pollution occur still require an improvement.

The 2016 EPA report assesses how successful Ireland has been in addressing four key challenges from their previous 2012 State of the Environment report. These are:

- Valuing and protecting our natural environment
- Building a resource efficient, low carbon economy
- Implementing environmental legislation
- Putting the environment at the centre of decision making

It was found that the country has been, in general, slow to meet these challenges. Noted in the 2016 document is that the loss of biodiversity is still a real issue, we are still highly dependent on fossil fuels, and we are slow in implementing some

environmental directives, particularly those relating to water quality. The current plan will contribute to meeting each of these challenges, as described in Table 5.1.

Table 5.1 Challenges from the 2012 State of the Environmental Report, and how the plan contributes to meeting them.

Challenge	Contribution of/Relationship to the Plan
Valuing and protecting our natural environment	The proposed plan aims to protect the FPM by improving the overall water quality in each of the 27 no. FPM catchments.
Building a resource efficient, low carbon economy	The proposed plan aims to allow afforestation and reforestation to continue in the form of native deciduous species rather than commercial coniferous forestry. This will still allow for production of timber as a resource (for construction, bioenergy, manufacturing, etc.).
Implementing environmental legislation	The proposed plan will provide the FS-DAFM with a focused method to apply beneficial measures to forestry in Ireland.
Putting the environment at the centre of decision making	The proposed plan places the environment, and specifically water quality at its core. This will not only have benefits for FPM populations, but also for general biodiversity.

5.3 Environmental Characteristics

Below is a summary of the main environmental baseline information for the 27 FPM catchments. For certain data, it is not feasible or practical to use only the information for the 27 FPM catchments, and in these situations the national data are used as a baseline, as the catchments are geographically dispersed around much of the country.

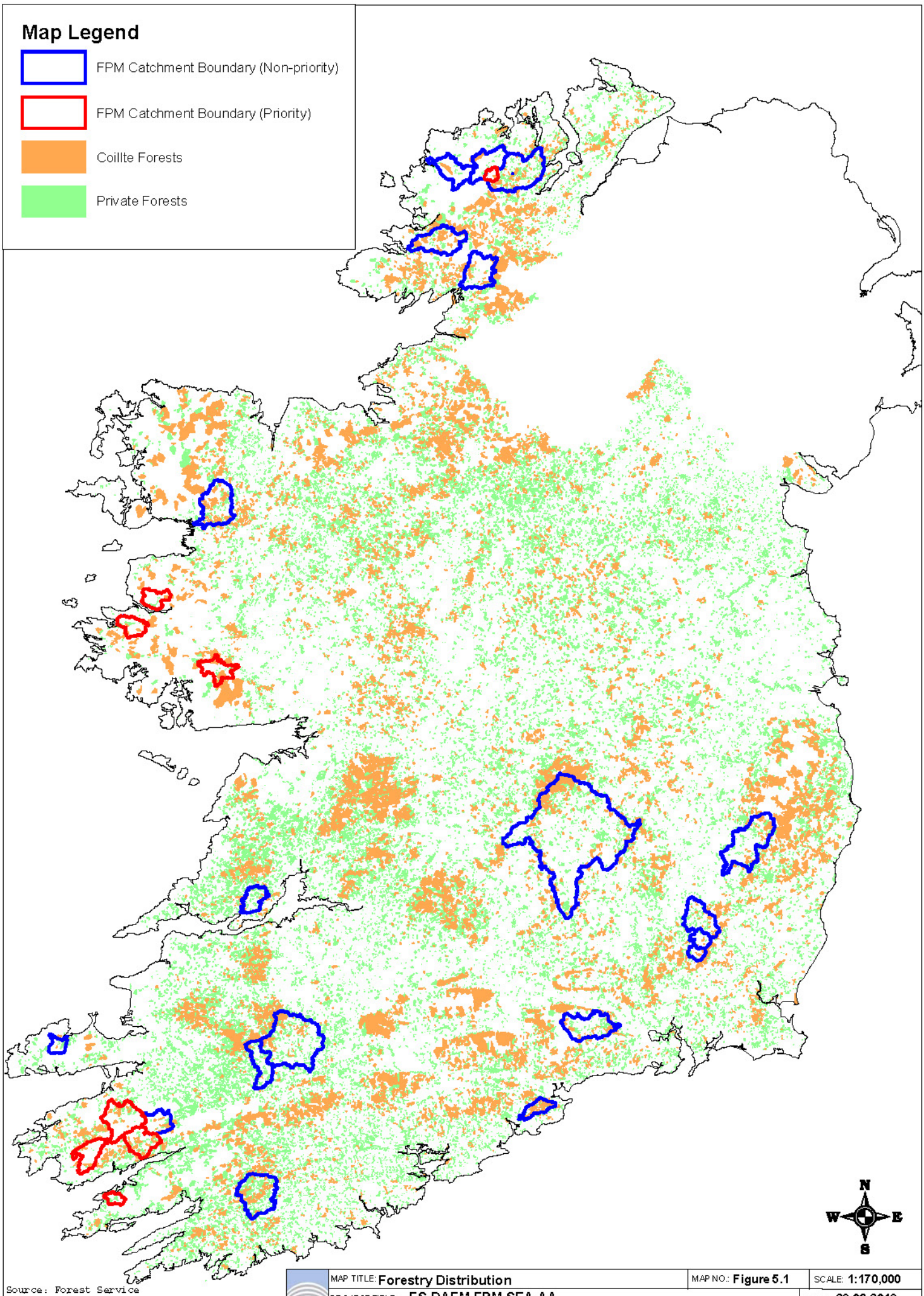
Figure 5.1 shows the actual forest footprint within the 27 catchments for reference purposes.

5.3.1 Biodiversity, Flora and Fauna

There are several designation types which are considered for the Plan for Forestry and Freshwater Pearl Mussel in Ireland. These are Special Areas of Conservation (SAC), Special Protection Areas (SPA), Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA). Data of all such sites that are found within the boundaries of the 27 no. catchments are shown in Table 5.2, and a map is shown in Figure 3.1.

The Corine 2012 data was used to assess the landcover for all 27 FPM catchments (Figure 5.2). Overall, the most common type of landcovers within the catchments are Pasture and Peat Bog, with many of the western coastal catchments being dominated by peat bog, while the inland catchments are generally pastoral. This dataset uses computer generated polygons which take account of and use areas greater than 5 hectares, with smaller sites being absorbed into the largest adjacent polygon. This produces a more suitable large scale map.

The areas of forestry within the 27 no. catchments were found to be composed of conifer forest, broadleaved forest, mixed forest and transitional woodland-scrub with



Source: Forest Service
www.agriculture.gov.ie/forestservice

MAP TITLE: **Forestry Distribution**	MAP NO.: **Figure 5.1**	SCALE: **1:170,000**	
PROJECT TITLE: **FS-DAFM FPM SEA AA**		DATE: **28-06-2018**	
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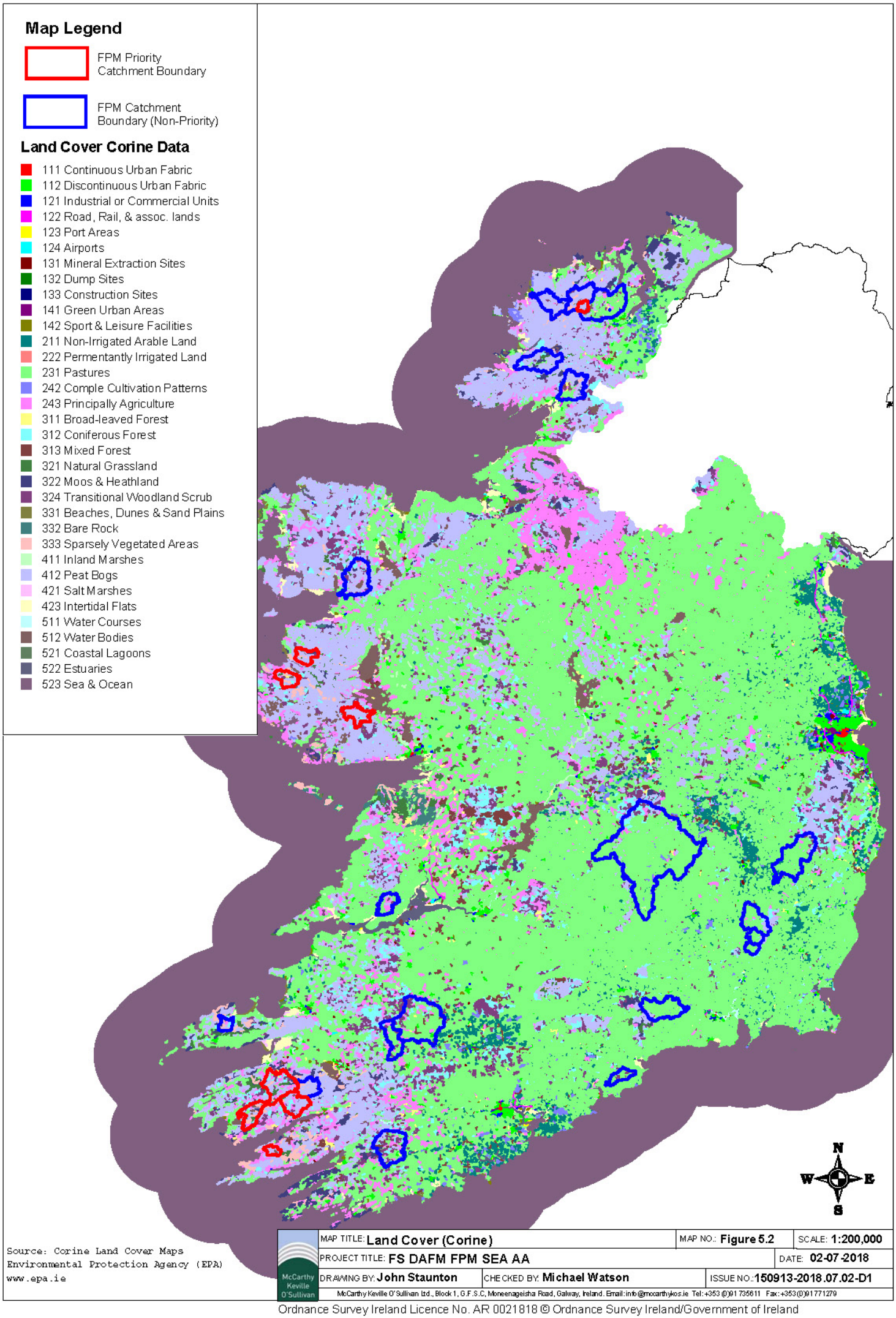

Source: Corine Land Cover Maps
Environmental Protection Agency (EPA)
www.epa.ie

MAP TITLE: **Land Cover (Corine)**		MAP NO.: **Figure 5.2**	SCALE: **1:200,000**
PROJECT TITLE: **FS DAFM FPM SEA AA**			DATE: **02-07-2018**
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the conifer forest and transitional woodland-scrub being the most common. These generalised categories of woodland were created for the Corine landcover 2012 dataset using several existing datasets. Forest Service data on planting dates was used to estimate the maturity of the forest, and while there may be some variation, this was seen as a good estimate to suit most sites. In some catchments, the areas of forestry were found to be aggregated in a small number of areas (usually uplands), while in other catchments they were dispersed throughout the catchment area.

The most recent available status of the Freshwater Pearl Mussel populations in each of the 27 no. catchments is shown in Table 5.2.

Table 5.2 Freshwater Pearl Mussel status and designated sites in each catchment (according to latest data in May 2018)

Catchment	Status	SAC	SPA	NHA	pNHA	Comment
Bandon/Caha	Unfavourable	1	-	-	1	Absence of juveniles (2005). Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Clady	Unfavourable	2	1	-	2	Suffering from excessive nutrients. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Newport	Unfavourable	1	-	1	1	Poor FPM demographic and habitat quality. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Dawros	Unfavourable	2	-	-	2	Suffering from siltation and poor FPM demographic. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Cloon	Unfavourable	1	-	-	1	Suffering from siltation, macrophyte growth and poor FPM demographic. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Owenmore	Unfavourable	2	1	-	2	Suffering from algae growth and poor FPM demographic. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

Catchment	Status	SAC	SPA	NHA	pNHA	Comment
Owenriff	Unfavourable	2	1	1	2	Suffering from a shortage of juveniles most likely due to periodically poor conditions, but it is an important population, with a 63% quadrat occupancy during a 2016 survey. Catchment fails a number of requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Owentaraglin	Unfavourable	1	1	-	-	Suffering from siltation. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Clodiagh	Unfavourable	2	-	-	3	Suffering from habitat quality and shortage of juveniles. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Nore	Unfavourable	11	2	2	23	Suffering from siltation, growth of macrophytes and algae and very poor FPM population which is critically endangered. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Dereen	Unfavourable	2	-	-	1	Suffering from degrading habitat quality and shortage of juveniles. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Licky	Unfavourable	1	-	-	-	Suffering from a major decline numbers up to 2016, with existing mussels stressed from agricultural drain works and forestry clearfell. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

Catchment	Status	SAC	SPA	NHA	pNHA	Comment
Mountain	Unfavourable	2	-	-	1	Suffering from heavy sedimentation and a rapidly declining FPM population, in danger of extinction soon. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Ballymurphy	Unfavourable	2	-	-	1	Suffering from siltation, macrophyte growthlow numbers of FPM. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Aughavaud	Unfavourable	2	-	-	1	Suffering from shifting substrate/sands with very few remaining FPM (possibly already extinct). Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Currane	Unfavourable	1	-	-	1	Very large population size (2007), but juveniles are rare due to habitat conditions. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Ownagappul	Unfavourable	1	-	-	1	Population decline of 24% over 10 years, and intermittent poor river bed habitat conditions which prevents juvenile survival. Verlarge population, estimated to be over 2 million in 2014. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

Catchment	Status	SAC	SPA	NHA	pNHA	Comment
Caragh	Unfavourable	1	-	-	1	Very large population size, and internationally important, but poor demographic due to habitat conditions. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Kerry Blackwater	Unfavourable	2	-	-	3	Suffering from poor habitat conditions in the main channel and a poor FPM demographic (the Kealduff river has the best habitat conditions and demographic in the catchment). Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Gearhameen	Unfavourable	1	2	-	1	Suffering from poor FPM demographic. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Allow	Unfavourable	1	1	-	1	Suffering from siltation, macrophyte growth and poor FPM demographic. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Bundorragha	Favourable	1	-	-	2	Reduced siltation and macrophyte presence resulted in a recent improved status. Large FPM population with good demographic. Catchment meets all requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. This is currently the only catchment with a favourable status.

Catchment	Status	SAC	SPA	NHA	pNHA	Comment
Owencarrow	Unfavourable	2	1	-	2	Suffering from siltation and macrophyte growth. 57% of the FPM found were already dead, and numbers were unlikely to have ever been large. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Glaskeelan	Unfavourable	1	1	-	1	Suffering from poor habitat conditions an absence of juveniles and a loss of excessive amounts of adult mussels. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Leannan	Unfavourable	3	2	-	5	Suffering from severe siltation and poor FPM demographic. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Owenea	Unfavourable	3	1	-	3	Suffering from siltation, macrophyte growth and poor FPM demographic. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.
Eske	Unfavourable	3	-	2	3	Suffering from macrophyte growth. Catchment fails most requirements of The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

5.3.1.1 Existing Environmental Pressures and Problems for Biodiversity, Flora & Fauna

There are numerous threats and pressures on Biodiversity, Flora and Fauna in the Irish environment. Among the most significant of these are agriculture and the development of built land. The intensification of agriculture and forestry over the recent decades has resulted in an increase in excess nutrients in watercourses around the country. Furthermore, the increasing population and underinvestment in waste water treatment systems means that many are discharging wastewater that has not been fully treated into watercourses. The intensification of land drainage, along with excessive stocking densities (causing poaching) has resulted high rates of siltation. The intensive growth of monoculture crops in both agriculture and forestry has reduced structural habitat diversity and food diversity, thereby negatively impacting local biodiversity in general. The reclamation of wetlands for agriculture or development is also having localised negative impacts on flora and fauna. Although built land is not one of the largest landcover types, it's growth has accelerated in recent years (with urban sprawl, road construction, etc.), which increases the threat caused by it to biodiversity.

Likely Evolution in the absence of the Plan

In the absence of the proposed plan, the current practices for forestry related activities in the 27 no. FPM catchments will continue. Existing legislation and forestry guidelines offer a reasonable level of protection for biodiversity from commercial forestry, but if the proposed plan is not introduced, the opportunity to offer an even higher level of protection specifically for the FPM will be lost.

5.3.2 Population and Human Health

This section of the Environmental Report describes the baseline environment in relation to population and human health. One of the principle concerns in the development process is that people, as individuals or communities, should experience no diminution in their quality of life from the direct or indirect impacts arising from the implementation of such a plan. Ultimately, all the impacts of such a management plan impinge on human beings, directly and indirectly, positively and negatively. The key issues examined in this section of the report include population, human health, land-use, community facilities and services and tourism.

5.3.2.1 Population

This information was sourced from the Census of Ireland 2011 and 2016, and from the CSO website, www.cso.ie. In the four years between the 2011 and the 2016 Censes, the population of Ireland increased by 3.8%, from 4,588,252 to 4,761,865 respectively. This figure has been increasing since the census of 1991, when the population was approximately 3.5 million.

There are three factors that affect population changes: births, deaths and net migration (combination of immigration and emigration). Natural growth (i.e. births minus deaths) is thought to be the main growth factor between 2011 and 2016.

Table 5.3 shows the breakdown of human population within each county that contains a Freshwater Pearl Mussel catchment, and the change in populations between the 2011 census and the 2016 census.

Table 5.3 Human Beings population data

County	Catchment	Population		
		2011	2016	Percentage change 2011-2016
Donegal	Clady Owencarrow Glaskeelan Leannan Owenea Eske	161,137	159,192	-1.21
Mayo	Newport Bondorragha	130,638	130,507	-0.1
Galway	Dawros Owenriff	175,124	179,390	2.44
Clare	Cloon	117,196	118,817	1.38
Kerry	Owenmore Currane Caragh Kerry Blackwater Gearhameen	145,502	147,707	1.52
Cork	Bandon/Caha Owentaraglin Allow Ownagappul	399,802	417,211	4.35
Waterford	Licky Clodiagh	67,063	116,176*	73.23*
Offaly	Nore	76,687	77,961	1.66
Kilkenny	Nore	95,419	99,232	4.0%
Tipperary	Nore	158,754	159,553	0.5%
Laois	Nore	80,559	84,697	5.14
Wicklow	Dereen	136,640	142,425	4.23
Carlow	Dereen Mountain Ballymurphy Aughavaud	54,612	56,932	4.25

*Waterford figures include Waterford City for 2016.

The results of the 2016 census show that the population growth in Leinster (5.2%) was more than Connaught (1.5%), Munster (2.7%) and Ulster (part of - 0.7%) between 2011 and 2016. Only counties Donegal and Mayo showed a decline in population. County Laois showed the highest increase at 5.14%, with Waterford's increase of over 73% due to the merging of the county and city data.

5.3.2.2 Human Health

5.3.2.2.1 Drinking water Supply

Irish water is currently responsible for the production, distribution and monitoring of drinking water for over 960 supplies, which covers approximately 83% of the population of Ireland. The remainder of the population source their water from private wells (11%), water schemes (6.1%) and small private supplies (0.9%). The

private drinking water supplies are exempt from the regulations that apply to the public supply, but it is the responsibility of the operator of the supply.

In 2016, the EPA published "Drinking water report for public water supplies 2015", which gave an insight into the state of the water supply I the country. Overall it found that the situation was similar to 2014 in many respects. Over 99% of supplies complied with microbiological (99.9%) and chemical (99.4%) parameter guidelines. E. coli was found to be present in seven water supplies in 2015, compared to eight in 2014. The main areas of concern for the water supply were in the high levels of pesticides, trihalomethanes and lead found in some water supplies. The presence of historical lead pipes in the distribution network resulted in the lead elevations, and accounted for four water restrictions in 2015, which was a significant improvement on the 22 such restrictions in 2014.

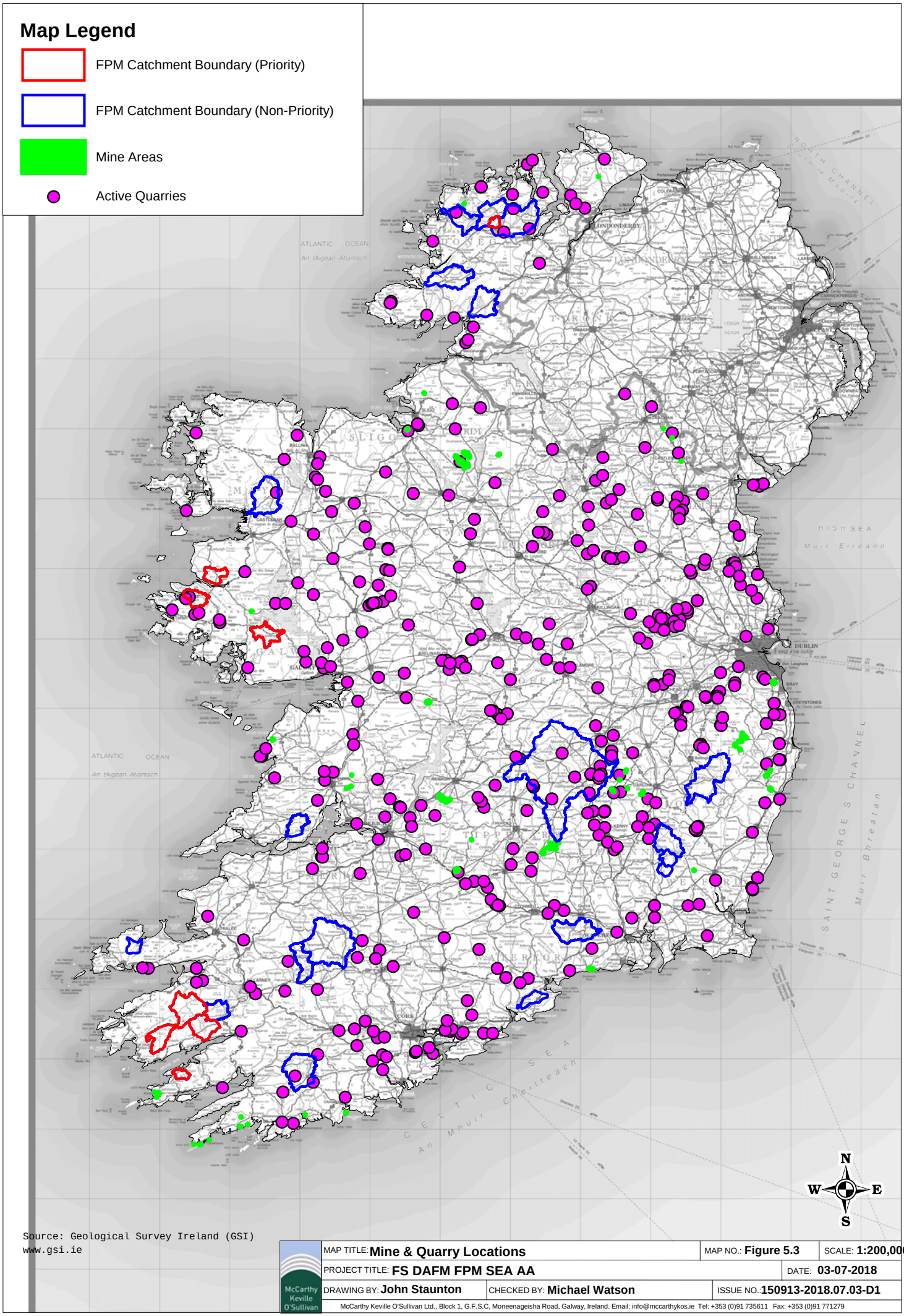
In the event that the public water supply parameters either exceed their guideline limits or if the supplier considers that there may be a risk to consumers, the supplier of the water must consult with the HSE to agree a strategy to deal with the issue. This may include a restriction / boil water notice or a prohibition of the use of the water.

Many of the problems currently being experienced in the water supply network are a result of under-investment and a reactive management strategy. The adoption of a proactive and preventative strategy through the development and implementation of Drinking Water Safety Plans (DWSP's). The completion of DWSP's for water supplies aims to eliminate sources of contamination between the source and tap. At the end of 2015, there were 6 of these DWSP's completed, and 173 in preparation. The priority actions to be completed for the EPA include the removal of all boil water notices around the country through the improvement of the water treatment and infrastructure, and the implementation

Approximately 10% of Ireland's population are served by private household wells for their water supply. Of these, it is estimated that approximately 30% have exceedances in levels of E. coli present. While the local authorities are responsible for ensuring that well operators/owners are aware of the need for monitoring and compliance, it is ultimately the responsibility of the well operator to ensure that the water is of sufficient quality for human consumption. Table 5.4 details the number of water treatment plants that can be found in each of the 27 no. catchments.

5.3.2.3 Land Use

The land use of each FPM catchment area is likely to have a significant influence on the catchment water quality. Certain activities such as intensive agriculture are more likely to result in elevated concentrations of nutrients downstream of a site. Table 5.4 shows the breakdown of land use within each of the 27 no. Freshwater Pearl Mussel catchments. Section 5.3.8 (Material Assets) discusses the IPPC licensing, waste facilities, water abstraction and other services and activities that are related with human activity and human health. Figure 5.2 shows the land cover for Ireland. Figures 5.3 – 5.5 show the distribution of the EPA Licenced Facilities, Waste Water Treatment Plants, Mines, Quarries & other water discharges and potential pollution sources.



Source: Geological Survey Ireland (GSI)
www.gsi.ie

MAP TITLE: **Mine & Quarry Locations**	MAP NO.: **Figure 5.3**	SCALE: **1:200,000**
PROJECT TITLE: **FS DAFM FPM SEA AA**		DATE: **03-07-2018**
DRAWING BY: **John Staunton**	CHECKED BY: **Michael Watson**	ISSUE NO.: **150913-2018.07.03-D1**

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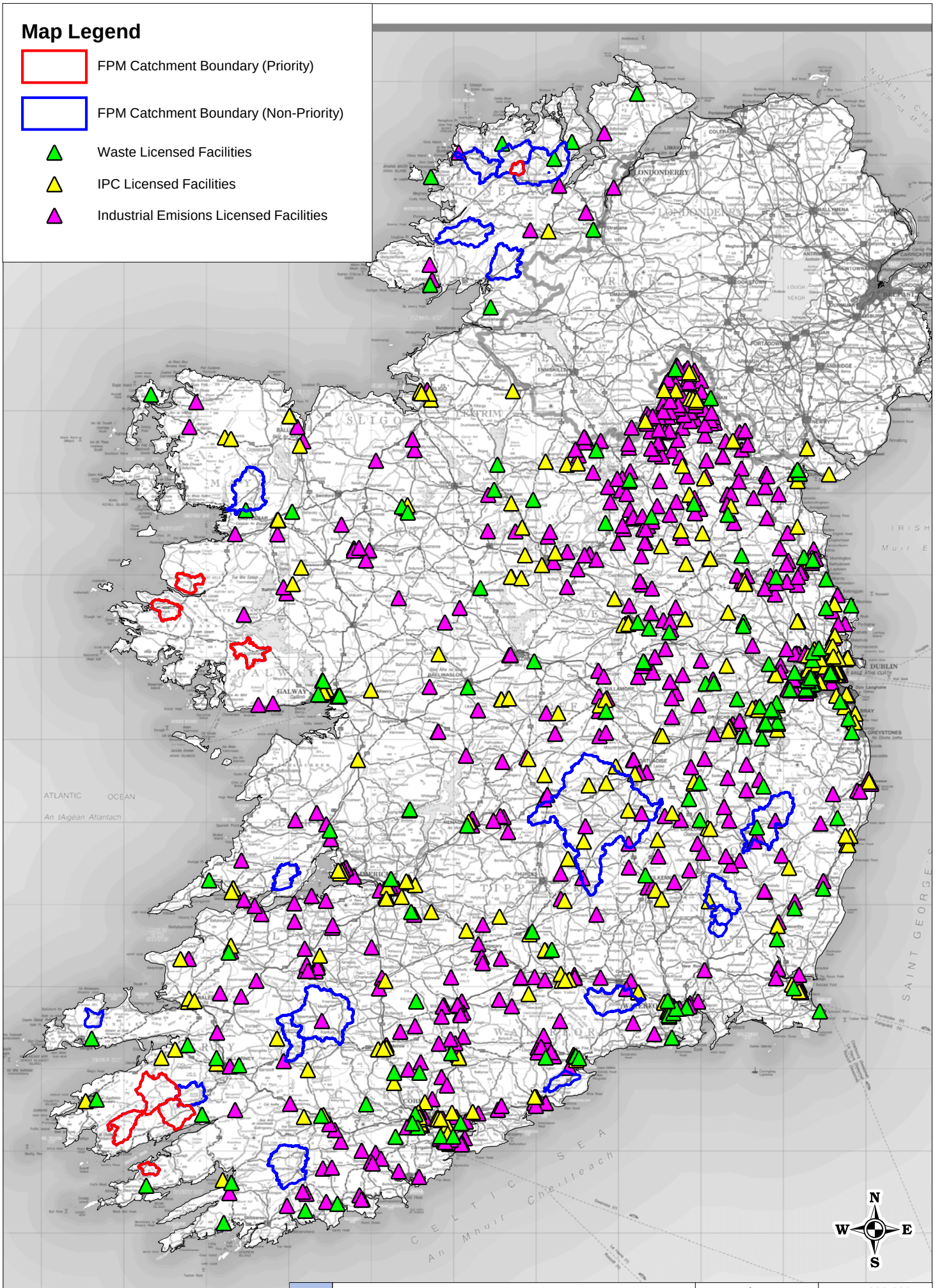

Source: Environmental Protection Agency (EPA)
www.epa.ie

MAP TITLE: **Licensed Facility Locations**		MAP NO.: **Figure 5.4**	SCALE: **1:200,000**
PROJECT TITLE: **FS DAFM FPM SEA AA**			DATE: **03-07-2018**
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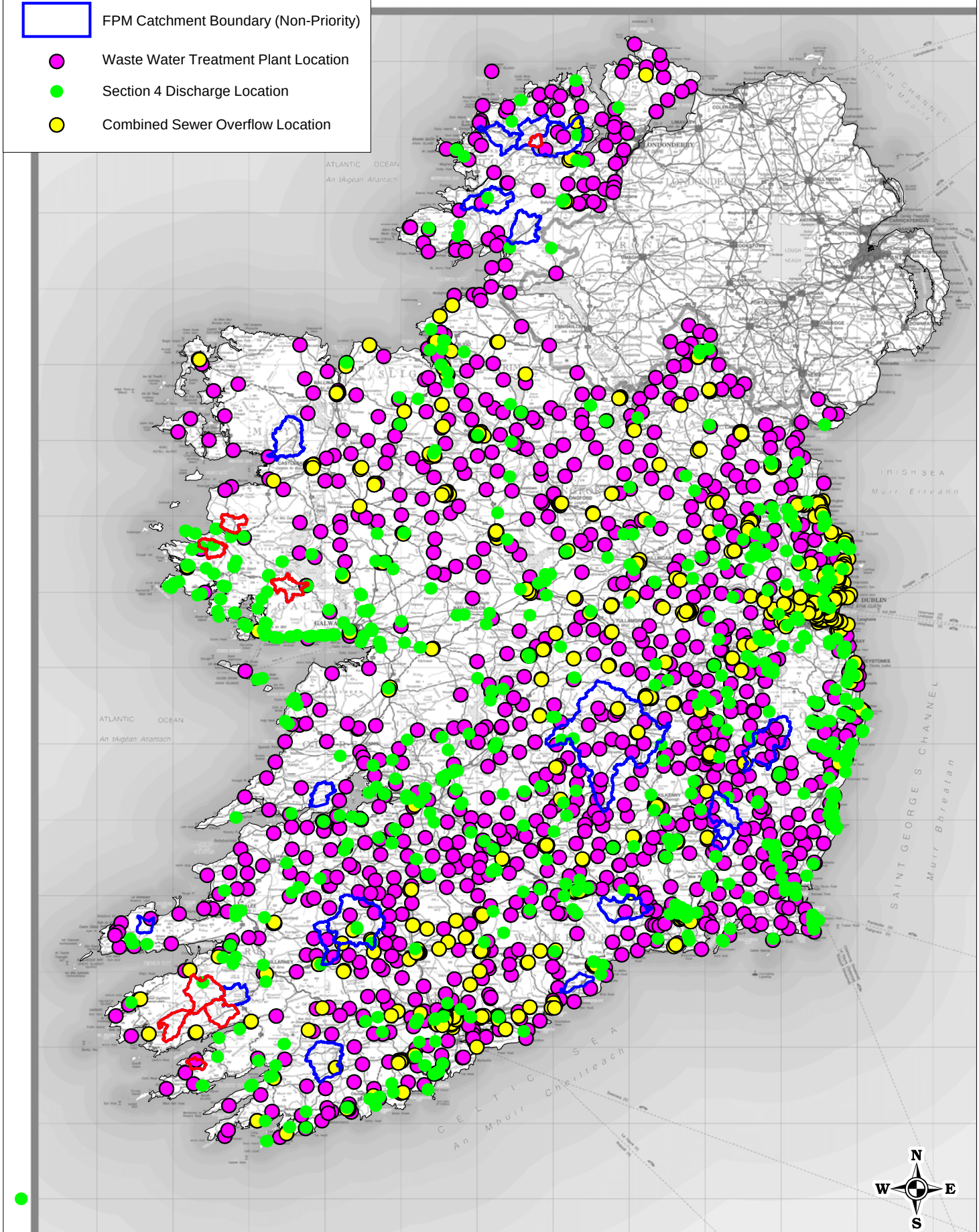
Map Legend

- FPM Catchment Boundary (Priority)
- FPM Catchment Boundary (Non-Priority)
- Waste Water Treatment Plant Location
- Section 4 Discharge Location
- Combined Sewer Overflow Location



Source: Environmental Protection Agency (EPA) www.epa.ie

MAP TITLE: **Point Discharge Locations**	MAP NO.: **Figure 5.5**	SCALE: **1:200,000**	
PROJECT TITLE: **FS DAFM FPM SEA AA**		DATE: **03-07-2018**	
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Table 5.4 Land use data

Catchment name	Land use								
	Primary Land use	Forestry area including valid technical approvals ha	IPPC Licensed Facility	Licensed Waste Facility	Other Licensed Facility	Section 4 discharge	Waste Water Treatment Plant	Combined Sewer Overflow	Water Treatment Plant
Clady	Peat Bogs (76.5) Pastures (5.2) Natural Grassland (4.6)	544	-	-	1	-	-	-	1
Newport	Peat Bogs (52.8) Agricultural (17.4) Pastures (0.001)	3,891	-	1	-	-	-	-	1
Dawros	Peat Bogs (71.7) Coniferous Forestry (5.7) Sparsely vegetated Areas (7.4)	502	-	-	-	1	-	-	-
Cloon	Pastures (63.3) Peat Bogs (18.2) Transitional Woodland Scrub (7.3)	764	-	-	-	-	-	-	-
Owenmore	Peatland (62.3) Forest and semi-natural area (32.7) Agricultural (4.1)	230	-	-	-	-	-	-	-
Owenriff	Peat Bogs (64) Transitional Woodland Scrub (12.3) Coniferous Forestry (11.5)	1,656	-	-	-	-	1	-	-

Owentaraglin	Pastures (79) Transitional Woodland Scrub (7.9) Land principally occupied by agriculture with areas of natural vegetation (7.9)	1,246	-	-	-	-	-	-	-
Clodiagh	Pastures (63.3) Non- irrigated Arable Land (10.1) Coniferous Forestry (6.2)	2,121	-	-	-	-	1	-	-
Nore	Pastures (70.5) Coniferous Forestry (7.1) Peat Bogs (5.0)	14,660	4	-	4	2	6	3	1
Dereen	Pastures (55.7) Peat Bogs (8.4) Non- irrigated Arable Land (17.4)	2,237	-	1	3	-	1	-	3
Licky	Pastures (45.3) Transitional Woodland Scrub (26.1) Coniferous Forestry (20)	1,742	-	-	-	-	-	-	-
Mountain	Pastures (46.5) Agricultural (17.9) Peat Bogs (15.4)	963	1	-	-	-	1	-	2
Ballymurphy	Pastures (65.6) Peat Bogs (21.9) Coniferous Forest (2)	213	-	-	-	-	-	-	-
Aughavaud	Pastures (65.6) Peat Bogs (20.5) Coniferous Forest (5.6)	250	-	-	-	-	-	-	1

Currane	Peat Bogs (54.7) Sparsely vegetated Areas (11.0) Pastures (9.1)	496	-	-	-	-	-	-	-
Caragh	Peat Bogs (62.8) Natural Grassland (10.5)	1,272	-	-	-	1	-	-	-
Kerry Blackwater	Peat Bogs (60.4) Natural Grassland (10.4) Coniferous Forestry (7.5)	1,498	-	-	-	-	-	-	-
Gearhameen	Peat Bogs (62) Sparsely vegetated Areas (20.9) Transitional Woodland Scrub (7.9)	736	-	-	-	-	-	-	-
Allow	Pasture (73.2) Coniferous Forestry (6.1) Transitional Woodland Scrub (5.5) Peat Bogs (3.0)	5,030	-	-	1	3	4	5	2
Bondorragha	Peat Bogs (54.8) Natural Grassland (22.3) Bare Rock (14.8)	347	-	-	-	-	-	-	-
Owencarrow	Peat Bogs (63.5) Natural Grassland (16.4) Coniferous Forestry (5.5)	670	-	-	-	-	-	-	1

Glaskeelan	Peat Bogs (70.1) Natural Grassland (15.8) Transitional Woodland Scrub (7.3)	129	-	-	-	-	-	-	-
Leannan	Peat Bogs (32) Pastures (25.8) Agricultural (18)	2,600	-	1	-	1	1	1	1
Owenea	Peat Bogs (37.4) Moors and Heathlands (22.8) Coniferous Forestry (9.4) Pastures (12.9)	2,726	-	-	-	1	1	-	1
Eske	Peat Bogs (32.6) Pastures (21.5) Moors and Heathlands (20)	1,359	-	-	-	-	-	-	2
Ownagappul	Peat Bogs (68.5), Sparsely Vegetated Areas (9.3) and natural grassland (9.4)	153	-	-	-	-	-	-	1
Bandon/Caha	Pasture (48.6), Peat Bogs (21.9(and Coniferous Forests (10.1)	4,434	-	-	-	-	1	1	1

5.3.2.4 Tourism

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. During 2016 (the latest year for which annual Fáilte Ireland figures are available, total tourism revenue generated in Ireland was approximately €8.3 billion, an increase of approximately 8.1% from the previous year. Overseas tourist visits to Ireland in 2016 grew by 8.8% to 8.7 million (*'Tourism Facts 2016'*, Fáilte Ireland, August 2017). Ireland is divided into eight tourism regions. Table 5.6 shows the total revenue and breakdown of overseas tourist numbers to each region in Ireland during 2016 (*'Tourism Facts 2016'*, Fáilte Ireland, June 2017)

Table 5.6 Overseas Tourists Revenue and Numbers 2016 (Source: Fáilte Ireland)

• Region	• Total Revenue • (€m)	• Total Number of Overseas Tourists (000s)
Dublin	€1,975 m	5,687
Mid-East	€251 m	626
Midlands	€72 m	226
South-East	€273 m	946
South-West	€849 m	2,079
Mid-West	€390 m	1,215
West	€543 m	1,675
Border	€286 m	815
Total	€4,639 m	13,269

Data showing the breakdown of overseas tourist numbers to each county and the associated revenue generated for 2016 was unavailable at the time of writing this EIAR (March 2018). Therefore, for the purposes of this assessment, figures from 2015 have been used ('Regional tourism performance in 2015, Fáilte Ireland, October 2016). As can be observed in Table 5.7, Counties Cork, Galway and Kerry had the highest tourism revenue during 2015.

Table 5.7 Overseas Tourism at County level during 2015 (Source: Fáilte Ireland)

• County	• Revenue Generated by Overseas Tourists (€m)	• No. of Overseas Tourists • (000s)
Donegal	83	289
Mayo	80	302
Galway	475	1,354
Clare	127	597
Kerry	234	1,026
Cork	558	1,449
Waterford	75	263
Limerick	212	537
Wicklow	82	248
Carlow	32	62
Laois	18	57
Tipperary (North)	25	51
Tipperary (South)	41	133
Kilkenny	45	267
Wexford	65	221

5.3.2.4.1 Tourist Attractions

There are numerous tourist attractions located within the 27 no. catchments relating to the Plan. Some of the more notable attractions (www.irishtourist.com) are mentioned below, but this is by no means a complete list. In Donegal, Glenveagh National Park, Ionad Cois Locha, Donegal Castle and Donegal Railway Heritage Centre are located within the catchments. Galway attractions include Connemara National Park, Kylemore Abbey Fishery, while Delphi Adventure Centre is located in Mayo. Kerry Attractions include Killarney National Park, the Eclipse Centre (Kerry's Equestrian and Adventure Centre) and Carrauntoohil. Borris House is located in the Carlow river catchments, while the Donaghmore Museum and Heywood Gardens are located in Laois catchments.

5.3.2.5 Existing Environmental Pressures and Problems for Population & Human Health

Currently, there are a number of environmental problems facing Population and Human Health. Water pollution threatens not only the biodiversity of aquatic habitats (and the associated impact on ecosystem services), but also the quality of water for the distribution network. The water quality threats come from a variety of sources including both point source (e.g. waste water discharge points, waste landfills, river fords) and diffuse source (e.g. agriculture and forestry runoff containing excess nutrients, septic tanks).

Intensive and industrial human activity such as quarrying, mining, peat harvesting (including turf cutting), intensive agriculture and commercial forestry can all have negative impacts on the FPM populations, causing problems including sedimentation, nutrient enrichment and contamination of watercourses. This impact is worsened when these activities occur on sites with steep slopes and soft soils, adjacent to watercourses. River fords which are used for vehicular and animal crossings can cause significant levels of sedimentation downstream.

Likely Evolution in the absence of the Plan

If the proposed plan is not introduced, the population and human health of Ireland would be largely unaffected. The opportunity to have a potential improvement in water quality, which would benefit water supplies in the 27 no. FPM catchments, would be lost. The development of land use would most likely continue as it currently is, with afforestation (and reforestation) occurring at present rates. Tourism would be largely unaffected, although this opportunity to boost the green tourism image that Ireland currently holds would be lost.

5.3.3 Land, Soils and Geology

This report provides a baseline assessment of the environmental setting of the proposed management plan in terms of soils and geology and discusses the potential impacts that the implementation of the proposed plan will have.

A desk study was carried out which included all 27 No. Freshwater Pearl Mussel catchments. The desk study involved collecting all the relevant geological data for the catchments. This included consultation with the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series. Geological Survey of Ireland (GSI, 1999);
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets; and,

- General Soil Map of Ireland 2nd edition (www.epa.ie);

The results of the desk study are shown in Table 5.8, where the underlying geology and soil/subsoil of each of the catchments are summarised.

Table 5.8 Underlying geology and soil/subsoil description for each of the 27 no. catchments, with data on quarries and mines (point pressures).

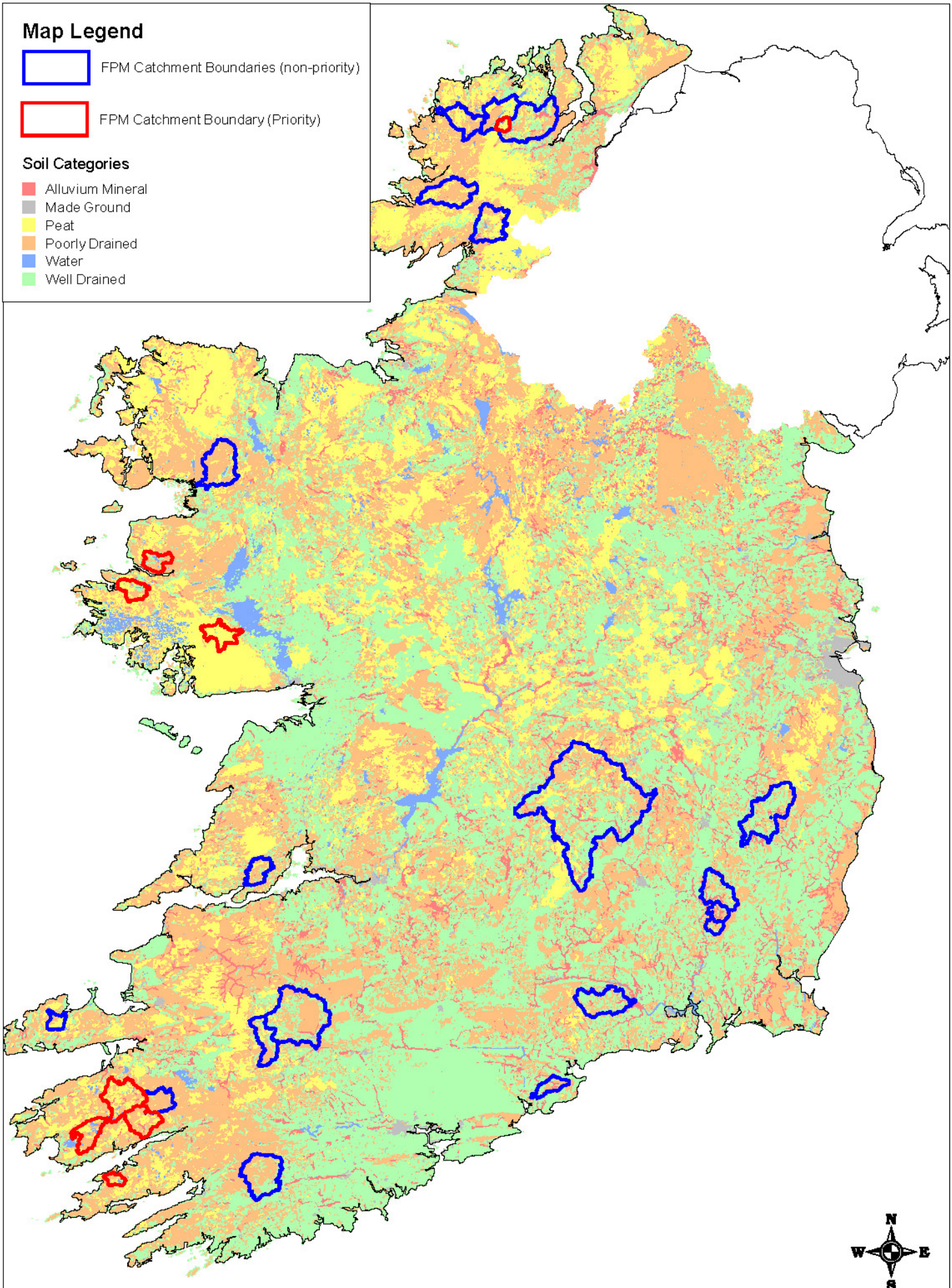
Catchment	Geology	Subsoil & Soil	Quarries	Mines
Bandon/Caha	Sandstones, siltstones and mudstones	Tills (sandstone and shale), sand and gravel (sandstone), exposed bedrock and alluvium	2	-
Clady	Quartzites, granites, marbles, schists, metadolerites	Mostly blanket peat, with some exposed bedrock, till (quartzite) and water	-	-
Newport	Conglomerates, sandstones, mudrock, siltstone, quartzites, schists, metavolcanics and grits	Tills (sandstone, metamorphic), blanket peat, alluvium, exposed bedrock, sands and gravels (metamorphic)	1	-
Dawros	Schists, grits, metavolcanics, mylonitic, marbes, quartzites, granites, gabros, metanorites,	Exposed bedrock, blanket peat, tills (metamorphic), sand and gravels (metamorphic), scree, alluvium, and water	2	-
Cloon	Sandstone, siltstone and mudstone	Blanket peat, exposed bedrock, tills (sandstone and shale), with small pockets of alluvium	-	-
Owenmore	Sandstone (bedded)	Mostly blanket peat and exposed bedrock, with some tills (sandstone) and water	-	-
Owenriff	Granites, quartzites, schists, marbles, pebble beds, gneiss, migmatite	Mostly blanket peat, with some tills (granite), water and exposed bedrock	-	2
Owentaraglin	Mostly shale, sandstones with some mudstone, siltstone and greywacke.	Mostly tills (sandstone and shale/sandstone), with some alluvium, blanket peat and exposed bedrock	-	-

Clodiagh	Dark grey slate, greywacke, boulder-pebble size conglomerate, green grey and purple slate and siltstone	Subsoils are mostly shale till and sandstone till with some blanket peat and exposed bedrock. Soils also contain some other types such as alluvium and scree	-	-
Nore	Mostly limestones and sandstones, with some siltstones, mudstones and shale	Tills (sandstone, limestone, shale) and peat, with some exposed bedrock and aluvium	5	1
Dereen	Mostly fine to coarse grained granite, with some slate-schist, quartzite, coticule and aplite	Subsoils mostly granite till, with some sandstone and shale till. Soils also include some alluvium, and exposed rock at the surface.	1	1
Licky	Mostly sandstone with mudstone and siltstone	Mostly sandstone till (Devonian), with some alluvium and bedrock at the surface	-	-
Mountain	Mostly granites, with some slate, schists, and gneissic granodiotite	Granite tills, cutover peat, exposed bedrock and alluvium	-	-
Ballymurphy	Mostly pale, fine to coarse-grained granite, with some slate, schists, and gneissic granodiotite	Granite tills, cutover peat, exposed bedrock and alluvium	-	-
Aughavaud	Mostly pale, fine to coarse-grained granite, with some schists	Granite tills, cutover peat, exposed bedrock and alluvium	-	-
Currane	Sandstones and siltstones with some mudstones	Blanket peat and exposed bedrock, with some tills (sandstone and shale) and water	-	-
Ownagappul	Sandstones and siltstones with some mudstones	Blanket peat and exposed bedrock, with some tills (sandstone and shale) and water	-	-
Caragh	Sandstones and siltstones with some conglomerates	Blanket peat and exposed bedrock, with some tills (sandstone)	-	-

Kerry Blackwater	Sandstones and siltstones with some conglomerates	Blanket peat and exposed bedrock, with some tills sandstone)	-	-
Gearhameen	Sandstones and siltstones with some conglomerates	Blanket peat and exposed bedrock, with some tills (sandstone)	1	-
Allow	Mostly shale and sandstone, grey silty mudstone, greywacke and siltstone	Mostly shale and sandstone till, with some alluvium and exposed bedrock	1	-
Bondorragha	Sandstones and conglomerates, ignimbrite, mudrock, tuff and slate	Exposed bedrock, blanket peat and water	-	-
Owencarrow	Mostly Granites and granoderites, schists, marbes,	Mostly blanket peat, with some exposed bedrock, alluvium, till (granite) and water	-	-
Glaskeelan	Mostly coarse biotite granite and granodiorite, with some schists, quartzite, marbles	Mostly blanket peat, with some exposed bedrock, till (metamorphic) and water	-	-
Leannan	Schists, pebbly grit beds, marble beds, quartzites	Mostly till (metamorphic), with some blanket peat, exposed bedrock, alluvium and water	-	-
Owenea	Quartzites, granites, schists, pebble beds, grit beds, marble, psammites,	Blanket peat, bedrock at surface, tills (metamorphic, granite), alluvium	-	-
Eske	Quartzites, limestones, feldspar pebbles, shales	Blanket peat, bedrock at surface, tills (metamorphic), alluvium and water	-	-

The nature of soil drainage for Ireland is shown in Figure 5.6. This illustrates the extent to which the majority of the 27 no. FPM catchments are underlain by poorly drained or peat soils, with well drained soils only being found at significant coverage proportions in the midlands and eastern FPM catchments.

Figures 5.6 – 5.8 show the soil drainage, subsoils and aquifer vulnerability categories throughout the 27 catchments.



Source: Geological Survey Ireland (GSI)
www.gsi.ie

MAP TITLE: **Soil Drainage Categories**		MAP NO.: **Figure 5.6**	SCALE: **1:170,000**
PROJECT TITLE: **FS-DAFM FPM SEA AA**			DATE: **28-06-2018**
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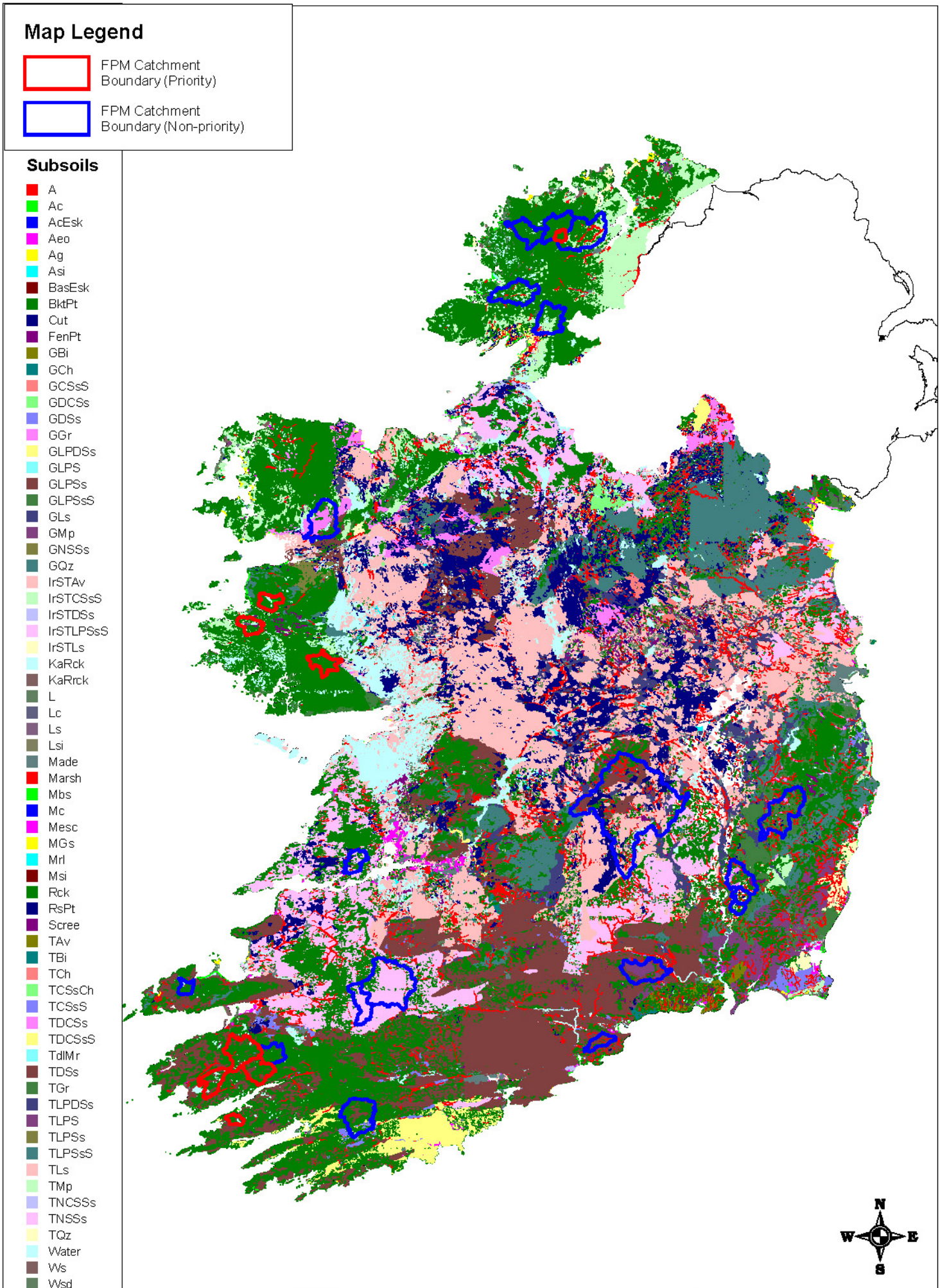

Source: Teagasc www.teagasc.ie

MAP TITLE: **Subsoil Distribution**		MAP NO.: **Figure 5.7**	SCALE: **1:1,400,000**
PROJECT TITLE: **FS DAFM FPM SEA AA**			DATE: **28-06-2018**
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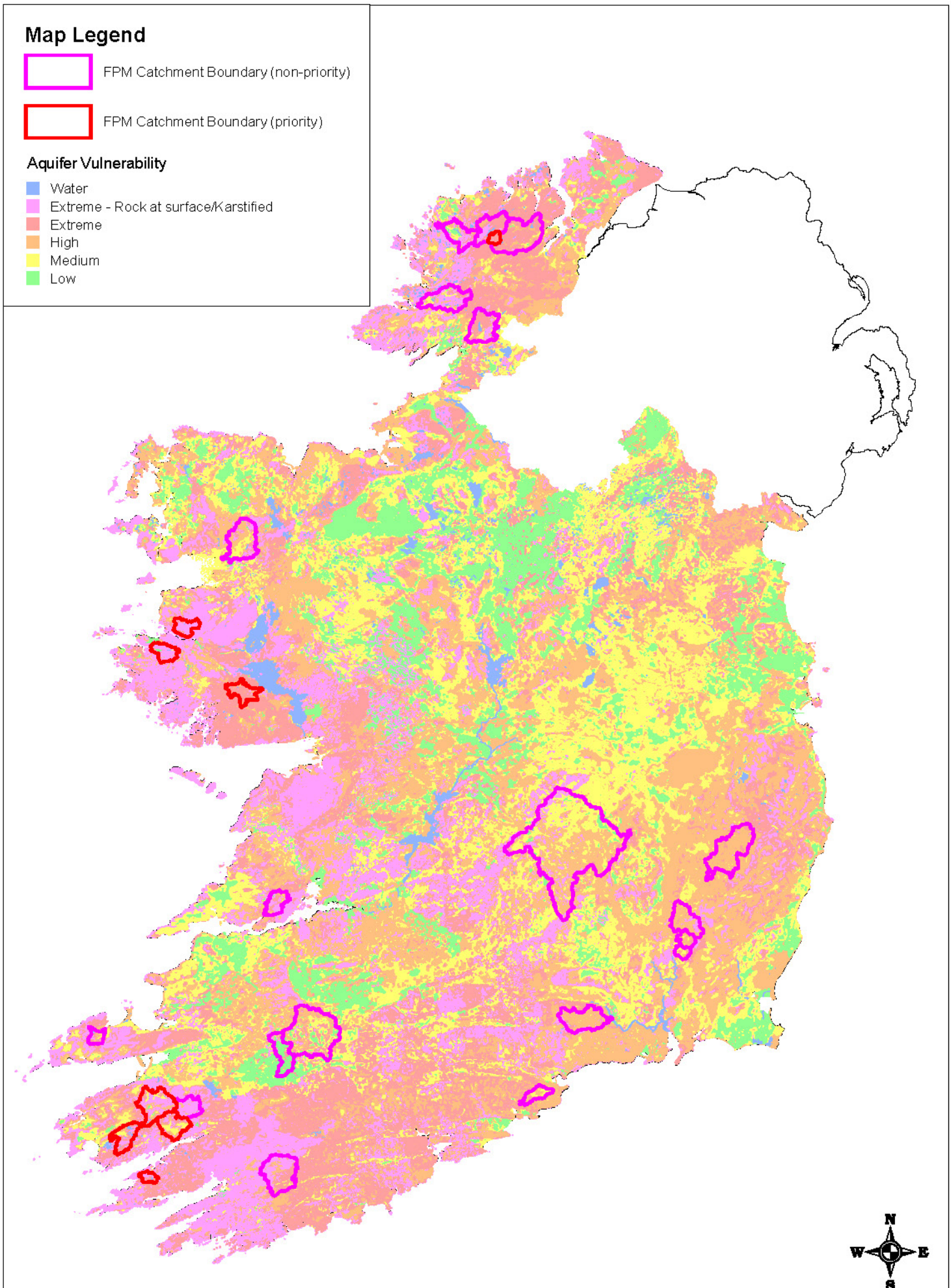

Source: Geological Survey Ireland (GSI)
www.gsi.ie

MAP TITLE: **Aquifer Vulnerability**	MAP NO.: **Figure 5.8**	SCALE: **1:1,900,000**	
PROJECT TITLE: **FS-DAFM FPM SEA AA**		DATE: **28-06-2018**	
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5.3.3.1 Existing Environmental Pressures and Problems for Land, Soils and Geology

There are a number of existing threats and pressures for Land, Soils and Geology in the 27 no. catchments. These mostly relate to the intensive agricultural practices such as overgrazing and excessive stocking densities which can lead to localised soil erosion, particularly on steeply sloped sites, where the soil type is peat or other soft material. Soil erosion is also a concern for commercial forestry, where significant erosion can occur, mostly during planting (with associated drainage) and harvesting stages. This soil erosion can cause an increased nutrient loading and sedimentation for the receiving watercourses, which will have a negative impact on FPM if present.

Likely Evolution in the absence of the Plan

Without the implementation of the proposed plan, the existing levels of soil erosion may continue. Current guidelines may offer some improvement but the opportunity to provide additional protection for soil erosion will be lost if the proposed plan is not implemented.

5.3.4 Hydrology and Hydrogeology

This section of the report provides a baseline assessment of the hydrological setting of the proposed management plan.

A desk study was carried out which included all 27 No. Freshwater Pearl Mussel catchments. The desk study involved collecting all the relevant hydrological data for the catchments. This included consultation with the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland Database (www.gsi.ie);
- Water Framework Directive catchments database (www.catchments.ie)

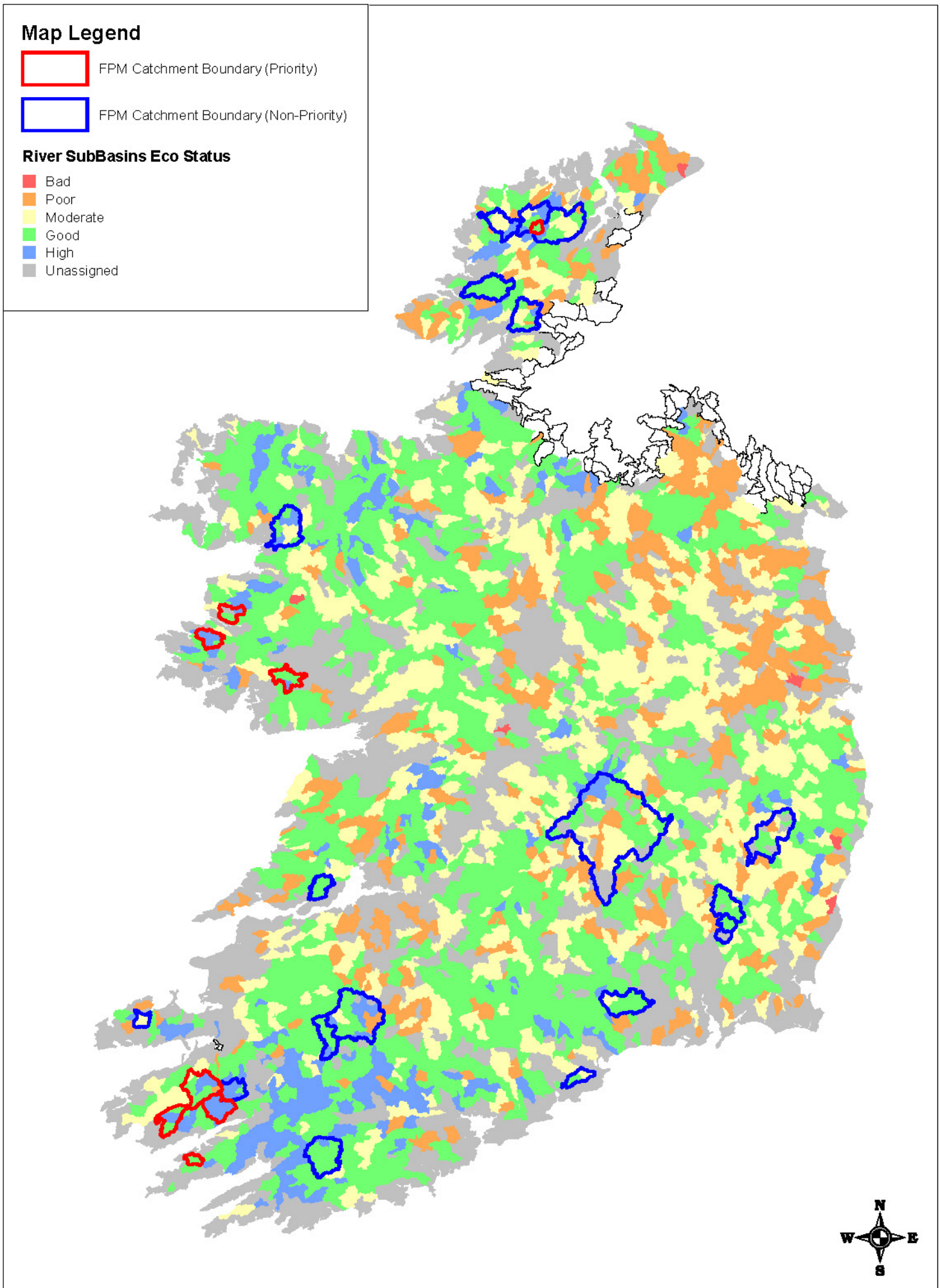
The results of the desk study are shown in Table 5.9, where the hydrology of each of the catchments are summarised. Figure 5.9 shows the ecological status of river sub-catchments.

5.3.4.1 Characterisation and prioritisation assessment

As part of the development of the 2nd cycle of the WFD, the EPA undertook a characterization and prioritisation assessment of all waterbodies within Ireland. This took place through technical assessments during the period 2014-2016, based on over 142 national datasets comprising information on pressures, impacts and physical settings. The impact of forestry was assessed using: sediment and nutrient water quality monitoring data; aerial photography to check for new plantations and recent clearfelling; DAFM and Coillte forestry mapping; soil drainage characteristics that could facilitate sediment runoff; and clearfelling licence applications. In addition, Local Authorities, Inland Fisheries Ireland and Irish Water provided local knowledge and information which was incorporated into the assessment.

The process also involved a series of Catchment Characterisation Workshops throughout 2017, involving input from all of the relevant public bodies (including DAFM and Coillte). For full details, see www.catchments.ie

The identification of the significant pressures provides the means to target local measures, as well as providing a picture at national level to inform overarching measures and national policy requirements.



Source: Environmental Protection Agency (EPA) www.epa.ie

MAP TITLE: **Ecological Status of Sub-catchments**	MAP NO.: **Figure 5.9**	SCALE: **1:1,900,000**	
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5.3.4.2 Forestry as a significant pressure

The characterisation process has shown that, of the total number of 4,829 water bodies, 1,460 are 'at risk' of not meeting their WFD status objective. Table 5.10 and Figure 5.10 show the frequency of significant pressures causing river and lake water bodies to be 'at risk'. These include agriculture (53%), hydromorphology (24%), urban waste water (20%), forestry (16%), domestic waste water (11%), peat extractive industry (8%) and urban run-off (9%).

Of the 1,460 water bodies that are 'at risk' of not meeting their WFD status objective, 765 (52%) are impacted by a single significant pressure, while the remaining 695 (48%) are impacted by more than one significant pressures.

Forestry is deemed to be a significant pressure in 238 (16%) water bodies at risk of not meeting their WFD status objective. This equates to 215 rivers, 18 lakes and 5 groundwater bodies. The pressure is largely associated with clearfelling, drainage, and planting and establishment. The significant pressure is predominantly located in catchment headwaters and often coincident with catchment boundaries (Figure 5.2). Forestry may be the single pressure or act in combination with the following pressures: agriculture, urban waste water, hydromorphology (River bank erosion; embankments; overgrazing; dams, barriers, locks and weirs; land drainage; and channelisation) and peat extraction.

Table 5.10 Significant pressures identified as impacting on 'at risk' water bodies. (Note, an individual 'at risk' water body may be impacted upon by several significant pressures.)

Significant Pressure	Water Body Type					No. 'at risk' WBs impacted	%. 'at risk' WBs impacted
	River	Lake	Transitional	Coastal	Ground-water		
Agriculture	629	80	32	8	31	780	53
Hydro-morphology	329	10	6	-	-	345	24
Urban Waste Water	252	15	23	3	-	293	20
Forestry	**215**	**18**	**-**	**-**	**5**	**238**	**16**
Domestic Waste Water	137	15	6	2	6	166	11
Diffusion Urban	126	2	7	1	-	136	9
Peat	115	3	-	-	1	119	8
Other	107	52	8	2	21	190	13
Industry	78	3	1	1	18	101	7
Mines and Quarries	47	1	-	-	-	48	3

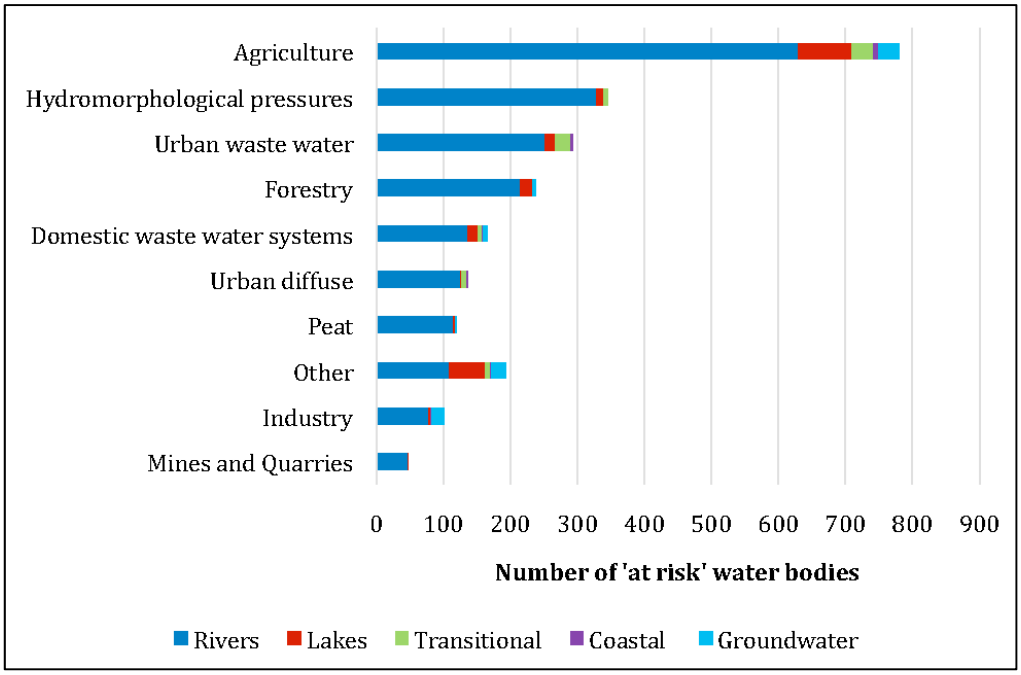


Figure 5.10 Significant pressures identified as impacting on 'at risk' water bodies. (Note, an individual 'at risk' water body may be impacted upon by several significant pressures.)

5.3.4.3 Water bodies with a high ecological status objective

Nationally, there are 384 river, lake, transitional and coastal water bodies that have a high ecological status (HES) objective, i.e. where the objective under the 2nd cycle of the WFD is to protect and restore high ecological status. HES objective water bodies therefore include water bodies currently at high status, and also water bodies earmarked to achieve high status. HES objective water bodies will remain (largely) fixed over the lifetime of the 2nd cycle of the WFD, as opposed to the database of high status sites, which may fluctuate, hopefully upwards in a consistent manner. This national number of 384 includes 319 river water bodies and 37 lake water bodies.

In total, 243 (63%) of these 384 water bodies are currently meeting their HES objective and therefore are 'not at risk'. A further 14 (4%) are 'at review'. However, 127 (33%) are 'at risk' of not meeting their HES objective and require further action.

In total, 124 river and lake water bodies are 'at risk' of not meeting their HES objective. Of particular relevance to forestry is that the risk profile for these is different to the general risk profile across all water bodies nationally. Forestry is identified as a significant pressure in 51 (40%) water bodies, followed by hydromorphology in 43 (34%), agriculture in 35 (28%), peat extraction or disturbances in 16 (13%), and domestic waste water in 13 (10%).

Figure 5.11 shows HES objective water bodies deemed to be 'at risk', where forestry is a significant pressure, either alone or in combination with other significant pressures.

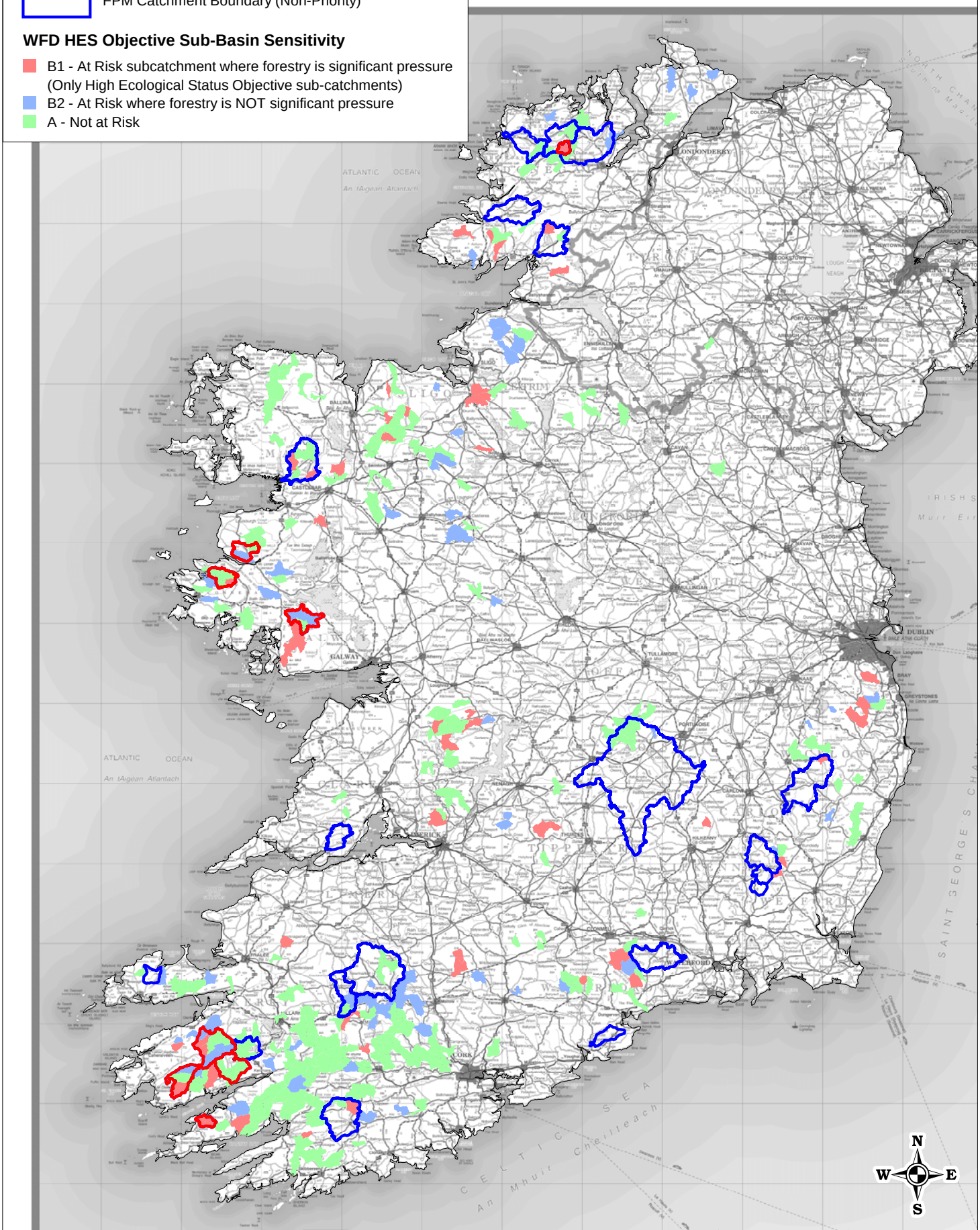
Map Legend

FPM Catchment Boundary (Priority)

FPM Catchment Boundary (Non-Priority)

WFD HES Objective Sub-Basin Sensitivity

- B1 - At Risk subcatchment where forestry is significant pressure (Only High Ecological Status Objective sub-catchments)
- B2 - At Risk where forestry is NOT significant pressure
- A - Not at Risk



Source: Environmental Protection Agency (EPA) www.epa.ie

MAP TITLE: **Water Sensitivity of HES Objective Catchments**		MAP NO.: **Figure 5.11**	SCALE: **1:1,900,000**
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5.3.4.4 High status rivers and lakes - principal actions for the 2nd WFD cycle

The following sets out the principal planned actions related to high status rivers and lakes:

- Existing measures, such as the GLAS scheme, forestry schemes and septic tank inspections will continue to promote the protection of high status waters. Uptake of these schemes in high status areas will continue to be promoted and a proportion of septic tank inspections will be weighted towards high status catchments.
- Recognising that protecting high status waters is a priority, a Blue Dot Catchments Programme will be developed and implemented. This will establish a network of river and lake catchments with the shared objective of protecting and restoring high ecological status waters. This programme will be delivered through local authority structures, integrating with wider implementation structures, and will facilitate focused deployment of resources to Blue Dot catchments.
- In addition to facilitating focused deployment of resources, the Blue Dot programme will facilitate public awareness and engagement including the development of community led catchment initiatives through Local Authority Water and Communities Office.

5.3.4.4.1 Principal forestry actions for the 2nd WFD cycle

In the context of the above, following sets out the principal actions relating to forestry:

- DAFM will implement the regulations, policies and requirements related to forestry which are being realigned with national water policy.
- Coillte, which owns over half of Ireland's forested lands, will continue to implement its integrated Environmental Risk Assessment approach to its forestry operations.
- DAFM will promote the uptake of the Native Woodland Establishment Scheme and the Native Woodland Conservation Scheme, and will finalise and launch the Environmental Enhancement of Forests Scheme.
- With regard to the protection of FPM populations from forestry pressures, DAFM will develop and implement the proposed Plan for Forestry & Freshwater Pearl Mussel in Ireland, and continue its engagement with the ongoing KerryLIFE project, with a view to assessing and adopting appropriate measures for possible wider application.
- The DAFM will work with other stakeholders, in particular local authorities, to ensure the strategic deployment of forestry measures to protect high status waters and to progress the other priorities set out in the River Basin Management Plan.
- DAFM and EPA will continue to undertake forestry and water research to inform future forestry practices for the protection and enhancement of water quality.

5.3.4.5 Existing Environmental Pressures and Problems for Hydrology and Hydrogeology

There are numerous impacts associate with Hydrology and Hydrogeology in the 27 no. FPM catchments. Intensive agricultural activities such as overstocking causing poaching, application of fertiliser/slurry, and land drainage can all contribute to nutrient enrichment and excessive siltation in watercourses, thereby impacting negatively on FPM. Forestry activities such as harvesting, drainage and fertiliser application can all have similar impacts. Discharges from waste water treatment

plants and septic tanks can cause significant problems with nutrient enrichment, causing a deterioration in water quality, and having a negative impact on FPM.

Likely Evolution in the absence of the Plan

Without the proposed plan, there would be little change to the hydrology and hydrogeology of the 27 no. FPM catchments. Existing legislation and guidelines offer some protection to water quality from forestry activities, however the opportunity to further reduce the potential forestry related impacts within these catchments would be lost.

5.3.5 Air Quality and Climate

5.3.5.1 Air Quality Standards

In 1996, the Air Quality Framework Directive (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) deals with sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- A third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, deals with polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air.

The Air Quality Framework Directive and the first three Daughter Directives have been replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality), which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for $PM_{2.5}$ (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM_{10}) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 5.11 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre (µg/m^3) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

Table 5.11 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: EPA)

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu g/m^3$)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1st Jan 2005

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m³)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	-	1st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 5.12 presents the limit and target values for ozone.

Table 5.12 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8 hour mean	120 mg/m³ not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m³
Protection of vegetation	AOT_{40} calculated from 1 hour values from May to July	18,000 mg/m³.h averaged over 5 years	6,000 mg/m³.h
Information Threshold	1 hour average	180 mg/m³	-
Alert Threshold	1 hour average	240 mg/m³	-

AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 µg/m³ and is expressed as µg/m³ hours.

5.3.5.2 Air Quality Zones

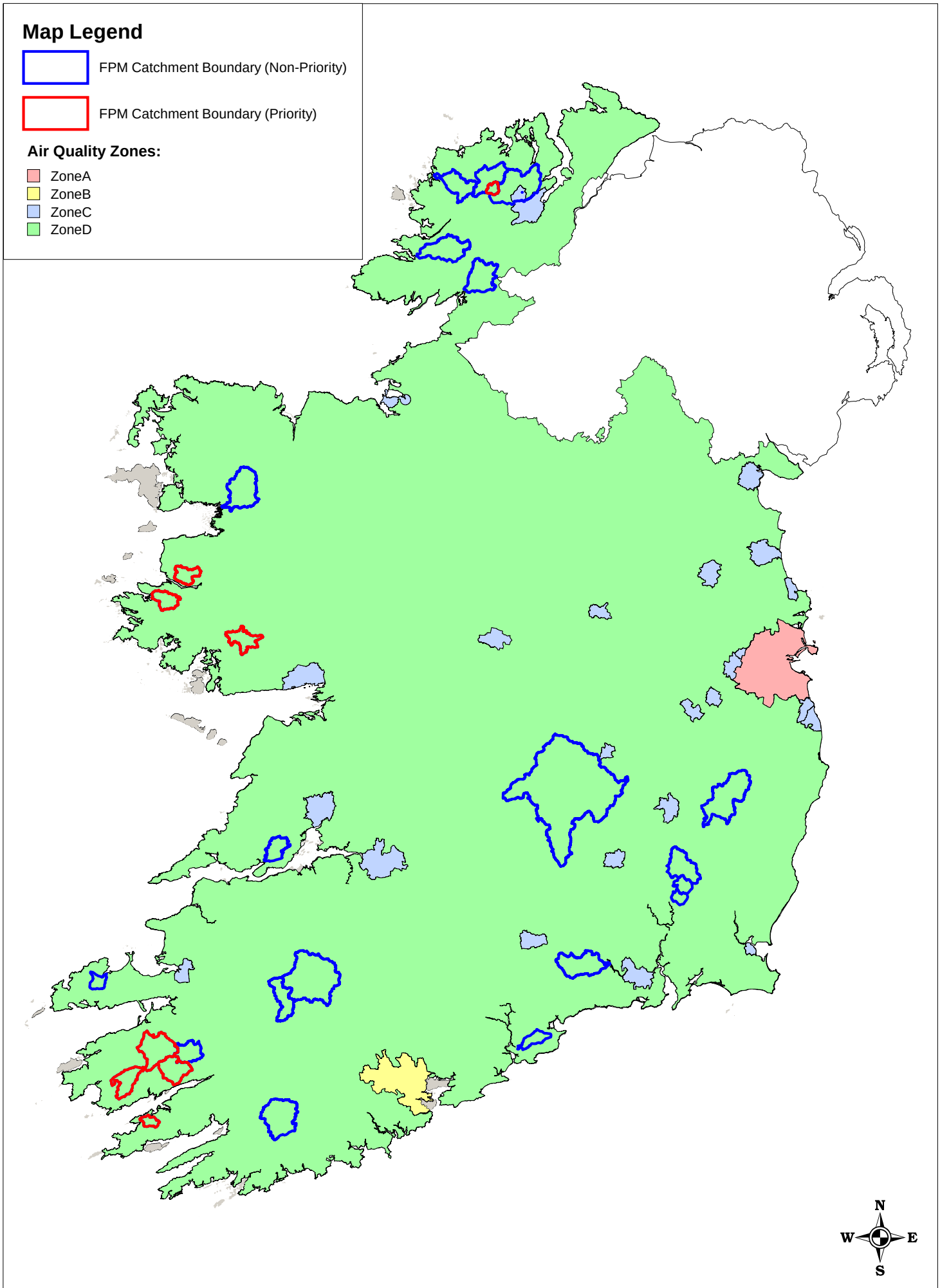
The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland as shown in Figure 5.12:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. Most of the Freshwater Pearl Mussel catchments lie within Zone D, with a small area of Zone C near Letterkenny. These zones represent rural areas located away from large population centres and large towns respectively.

The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. Concentrations within zones C and D are generally compliant with the Air Quality Standards limit values for pollutants. Zone C air quality is typical of urban areas, where traffic, industry and heating systems tend to contribute most to air pollution. Zone D tends to have very good air quality, away from major urban sources of many pollutants such as nitrogen dioxide, carbon monoxide and particulates. Ozone tends to be found at higher levels in rural areas, when compared with urban areas where nitrogen oxide acts as an ozone scavenger.

Excessive of nuisance pollutants (i.e. those not legislated for) such as odour and dust deposition usually only occur in areas surrounding industry or waste and wastewater treatment facilities.



Source: Environmental Protection Agency (EPA)
www.epa.ie

MAP TITLE: **Air Quality Zones**	MAP NO.: **Figure 5.12**	SCALE: **1:1,900,000**
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There are no significant concerns relating to air quality within any of the 27 no. Freshwater Pearl Mussel catchments. Works (such as construction) can cause some local nuisance with dust and particulate matter. Some local issues with odour can occur as a result of industry, and poor waste/wastewater treatment facilities.

5.3.5.3 Climate Change and Greenhouse Gases

Although climate change is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases such as carbon dioxide and methane in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel combined with increasing carbon fixation through forestry planting is essential to reduce concentrations of greenhouse gases and combat climate change.

5.3.5.3.1 Climate and Weather in the Existing Environment

Ireland has a temperate oceanic climate, resulting in mild winters and cool summers. The Met Éireann weather stations at Malin Head, Belmullet, Shannon Airport, Valencia, Cork Airport, Johnstown Castle and Kilkenny are the most relevant weather and climate monitoring stations to the 27 FPM catchments that have meteorological data recorded for 30-year periods. The wettest months are usually in winter, and early summer is usually the driest, while rainfall is usually highest in the west, particularly in upland areas. Mean annual rainfall varies from approx. 800mm to 2,800mm. Wind speeds for Ireland tend to be higher in winter than in summer, with the midlands having the lowest mean annual speed (approx. 4m/s), compared to the highest in the northwest (7m/s). The mean annual temperature for Ireland is approx. 9°C.

Climate change has the potential to alter the levels of precipitation within the catchments, resulting in pressures on water quantity therein. Any works or activities that require the use of fossil fuels which are to be undertaken within any catchment as part of the proposed plan will contribute to greenhouse emissions for the respective catchments.

5.3.5.4 Existing Environmental Pressures and Problems for Air Quality and Climate

On a broad scale, the predicted impacts of climate change are likely to have a negative impact on hydrology, particularly in relation to rainfall patterns. There are very few issues with air quality in the 27 no. FPM catchments due to their mostly rural settings, however, some localised threats may exist. Air quality (including odour), dust, noise and vibration may cause an issue adjacent to industrial sites (including waste treatment), or beside construction works. This may have negative impacts on watercourses in terms of habitat disturbance and sedimentation.

Likely Evolution in the absence of the Plan

As there are limited impacts from forestry on air quality and climate, in the absence of the proposed plan, the current situation is likely to continue.

5.3.6 Cultural Heritage

The purpose of this section is to assess the potential impacts of the proposed wind farm on the surrounding archaeological, architectural and cultural heritage landscape. The assessment is based on a desktop review of the available cultural heritage and archaeological data.

5.3.6.1 Statutory Context

5.3.6.1.1 Current Legislation

Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource. This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention). This was ratified by Ireland in 1997.

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource. These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under that Act. All registered monuments are included on the Record of Monuments and Places (RMP).

The Record of Monuments and Places (RMP) was established under Section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps. The Record of Monuments and Places affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004).

Under the Heritage Act (1995) architectural heritage is defined to include *'all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents…'*. A heritage building is also defined to include *'any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally'*.

5.3.6.1.2 Granada Convention

The Council of Europe, in Article 2 of the 1985 Convention for the Protection of the Architectural Heritage of Europe (Granada Convention), states that *'for the purpose of precise identification of the monuments, groups of structures and sites to be protected, each member State will undertake to maintain inventories of that architectural heritage'*. The Granada Convention emphasises the importance of inventories in underpinning conservation policies.

The NIAH was established in 1990 to fulfill Ireland's obligations under the Granada Convention, through the establishment and maintenance of a central record, documenting and evaluating the architectural heritage of Ireland. Article 1 of the Granada Convention establishes the parameters of this work by defining *'architectural heritage'* under three broad categories of Monument, Groups of Buildings, and Sites:

- **Monument:** all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including their fixtures and fittings;

- **Group of buildings**: homogeneous groups of urban or rural buildings conspicuous for their historical, archaeological, artistic, scientific, social or technical interest, which are sufficiently coherent to form topographically definable units;

- **Sites:** the combined works of man and nature, being areas which are partially built upon and sufficiently distinctive and homogenous to be topographically definable, and are of conspicuous historical, archaeological, artistic, scientific, social or technical interest.

The Council of Europe's definition of architectural heritage allows for the inclusion of structures, groups of structures and sites which are considered to be of significance in their own right, or which are of significance in their local context and environment. The NIAH believes it is important to consider the architectural heritage as encompassing a wide variety of structures and sites as diverse as post boxes, grand country houses, mill complexes and vernacular farmhouses.

5.3.6.2 Desktop Assessment

A primary cartographic source and base-line data for the archaeological assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP). All known recorded archaeological monuments are indicated on 6 inch Ordnance Survey (OS) maps and are listed in aforementioned records.

The following sources were consulted for this assessment report and sites mapped as shown on Figure 5.13:

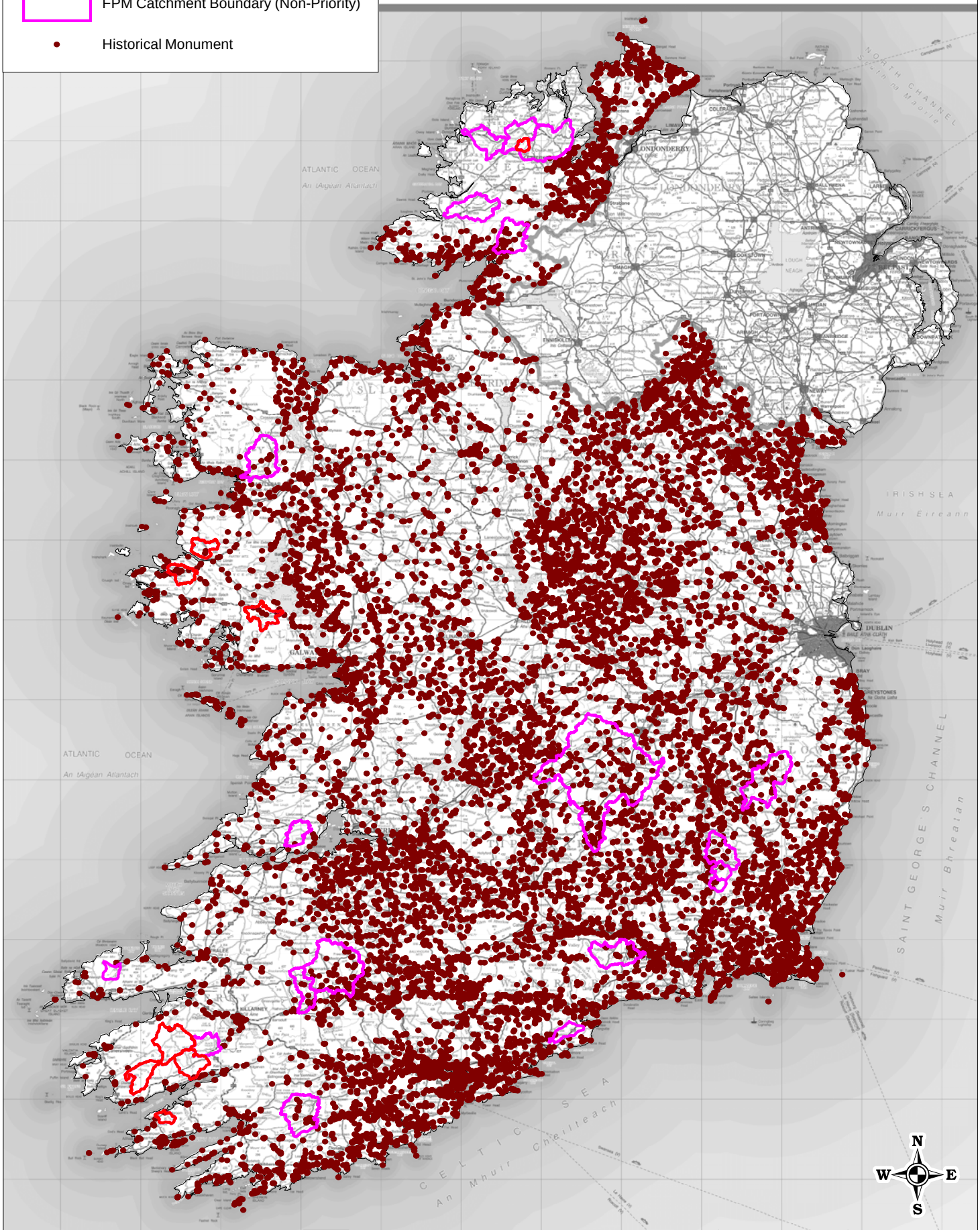
- The Record of Monuments and Places (RMP)
- National Inventory of Architectural Heritage (NIAH)
- UNESCO World Heritage List

5.3.6.2.1 Record of Monuments and Places

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP). All known recorded archaeological monuments are indicated on 6 inch Ordnance Survey (OS) maps and listed in this record. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments which may be accessed at www.archaeology.ie was also consulted.

Map Legend

- FPM Catchment Boundary (Priority)
- FPM Catchment Boundary (Non-Priority)
- Historical Monument



Source: www.archaeology.ie

MAP TITLE: **Cultural Heritage / Monuments**	MAP NO.: **Figure 5.13**	SCALE: **1:1,900,000**
PROJECT TITLE: **FS-DAFM FPM SEA AA**		DATE: **28-06-2018**
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5.3.6.2.2 National Inventory of Architectural Heritage (NIAH)

This source lists some of the architecturally significant buildings and items of cultural heritage and is compiled on a county by county basis by the Department of Arts, Heritage and the Gaeltacht. The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the Department of Arts, Heritage and the Gaeltacht and established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.

The purpose of the NIAH is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently, as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for the Arts, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS). The published surveys are a source of information on the selected structures for relevant planning authorities. They are also a research and educational resource. It is hoped that the work of the NIAH will increase public awareness and appreciation of Ireland's architectural heritage.

5.3.6.2.3 UNESCO World Heritage List

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage List provides a list of cultural and natural heritage sites around the world considered to be of outstanding value to humanity.

The results of the SMR/RMP and NIAH consultations for all 27 no. Freshwater Pearl Mussel river catchments are given in Table 5.13. There were no UNESCO world heritage sites found in any of the 27 no catchments.

Table 5.13 Sites of Cultural Heritage significance within the 27 no. catchments.

Catchment	RMP	NIAH*
Bandon/Caha	224	60
Clady	9	-
Newport	31	33
Dawros	12	15
Cloon	35	1
Owenmore	64	1
Owenriff	19	21
Owentaraglin	175	9
Clodiagh	175	105
Nore	1,398	331
Dereen	233	40
Licky	14	2
Mountain	113	39
Ballymurphy	55	1
Aughavaud	32	2
Currane	88	-
Ownagappul	75	1
Caragh	132	1
Kerry Blackwater	193	2
Gearhameen	94	-
Allow	791	84

Bondorragha	8	2
Owencarrow	2	-
Glaskeelan	4	-
Leannan	152	-
Owenea	31	-
Eske	31	44

* NIAH data is currently in the process of being digitised for some Counties and parts of Counties, therefore these figures do not include the catchments or parts of catchments in Counties Donegal, Mayo, Galway, Limerick, West Cork and Wexford.

The Underwater Archaeology Unit is currently compiling a national underwater archaeology database. Some of these monuments may be relevant to the Freshwater Pearl Mussel catchments.

Archaeological heritage is a non-renewable resource. The overall objective of the proposed plan should ensure that the archaeological heritage will be available for future generations.

Architectural and cultural heritage is a non-renewable resource. The cultural heritage items identified in this report are not currently subject to any statutory protection by their inclusion in the RPS or RMP. However some of the items do add value to the cultural heritage of the area and should be preserved where possible to ensure that the built heritage will be available to future generations.

5.3.6.3 Existing Environmental Pressures and Problems for Cultural Heritage

There are numerous threats to the existing cultural heritage resource throughout Ireland. The landscape setting of the individual sites is one such impact, with cumulative impact being an important factor. Afforestation with commercial monocultures can significantly alter the landscape setting of individual archaeological sites. Direct damage to archaeological sites is also a notable threat, particularly when the sites are undocumented.

Likely Evolution in the absence of the Plan

Without the proposed plan being implemented, the current practice of afforestation and other forestry related activity will continue. The opportunity to increase the use of measures such as CCF and larger setback areas, thereby reducing the impact that forestry can have on cultural heritage, will be lost.

5.3.7 Landscape

Throughout Ireland, local authorities are responsible for designating their own scenic/protected views, areas of high scenic amenity or areas of outstanding natural beauty, which usually occurs as part of a development plan.

In 2000, the Department of the Environment and Local Government built on this document by producing *'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities'*, which recommended that all Local Authorities adopt a standardised approach to landscape assessment for incorporation into Development Plans and consideration as part of the planning process.

The European Landscape Convention, also known as the Florence Convention, promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues. The Convention was adopted on the 20 October 2000 and came into force on the 1 March 2004. It is the first

international treaty to be exclusively concerned with all dimensions of European landscape. The Convention was ratified by Ireland in 2002, and has now been ratified by thirty-eight countries. The Convention introduced a European-wide concept centring on the quality of landscape protection, management and planning. The Convention covers natural, urban, peri-urban and rural areas, encompassing land, inland water, coastal and marine areas. It deals with every-day and degraded landscapes, as well as those that can be considered outstanding. In other words, it recognises the importance of all landscapes, and not just exceptional landscapes, as having a crucial bearing on quality of life and as deserving attention in landscape policy.

The National Landscape Strategy (described further in Section 4.3.5 above) is Ireland's way of meeting our obligations and delivering on the objectives under the European Landscape Convention. Its implementation can also assist Ireland in complying with United Nations, EU and national targets to foster sustainable development along with the implementation of other plans and policies.

There are limited pressures on landscape as a result of current water management activities within the 27 no. Freshwater Pearl Mussel catchments. Any current pressures are limited to impacts to sensitive views due to the poor location of development, including water related infrastructure.

The Forestry and the Landscape Guidelines have been developed through extensive consultation with a wide range of relevant parties. They set out sound and practical measures based on the principles of Sustainable Forest Management (SFM), and are firmly rooted in the best available information. The guidelines will be kept under review to facilitate amendment in the light of new research findings. To ensure the successful implementation of SFM in Ireland, it is important that forest owners adhere to the guidelines and undertake all work in a way which is compatible with the protection of the environment. The guidelines describe a range of measures intended to cover all situations relating to forestry and the landscape. Not all of the measures outlined will be applicable to every site. However, it is the responsibility of forest owners to identify and apply those measures which are appropriate to their particular forest. The guidelines apply to all grant-aided projects and to all activities associated with a Felling License. Any breach may result in the forfeit of grant aid and premium payment or the withdrawal of a Felling License.

Ireland's landscape character varies considerably in regard to both landform and landcover. Any approach to forest landscape planning and design should therefore deal with the forest in the context of the surrounding landscape, and aim at achieving a sympathetic response to the distinctive landscape character of that given location. The Forestry and the Landscape Guidelines deal with factors such as size, arrangement, location, shape, pattern, proportion, edge, margin, texture and colour. The Guidelines also provide recommendations for various forest development scenarios and for four distinct landscape character types commonly found in Ireland, namely:

i. rolling moorland;
ii. rolling fertile farmland;
iii. drumlins;
iv. mountain and farmland complex.

Under each of the above, guidelines on the preferred size, arrangement, location, shape pattern, proportion, edge, margin colour and texture are provided for

afforestation of sites. In addition, guidance is given for the landscape character types for forestry felling activities.

The landscape associated with the 27 no. FPM catchments is widely varied, ranging from relatively flat lowlands to mountainous uplands. In order to look at the landscape of each catchment, Table 5.14 details the main Landscape Character Areas LCA) and Landscape Character Types (LCT) for each, where available.

Table 5.14 Landscape Character Types (LCT) and Landscape Character Areas (LCA) for each of the 27 no. catchments.

Catchment	Main LCTs	Main LCAs
Bandon/Caha	Rolling Marginal Middleground, Glaciated Cradle Valley, Broad Fertile Lowland Valleys	Dunmanway (Semi-rugged and marginal mosaic basin), Cousane Gap East (Serrated ridge and upper moorland valley), Shanlaragh (Middle valley of rugged moorland and patchwork moraines), Cullenagh Lake (Glaciated cradle, serrated forested ridge and middle valley)
Clady	Mosaic including mostly: 0-200 metre Atlantic Blanket Bog, 200-300 metre Mountainous Blanket Bog, 300 metre Highland Blanket Bog, Lakes, Natural Grassland	Derryveagh Mountains, Bloody Foreland Uplands and Coast, Tory Sound
Newport	Uplands, Moors, Heath or Bog; Lowland Coastal Zone	North Mayo Mountain Moorland, Central Mayo Mountain Moorland
Dawros	*None listed*	Connemara National Park (including Lough Fee, Lough Inagh and Derryclaire Lough)
Cloon	Farmed Rolling Hills, Farmed Lowland Ridges	Shannon Estuary Farmland, Kilrush Farmland
Owenmore	*None listed*	Brandon Bay
Owenriff	*None listed*	East Connemara Mountains (Moycullen, Recess to Glinsk)
Owentaraglin	Broad Marginal Middleground Valleys	Newmarket (Fissured and hilly mosaic farmland), Upper Blackwater (Moorland ridge and undulating mosaic farmland upper-middle valley)
Clodiagh	N/A	N/A
Nore	Laois: Mountain Areas, Hills and Upland Areas, Lowland Agriculture Areas, Rolling Hills, Peatland Areas. Kilkenny: Transition Zone, Lowland, Upland Tipperary: *None listed*	Laois: *None listed* Kilkenny: Slieveragh Hills (North and South), Slieverage Western Transitional Zone, Slieverage Central Transitional Zone, Castlecomer Plateau, Castlecomer Western Transition, Kilkeny Northern Basin Tipperary: The Plains, The Foothills

Dereen	Carlow: Rolling Rough Grazing, Farmed Ridges, Farmed Lowland Wicklow: Rolling Lowlands, Transitional Lands (5-AHA), Mountain Uplands (1-AONB)	Carlow: River Slaney – East Rolling Farmland Wicklow: *None listed*
Licky	N/A	N/A
Mountain	Rolling Rough Grazing, Uplands, Narrow River Valley, Farmed Lowland	Blackstairs and Mount Leinster Uplands, Central Lowlands
Ballymurphy	Rolling Rough Grazing, Uplands, Farmed Lowland	Blackstairs and Mount Leinster Uplands, Central Lowlands
Aughavaud	Rolling Rough Grazing, Uplands, Farmed Lowland	Blackstairs and Mount Leinster Uplands, Central Lowlands
Currane	*None listed*	Inny Valley
Ownagappul	Rugged Ridge Penninsulas	Glenbeg Lough (V-shaped lake valley), Ardgroom (Rugged ridge and rocky march with hump-back coastal fringe)
Caragh	*None listed*	Lough Caragh and Inner Highlands
Kerry Blackwater	*None listed*	River Blackwater Valley
Gearhameen	*None listed*	MacGillycudy Reeks, Lough Leane and Killarney National Park
Allow	Broad Marginal Middleground Valleys, Fissured Marginal and Forested Rolling Upland	Newmarket (Fissured and hilly mosaic farmland), Upper Blackwater (Moorland ridge and undulating mosaic farmland upper-middle valley), Rockchapel (Marginal moorland and forested hills)
Bondorragha	Uplands, Moors, Heath or Bog	South West Mountain Moorlands
Owencarrow	Mosaic including mostly: 0-200 metre Atlantic Blanket Bog, 200-300 metre Mountainous Blanket Bog, 300 metre Highland Blanket Bog, Lakes, Natural Grassland, Forest	Derryveagh Mountains, Glenlough Uplands
Glaskeelan	Mosaic including mostly: 0-200 metre Atlantic Blanket Bog, 200-300 metre Mountainous Blanket Bog, 300 metre Highland Blanket Bog, Forest	Derryveagh Mountains, Churchill
Leannan	Mosaic including mostly: 0-200 metre Atlantic Blanket Bog, Forest, Agricultural Arable and Pasture	Churchill, Lough Fern, South Fanad Uplands and Coast, Ramelton Swilly Coast

Owenea	Mosaic including mostly: 0-200 metre Atlantic Blanket Bog, 200-300 metre Mountainous Blanket Bog, Forest, Upland Heath and Moorland, Agricultural Riverine	Fintown Valley, Bluestack, Ardera Bays & Coast
Eske	Mosaic including mostly: 200-300 metre Mountainous Blanket Bog, 300 metre Highland Blanket Bog, Forest, Upland Heath and Moorland, Agricultural Riverine, Agricultural Foothills	Bluestack, Lough Eske, Donegal Bay Drumlins, Croaghnameal Boarder and Uplands

5.3.7.1 Existing Environmental Pressures and Problems for Landscape

The primary pressure relating to Landscape from forestry related activities is visual amenity. Where forestry has been planted in locations and patterns that are unsympathetic to the surrounding environment, this can have a negative impact on landscape.

Likely Evolution in the absence of the Plan

In the absence of the proposed plan, the current forestry related activities and afforestation patterns (including reforestation) would continue.

5.3.8 Material Assets

The term 'Material Assets' has not been define in the SEA Directive, but is defined in the 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003) as 'resources that are valued and that are intrinsic to specific places'. This includes cultural assets, economic assets of natural heritage, and economic assets of human origin. The cultural assets of Archaeology and Cultural Heritage are addressed in Section 5.3.6 of this ER. Economic assets of natural heritage include non-renewable resources such as minerals or soils, and renewable resources such as wind and water. These assets are addressed in Section 5.3.3: Land, Soils and Geology, Section 5.3.4: Hydrology and Hydrogeology, and Section 5.3.5: Air Quality and Climate. Tourism and amenity, which are also considered material assets, are addressed in Section 5.3.2 on Population and Human Health. The Population and Human Health chapter also addresses the baseline data in terms of employment and economic activity, and land-use. The sections below include a summary at a high level of the

5.3.8.1 Water Abstraction

Water treatment plants are located throughout the country to take water from the ground or rivers, and treat it for human consumption. Table 5.4 lists the number of water treatment plants that are located within each of the 27 no. FPM catchments.

5.3.8.2 Waste Water

Urban Waste Water Treatment Plants (UWWTP) are located in towns and cities across Ireland. Table 5.4 details the distribution of these UWWTP's in relation to the 27 no. FPM catchments. In general nationally, the western areas have fewer UWWTP's than

elsewhere, and the larger design volume plants are focused on the Dublin and the surrounding counties, along with other cities and major towns, as would be expected. While there are a number of UWWTP's in the 27 no. pearl mussel catchments, these all have small design volumes (<10,000 population equivalent).

5.3.8.3 Flood Defense

There are a number of Office of Public Works Drainage Schemes which have been (or are being) carried out, however, none of these relate to the 27 no. FPM catchments. The OPW has an online mapping tool (http://maps.opw.ie/drainage/map/) to show the location of drainage districts, channelization works, embankments and benefitting areas. Under the OPW, there have been 29 no. drainage schemes carried out nationally since the 1940's, with 647,050 acres of lands benefitting from these works. Some minor drainage works are carried out under the Planning and Development Regulations by local authorities.

5.3.8.4 Damming

There are a number of hydroelectric power stations in Ireland. These were typically built on the larger catchment rivers which have a more consistent flow rate. One of the most widely known examples of such a dam is Ardnacrusha in Co. Limerick.

Other minor structures such as weirs and fish passages are more numerous, and while they may not all be causing a significant problem for fish passage, this is not yet fully understood. Current research is underway under the AMBER project (Adaptive Management of Barriers in European Rivers) to better understand the problems posed by such structures.

5.3.8.5 Navigable Waters

The navigation authority for the Inland Navigable Waterways of Ireland is Waterways Ireland. These water bodies include the Barrow Navigation, the Erne System, the Grand Canal, the Lower Bann, the Royal Canal, the Shannon Erne Waterway and the Shannon Navigation. Waterways Ireland has responsibility for approximately 1000 kilometres of inland waterways between Northern Ireland and Southern Ireland, and these waterways are principally used for recreational purposes.

The following legislation applies to Ireland's inland waterways;

- Shannon Navigation Act, 1990
- Shannon Navigation (Extension of Limits of Navigation) Bye-laws, 1991
- Shannon Navigation Bye-laws, 1992
- Shannon Navigation (Construction of Vessels) Bye-laws, 1992
- Shannon Navigation (Extension of Limits of Navigation) Bye-laws, 1998
- Ireland's Inland Waterways – Navigational Information
- Canals Act, 1986
- Canals Act, 1986 Bye-laws, 1988
- The Merchant Shipping (Mechanically Propelled Pleasure Craft) (Safety) Regulations, 2001
- Lough Erne (Navigation) Bye-laws (Northern Ireland), 1978 (and subsequent Amendment)
- Bye-laws (Northern Ireland), 1968

5.3.8.6 Fisheries

Shellfish (including mussels, oysters and scallops) production occurs in many areas around Irelands coast, including river estuaries where contaminants in the rivers may

have an impact at the shellfish farms. There are in excess of 2,000 commercial aquaculture activities registered around Ireland which produce shellfish (Ireland's Marine Atlas: http://atlas.marine.ie). As these (such as mussels) are filter feeders, there is a greater likelihood that they might bioaccumulate the contaminants. In order to harvest shellfish for safe human consumption, a number of water parameters (such as pH, temperature, suspended solids, colour, salinity, dissolved oxygen, hydrocarbons, organohalogenated substances, dissolved metals and fecal coliforms) must be within strict limits. Most of Ireland's approximately 181 commercial fisheries are located along the west coast of Ireland. These fisheries include drift netting, crustacean pots and trawling.

The rivers, lakes and estuaries of Ireland also provide a significant resource for angling and related tourism, both in terms of trout and salmon angling, and coarse angling (for species such as roach, perch, and pike). The 27 no. FPM catchments which are relevant to the Plan are likely to be regularly used for angling, though specific data on the use of each catchment is not available. Any improvement of water quality which occurs as a result of the correct implementation of the plan is likely to also have beneficial effects for many of the fish stocks, particularly the salmonid species.

5.3.8.7 Mines, Quarries and Landfills

There are a number of active quarries located nationwide, with the distribution of quarries within the 27 no. FPM catchments detailed in Table 5.8. These represent active locations of rock extraction, mostly for the construction industry. Table 5.6 also gives information of the distribution of mines within each of the 27 no. FPM catchments. The distribution of both active quarries and mineral locations is in general quite dispersed on a national scale.

The number of municipal waste landfills operating in Ireland has been reducing in recent years, with 7 no. in operation in 2016, compared with 25 no. in 2010. In addition to municipal waste landfills, a larger number of Licensed Facilities process the waste for recycling, reuse, recovery or disposal. The distribution of these facilities through the 27 no. FPM catchments is detailed in Table 5.4.

5.3.8.8 Industrial activities

Industrial activities of a variety of types can be found throughout Ireland. These can have a variety of emissions depending on their site activity, but any site that does involve industrial emissions will require an IPPC license, which involves regular monitoring of these emissions. Table 5.4 gives information on the numbers of such facilities in the 27 no. FPM catchments. Minor emissions such as those from vehicles or central heating boilers would not be included in this licensing process.

5.3.8.9 Traffic and Transportation

For the Plan, the planting, road building, thinning and harvesting phases of any given forestry land parcel are the critical periods with respect to the traffic effects experienced on the surrounding road network in terms of the additional traffic volumes that will be generated. The requirements of the additional forestry related traffic generated during the construction stage should be assessed on a site by site basis. If an ER or EIAR are required, they would include details of any likely impacts that a forestry activity might have on local road networks.

The magnitude of any increase in traffic volumes experienced on the surrounding network is identified during the various construction stages of the Proposed

Development. If required, a traffic management plan can be provided to ensure that any impact to the local road network are minimised.

5.3.8.10 Existing Environmental Pressures and Problems for Material Assets

The expansion of urban areas, and built services (including water treatment and distribution, and wastewater systems) may be putting pressures locally on sensitive environmental receptors. Waste water discharge points can cause nutrient enrichment downstream, particularly where the treatment plants are operated above their capacity.

Likely Evolution in the absence of the Plan

In the absence of the proposed plan, there would be no change to the existing practices.

6 ENVIRONMENTAL PROTECTION OBJECTIVES AND SEA FRAMEWORK

6.1 Developing SEA objectives, targets and indicators

6.1.1 SEA Objectives

When determining the objectives for this SEA process, there were three objective types found: objectives of the plan, objectives for the environment (from a local to a national level), and the objectives to test the effects of the Plan for Forestry and Freshwater Pearl Mussel in Ireland on the whole environment (these are known as SEA objectives).

The appropriateness of the objectives of the SEA is decided on based on any other relevant plans and policies, the baseline setting and the consultation responses to the scoping document. Table 6.1 shows the Strategic Environmental Objectives chosen for this SEA. The development of these objectives was based on the current knowledge of environmental issues and policies, comments received during the scoping process and dialogue between the SEA team and the Forest Service team preparing the plan.

6.1.2 SEA indicators and targets

Targets and indicators are used as a means of measuring the effectiveness of the plan, and any environmental effects that the plan may have had. Targets are used alongside objectives to ensure that the objectives of the plan (in addition to the SEA objectives) were met. These targets are then tracked using indicators. The targets and indicators that were chosen for this SEA were selected based on the possibility of making the link between the plan and the environment, in addition to using easily available data. These targets and indicators were also formulated to keep in mind existing national targets and indicators, such as those in the National Biodiversity Action Plan, etc.

All of the above Strategic Environmental Objectives have been examined for any conflicts, and were found to be in general compatible with one another. Some objectives are not directly linked to one another (e.g. no direct link between protecting cultural heritage resources and maintaining/achieving water quality standards), while others do have a more obvious link (there no major conflicts between protecting soil, aquatic and terrestrial biodiversity and protecting the risk to human health through the water resource).

Table 6.1 SEA Objectives, Targets & Indicators

Objective	Target	Indicator
Objective 1: Biodiversity, Flora & Fauna: To protect, maintain and (where necessary) restore the EU designated habitats and species, particularly the Freshwater Pearl Mussel and its associated habitats	▪ To ensure that forestry does not cause (or contribute to) the degradation of habitat quality for FPM, and to ensure that it does not prevent the improvement of habitat quality for FPM. ▪ To not impede the return of FPM catchments to favourable population status	▪ Water Quality Status ▪ FPM surveys ▪ Analysis of actual forestry activities including types of species planted within FPM catchments following implementation of the proposed Plan
Objective 2: Population & Human Health: To contribute to better quality water supplies for human consumption, while also promoting sustainable development of rural areas	▪ To ensure that the plan does not contribute to a degredation in water quality where water is abstracted for human consumption	▪ EPA Water Monitoring
Objective 3: Soils & Geology: To avoid damage to the function and quality of the geology and soil resource	▪ To reduce sediment runoff from forestry sites in FPM catchments	▪ EPA Water Monitoring
Objective 4: Hydrology: To protect, maintain and (where necessary) restore water quality in surface and ground water bodies	▪ To improve water quality of runoff on forestry sites (lower concentrations of nutrients, etc.)	▪ EPA Water Monitoring
Objective 5: Air Quality: Minimise emissions of pollutants and greenhouse gases to atmosphere.	▪ To avoid any degradation in air quality	▪ Monitor the future trend in Air quality near the catchments
Objective 6: Cultural Heritage: To ensure the protection of historical monuments, buildings and landscapes	▪ To avoid any increased risk of direct or indirect impact to any cultural heritage feature	▪ Analysis of Conditions applied in Forest Service consents related to Archaeology & Cultural Heritage
Objective 7: Landscape: To protect and maintain Irish landscape character and visual amenity	▪ To maintain the landscape value of regions while developing a sustainable forestry industry	▪ Analysis of the forestry consents in particular clearfelling and afforestation species

Objective	Target	Indicator
Objective 8: Material Assets: To support sustainable activities without conflicting with the other objectives listed above	▪ To increase the rate of land being sustainably afforested	▪ Monitor the area granted approval for afforestation & species type.

7 CONSIDERATION OF ALTERNATIVES

7.1 Introduction

The SEA Directive states that the SEA Environmental Report should be prepared in which the *likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme are identified, described and evaluated*. The reasonable alternatives to be assessed as part of the process should be as realistic, practical and constructive as possible, and should incorporate as best as possible the objectives of the plan. It is possible that multiple alternative layers may exist, particularly for complex large-scale plans. The process should refer to the possible mechanisms that could be used, and the potential impacts of each of these mechanisms.

The development of alternatives must also take account of the following documents:

- Developing and Assessing Alternatives in Strategic Environmental Assessment (EPA, 2015)
- Implementation of SEA Directive (2001/42/EC): Assessment of the Effects of Certain Plans and Programmes on the Environment (DEHLG, 2004)

Further to the above, in order to ensure the most beneficial input into the SEA process, the consideration of alternatives should take place as early as possible.

7.2 Approach to Alternatives

There were a number of reasonable alternatives considered throughout the SEA process for this plan. As with the proposed plan, the alternatives were based on the same strategic level and broad scale.

The delivery mechanisms used for plans such as the Plan for Forestry and Freshwater Pearl Mussel in Ireland are often restricted by the necessity to adhere to European legislation. In the case of this plan, any mechanisms used must meet the requirements and conditions of the Habitats Directive and the Water Framework Directive. National legislation such as the Forestry Act 2014 must also be satisfied, and regional and local plans must also be considered.

7.3 Alternatives Considered

The following three scenarios were considered as part of the SEA for the Plan for Forestry and Freshwater Pearl Mussel in Ireland.

7.3.1 Scenario 1

Continue with the current forestry regulations that are already in place for the 27 no. FPM catchments

This option is essentially the do-nothing option, as it would involve no change to the current practice. Currently it is thought that forestry may potentially have a negative impact on some water bodies, through factors such as acidification and sedimentation. This may result in a continued decline in the habitat quality of the 27 no. FPM catchments, and an associated decline in the populations within these catchments. Currently just a single river catchment (the Bundorragha) has a favourable status for FPM, with the remaining 27 no. catchments being unfavourable.

As afforestation increases within the catchments, any potential for forestry-related impacts would increase, and so have an increasing potential negative impact for FPM.

7.3.2 Scenario 2

Apply additional measures to only the 8 no. FPM catchments which have the best FPM population viability to protect aquatic habitats and FPM, with commercial forestry to be allowed only in low risk sites. The remaining 19 no. FPM catchments would continue with the current forestry regulations that are already in place

This Option should prevent any increase in the pressure caused by forestry on water quality in the 8 no. priority FPM catchments. However, there would be no increased protection offered to the FPM populations in the other 19 no. FPM catchments as a result of the measures. In the long term (as forestry reaches the end of rotation), it will prevent any potential for negative impact caused by forestry, and the associated activities such as harvesting in the priority 8 no. FM catchments. Replacing some of the commercial forestry in these catchments with other forest regimes (such as native woodlands or buffer zones) will further aid in protecting aquatic habitats here. While this option should reduce the potential for negative impacts on FPM in the priority 8 no. catchments, it will not have any effect of the remaining 19 no. catchments.

7.3.3 Scenario 3

Apply additional measures to all 27 no. FPM catchments to protect aquatic habitats and FPM, with commercial forestry to be allowed only in low risk sites

This option is the most likely to have a significant positive impact on all FPM populations, as existing forestry plantations will be modified to prevent any potential negative impact on water quality in a gradual manner. Native woodland could be used more extensively and would replace many of these commercial forestry areas, which would have beneficial impacts on water quality.

7.4 Preferred Alternative

Scenario 3 above is likely to have the most beneficial impact on FPM populations in the 27 no. catchments and is considered the Preferred Approach. There will be direct and indirect benefits for Biodiversity, Flora and Fauna, Population and Human Health, Land, Soils and Geology, Hydrology, Landscape and Material Assets associated with this option, all of which are discussed in Section 8 below.

8 DETAILED ASSESSMENT OF PREFERRED SCENARIO

From the three strategies provided in Section 7, there was one identified as the preferred strategy, Scenario 3. This preferred strategy will be assessed below. A number of issue areas have been identified for which a variety of measures have been compiled to ensure that the plan does not cause any negative impacts. These measures are:

- A new FPM Management Framework (consenting system)
- A proposed water management Model to be employed
- Awareness Raising &Training
- Monitoring

An objective-based approach is used below to assess the Plan. The following indicators will be used for this assessment:

- A "+" symbol indicates a potentially positive environmental impact
- A "-" symbol indicates a potentially negative environmental impact
- "+/-" indicates a potential for both positive and negative environmental impacts to occur
- "0" indicates a potentially neutral environmental impact or no impact

8.1 Assessment Parameters

As set out in the SEA Directive, the all impact durations must be considered during the assessment. In this regard, impacts can have short, medium or long-term impacts.

The growth of forestry is inherently a medium to long-term process, and therefore many of the impacts of this plan will be similar. Short term impacts are likely to be associated with site works

Cumulative impacts have the potential to arise when numerous individually insignificant impacts are considered together as a whole. In doing do, they may together be found to have a significant impact. Synergistic impacts occur when the sum of each individual impact is exceeded by the overall total impact. These impacts are assessed in the following sections.

Each impact is described in terms of its quality, significance, duration and type, where possible. A 'Do-Nothing' impact is also predicted in respect of each environmental theme in the EIAR. Residual impacts are also presented following any impact for which mitigation measures are prescribed, and the likely significant effects are identified. The remaining impact types are presented as required or applicable throughout this SEA Environmental Report.

8.1.1 Integration of SEA and AA with the plan

The teams that carried out the SEA and AA assessments provided advice and held discussions with the FS-DAFM team that produced the Plan for Forestry and Freshwater Pearl Mussel in Ireland. These discussions and advice influenced the evolution of the plan from the initial ideas into the current draft plan. The ER and AA teams provided advice and assistance specifically on topics such as:

- Potential issues with prioritisation of 8 no. FPM catchments – this resulted in the plan being applied to all 27 no. catchments, while the site risk and operations form will help the forester to determine the most suitable measures to be applied.
- Simplification of the plan, removing some unnecessary sections that may lead to confusion.
- Advised on the nature of the Site Risk Forms and Site Operation Forms.
- Advised on the levels of site inspections required and competency of personnel to ensure a robust assessment of applications at the project level
- Correction of typographical errors

The original plan proposed by the FS-DAFM was similar to the Scenario 2 listed in Section 7.3 above. This involved the Management Framework only applying to the 8 no. priority catchments. Once the initial scoping had been carried out, and following discussions, it was decided to apply the Management Framework to all 27 no. catchments as they are all legally designated and therefore equal. The risk assessment procedure will allow the correct measures to apply to each individual site. This will result in the most effective plan and will offer the highest protection to the FPM populations of all 27 no. FPM catchments, while minimising the potential negative impacts to timber production, and economic activity in each.

The AA and NIS were prepared in parallel with this ER, but in different documents. The AA screening report was prepared in accordance with the European Commission guidance document Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2001) and the Department of the Environment's Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009, amended February 2010). Other information relating to the AA methodology and other guidelines referenced during the preparation of the AA screening report can be found in the AA document itself.

8.2 Assessment of measures of the preferred scenario

Section 4 of the Plan describes the current application process for forestry related activities. This applies to the entire country, including the 27 no. FPM catchments. The safeguards and environmental considerations will be retained for the entire country, but for sites within the 27 no. FPM catchments, this plan will form an additional layer of protection.

A central driver of the proposed Plan is a model for forestry within these areas, achieved principally through appropriate afforestation and forest restructuring at the clearfell / reforestation stage, and delivering a permanent buffer along the watercourse comprising an undisturbed setback and native woodland habitat realised with minimum site inputs and to be managed under continuous cover forestry. These features combined deliver a wide range of ecosystem services that directly benefit water quality and the aquatic habitat for FPM, namely:

- reduction in sediment mobilisation and runoff into watercourses
- interception of nutrient runoff into watercourses
- bank stabilisation
- food input into the aquatic ecosystem
- shading / cooling
- regulation of floodwater

- mitigating acidification

This model is set out in Section 5 of the plan, "A Model for Woodlands and Forests within FPM Catchments", details the additional protections that will be applied to these areas.

The practical implementation of the plan allowed for through the use of the Management Framework. It is simplified in the form of a schematic diagram (Figure 2.1) which illustrates an example (rather than an exhaustive list) of some practical features of the plan which could be implemented on any forestry site as required. The following features include not only those illustrated in Figure 2.1, but also additional policies which would be implemented:

- Management Framework – Site Risk Form & Site Operations Form
- Proposed Model
  This includes the possible use of practical features such as:
  - Water setback
  - Continuous Cover Forestry Zone
  - Commercial Forest Zone (or other)
  - Drain treatment
  - Natural vegetation within the water setback
  - Tree cover within the water setback
- Monitoring regime
- Training and awareness raising

These features will be used in Table 8.1 below and the following discussion to assess the impact of the plan.

Table 8.1 Assessment of the features of the Plan for Forest and FPM in Ireland

Feature	BFF	PHH	LSG	Hyd	AQC	CH	Lnd	MA
Management Framework	+	+	+	+	0	+	+	+/-
Proposed Forestry Model	+	+	0	+	0	0	0	+
Monitoring regime	+	0	0	+	0	0	0	0
Training and awareness raising	+	+	0	+	0	0	0	0

Legend: BFF = Biodiversity, Flora and Fauna; PHH = Population and Human Health; LSG = Land, Soils and Geology; Hyd = Hydrology; AQC = Air Quality and Climate; CH = Cultural Heritage; Lnd = Landscape; MA = Material Assets.

8.2.1 Management Framework

A key component of the Plan is the use of a new Forestry & FPM Forest Management Framework. This Framework will replace the existing Forest & FPM Requirements (2008) document and will be applied to all forest activities regulated by DAFM under the Forestry Act 2014, without or without grant aid (i.e. afforestation, forest road construction, felling and aerial fertilisation), where overlap with a FPM catchment occurs.

The Framework applies to forestry applications within all 27 FPM hydrological catchment. The function of the Framework is to enable Applicants and Registered Foresters to evaluate the degree of sensitivity regarding FPM, and to select the most appropriate approach regarding the operation in question. This results in applications

appropriately tailored to the sensitivities regarding FPM, which then enter the DAFM evaluation process. The Forestry & FPM Management Framework is applied within the context of, and is in addition to, the enhanced baseline level of protection for water, as set out in the DAFM document Forests & Water: Achieving the Objectives under Ireland's River Basin Management Plan 2018-2021 - Programme of Measures for Forestry to Protect & Enhance Water (2018).

The management framework of the proposed plan is described further in Section 2 of this ER.

The implementation of the management framework is expected to have a positive impact on Biodiversity, Flora and Fauna, Population and Human Health, Land Soils and Geology, Hydrology and Hydrogeology, Cultural Heritage, Landscape and material Assets. The improved and more detailed site risk assessment and mitigation measures will further reduce risk of soil erosion and sedimentation of watercourses, and it will reduce the potential for nutrient enrichment and acidification in the watercourses. These factors have a consequential positive impact on water quality, aquatic habitats, and the biodiversity that exists within these watercourses, including positive impacts for the FPM.

Licence applications within FPM catchments will, under the new Framework, be subjected to a higher level of site inspection by DAFM. Any application for consent which includes works to an area described as Moderate or High Risk sites will be subject to a site inspection by FS-DAFM. There will be competent FS-DAFM personnel assigned to provide centralised coordination and to undertake these site inspections.

8.2.2 Proposed Model

Some of the potential practical measures which could be used on any forestry site are discussed below, although this is not an exhaustive list, and there is scope to change the measures which can be used, depending on the most current research at any time.

8.2.2.1 Water Setback

Implementing water setbacks is expected to have a long term positive impact on Biodiversity, Flora and Fauna, Hydrology and Material Assets. The setback would allow for improved botanical (and structural) diversity alongside watercourses, and the improved water quality would be beneficial for aquatic ecosystems (including that of the FPM), and any downstream water abstraction points. This feature of the plan is expected to have a neutral impact on Population and Human Health, Land, Soil and Geology, Cultural Heritage and Landscape.

8.2.2.2 Continuous Cover Forestry Zone

The incorporation of a CCF zone is expected to have a long term positive impact on Biodiversity, Flora and Fauna, Land, Soil and Geology, Hydrology, Landscape and Material Assets. The positive impact is a result of increased structural diversity which allows improved biodiversity. The constant cover of trees will benefit the landscape where clearfell can be unsightly. Soil stabilisation from the tree roots will have benefits for hydrology, and Land, Soils and Geology, while the associated reduction in potential sedimentation should reduce the risk to downstream water quality for both biodiversity and water abstraction points (for human consumption).

8.2.2.3 Commercial Forest Zone (or other)

Incorporating areas of commercial forest zones into the low risk sites may would have a positive impact on Air Quality and Climate, as there would be increased cabon fixation associated with the faster growing commercial crop. In addition, the shorter growth period for the trees would result in increased timber yields, which would have a positive impact on Material Assets. However, the incorporation of areas of monoculture type commercial forestry would result in a negative impact to water quality and a negative impact to biodiversity, both terrestrial and (in the case of diminished water quality occurring) aquatic. The growth cycles of commercial forestry stands (particularly after clearfell) can have a negative impact on local landscape, and the setting of any local monuments in their landscape. The commercial forest zones are expected to have a neutral impact on Population and Human Health and Land, Soils and Geology.

8.2.2.4 Natural vegetation within the water setback

Allowing the growth of natural vegetation within the water setback will have a positive impact on Biodiversity, Flora and Fauna, as the diversity of vegetation composition and structure will provide additional habitats for terrestrial flora and fauna. Furthermore, the vegetation will stabilize the soil in the area, having a positive impact on Land, Soil and Geology, and will absorb excess nutrients from the forestry runoff, thereby reducing the risk of nutrient enrichment in the neighboring watercourse. This will have a positive impact on Hydrology, Material Assets (improved water quality), and Biodiversity, Flora and Fauna (improved aquatic habitat quality).

8.2.2.5 Tree cover within the water setback

Allowing tree growth within the water setback will have a positive impact on Biodiversity, Flora and Fauna, as the diversity of vegetation structure will provide additional habitats for terrestrial fauna. The trees will also stabilize the soil to have a positive impact on Land, Soil and Geology. Although they will absorb excess nutrients from commercial forestry runoff, thereby reducing the risk of nutrient enrichment in the neighboring watercourse, they may (depending on the species) cause siltation within the watercourse as foliage falls into the watercourse and decays. This will have both a potential positive and negative impact on Hydrology, Material Assets (improved water quality), and Biodiversity, Flora and Fauna (improved aquatic habitat quality).

8.2.2.6 Sediment and Nutrient Controls

There are three main pathways for sediment transport from forestry to surface watercourses. These are:

- Over surface - Surface run-off tends to occur more frequently on impermeable soils such as peat or heavy clays or on very thin soils over bedrock or iron pans. It is most evident during heavy rainfall.
- Through the soil/subsoil - This pathway is associated with highly permeable soils, e.g. brown earths and brown podsols.
- Through the drains/channels flowing directly from the site to the aquatic zone - This pathway also includes temporary drains (in which water may not be permanently present) that may only operate during and immediately after rainfall.

Careful drain and sediment management will be employed before, during and after any harvesting activities, including drain-blocking, creating settlement ponds and, where necessary, silt fences or other sediment trapping techniques. Permanent drain blocking will particularly be used within areas where trees are felled-to-waste,

where naturally-vegetated buffer zones are being created adjacent river/stream/drain channels and in other identified critical source areas, to break the hydrological connectivity between the forest and receiving waters. Sediment and nutrient losses will be monitored and the results used to inform and adapt site management and the forest management plans. Drains will also be managed, where possible, to reduce hydrological impacts in the receiving rivers. The hydrologist will advise on the design of the drain and sediment management plans. Diversion of water from an existing field drain leaving the forest into a vegetated buffer area will reduce connectivity between the clearfell site and water courses leading to FPM habitat tributaries.

The use of silt traps, geotextile silt traps, silt fencing, log dams, brash mats, soil dams, straw bales, settlement ponds, grass seeding and willow planting are explained in Appendix B of the plan, and can play a role in the control of sediment and nutrients in forestry runoff.

Using sediment and nutrient controls and drain treatment methodologies such as blocking or slow water damming will reduce the water velocity, and therefore reduce erosion of soil in the area. This has a positive impact on Land, Soils and Geology. The reduced sediment loading of the watercourses has positive impacts on hydrology and the consequential improvements in the downstream water quality and aquatic ecosystems have a positive impact on Biodiversity, Flora and Fauna and Material Assets (for any water abstraction points). The impacts on Population and human Health, Air Quality and Climate, Cultural Heritage and Landscape are expected to be neutral.

8.2.3 Monitoring regime

A detailed and bespoke monitoring regime will be a requirement for any works within the area served by the proposed Plan. The monitoring will be decided by the Forest Service based on site risk but will include a range of options such as:

- Taking representative photographs to show the progress of work on the site
- Arrange for river/stream water sample collections by a 3rd party accredited laboratory upstream and downstream of the site
- Prior to works beginning on site, an update must be provided detailing the environmental (hydrological) protection measures both planed and employed thus far, with details on the locations of such measures, monitoring point locations, record of tool box talks provided, and a copy of the contingency plan.
- Following this initial update, weekly updates must be prepared with information on all works carried out, record of inspections and works carried out, monitoring results, daily checks and any other issues regarding water protection.

An Environmental Clerk of Works (ECoW) should be appointed by the Licence Holder to oversee the clearfelling, extraction and reforestation works. The ECoW shall be experienced and competent, and shall have a number of functions as described in Appendices B and D of the Plan. They will be responsible for implementing environmental safeguarding and monitoring procedures, including contingency plans, briefing of site personnel (tool box talks, etc.), and guiding the forestry owner (or land owner) on the procedure for regular monitoring (daily, weekly, etc.).

The level of monitoring required for any given site is based on the risk level for that site, with high risk sites requiring the most intensive monitoring, while low risk sites

require the least. Full details of the monitoring requirements are given in Appendix C of the Plan.

The proposed monitoring regime will have potentially positive impact on Biodiversity, Flora and Fauna, Hydrology and Hydrogeology, Land, Soils and Geology, Population and human Health and Material Assets (for any water abstraction points), as it will increase the quality of work carried out, and will allow any potential problems to be noticed and dealt with quickly. The impacts on Air Quality and Climate, Cultural Heritage and Landscape are expected to be neutral.

8.2.4 Training and awareness raising

Forester/Contractor training

The DAFM will host several training events for Registered Foresters and Forestry Companies and key forest contractors operating within each FPM catchment. Training events undertaken in 2017 in relation to Annex 1 habitats and environmental setbacks on afforestation sites, demonstrate the effectiveness of this type of training. Training for Registered Foresters and contractors will be practical in nature, and will focus on the following:

- the extreme sensitivity of FPM to nutrient enrichment, siltation, pollution and hydrological change;
- inappropriate forestry practices that can impact severely on the species, and appropriate practices that are compatible and proactive regarding FPM conservation and the protection and enhancement of water quality;
- the use of the Forest & FPM Management Framework as the key decision-making tool for forest management within the catchments;
- the use, under the framework, of the Site Risk Form for assessing the sensitivity of a site, and the Site Operation Form and associated Options Table, to guide the selection of the most appropriate forest management option(s), based on site sensitivity; and
- the various regulatory and promotional tools to realise change, including licence conditions and the availability of funding under the Native Woodland Scheme (see Section 13 of the Forests & Water document).
- the model set out in Section 2.4.2 will form a central part of all of this training, by stressing the end-point whereby all forest within these catchments will be accompanied by permanent, semi-natural buffer along watercourses, design and managed to protect water quality and FPM.

These training events will stress the need to tailor applications before submission to DAFM, and the mechanisms that will otherwise be deployed, e.g. the potential requirement for a NATURA Impact Statement (NIS).

These training events will take place at a suitable location based on FPM catchment clusters, and may incorporate a field element.

Further training events are also envisaged in the medium to long term, centred around sites that have undergone appropriate treatment in relation to FPM, including demonstration sites treated under the KerryLIFE project.

The proposed training will have potentially positive impact on Biodiversity, Flora and Fauna, Hydrology and Hydrogeology, Land, Soils and Geology, Population and human Health and Material Assets (for any water abstraction points), as it will increase the quality of work carried out throughout the process. The impacts on Air Quality and Climate, Cultural Heritage and Landscape are expected to be neutral.

Awareness raising

Once the draft Plan is finalised, DAFM will instigate a campaign to promote awareness amongst foresters and forest owners, via circulars to the trade, articles in relevant publications and a tailored information brochure. The overall aims of this awareness-raising are as follows:

- To increase awareness amongst the forestry sector of FPM and its rarity, and the significance of Ireland's population at the European level. The link between the species' presence and the high quality nature of the catchment's streams, rivers and lakes, will be highlighted.
- To outline the species' extreme sensitivity to potential impacts arising from forests and forestry activity, particularly in relation to nutrients and siltation running of sites into receiving waters.
- To outline the beneficial role woodlands and forests can play in protecting water quality and conserving the species. The Woodlands for Water approach and the model outlined in Section 2.4.2 of this draft Plan, will be central to this message.
- To outline the scope and objectives of the Plan, i.e. to ensure that forestry and forest-related activities within the catchment do not impact negatively on FPM, and where possible, are deployed proactively as a tool to protect and enhance water quality.
- To outline the key mechanisms involved in realising this, i.e. the Forestry & FPM Management Framework and the availability of support under the NWS package, the incoming Environmental Enhancement of Forests Scheme, and the proposed Continuous Cover Forestry Scheme.
- To promote awareness of the range of appropriate forestry practices on various sites, ranging from high risk sites (e.g. native woodland creation through natural regeneration) to low risk sites (e.g. commercial forestry, with enhanced safeguards).

In the context of the training and peer-to-peer learning set out in the Forests & Water, personnel within other relevant bodies, including NPWS, Inland Fisheries Ireland, WFD Regional Operations Committees and LAWCO Office, EPA, Teagasc, etc., will be informed of the Plan how it operates.

In particular, officials whose operational areas overlap with the various FPM catchments will be the focus of information events. These events will present an overview of the Plan and the role of the DAFM (as the national forest authority) in implementing it, and the use of the Forest Management Framework and components (SITE RISK FORM, the SITE OPERATION FORM and the Operation Option Table). These events will explore the types of forestry practices appropriate for various levels of site risk regarding FPM, and will highlight practices that can actively contribute to the enhancement of water quality. The various regulatory and promotional tools to be used by DAFM to realise change, including the Assessment Procedure (AAP) and the availability of funding under the Native Woodland Scheme and others, will also be outlined.

This measure will increase awareness amongst local statutory personnel who can positively influence landowners through their own interaction on-the-ground. This will also help ensure that responses received from the various statutory bodies, following referral by DAFM, are framed within the context of the overall Plan. Therefore, it will have a potentially positive environmental impact.

8.2.5 Cumulative Impacts

There is a general possibility of cumulative impacts occurring between different measures within the draft plan, as well as the possibility of cumulative impacts with other related plans and policies. The benefits associated with the draft plan are envisaged to occur in the years following its implementation, with the positivity of the impacts increasing over time. Due to the long rotation times involved with forestry plantations, and the slow growth rate of FPM, these positive impacts are unlikely to be measurable in the immediate or short term. Some of the potential cumulative impacts are described below.

8.2.5.1 Cumulative impacts from Measures within the draft Plan

Biodiversity, Flora and Fauna

The potential cumulative impacts relating to Biodiversity, flora and fauna will be positive. The plan is targeted specifically at improving the habitat quality for the FPM, and this will have beneficial impacts for other species and habitats as well, particularly those that live in the freshwater aquatic environment. The expected beneficial impacts the plan will have on aquatic habitat quality and other aquatic species will also have cumulative positive impacts on FPM. As there is a close link between some salmonid species and the FPM, any beneficial impact that might occur for them would likely have a positive cumulative impact for the FPM.

Population and Human Health

The anticipated improved water quality associated with the plan measures should have a positive impact on human health and river amenity use, through better quality water for abstraction and recreational activities (such as angling, swimming, etc.). The improved biodiversity associated with the improved aquatic habitats will also aid in the provision of ecosystem services.

Land, Soils and Geology

There will be some cumulative positive impacts in relation to land, soils and geology and the plan. As some features of the plan such as CCF are used on sites, it reduces the potential for poaching and sediment runoff into streams during forestry related works. This will have a positive impact on aquatic habitat quality and therefore it will have a potential positive cumulative impact for FPM.

Hydrology

The draft plan will have positive cumulative impacts with hydrology. Although the plan is focused on the FPM, the main mechanism for achieving it's objective is through improved water quality and therefore improved aquatic habitat quality. This may have consequential beneficial impacts on other flora and fauna within the watercourse, such as salmonid species, some of which may aid the FPM survival.

Air Quality and Climate, Noise and Vibration

There is a potential for some negative impacts for climate with the proposed plan. The proposed reduction in area planted with commercial will reduce the potential amount of carbon sequestration that would occur on the sites. The water setback areas are unlikely to sequester carbon at the same rate as forestry. Although the impact here may be negative, suitable (low risk) sites can still be afforested, and native woodlands will also be encouraged in many places to counteract this. Furthermore, this will be a very small-scale reduction in forestry when compared to national data, and the national afforestation targets will still apply, but can be focused on more suitable sites.

Cultural Heritage

The proposed plan has the potential to have positive impacts on cultural heritage, and the landscape setting of archaeological monuments. Some of the practical measures of the plan, such as the CCF zones and natural vegetation areas will provide a more constant and naturalised setting for the monuments.

Landscape

The proposed plan will have some positive impacts on landscape, as it will encourage any afforestation to consist of native woodland within the 27 no. catchments, rather than commercial conifer forestry. The use of measures such as CCF and wider water setbacks will also improve the visual appearance of the forestry areas in the landscape, particularly on higher sites.

Material Assets

The draft plan will have both positive and negative cumulative impacts relating to material assets. Although the plan does not seek to completely prevent afforestation works within the 27 no. FPM catchments, and there will be a continuation of timber production in these areas, the intensity of the production will be negatively impacted upon due to the implementation of the plan measures (such as CCF, wider buffers, etc.). In addition, the achievement of improved water quality which is sought under the plan will contribute to a higher quality water source for abstraction points where they occur.

8.2.5.2 Cumulative impacts from Policies and Proposals from other related plans

Assessment material for the cumulative impact assessment was compiled on the relevant planning and sectoral plans/programmes. The material gathered comprised National Plans, Regional Plans and Guidance as well as the relevant Development and Local Area Plans as set out below, and in Section 4 of this ER.

The FPM Plan sits within a hierarchy of legislation, plans, programmes and strategies, which include international, EU, national, regional and local levels. The principle requirements in relation to international Plans and Programmes have been incorporated into the national and regional Plans and Programmes.

The FPM Plan, which must comply with relevant higher-level legislation, plans and strategic actions and may, in turn, guide lower level strategic actions.

International and European Plans/Programmes:

- Directive 2000/60/EC Water Framework Directive
- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)
- Directive 2009/147/EC on the conservation of wild birds
- EU Biodiversity Strategy
- EC (2013) New Forest Strategy
- Europe 2020, A Strategy for Smart, Sustainable and Inclusive Growth
- European Commission's Effort Sharing Regulation (2021-30)
- European Communities (Aerial Fertilisation) (Forestry) Regulations 2012
- European Communities (Birds & Natural Habitats) Regulations 2011
- European Communities (Forest Consent & Assessment) Regulations 2010 (as amended)
- European Communities (Water Policy) Regulations 2003
- European Union (EU) Directive on the Promotion of the Use of Energy from Renewable Sources (Directive 2009/28/EC)
- EU (2013) Environmental Liabilities Directive (2013/30/EU)

- United Nations (2012). Doha Amendment to the Kyoto Protocol. United Nations Framework Convention on Climate Change.

National Plans/Programmes

- A Strategy for Native Woodlands in Ireland 2016-2020 - Woodlands of Ireland
- COFORD (2004) Forest Road Manual
- COFORD Mobilising Ireland's forest resource
- DAFM (2015) Forestry Programme 2014-2020
- DAFM (2016) Statement of Strategy 2016 – 2019
- DAFM (2015) Foodwise 2025
- DAFM (2014) The Rural Development Programme (RDP) 2014 – 2020;
- DAFM (2013) Food Harvest 2020
- DAFM Forests, products and people Ireland's forest policy – a renewed vision
- DAHG (2014) National Raised Bog SAC Management Plan: Draft for Consultation
- DARDNI (2014) Rural Development Programme 2014 – 2020
- DCENR (2014) Draft Bioenergy Plan
- Department of Public Expenditure and Reform (2011) Infrastructure and Capital Investment 2012-2016: Medium Term Exchequer Framework
- DECLG (2012) National Climate Change Adaptation Framework: Building Resilience to Climate Change
- Second Cycle of the WFD River Basin Management Plans
- DRDNI (2010) Regional Development Strategy 2035
- EPA (2016) Ireland's Environment - An Assessment
- Forest Service (2014) Forestry and Aerial Fertilisation Requirements
- Forest Service (2012) Appropriate Assessment Procedure (AAP)
- Forest Service (2009) Forestry and Otter Guidelines
- Forest Service (2009) Forestry and Kerry Slug Guidelines
- Forest Service (2008) Forestry and Freshwater Pearl Mussel Requirements
- Forest Service (2000) Irish National Forest Standard
- Forest Service (2000) Forestry and Water Quality Guidelines;
- Forest Service (2000) Forest Protection Guidelines
- Forest Service (2000) Forest Harvesting and the Environment Guidelines
- Forest Service (2000) Forest Biodiversity Guidelines
- Forest Service (2000) Code of Best Forest Practice
- Forest Service / EPA / COFORD (amended 2013) Protocol for the determination of the acid sensitivity of surface water in acid sensitive areas (ASAs)
- Forestry Act 1946 (Part IV)
- Irelands Prioritised Action Framework (PAF) For NATURA 2000
- National Biodiversity Action Plan 2017 – 2021
- National Landscape Strategy for Ireland 2015 – 2025
- National Mitigation Plan
- NPWS (2011) Draft National Peatlands Strategy.

Regional Plans and Programmes:

- Border Regional Authority (2010) Regional Planning Guidelines 2010-2022;
- Dublin Regional Authority and Mid-East Regional Authority (2010) Regional Planning Guidelines for the Greater Dublin Area 2010-2022
- Mid-West Regional Authority (2010) Mid-West Regional Planning Guidelines 2010-2022;
- South-East Regional Authority (2010) Regional Planning Guidelines for the South-East Region 2010-2022

- South-West Regional Authority (2010) Regional Planning Guidelines 2010-2022;
- West Regional Authority (2010) Regional Planning Guidelines for the West Region 2010-2022

Many of these have the potential to have either a positive or negative cumulative impact on the environment. This is particularly true of those plans, policies and programmes that are related to forestry, water, flooding and biodiversity. Water catchments are extremely complex, so although a complete assessment of every possible cumulative impact is not practical in this ER, the proposed draft plan is designed to be broadly beneficial to aquatic habitats. Provided it is implemented as intended it will contribute to a positive cumulative impact with the plans, programmes and policies listed in Chapter 4, not only on FPM, but on aquatic habitats and general biodiversity within the 27 no. FPM catchments.

8.2.6 Implementation Strategy

Although the implementation strategy for the proposed plan will not be subject to environmental impact assessment, it is nonetheless very important for the success of the plan, and to allow the best possible protection of FPM in each of the 27 no. catchments. Section 2.2.3 above discusses the implementation methods that the FS-DAFM has available for use with the plan. The FS-DAFM has a defined ability to control and influence, and cannot compel land owners to undertake afforestation or felling aimed at protecting water quality and FPM. Instead, it can regulate key forestry activity in relation to applications received for afforestation, forest road works, felling and aerial fertilisation. The FS-DAFM can also operate schemes that encourage certain types of forest activity. For further details, see Section 2.2.3 above.

Although the proposed plan would come into effect on a specific date, it would only be implemented on individual forestry sites at times of activity as they go through their natural cycles (i.e. afforestation/reforestation, thinning, forest road construction, felling, fertilisation, etc.). This means that the proposed plan would in effect have a gradual implementation in all 27 no. FPM catchments.

9 MITIGATION AND MONITORING

9.1 Introduction

Various levels of monitoring are required regarding the implementation of the draft Plan. It Is intended to use the Forest Service's existing inhouse capabilities to monitor activities within the area affected by the Plan and also use the onsite monitoring data to carry out analysis at a higher level and with a view to assessing the effects of implementing the Plan.

9.2 Sources of Information for Monitoring

The Plan is designed with the purpose of ensuring that forestry foes not negatively impact on aquatic habitat quality, and therefore Pearl Mussel populations. As the plan is primarily focused on improving water quality, the monitoring of the effectiveness for the plan would be best done by regular monitoring the water quality in the area. Any positive impact to the FPM will only be noticeable in the long term, as their life cycle is quite lengthy and they have a slow growth rate. Historically, water monitoring has been carried out by the EPA in many of the waterbodies in Ireland, including the 27 no. FPM catchments.

The three levels of monitoring (onsite monitoring by the Applicant; onsite monitoring by the DAFM; and overall monitoring of the draft Plan) required for the plan are discussed below in further detail.

Overall monitoring of the draft plan

As with any plan for change, DAFM must monitor the implementation of the draft Plan, to track and record progress, to identify and eliminate deficiencies, and where required, apply appropriate measures to ensure consistency and compliance, to ensure that forest activity undertaken within each catchment does not threaten the achievement of the conservation objectives for the SACs involved, namely "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.". This system builds on existing controls whereby compliance with conditions attached to any licence, arising from the AAP, referrals and other pre-approval procedures, is checked through follow-up DAFM inspections.

Existing sections within DAFM will have a key role in regulatory oversight and in the operation of forestry schemes in support of implementation of the Plan. These include the Forestry Inspectorate, the Felling Section, and the Approvals Section. In addition, specific personnel will be assigned to provide centralised coordination and to undertake the following roles:

- orchestrate the roll-out of the FPM Management Framework, including the awareness-raising and training measures detailed in Section 2.4.4;
- provide internal coordination within the Forest Service (Inspectorate and Administration), with other divisions within the Department, and with agencies under the Department's auspice (e.g. Teagasc);
- coordinate with NPWS and other relevant statutory bodies, such as Inland Fisheries Ireland, the WFD Regional Operations Committees and the Local Authority Community Water Office (LAWCO);
- instigate the engagement of a FPM ecologist and a hydrologist, as and when required, to support the Inspectorate in decision-making;

- provide ongoing support to Forestry Inspectors, Administration, Registered Foresters and Forest Owners;
- provide regular updates to DG Environment on progress in implementing the Plan;
- quality control, to ensure consistency in the application of the FPM Management Framework from pre-approval stage onwards, both externally (Forest Owners, Registered Foresters and Forestry Operators) and internally within DAFM (this function will operate in addition to standard quality control and oversight, and will identify and implement any additional safeguards or refinements required);

Overall monitoring of progress regarding the implementation of the Plan will be undertaken by the Forest Service in close coordination with NPWS, within the context of parallel measures being deployed for agriculture (e.g. under the proposed locally-led FPM scheme). While it is envisaged that direct surveys of FPM populations within each catchment will be undertaken by NPWS, DAFM will track progress regarding a range of indicators that illustrate the restructuring of the catchment-wide forest resource towards the protection and enhancement of water quality and the aquatic habitat in favour of FPM (i.e. the realisation of the model presented in Section 2). These indicators include (inter alia) the following:

- area of new native woodland established on 'greenfield' sites adjoined by watercourses;
- area of new native woodland created through the reforestation of former conifer forest;
- length (m) and area (ha) of new water setbacks installed at afforestation stage and during the rotation (e.g. 'retro-fitted' at 1st thinning stage);
- length (metres) and area (ha) of new water setbacks installed at reforestation stage;
- area of former conifer forest converted from clearfell system to CCF / long-term retention;
- area of forest reforested under CCF or BIO Reforestation Options;
- area of conifer forest converted to widely-spaced pine forest;
- area of conifer forest deforested and reverted to open habitat.

A feedback loop will also be established, whereby experiences gained in rolling-out the draft Plan will result in ongoing refinement of the FPM Management Framework and the various elements underpinning it. Related research and demonstration projects (such as KerryLIFE, etc.) will also be closely monitored, and further improvements made to capture relevant outputs from these. Registered Foresters and Forest Owners within the catchments will be notified of any material refinement to the FPM Management Framework, and further training undertaken, as deemed necessary.

9.3 Mitigation Measures

The Plan was drawn up specifically to address any existing potential negative impacts associated with forestry in each of the 27 no. FPM catchments. The plan is itself a mitigation measure for forestry and forestry activities in the 27 no. FPM catchments in Ireland and the proposed measures within the Plan are based on current scientific knowledge in relation to management of forestry activities with a view to maintaining water quality and morphology.

While the plan was being drafted, there was regular consultation with the team carrying out the SEA and AA procedure, and this fed into the plan itself, so that almost all of the mitigation measures proposed for the plan have already been incorporated into it. Table 9.1 details the most significant of these mitigation measures.

Table 9.1 Proposed SEA mitigation measures for the Plan for Forest and FPM in Ireland

Topic	Proposed mitigation measure
Plan Application	• The plan should apply to all 27 no. FPM catchments, and not be restricted to the priority 8 no. catchments or the 6km hydrological zome which currently exists in the FPM Requirements Document.
Ease of use	• The plan should include an easy to follow flow diagram detailing the steps for afforestation of a site under the proposed plan • The plan should be simplified wherever possible, to avoid possible confusion relating to how it applies to sites and applicants
Plan wording	• The objective of the plan should be re-worded to improve clarity. It should ensure that forest activities do not prevent any QI of any EU site from achieving/maintaining favourable conservation status as defined in the Habitats Directive.

10 NEXT STEPS

There are numerous tasks and steps to be carried out before the draft Plan is finalised and adopted. This includes:

- Publication of draft Plan
- Consultation period for the draft plan
- Review of submissions and proposed amendments for the plan
- Adoption and publication of the final plan

There are also several steps remaining on the SEA/AA process for the plan. These steps include:

- Publication of the SEA Environmental report and AA documents
- Consultation period
- Preparation of SEA statement
- Publication of SEA statement

The next step for now will be a twelve week consultation period for the draft plan, the SEA and AA documents. During this time comments may be submitted for consideration. These submissions should be sent via email to forestryfpmplan@agriculture.gov.ie Any submissions will be taken into consideration before finalising the final Plan. The final date for the receipt of any submission is Wednesday, 3rd October at 5pm, though early responses would be appreciated.

The final plan will then be published, along with the SEA statement and ER.

11 REFERENCES AND FURTHER READING

Bauer, G. 1987. Reproductive strategy of the freshwater pearl mussel Margaritifera margaritifera. Journal of Animal Ecology 56:691-704.

Bauer, G. 1992. Variation in the life span and size of the freshwater pearl mussel. Journal of Animal Ecology 61:425-436.

Cross, J.R. & Collins, K.D. 2017. Management Guidelines for Ireland's Native Woodlands. Jointly published by the National Parks & Wildlife Service (Department of Arts, Heritage, Regional, Rural & Gaeltacht Affairs) and the Forest Service (Department of Agriculture, Food & the Marine). Department of Agriculture, Food & the Marine, Kildare Street, Dublin 2, Ireland.

DAFM. 2015. Forestry Standards Manual. Department of Agriculture, Food & the Marine, Johnstown Castle Estate, Co. Wexford.

DAFM. 2015. Native Woodland Conservation Scheme: September 2015. Department of Agriculture, Food & the Marine, Johnstown Castle Estate, Co. Wexford. www.agriculture.gov.ie/forestservice/grantsandpremiumschemes2015-2018/

DAFM. 2015. Native Woodland Establishment GPC9 & GPC10: Silvicultural Standards (September 2015). Department of Agriculture, Food & the Marine, Johnstown Castle Estate, Co. Wexford. ww.agriculture.gov.ie/forestservice/grantsandpremiumschemes2015-2018/

DAFM. 2016. Environmental Requirements for Afforestation. Department of Agriculture, Food & the Marine, Johnstown Castle Estate, Co. Wexford.

DAFM. 2017. Felling and Reforestation Policy. Department of Agriculture, Food & the Marine, Johnstown Castle Estate, Co. Wexford.

DAFM. 2017. Land Types for Afforestation. Department of Agriculture, Food & the Marine, Johnstown Castle Estate, Co. Wexford.

DAFM. 2018. Woodland for Water: Creating new native woodlands to protect and enhance Ireland's waters. Department of Agriculture, Food & the Marine, Johnstown Castle Estate, Co. Wexford.

Department of Housing, Planning & Local Government. 2018. River Basin Management Plan for Ireland 2018-2021. Department of Housing, Planning & Local Government, Customs House, Dublin 1.

Forest Service. 2008. Forestry and Freshwater Pearl Mussel Requirements: Site Assessment and Mitigation Measures. Forest Service, DAFM, Johnstown Castle Estate, Co. Wexford.

Hastie, L.C. and Young, M.R. 2003. Conservation of the Freshwater Pearl Mussel: 2. Relationship with Salmonids. Conserving Natura 2000 Rivers Conservation Techniques Series No. 3. English Nature, Peterborough.

Kelly-Quinn, M., Bruen, M., Harrison, S., Healy, M., Clarke, J., Drinan, T., Feeley, H.B., Finnegan, J., Graham, C., Regan, J. & Blacklocke, S. 2016. HYDROFOR: Assessment of the Impacts of Forest Operations on the Ecological Quality of Water. EPA Research

Report No. 169. EPA, Johnstown Caste Estate, Co. Wexford. www.epa.ie/pubs/reports/research/water/researchreport169.html

Moorkens, E., Purser, P., Wilson, F., and Allott, N. 2013. Forestry Management for the Freshwater Pearl Mussel Margaritifera (FORMMAR). Final Report. University of Dublin, Trinity College. Funded under the FIRM / RSF / CoFoRD 2011 Research Call. In press.

Moorkens, E.A. 1996. Studies on the Biology and Ecology of Margaritifera in Ireland. Unpublished PhD thesis, Environmental Science, University of Dublin.

Moorkens, E.A. 1999. Conservation Management of the Freshwater Pearl Mussel Margaritifera margaritifera. Part 1: Biology of the species and its present situation in Ireland. Irish Wildlife Manuals, No. 8.

Moorkens, E.A. 2010. Addressing the conservation and rehabilitation of Margaritifera margaritifera populations in the Republic of Ireland within the framework of the Habitats and Species Directive. Journal of Conchology 40(3).

Ní Chatháin, B., Moorkens, E. & Irvine, K. 2012. Management Strategies for the Protection of High Status Water Bodies. STRIVE Report Series No. 99. EPA, PO Box 3000, Johnstown Castle, Co. Wexford, Ireland. www.epa.ie/pubs/reports/research/water/strivereport99.html

Nisbet, T., Silgram, M., Shah, N., Morrow, K. and Broadmeadow, S. 2011. Woodland for Water: Woodland measures for meeting Water Framework Directive objectives. Forest Research Monograph 4. Forest Research, Surrey, UK. 156 pp.

NPWS. 2011. Strategy for Conservation of the Freshwater Pearl Mussel. National Parks & Wildlife Service, Dublin.

NPWS. 2013. Format for a Prioritised Action Framework (PAF) for NATURA 2000: For the EU Multiannual Financing Period 2014-2020. Ireland. National Parks and Wildlife Service (NPWS), Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS. 2013. The Status of Protected EU habitats and Species in Ireland. Overview Volume 1. Unpublished Report. National Parks & Wildlife Service. Edited by D. Lynn. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Ross, E.D. 1988. The reproductive biology of freshwater mussels in Ireland, with observations on their distribution and demography. PhD Thesis, National University of Ireland, Galway.

Ross, H.C.G. 1992. The reproductive biology of the freshwater pearl mussel Margaritifera margaritifera (L.) in Co. Donegal. Irish Naturalists Journal 24:43-86.

RPS. 2010. Freshwater Pearl Mussel Sub-Basin Management Plans: Background Documentation Literature Review. Prepared for the Department of the Environment, Heritage and Local Government.

Sanchez, C. 2017. Pro Silva Silviculture: Guidelines on Continuous Cover Forestry / Close to Nature Forestry Management Practices. Pro Silva Ireland, 36 Fitzwilliam Square, Dublin 2.

Skinner, A., Young, M. and Hastie, L. 2003. Ecology of the Freshwater Pearl Mussel. Conserving Natura 2000 Rivers Ecology Series No. 2. English Nature, Peterborough.

DEHLG 2004. Implementation of SEA Directive (2001/42/EC): Assessment of the Effects of Certain Plans and Programmes on the Environment.

Appendix 2-1

Scoping Responses

Department of
Agriculture,
Food and the Marine
An Roinn
Talmhaíochta,
Bia agus Mara

Michael Watson
McCarthy Keville & O'Sullivan Ltd
Block1, GFSC
Moneenageisha Road,
Galway.

14th January 2016.

Re; The Plan for Forestry and Freshwater Pearl Mussel in Ireland

Dear Mr Watson,

I refer to your recent correspondence concerning the above. The Department of Agriculture, Food and the Marine has made a commitment in the Rural Development Plan to introduce a locally-led outputs-based scheme in 9 priority Freshwater Pearl Mussel catchments, identified by the National Parks and Wildlife Service.

It is important that any such Freshwater Pearl Mussel Scheme is closely aligned with the Plan for Forestry and Freshwater Pearl Mussel.

I am also attaching general scoping recommendations from this Department.

Yours sincerely

McCarthy KOS
Received on
18 JAN 2016
150913.
Michael Wats.

Liz McDonnell
Environmental Co-ordination Unit
Climate Change and Bioenergy Division
Department of Agriculture Food and the Marine
Pavilion A
Grattan Business Park
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Co. Laois
057 8689915

SCOPING RECOMMENDATIONS FROM DEPARTMENT OF AGRICULTURE, FOOD AND THE MARINE

Where SEA scoping indicates potential impacts on sea-fisheries and the marine environment, the following information should be taken into account in the SEA.

Relevant Legislation, Plans and Policies

- Foreshore Acts 1933 to 2011
- Aquaculture Acts 1997 to 2006 (Fisheries (Amendment) Act 1997 and amendments)
- Sea Fisheries and Maritime Jurisdiction Act 2006 & Sea-Fisheries Regulations
- Fisheries Natura Plans & Declarations made under European Union (Birds and Natural Habitats) (Sea-fisheries) Regulations 2013 (online at http://www.fishingnet.ie/sea-fisheriesinnaturaareas/natura2000sitesundermanagement/)
- National Seafood Operational Programme (EMFF requirement) & National Strategic Plan for Aquaculture (CFP requirement) currently under preparation for 2014 – 2020
- Food Harvest 2020
- Harnessing Our Ocean Wealth – the national integrated marine plan for Ireland
- Implementation of pollution reduction programmes for designated shellfish waters (Shellfish Waters Directive 2006/113/EC)
- Classified Shellfish Production areas (classified for food safety and consumer protection purposes under Regulation (EC) No 854/2004)
- National Climate Change Adaptation Framework – particularly sector adaptation plans (including marine) due to undergo consultation in 2014.

Issues for consideration

In the development of any Plans or Programmes due consideration should be given to:

- Potential impacts, both positive and negative, on marine environmental quality including potential impacts on designated Shellfish Growing Waters. Examples include, but are not limited to the following: increased sedimentation; re-suspension of contaminants; discharge of contaminants; and introduction of non-native or invasive species.
- Potential impacts , both positive and negative, on the microbiological quality of shellfish in Classified Shellfish Production areas
- Potential impacts on human health resulting from the placing on the market of microbiologically contaminated shellfish
- Potential impacts on commercially important fish and shellfish stocks, licensed aquaculture sites and areas of importance for fish / shellfish and fisheries e.g. spawning grounds, nursery areas
- Potential impacts on freshwater aquaculture operations including the requirement for water abstraction and capacity of the receiving waters to assimilate discharges
- Future designations of areas of importance to the Aquaculture & Fisheries Sector
- Relevant EU Directives and National Legislation in the area of Marine Spatial Planning

Potential Impacts on Sea-Fisheries & Aquaculture

Major land-use changes can significantly impact the quality of the marine (particularly coastal) environment (e.g. sedimentation, hydrographic change, impacts on benthic eco-system, etc).

All aspects of the seafood sector rely on safe high quality water and assessment of potential impacts on water quality should include the seafood sector. To guarantee food safety the growing waters must attain certain standards. This is of relevance to the fishing and aquaculture sectors. In

freshwater aquaculture (on land) a continuity of supply is important to ensure animal welfare and quality. Water supplies in this instance are sourced from rivers, wells and occasionally from mains supplies.

The seafood processing sector also requires a safe and reliable water supply to support its operations.

Designated shellfish waters are very important to the shellfish sector in Ireland working to maintain standards in product safety and quality and enabling sale for direct consumption from many areas, reducing production costs and contributing to the good international reputation of the products. The role of filter-feeding shellfish as a nutrient sink thus helping to reduce eutrophication potential and improve water quality is also important to consider in assessments.

Sources of Marine Data

Details of designated shellfish growing areas which are protected by law (2006/113/EC) are available at: http://www.environ.ie/en/Environment/Water/WaterQuality/ShellfishWaterDirective/

Details of Classified Shellfish Production areas (classified for food safety and consumer protection purposes under Regulation (EC) No 854/2004) are available on the Sea-Fisheries Protection Authority website: http://www.sfpa.ie/

The Marine Institute publishes a range of corporate reports, scientific and technical reports, peer reviewed articles and conference papers which are relevant to the SEA process. These can be found on the Marine Institute website: http://www.marine.ie/home/Publications/ or Marine Institute Open Access Repository.

Relevant reports and on line GIS include:

- Shellfish Stocks and Fisheries Review 2011: An Assessment of Selected Stocks
- Atlas of Commercial Fisheries Around Ireland
- Atlas of Commercial Discarding
- Ireland's Marine Atlas

Information on the Initial Assessment of Ireland's marine waters, required under the Marine Strategy Framework Directive, is available at

http://www.environ.ie/en/Environment/Water/WaterQuality/Marine/

Who to Consult With

DAFM – Policies, plans and legislation concerning sea-fisheries & aquaculture

SFPA – Competent Authority for Seafood Safety (classifications, monitoring & sanitary surveys) & Sea-fisheries Control

Marine Institute – Fisheries & Marine Environment

BIM – Seafood Development Agency

Consideration should also be given to consulting directly with the seafood sector. This may include regional inshore fisheries forums, Fisheries Local Action Groups, fisheries representative bodies, including producer organisations, local advisory committees, associations, co-operatives; seafood processors; aquaculture representative bodies, etc.

Version: December 2014

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

Your Ref: 150913
Our Ref: **G Pre00389/2015**
(Please quote in all related correspondence)

05 February 2016

McCarthy Kelville O'Sullivan Ltd.
Block 1, G.F.S.C.
Moneenageisha Road
Galway

Via email

Re: Strategic Environmental Assessment Draft Scoping Report Plan for Forestry and Freshwater Pearl Mussel in Ireland

A chara

The Department of Arts, Heritage and the Gaeltacht refers to the correspondence from the Forest Service of the Department of Agriculture, Food and the Marine in relation to its scoping for Strategic Environmental Assessment for its Plan for Forestry and Freshwater Pearl Mussel in Ireland, and its screening for Appropriate Assessment.

Outlined below are heritage-related observations of the Department under the stated heading(s).

Archaeology

With respect to the cultural heritage section of the scoping report, the FS-DAFM has not listed the Shipwreck Inventory of Ireland as a primary source in relation to archaeological heritage. Historic wrecks are protected under the National Monuments Act 1930 – 2004 with the protection of underwater archaeology specifically addressed in 1987 and 1994 (Amendment) Acts. Section 3 (4) of the 1987 Act provides that a person shall not dive on, damage, or generally interfere with, any wreck which is more than one hundred years old or an archaeological object which is lying on, in or under the sea bed or on or in land covered by water except in accordance with a licence issued by the Minister for Arts, Heritage & Gaeltacht under Section 3 (5) of the Act. The National Monuments Service has compiled an inventory of shipwrecks for the coastal and inland waterways of Ireland, the records of which are stored in a shipwreck inventory database and housed in the UAU archive in Dublin. The Shipwreck Inventory of Ireland Database is the official register of historic shipwrecks protected under the National Monuments Acts with over 18,000 wrecks recorded to date. Works associated with forestry development, CFMPs or with the protection of the pearl mussel may have the potential to negatively impact known or potential submerged or buried

archaeology. There will be a need for an appropriate level of archaeological assessment if works are to take place in the vicinity of recorded monuments or protected wrecks.

There will be a need for an appropriate level of archaeological assessment if works are to take place in the vicinity of recorded monuments, near protected wrecks or on or near water courses. It is therefore recommended that this Department is consulted with regard to any potential works located at or near archaeological monuments or wrecks or any works which will significantly affect watercourses such as rivers, streams or lakes. This will enable the Department to make an informed archaeological recommendation before works proceed.

Architectural Heritage

The Department notes that in Cultural Heritage, architectural heritage is described as a subset to archaeological heritage in Section 4.12 and with regard to the Heritage Act (1995). The Department's observation is that this section should refer to architectural heritage separately in the subsection and with reference to the primary legislation that protects it namely Part IV of the Planning and Development Act 2000 and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Mention should be made of the local authorities' Records of Protected Structures and Architectural Conservation Areas (to which the 2000 Act relates) and to this Department's National Inventory of Architectural Heritage (to which the 1999 Act relates). In the Department's view this sub-section needs to be rewritten.

Nature Conservation

The Department has the following observations in relation to nature conservation. In preparing this submission, the Department has regard to the following Forest Service documents:

- The Strategic Environmental Assessment Draft Scoping Report- received January 2016
- Article 6(3) Screening Assessment – received 1 February 2016.

While the Department previously informally received a "*Draft Catchment Forest Management Plan for Priority 8 Freshwater Pearl Mussel Catchments*" dated 13 May 2014, it has not reviewed that document to inform these observations as its current status is not known and may have been subject to further change, as stated on its cover, thus rendering it out-of-date.
The Department's observations are presented in the following format:

A. The proposed scope of the "*Plan for Forestry and Freshwater Pearl Mussel in Ireland*"
B. SEA Draft Scoping Report
C. Article 6(3) Screening Assessment, and

Appendix 1: Notes on the preparation and content of an NIS.
Appendix 2: Explanatory Note and 16 Excel Files of Attributes for remaining 16 *M. margaritifera* Site-Specific Conservation Objectives (SSCOs).
Appendix 3: List of NPWS commissioned reports on the Freshwater Pearl Mussel (*Margaritifera margaritifera*) 1995-present.

A. THE PROPOSED SCOPE AND OBJECTIVES OF THE PLAN FOR FORESTRY AND FRESHWATER PEARL MUSSEL IN IRELAND:

The Plan, as described within the Scoping Report, appears to fall short of earlier commitments to the Commission in September 2011 and in 2012 and there are a number of technical aspects that would benefit from more detailed consideration. The Department expected that the proposed Plan would set out a vision and a strategic (yet specific) approach for forestry in these catchments and how its management will contribute to the restoration of the freshwater pearl mussel and its habitat to favourable conservation status, as is required under Article 3 of the Habitats Directive. On the basis of the documents circulated through this consultation process, the Department remains unclear as to how the plan will contribute to the restoration of the freshwater pearl mussel and its habitat to favourable conservation status.

For instance, earlier documents that set out an ambition for this Plan/CFMPs stated that it/they "*will critically inform the mechanisms through which site sensitivity and risk to FPM populations can be assessed and evaluated leading to the selection of appropriate forest management options – under the legislative, system and scheme control of the Forest Service. The initial task towards the development of Strategic Plans for Forestry is to complete a catchment characterisation through analysis and evaluation of FPM population status and assessment of forestry in terms of its type, age class, location and ownership within the catchment using information available from the DAFF forest inventory. These assessments will inform the final Strategic Plans for Forestry. The desk-based risk assessment will identify high risk sites and forest operations and will recommend a range of forest management measures on a site sensitivity basis. The recommended management measures for existing and future forests will produce the programme of forestry measures and strategies for each Strategic Plan for Forestry. The economic implications of the measures and strategies will be assessed prior to the development of the Strategic Plans for Forestry".*

The Department also draws the Forest Service's attention to the flow diagram presented to the European Commission in September 2011 as part of Ireland's Pearl Mussel Conservation Strategy. Building on that Strategy and the Department's understanding of commitments provided by DAFM - Forest Service to the European Commission under the freshwater pearl mussel pilot case, the Department's view remains that:

1. The scope of the ecological implications of forestry for the pearl mussel that are proposed to be addressed in the Plan, and in revisions to the Appropriate Assessment Procedure (AAP), needs to be broadened, particularly (but not only) in considering the hydrological impacts arising from current and future forestry operations.

2. The proposed Plan for Forestry and Freshwater Pearl Mussel in Ireland, as described in the documents received December 2015-January 2016 does not appear to contain, nor is it proposed to contain, detailed, scientific risk assessments of forestry in the catchments,

3. It is not proposed to include or present a strategic plan for forestry in the catchments, and

4. As a result (of 1, 2. And 3), there is, as yet, insufficient detail available to conduct a strategic environmental assessment (SEA) and appropriate assessment (AA) of this draft plan.

The Department would also welcome clarification on the mechanism that will be used by the Forest Service to ensure that this Plan, and relevant findings of the SEA and AA, to inform any amendments to the Forestry Programme 2014-2020 that may be needed to allow it to achieve its objective. This question similarly arises in relation to Coillte's developing Business Area Unit Plans and the assessments that these are likely to require in order to comply with Article 6 of the Habitats Directive and the national transposing legislation.

The Department would be happy to meet with the Forest Service to discuss these, as well as the other matters raised below, in more detail, in order to help progress the development of the Plan and the revisions to the AAP.

B. Draft Scoping Report for Strategic Environmental Assessment

The Department has the following observations to make on specific sections of the SEA Scoping Report. These are provided with a view to informing the development of the scope, objectives and content of the Plan/Catchment Forest Management Plans, the Forest Service's consenting procedures and the associated environmental assessments. The Forest Service is advised that the observations set out below on the ecological implications of the proposed Plan, and forestry activities contained within, should be used to inform both the SEA and the AA.

The documents provided to this Department refer interchangeably to "*the Plan*" *(Plan for Forestry and Freshwater Pearl Mussel in Ireland)* and to "*CFMPs" (Catchment Forest Management Plans*). It is unclear if the Forest Service intends to prepare one document that will be the "*Plan for Forestry and Freshwater Pearl Mussel in Ireland*", with discrete chapters or sections for each of the 8 priority catchments that will comprise the "*CFMPs"*. As a result, the Department's observations also use the terms interchangeably; this would benefit from some clarification from the Forest Service in due course.

The numbering of Sections below mirrors those of the Sections within the documents provided by the Forest Service's consultants, McCarthy Keville O'Sullivan Ltd., to this Department. Matters relating to Appropriate Assessment are set out within the observations on the SEA Scoping Report, as the SEA Report includes sections on AA. The Department's observations on the Screening for Appropriate Assessment, received from the Forest Service's consultants on 1 February 2016, are set out separately.

Section 1.2 Freshwater Pearl Mussel Ecology and Status

The Forest Service is advised that the Nore Freshwater Pearl Mussel captive breeding programme has been terminated and that there are no Nore pearl mussels (*Margaritifera margaritifera*) outside of the River Nore. Consequently, reference to extinction 'in the wild' is inappropriate, as extinction of the Nore population would mean extinction of the taxon. While it advocated captive breeding as an on-going measure for the Nore, the 2011 Conservation Strategy also cautioned that the Nore pearl mussel breeding programme had "*proven extremely challenging technically and the chances of success are low*", and highlighted failures in *Margaritifera* captive breeding from across Europe.

More detailed reflection of the status of *Margaritifera margaritifera* in the EU as reported in 2013 would be of benefit. See: http://bd.eionet.europa.eu/article17/reports2012/species/summary/ for further information.

S1.2.1 Current status

The Forest Service's attention is drawn to the *detailed* species assessment for freshwater pearl mussel published in: NPWS (2013). *The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3, Version 1.1.* Unpublished Report, National Parks and Wildlife Services, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. 62-83. Available at: http://www.npws.ie/article-17-reports-0/article-17-reports-2013

In particular, attention is drawn to the text on pressures and impacts, highlighting the importance of hydrological and morphological impacts, as well as impacts for sedimentation and nutrient-enrichment. NPWS (2013) states that "*The pressures impacting on* Margaritifera margaritifera *are often indirect, arising within the catchments of the occupied rivers, and can be broadly categorised into pollution and hydrological change*". The draft freshwater pearl mussel Sub-basin Management Plans (SBMPs) (available at: http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/) highlight the contribution of channelisation and drainage to the decline of the species in Ireland and detail the pressures and impacts associated with forestry in freshwater pearl mussel catchments. As well as sediment and nutrient enrichment owing to forest operations, hydrological changes associated with drainage and ground preparation, and losses of dissolved organic matter are highlighted. Further, site-specific information on pressures and impacts on freshwater pearl mussels is available from the many NPWS monitoring reports. A list of these is provided in Appendix 3 and these can be requested using the Department's data request form (see http://www.npws.ie/maps-and-data/request-data). The findings of the Interreg IVa project Practical Implementation of Freshwater Pearl Mussel Measures and on-going KerryLIFE project are two other examples of more recent sources of relevant information.

The Department is fully in agreement that rigorous, scientifically robust and fully implemented CFMPs are important, and for some catchments, critical, to the improvement of the species' future prospects. It should be noted, however, that the 2013 Habitats Directive Article 17 report concluded that the future prospects of the species are as follows: "*All of these considerations combined with the current bad status of the species' population and habitat quality and the on-going pressures from sectors such as agriculture and forestry, mean that the future prospects are considered bad*."

S1.2.2 Legal protection and S1.2.3 Forest Service Responsibilities regarding Freshwater Pearl Mussel

These sections omit reference to the responsibilities of the Forest Service pursuant to Regulation 27 of the European Communities (Birds and Natural Habitats) Regulations 2011. This Regulation gives effect to the obligations of Article 6 (2) of the Habitats Directive.

All public authorities, including the Department of Agriculture's Forest Service, "*having or exercising functions, including consent functions, which may or have implications for or effects on nature conservation shall exercise those functions in compliance with and, as*

appropriate, so as to secure compliance with, the requirements of the Habitats Directive and the Birds Directive and these Regulations".

Public authorities shall also, amongst other things, "*take the appropriate steps to avoid, in European sites, the deterioration of natural habitats and the habitats of species as well as the disturbance of the species for which the areas have been designated in so far as such disturbance could be significant in relation to the objectives of the Habitats Directive."*

These obligations relate not only to the Forest Service's consent functions, but to any other functions of a public authority, such as the administration of grant schemes. Regulation 27 goes on to set out further obligations, and these should be used to inform the development of the Catchment Management Plans to ensure its compliance with same. These obligations are conferred upon all public authorities, as defined in Part 1 of the 2011 Regulations, and not solely on *regulatory* authorities, as may be inferred from the final statement in S1.2.2 and the final paragraph in S1.2.3.

It is stated in S1.2.3 that the Forest Service undertakes detailed assessments of every application and its potential impact on the environment. This assessment is stated as being a combination of "*field inspection and GIS-based desk assessment, EIA screening (and EIA, if required), AA screening (and Appropriate Assessment, if required), public consultation, referral to various statutory consultees and an objector's appeal system."* It is not this Department's current understanding that the Forest Service undertakes a field inspection for every application submitted, as implied in this statement. The Department would welcome clarification on this as it has implications for recommendations it may make in future submissions on revisions to the Forest Service's Appropriate Assessment Procedure.

The Department recalls that the Forestry Programme 2014-2020 also commits that, as part of its environmental mitigation measures, decisions on applications where Annex I habitats, Annex I birds or Annex II species may be affected will be informed by an ecological assessment. The Plan for Forestry and FPM and the revisions to the AAP should also reflect how this commitment is being operationalised and demonstrate how they will inform decision-making and assessment obligations. The "*post-activity checks*" referred to in S1.2.3 should also be expanded on *e.g.* inspection rate etc. as the effectiveness of compliance systems are a significant aspect of the on-going Freshwater Pearl Mussel Pilot Case.

S2.1.1 Background *(to the Content and Context of the Catchment Forest Management Plans for Priority FPM Areas)* **and S2.1.2 Overview of Proposed Catchment Forest Management Plans**

The Department notes that some of the text in these Sections is out-of-date, for example, in relation to conservation status of the Bundorragha which has been in unfavourable conservation condition since 2012, as set out in the 2013 Article 17 Report. The Forest Service should use the most up-to-date scientific information and data available for the Environmental Report and Natura Impact Statement.

In S2.1.1, the principal cause of the species decline is referred to as "*sedimentation, with eutrophication also a significant factor*". Localised pressures are also referred to, *e.g.* flow regulation and morphological changes to river beds and banks. Section 2.1.2 states that

"*The CFMPs will be developed in order to set out strategies and associated measures to eliminate, reduce or mitigate diffuse pollution arising from forestry, as a long-term land use … and ensure that all forest activity undertaken within each catchment is fully compatible with - and where possible, proactively contributes towards - the protection of FPM and the restoration of favourable conservation status within these SACs*". As explained above, these statements suggest an under-estimation of the role of hydrological change, and interactions between commercial non-native forestry plantations, associated drainage, ground cultivation methods and flow regulation, morphological changes to river beds and banks and freshwater pearl mussel habitat modification (both in-stream and supporting riparian habitats). The Plan will need to address a broader range of impacts arising from forestry than solely diffuse pollution issues if it is to achieve the commitment referred to above, and these will also need to be assessed for the purposes of the SEA and AA.

S2.1.2 also refers to the units of change for the CFMPs as being individual applications submitted for consent/license to, *e.g.* afforest, forest road construction, thinning, clearfell and reforestation, which suggests a reactive rather than a proactive or strategic approach to protecting the freshwater pearl mussel and restoring it to favourable conservation status. Such a reliance on the implementation of the Forest Service's AAP at the project level means that:

1. There is no strategic plan for the management of on-going and potential impacts arising from existing conifer plantations in the catchments,

2. There is no strategic plan to prevent further forestry impacts from future afforestation and other operations,

3. The cumulative impacts of forestry are not or cannot be strategically assessed.

S2.1.2 sets out a number of the likely key components of the CFMPs. The Department recommends further useful components for inclusion as follows:

A. Expansion of the scope of the proposed mapping exercise to include
    i. Incorporation of the maps of the habitat of the freshwater pearl mussel to which the site's conservation objectives apply (the FPM_Habitat_Classification_" feature class/shapefile in the NPWS Margaritifera GeoDatabase). The objective is to restore these habitats in order to support the survival of adult, and particularly, juvenile mussels.
    ii. the identification of areas where riparian or other habitats will or may need to be restored to achieve those objectives, specifically to restore hydrological function and/or reduce sediment and nutrient loads to water.
B. Research and development programme *e.g.* to test, trial and demonstrate the efficiency of mitigation and restoration measures, to further develop understanding of the effects of forestry on the environment.
C. Application of appropriate ecological and hydrological expertise to all relevant stages of decision-making *e.g*. in S2.1.2, it is stated that applications within the Priority 8 catchments will only advance where "*the applicant and the forester have assessed individual site sensitivity regarding FPM and have tailored the proposal accordingly (either at initial application stage or arising from a Natura Impact Statement)"*. The Department is concerned that such site assessments could be made in the absence

of ecological and possibly hydrological advice, and potentially in the absence of Natura Impact Statements and Appropriate Assessments. As well as this use of expertise at the practical operation level, the Department is concerned as to whether and how the necessary expertise will be used in scientific risk assessments at the strategic planning level, and how these will then inform site-level assessments. The Department will expand on this in the Section below on S2.2.

D. The commitment to identify individual forest sites in which to initiate and effect change would also benefit from an explanation as to how this will be operationalised (and could be informed by the expansion of the mapping exercise as referred to above), and how it will contribute to the restoration of the species and avoid any further deterioration from forestry .

Section 2.2. Forestry and FPM Requirements

The Forestry and FPM Requirements were developed between 2006 and 2008 by the Forest Service, with significant input from this Department and Coillte, in response to an infringement case (2004/4759) taken by the European Commission against Ireland. This infringement case followed a mussel kill in the Owenriff River, in which clear-felling was implicated. Ireland responded by imposing a moratorium on felling in SAC catchments. The Forest Service's Pearl Mussel Requirements were developed to allow forest operations to resume in these catchments.

The Requirements were seen as a mechanism for imposing stricter environmental standards (mainly on clear-felling) in sensitive pearl mussel catchments and for managing Irish forests out of situations arising from poor historical practices (*i.e*. planting right up to river banks, on peat, on steep slopes etc.). The Requirements were not designed to eliminate all risks from forestry to the pearl mussel, but rather to reduce those risks, and were not subject to an Article 6(3) assessment.

A working group comprising the Forest Service, NPWS (at the time, part of the Department of the Environment, Heritage and Local Government) and Coillte was established in early 2010 to review the 2008 *Forestry and Freshwater Pearl Mussel Requirements,* and to improve and extend the risk assessment methodology. The revision of these forms was intended as an interim measure for the period of 2011-2012 while the CFMPs were being developed. The revised clear-fell forms (previously Forms A & B of the original *Requirements*) were trialled by working group members at two proposed clear-fell properties in the Caragh and Kerry Blackwater pearl mussel catchments in November 2010. The revised forms were extended to cover the entire catchment (*i.e.* not just the 6km hydrological limit) for the priority catchments. The risk assessment methodology was improved at that time, and a greater emphasis placed on appropriate training, however, the Department continues to have concerns on the following aspects of the Requirements, notably:

1. There is a need for improved consideration of the available scientific literature and further input from specialists in hydrology, soil science and engineering,

2. There is a need for suitably qualified individuals (notably hydrologists and ecologists) to undertake the risk assessment,

3. They would benefit from further linkages between the risks and the appropriate management and mitigation responses,

4. There is a need for testing of the efficacy of the recommended management and mitigation measures,

5. The residual risks require further consideration,

6. There is a need for the inclusion of guidelines on the production of long-term, strategic plans for the forest unit,

7. There is a need for consideration of other qualifying features of SAC and SPA, or other protected species,

8. There is a need for further analysis of "*in-combination with other plans and projects*" and cumulative effects,

9. There is a need to develop a more considered analysis of the information submitted by an applicant and the making of a determination that no adverse effects on site integrity will arise, *e.g*. including expanding and applying indicators for effects on site integrity, elaborated on further below.

10. The level of site-specific detail documented is likely to be insufficient to inform an Article 6 (3) assessment or to provide the necessary information for site managers and operators.

With specific reference to the derivation and use of the 6km hydrological zone, the Forest Service should be cognisant of the fact that this does not constitute the full extent of the potential zone of influence of forest operations on FPM populations and does not ensure that there is no reasonable scientific doubt remaining as to whether adverse effects will arise on the integrity of a site, as stated in S2.2.1. With regard to it being informed by "*the distance over which the effects of sediment trap overflow have been observed"*, this Department is of the view that this is not a robust basis for concluding that no effects will arise further down the watercourse, as once the sediment is in the system, it will eventually work its way downstream and reach a FPM population or suitable FPM habitat and contribute to deteriorating conditions for the species.

It is also noted that it was informed by "*uncertainty with regard to P dynamics in Irish FPM streams (i.e. lack of site-specific data)"*- this rather indicates that a more precautionary approach is required, including assuming an influence the entire distance downstream rather than a selected distance.

S2.2.2 Overview of Proposed Requirements Element of the Proposed Plan

It is stated that "*the intention* [of revising the FPM Requirements] *is to consider submissions received and to ensure that the new FPM requirements element of the proposed Plan addresses stakeholder concerns and introduces, where appropriate, new actions to protect FPM habitats*". A number of revisions are envisaged and are set out in this section. The Department recommends that the objective of the revision process is more explicit in its

intention to ensure compliance with Article 6(3) of the Habitats Directive and national transposing legislation, to address the points set out in these observations for the previous Section, and to reflect relevant developing jurisprudence and best practice. Some examples of relevant jurisprudence include:

- Kelly v An Bord Pleanala (Judicial Review, Ireland, 2014) (procedural obligations)
- Sweetman v An Bord Pleanala (Case C-259/11) (2013) (adverse effects on integrity)
- Briels (2014) Case C-521/12 (mitigation and compensation)

Other developments in European jurisprudence are expected in the coming months, *e.g.* Grüne Liga v Freistat Sachen and Orleans and Others -v- Vlaams Gewest, and may also be relevant to the Forest Service's AAP revision process.

Section 3: Strategic Environmental Assessment
S3.3 Appropriate Assessment

The Department seeks clarification of how the conservation objectives, particularly the site-specific conservation objectives (SSCOs) for the freshwater pearl mussel, will be used to inform the development of the Plan/CFMPs and the Appropriate Assessment thereof. SSCOs, while site-specific, also have general application as they utilise standard lists of attributes for each habitat/species. SSCOs contain notes on these attributes and targets, and may be accompanied by supporting documents (note: *Margaritifera* SSCOs do not have supporting documents, but do have very detailed notes and references). All published SSCOs are available at http://www.npws.ie/protected-sites/conservation-management-planning/conservation-objectives). An Appropriate Assessment must focus on the potential effects on the conservation objectives of sites, by analysing and assessing how the plan or project could impact upon the relevant attributes and targets, in view of their current condition.

As per the response provided to the Commission for the EU pilot case on the freshwater pearl mussel (submitted on 23rd December 2015), as prepared by this Department and the Forest Service, SSCO tables have been prepared for all mussel sites and four have been published (*M. durrovensis* in SAC 2162, *M. margaritifera* in SACs 2165, 2170 and 197). The tables for the remaining 16 *M. margaritifera* SSCOs are attached (Appendix 2 Excel file).

The SSCOs for the freshwater pearl mussel SACs are "*to restore the favourable conservation condition of the freshwater pearl mussel*". The freshwater pearl mussel is unique as a qualifying interest of Irish Special Areas of Conservation in having environmental objectives established in law (European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, S.I. 296 of 2009). SSCOs for the species include the attributes and targets established in these Regulations. They also include additional attributes, such as hydrological regime, and expand upon those contained in the Regulations (*e.g.* using redox measurement, in addition to siltation levels). The SSCO attributes are based on monitoring and research programmes, and are detailed in Article 17 and freshwater pearl mussel monitoring reports.

The Forest Service's attention is drawn to European Commission (2001) and Department of the Environment, Heritage and Local Government (2009) guidance which points out that appropriate assessments are to "*assess whether there will be adverse effects on the integrity of the site as defined by the conservation objectives and status of the site*" [1]; and include an "*integrity of site checklist*", which could usefully be used and expanded to inform the appropriate assessment of these Plans (and all applications for consent to the Forest service). This Checklist includes indicators such as the following:

- *will the plan or project cause delays in progress towards achieving the conservation objectives of the site?*
- *will the plan or project interrupt progress towards achieving the conservation objectives*?[2]

The Department notes that the submitted Screening for Appropriate Assessment includes consideration of a limited range of criteria that may indicate "*Likely changes to European sites*". It is recommended that these be expanded to include a more comprehensive set of indicators, including those referred to above, and to reflect the matters raised in this submission.

The Natura Impact Statement and the Forest Service's Appropriate Assessment must consider the current unfavourable condition of the populations and their habitat, particularly the risk that forest operations could:

1. Prolong the poor condition of the freshwater pearl mussel habitat
2. Result in further deterioration in freshwater pearl mussel habitat condition
3. Increase the area of freshwater pearl mussel habitat negatively affected

And in so doing:

1. Prevent juvenile recruitment, owing to unsuitable juvenile habitat condition
2. Cause stress to adult mussels resulting in reproductive failures
3. Cause mortalities of adult mussels, impacting population size
4. Result in an extended 'gap' in the population's age profile, impacting population size and future reproductive potential
5. Increase the patchiness of mussel distribution, impacting future reproductive potential.

In particular, the hydrological impacts of forestry will require careful assessment. Alteration of the natural hydrological regime can have significant negative impacts on freshwater pearl mussels. Sediment and nutrient mobilisation, transport and deposition are integrally linked to hydrology. Soil compaction, creation of preferential flow paths and drainage can increase run-off rates. This has the effect that:

1. flood peaks increase in energy/erosive power and occur more rapidly, resulting in
    a. Increased river bank erosion and slumping, leading to river widening and increased sediment load
    b. Scour of freshwater pearl mussel habitat
2. base flows decrease, resulting in
    a. exposure (emersion) of mussels and their habitat

[1] European Commission, 2001, p28
[2] European Commission, 2001, p28 and DEHLG, 2009, p83.

b. increased sedimentation of mussel habitat
c. increased macrophyte and macroalgal colonisation of mussel habitat.

Moorkens (2010[3]) demonstrated that there was a direct relationship between more intensive catchment management (*i.e*. more drainage, and relatively intensive agriculture and forestry) and recruitment failures in mussel populations. Good recruitment and high mussel densities correlated with lower levels of artificial drainage and sustained high near-bed water velocities, even at low flow periods (Moorkens & Killeen, 2014[4]).

Sub-surface/shallow groundwater flow to rivers generates interstitial flow, which helps maintain oxygen levels in the substratum and influences sediment mobilisation and deposition, thus contributing to favourable juvenile freshwater pearl mussel habitat condition.

As well as providing hydrological function, the importance of fringing wetlands as a food source to the freshwater pearl mussel is increasingly being recognised. Water flowing through and over such wetlands accumulates detritus that has been shown to play an essential role in sustainable juvenile growth and survival (Hruska, 1999, 2001; Eybe, 2013). The loss of such habitat is associated with mussel declines and loss of recruitment of juveniles (Junjiro *et al*., 2014).

The natural hydrological regime of many of the forest areas within freshwater pearl mussel catchments has been altered as a result of forest operations, particularly drainage, mounding and other ground preparations, tree planting and growth. This is particularly true of forests on peat and peaty-soils. Restoration of a near-natural hydrological regime is necessary to the achievement of the conservation objective for most freshwater pearl mussel populations.

In relation to the assessment of on-going and potential hydrological impacts arising from coniferous forests in freshwater pearl mussel catchments, the Forest Service's attention is drawn to hydrological risk assessment methods developed by the Interreg IVa project *Practical Implementation of Freshwater Pearl Mussel Measures*, the Technical Group of which both this Department and the Forest Service were members.

The Department also seeks clarification as to how the best-practice forestry hydrological risk assessments under development by the KerryLIFE project will be incorporated into the Plan and the Appropriate Assessment of the same. The Forest Service, as the beneficiary responsible for implementing KerryLIFE Action A3: Preparation of forest management plans, and as consent authority for the project's concrete forest actions, has access to the source mapping and risk assessment reports circulated, to date, for three forest properties (Purser Tarleton Russell Ltd., 2015) and the more detailed Gortfadda Forest – Hydrological Assessment report (RPS, 2015).

Further advice on the preparation of a Natura Impact Statements is presented in Appendix 1. The Forest Service is also advised that, as well as preparing an NIS, a public authority is required to complete a determination as to whether its proposed plan would adversely affect the integrity of a European site, and this must be completed before a decision is taken to

[3] Moorkens, E.A. (2010) Addressing the conservation and rehabilitation of Margaritfera margaritifera populations in the Republic of Ireland within the framework of the habitats and species directive. Journal of Conchology. 40, 339.
[4] Moorkens, E.A. and Killeen, I.J. (2014) Assessing near-bed velocity in a recruiting population of the endangered freshwater pearl mussel (Margaritifera margaritifera) in Ireland. Aquatic Conservation: Marine and Freshwater Ecosystems. DOI: 10.1002/aqc.2530

approve or undertake the plan, as the case may be (Regulation 42 (11) of the 2011 Regulations).

This Section, S2.2.2, also commits to a revision of "*the wider procedures applied by the Forest Service in its assessment of applications submitted under the FPM Requirements*", including referral with the NPWS of this Department. The Department would also welcome an opportunity to discuss the current form of the referral process between the two Departments, particularly with regard to the obligation in Regulation 42 of the 2011 Regulations for Natura Impact Statements to be submitted to the Minister for Arts, Heritage and the Gaeltacht, prior to the completion of an appropriate assessment.

S3.4 Overview and Outcome

This Section states that "*The key role of the Appropriate Assessment (AA) is to provide an impact assessment of the implications that the Plan may have on the conservation objectives of Natura 2000 sites and the development, if necessary, of mitigation measures*." The role of an AA goes beyond that of solely assessing impacts but is rather a key part of an authority's decision-making process, as it limits the discretion of authorities to consent to plans that may or will adversely affect Natura 2000 sites. Please also note the obligation to complete a determination, pursuant to Regulation 42(11) as noted above.

S3.5.3 AA Consultation

This Section does not reflect the statutory consultation required with the Minister for Arts, Heritage and the Gaeltacht when a public authority prepares or commissions a Natura Impact Statement. These requirements are set out in Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011.

S4 Key Environmental Issues:

Please refer to the comments set out in the Section above on Appropriate Assessment.

S4.4. Biodiversity and Flora and Fauna

The Environmental Report is required to contain information on the environmental characteristics of the areas likely to be affected significantly by the plan. For biodiversity, flora and fauna, the scope of the SEA should include:

- All nature conservation sites, including European sites, sites protected under national legislation, National Parks etc.;
- Species of wild flora and fauna, including rare and protected species and their habitats; Annex IV (Habitats Directive) species of flora and fauna, and their key habitats (i.e. breeding sites and resting places), which are strictly protected wherever they occur, whether inside or outside sites, (including data on rare and protected species from NPWS, the National Biodiversity Data Centre, BirdWatch Ireland, etc.);
- Other species of flora and fauna and their key habitats which are protected under the Wildlife Acts, 1976-2000, wherever they occur
- 'Protected species and natural habitats' as defined in the Environmental Liability Directive (2004/35/EC) and European Communities (Environmental Liability) Regulations, 2008, including:

- Birds Directive – Annex I species and other regularly occurring migratory species, and their habitats (wherever they occur)
- Habitats Directive – Annex I habitats, Annex II species and their habitats, and Annex IV species and their breeding sites and resting places (wherever they occur)
- Stepping stones and ecological corridors including nature conservation sites (other than European sites), habitat areas and species' locations covered by the wider obligations of the Habitats Directive.
- All watercourses, surface water bodies and associated wetlands, including floodplains and flood risk areas.

The Environmental Report is required to contain environmental protection objectives. For biodiversity, flora and fauna, these should integrate with the objectives and obligations of other directives such as the Habitats Directive, the Birds Directive, the Water Framework Directive and the Floods Directive, and with the Wildlife Acts, 1976-2000 and the National Biodiversity Plan.

Data/Information Sources:

The National Parks and Wildlife Service website (www.npws.ie) is a key source of data, information and publications, including GIS datasets, on nature conservation sites and biodiversity issues of relevance to the Strategy and its associated environmental assessments. This includes site boundaries, site synopses, lists of qualifying interests (SACs) and special conservation interests (SPAs), conservation objectives (European sites – see also below), features of interest (NHAs), and dates of site designation. GIS datasets are available for download for certain habitats and species arising from various sources, including national surveys[5]. Other NPWS-held data on habitats and species may be requested by submitting a 'Data Request Form'[6].

Site-specific conservation objectives, and associated backing documents and GIS datasets, are available for download in the case of some European sites. The limitations of the data, however, should be noted as outlined.

Additional information about sites, habitats and species will become available over time. It is recommended that the most up-to-date data and information available from the NPWS website should be accessed and used at each successive stage of the plan-making process.

S5: Key Scoping Issues

S5.2 Relationship with Legislation and Other Plans and Programmes

This Section sets out a number of other Plans and Programmes that the SEA will consider. These will also need to be assessed in the Appropriate Assessment, for in-combination and cumulative effects.

[5] http://www.npws.ie/maps-and-data/habitat-and-species-data
[6] http://www.npws.ie/maps-and-data/request-data

The Department recommends that the following plans are also analysed for potential and likely cumulative effects:

- Coillte's Business Area Unit Plans
- Inland Fisheries Ireland's National Strategy for Angling Development
- National Climate Change Adaptation and Mitigation Plans
- Irish Water's Lead Mitigation and Sludge Plans, amongst others.

C. Article 6(3) Screening Assessment (as submitted by Forest Service's consultants, 1 February 2015).

The Department agrees that the proposed Plan may have significant effects on European sites. Particular regard will need to be given to the potential effects that may arise on other Qualifying Interests of the European sites, as well as to the pearl mussel.

With regard to the methodology used for the "screening assessment", the Department has the following brief observations to provide which should be used by the Forest Service and its consultants to develop its methodology for the Natura Impact Statement and Appropriate Assessment.

The Department welcomes the commitment to applying a precautionary approach to this screening, as is required by jurisprudence. However, given the as-yet unclear scope of the proposed Plan, and activities that will arise from it, it is possible that the current screening exercise has not fully identified or considered all the impacts that will arise from the proposed Plan. This subsequently undermines the robustness of the conclusions that all potentially affected European sites have been identified. This will need to be revisited as the contents of the Plan develop.

It is stated in the document that a "*likely zone of impact*" was used to identify European sites that may be affected by the proposed Plan. This was informed by:

- The 8 priority catchments
- A 6km zone from populations in SACs
- A 15km buffer radius
- European sites outside the 15km buffer "*where pathways for impact were identified and where hydrological connectivity could be established*".

The identification of impacts arising from the Plan should be revisited in view of these observations, and as the contents of the Plan itself develops. Their effects on European sites and other ecological receptors should then be assessed to inform the SEA and AA.

As also set out earlier in this document, the possible and likely changes that may arise to European sites should also be revisited and expanded, as well as the indicators for adverse effects on site integrity.

You are requested to send further communications and any requests for clarification to this Department's Development Applications Unit (DAU) at **manager.dau@ahg.gov.ie** (team monitored); if this is not possible, correspondence may alternatively be sent to:

The Manager
Development Applications Unit (DAU)
Department of Arts, Heritage and the Gaeltacht
Newtown Road
Wexford
Y35 AP90

Is mise, le meas

Joanne Lyons
Development Applications Unit
Tel: 053-9117447

Appendix 1: Notes on the preparation and content of an NIS

The term 'NIS' is defined in legislation[7]. In general, an NIS, if required, should present the data, information and analysis necessary to reach a definitive determination as to

1. the implications of the plan or project, alone or in combination with other plans and projects, for a European site in view of its conservation objectives, and
2. whether there will be adverse effects on the integrity of a European site. The NIS should be underpinned by best scientific knowledge and objective information, as required in the case of screening for appropriate assessment, and by the precautionary principle.

The following advice is offered in relation to the preparation and content of an NIS:

1. An NIS is a scientific assessment that presents relevant evidence, data and analysis, and focuses on the implications of the plan or project, on its own and in combination with other plans and projects, for the conservation objectives of the relevant European site(s), taking the full scope of these objectives, whether generic or site specific, into account;

2. Examination of the potential effects of the plan or project must be undertaken to identify what European sites, and which of their qualifying interests (SAC), special conservation interests (SPA) or conservation objectives, are potentially at risk. In combination effects must also be taken into account. This is required to determine a 'zone of influence' or 'zone of impact' for the project, if such a concept is used. The 15km distance in existing guidance is an indicative figure only and its application and validity should be examined and justified in each specific case on an ecological or other basis;

3. The *scientific* basis on which sites and their conservation objectives are included or excluded from assessment and analysis should be presented and justified;

4. The full area or extent of the likely effects of the plan or project should be determined and quantified. Where temporary damage and disturbance will occur, predicted timelines for recovery should be presented;

5. The relevant environmental baseline, conservation condition and trends in European sites should be taken into account, bearing in mind changes and in combination effects which have occurred since site designation;

6. An NIS should be informed by any necessary surveys of habitats and species at the appropriate time(s) of year to identify, describe, evaluate and map their presence within the receiving environment. In all relevant cases, the scientific basis and justifications for categorising or not categorising habitats as Annex I habitats, or priority types, should be presented;

7. An NIS should be informed by any necessary hydrological, hydrogeological or geotechnical investigations to assess impacts on habitat structure and function;

[7] The term, 'NIS', is defined in the European Communities (Birds and Natural Habitats) Regulations, 2011, and Part XAB, Section 177T of the Planning and Development Act, 2000 as amended

8. Where mitigation measures are required, full details should be included in the project description and drawings, with method statements provided, where necessary. It must be demonstrated that mitigation measures will be delivered in full, and at the appropriate time, at all post-consent stages, and that they will be effective in any specific location or set of conditions. The necessary analysis should be presented to demonstrate how the mitigation measures will avoid or remove the risks of adverse effects on the integrity of European sites that have been identified in an NIS so that the final analysis is undertaken in the context of the predicted residual effects;

9. An NIS should reach a clear and precise conclusion as to the implications of the project, on its own and in combination with other plans and projects, for the conservation objectives of the relevant European site(s).

Guidance and studies relating to Article 6 of the Habitats Directive:

A short list of relevant guidance, studies and a potentially relevant Court Rulings is provided below. More is available on the Commission's website (listed below also).

- Department of Environment, Heritage and Local Government. 2009. Appropriate assessment of plans and projects in Ireland: Guidance for planning authorities. Available on www.npws.ie.
- European Commission, 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.
- European Commission, 2001. Methodological guidance on the provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC.
- European Commission, 2013. EC Study on evaluating and improving permitting procedures related to Natura 2000 requirements under Article 6.3 of the Habitats Directive 92/43/EEC.
- European Commission, 2014. Guidance Document: Farming for Natura 2000.

All European Commission guidance and publications available at:
http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm.

Appendix 2: Note on *Margaritifera margaritifera* Site-Specific Conservation Objective (SSCO) DRAFT Tables, MS Excel files forwarded to the Forest Service in February 2016

The sixteen draft SSCOs, presented in 16 separate excel files, are for *Margaritifera margaritifera* (1029) in the following sites:

1. 000140 Fawnboy Bog/Lough Nacung SAC
2. 000163 Lough Eske and Ardnamona Wood SAC
3. 000297 Lough Corrib SAC
4. 000365 Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC
5. 000375 Mount Brandon SAC
6. 000781 Slaney River Valley SAC
7. 001879 Glanmore Bog SAC
8. 001932 Mweelrea/Sheeffry/Erriff Complex SAC
9. 002031 The Twelve Bens/Garraun Complex SAC
10. 002047 Cloghernagore Bog and Glenveagh National Park SAC
11. 002137 Lower River Suir SAC
12. 002144 Newport River SAC
13. 002162 River Barrow and River Nore SAC
14. 002171 Bandon River SAC
15. 002173 Blackwater River (Kerry) SAC
16. 002176 Leannan River SAC

SSCOs are published for the following sites

17. 000197 West of Ardara/Maas Road
18. 002162 River Barrow and River Nore SAC (Margaritifera durrovensis, Nore pearl mussel only)
19. 002165 Lower River Shannon
20. 002170 Blackwater River (Cork/Waterford)

And are available on www.npws.ie (see: http://www.npws.ie/protected-sites and http://www.npws.ie/protected-sites/conservation-management-planning/conservation-objectives)

The following should be noted:

- These draft tables have not yet been reviewed internally, and, hence may contain typographical and formatting errors.
- The date of production is contained within the file name, and varies from June 2013 to November 2015. The older files have yet to be updated to the current standard format.
- The maps have not yet been produced for these SSCOs, hence the length targets for distribution and suitable habitat extent are not specified.
- Although the target for the extent of the suitable habitat is not specified in the tables, it refers to the habitat polyline (FPM_Habitat_Classification_[*year*]_v0#) in the NPWS *Margaritifera* Geodatabase)

- These SSCO tables will be updated to coincide with formal publication.
- The Forest Service and its contractors should regularly check the NPWS website for publication of SSCOs
- These data should not be shared beyond the Forest Service staff and contractors involved in SEA and AA of the “Plan for Forestry and Freshwater Pearl Mussel in Ireland” process

Appendix 3: List of NPWS commissioned reports on the Freshwater Pearl Mussel (*Margaritifera margaritifera*) 1995-present.

Reports are listed in alphabetical and chronological order under three headings:

1. **Monitoring** Surveillance in accordance with Article 11 of the Habitats Directive and Regulation 4 of S.I. 296 of 2009

2. **NS2** The 'North South 2' Project. A DEHLG-funded project that ran from 2008-2010 and produced draft Sub-basin Management Plans for the species, in accordance with S.I. 296 of 2009

3. **Other** various reports, including those related to assisted breeding projects and Article 17 reporting.

Note, 2009 monitoring reports appear under both 'Monitoring' and 'NS2' Headings.

Monitoring

Killeen, I.J. & Moorkens, E.A. (2008) *A rapid survey for the freshwater pearl mussel* Margaritifera margaritifera *(L. 1758) in the Aughavaud River, County Carlow*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2004a) *Pilot Project for Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. Baseline survey of the Owenriff River SAC, County Galway*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2004b) *Pilot Project for Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. Monitoring survey of the Nore River SAC, Counties Laois and Kilkenny*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2005a) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera*. Baseline survey of the Newport River cSAC, County Mayo*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2005b) *Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. Baseline survey of the Bundorragha River cSAC, County Mayo*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2005c) *Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. Repeat survey of the Owenriff River SAC, County Galway*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2005d) *Monitoring Populations of the Freshwater Pearl Mussel,* Margaritifera margaritifera*. Repeat survey of the Nore River SAC, County Laois / Kilkenny*. Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E.A. (2006) *Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. 2006 repeat survey of the Owenriff River SAC, County Galway*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2007a) *Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. 2006 Baseline Survey of the Clady River, County Donegal*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2007b) *Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. 2006 Baseline Survey of the River Eske, County Donegal*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2007c) *Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera. *2006 Baseline Survey of the Swanlinbar River, County Cavan.* Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2007d) *Rapid Assessment of Rivers with Prior records of* Margaritifera margaritifera, *2007 Survey.* Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E.A. (2007e) *Survey of the Freshwater Pearl Mussel,* Margaritifera durrovensis, *2007.* Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2008a) *Rapid Assessment of Rivers with Prior records of* Margaritifera margaritifera, *2008 Survey.* Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E.A. (2008b) *Monitoring Populations of the Freshwater Pearl Mussel*, Margaritifera margaritifera*. 2008 Repeat survey of the Owenriff River SAC, County Galway*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2008c) Survey of Dawros River – July 2008. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2008d) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Aughavaud. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009a) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Allow. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009b) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Ballymurphy. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009c) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Bandon. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009d) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Bundorragha. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009e) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Clady. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009f) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Derreen. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009g) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Eske. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009h) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Glaskeelan. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009i) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Leannan. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009j) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Mountain. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009k) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Newport. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009l) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Nore. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009m) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owencarrow. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009n) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenea. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009o) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenriff. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2011) Derreen River 2011 *Margaritifera* monitoring results. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2012a) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera - *A condition assessment survey of the freshwater pearl mussel in the Bundorragha River, Co. Mayo.* Spring 2012. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2012b) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera - *A condition assessment survey of the freshwater pearl mussel in the Glaskeelan River, Co. Donegal*. Spring 2012. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2015a) *KerryLIFE Project. 2014 Surveys of the Kerry Blackwater and Caragh Rivers*. March 2015. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2015b) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera – *2014 Monitoring Survey of the Owenriff River, County Galway*. March 2015. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2015c) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera – *2014 Monitoring Survey of the River Clady, County Donegal*. April 2015. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2015d) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera – *2015 Monitoring Survey of the Owenriff River, County Galway*. November 2015. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2015e) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera – *2014/2015 Monitoring Survey of the River Derreen, County Carlow/Wicklow*. November 2015. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2015f) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera – *2015 Monitoring Survey of the Recess River system, County Galway*. November 2015. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E.A. (2015g) *Monitoring Populations of the Freshwater Pearl Mussel* Margaritifera margaritifera – *2015 Monitoring Survey of the Swanlinbar River, County Cavan*. November 2015. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Moorkens, E. & Killeen, I. (2009) *Mapping of the Distribution of* Margaritifera margaritifera *in the River Deel (Moy Catchment), Co. Mayo*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2004a) *A Pilot Project to Develop a Monitoring Protocol for the Freshwater Pearl Mussel* Margaritifera margaritifera *(L.) in the Blackwater River, County Kerry, Ireland.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2004b) *A Pilot Project to Develop a Monitoring Protocol for the Freshwater Pearl Mussel* Margaritifera margaritifera *(L.) in the Caragh River, County Kerry, Ireland*. Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2005a) *Initiation of a monitoring program for the freshwater pearl mussel,* Margaritifera margaritifera *(L.) in the Licky River.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin n.

Ross, E.D. (2005b) *Initiation of a monitoring program for the freshwater pearl mussel,* Margaritifera margaritifera *(L.) in the Ownagappul River.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2005c) *A survey of the Owenshagh River, Co. Kerry, for the freshwater pearl mussel,* Margaritifera margaritifera *(L.).* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E. (2006a) *Initiation of a monitoring program for the freshwater pearl mussel,* Margaritifera margaritifera *(L.) in the Clodiagh River (Suir).* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E. (2006b) *Initiation of a monitoring program for the freshwater pearl mussel,* Margaritifera margaritifera *(L.) in the Mountain River (Barrow).* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2006c) *Report on searches for juvenile* Margaritifera margaritifera *(L.) in the Blackwater River (Co. Kerry).* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2006d) *Report on searches for juvenile* Margaritifera margaritifera *(L.) in the Caragh River, Co. Kerry.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2007a) *Report on searches for juvenile* Margaritifera margaritifera *(L.) in the Derreen River (Co. Carlow).* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2007b) *Report on juvenile searches for* Margaritifera margaritifera *(L.) in the Owenreagh River (Laune).* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2008) *Rapid Assessment of* Margaritifera margaritifera *(L.) populations in Ireland: Rivers assessed in 2007.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2009a) *Rapid Assessment of* Margaritifera margaritifera *(L.) populations in Ireland: Rivers assessed in 2008.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009b) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Caragh. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E. (2009c) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Clodiagh. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009d) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Cloon. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E. (2009e) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Currane. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009f) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Gearhameen. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009g) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Kerry Blackwater. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009h) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Licky. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009i) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Munster Blackwater. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009j) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenmore. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009k) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenagappul. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.D. (2011a) *Caragh River System2011* Margaritifera *Monitoring Results 2011*. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Ross, E.D. (2011b) *Blackwater (Kerry) River 2011* Margaritifera *Monitoring Results*. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Ross, E.D. (2011d) *Licky River, Co. Kerry, 2011* Margaritifera *Monitoring Results*. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NS2 (see http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/)

Central Fisheries Board (2009) *Report and analysis of salmonid populations in selected pearl mussel* (*Margaritifera margaritifera and M. durrovensis*) *catchments*. [Report to the North South 2 Project/National Parks and Wildlife Service]. Central Fisheries Board, Dublin.

Conservation Services (2008a) *NS II Freshwater Pearl Mussel Sub-basin Management Plans: Biological Monitoring of Surface Water Quality in the Allow Catchment*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2008b) *NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Owenagappul Catchmen*t. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2009a) NS II *Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Bandon/Caha Catchment. September 2009*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2009b) NS II *Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Caragh River Catchment*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2009c) *NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Derreen River Catchment*. *September 2009*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2009d) *NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Gearhameen River Catchment*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2009e) *NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Kerry Blackwater River Catchment*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2009f) *NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Munster Blackwater River Catchment*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Conservation Services (2009g) *NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Nore River Catchment*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Department of the Environment, Heritage and Local Government (2010) *Second Draft Allow Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Aughavaud Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Ballymurphy Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Bandon Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Bundorragha Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Caragh Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Clady Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Clodiagh Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Cloon Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Currane Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Dawros Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Derreen Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Eske Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Gearhameen Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Glaskeelan Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Kerry Blackwater Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Leannan Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Licky Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Mountain Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Munster Blackwater Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Licky Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Nore Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Owencarrow Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Owenea Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Owenmore Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Owenriff Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Department of the Environment, Heritage and Local Government (2010) *Second Draft Ownagappul Freshwater Pearl Mussel Sub-basin Management Plans (2009-2015)*. March 2010. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/

Johnston (Associates), P. (2009a) *Freshwater Pearl Mussel: Juvenile fish survey – September 2009. NS II Freshwater Pearl Mussel Sub-basin Management Plans.* Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Johnston (Associates), P. (2009b) *NS II Freshwater Pearl Mussel Sub-basin Management Plan: Fisheries Survey. Stage 1 Report*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2008c) Survey of Dawros River – July 2008. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2008d) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Aughavaud. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009a) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Allow. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009b) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Ballymurphy. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009c) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Bandon. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009d) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Bundorragha. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009e) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Clady. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009f) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Derreen. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009g) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Eske. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009h) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Glaskeelan. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009i) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Leannan. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009j) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Mountain. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009k) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Newport. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009l) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Nore. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009m) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owencarrow. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009n) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenea. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Moorkens, E.A. (2009o) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenriff. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Morgan, G. (2009a) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Clodiagh (Waterford) Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Morgan, G. (2009b) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Licky Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Morgan, G. (2009c) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Mountain Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009a) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Allow Catchment, Co. Cork. (SWRBD). June & July 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009b) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Aughavaud Catchment, Co. Carlow. (SERBD). June & July 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009c) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Ballymurphy Catchment, Co. Carlow. (SERBD). June & July 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009d) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Bandon Catchment, Co. Cork. (SWRBD) June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009e) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Bundorragha Catchment, Co. Mayo. (WRBD). April & September 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009f) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Caragh Catchment, Co. Kerry. (SWRBD). June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009g) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Clady Catchment, Co. Donegal. (NWIRBD). June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009h) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Clodiagh Catchment, Co. Waterford. (SERBD). June & July 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009i) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Cloon Catchment, Co. Clare. (ShIRBD). May & August 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009j) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Currane Catchment, Co. Kerry. (SWRBD). May & August 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009k) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Dawros Catchment, Co. Galway. (WRBD). June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009l) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Derreen Catchment, Counties Wicklow & Carlow. (SERBD). June & July 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009m) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Eske Catchment, Co. Donegal. (NWIRBD). April 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009n) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Gearhameen Catchment, Co. Kerry. (SWRBD). May & August 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009o) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Glaskeelan Catchment, Co. Donegal. (NWIRBD). April 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009p) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Kerry Blackwater Catchment, Co. Kerry. (SWRBD). May 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009q) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Leannan Catchment, Co. Donegal. (NWIRBD). April 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009r) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Licky Catchment, Co. Waterford. (SWRBD). June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009s) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Mountain Catchment, Co. Carlow. (SERBD). June & July 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009t) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Munster Blackwater, Co. Cork. (SWRBD). June & July 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009u) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Newport Catchment, Co. Mayo. (WRBD). June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009v) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Nore Catchment, Co's Laois & Kilkenny. (SERBD). June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009w) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Owencarrow Catchment, Co. Donegal. (NWIRBD). April 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009x) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Owenea Catchment, Co. Donegal. (NWIRBD). April 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (200y9) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Owenmore Catchment, Co. Kerry. (ShIRBD). June 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009z) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Owenriff Catchment, Co. Galway. (WRBD). April & August 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ní Chatháin, B. (2009aa) NS2 Freshwater Pearl Mussel Sub-Basin Management Plans. Phytobenthos monitoring of the Ownagappul Catchment, Co. Cork. (SWRBD). May-August 2009. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009a) *Monitoring Methods Report. Freshwater Pearl Mussel Sub-basin Management Plans.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Monitoring%20Manual/

North South (NS) 2 Project (2009b) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Allow Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009c) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Aughavaud Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009d) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Ballymurphy Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009e) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Bandon Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009f) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Bundorragha Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009g) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Caragh Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009h) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Clady Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009i) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Clodiagh Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009j) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Cloon Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009k) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Currane Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009l) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Dawros Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009m) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Derreen Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009n) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Eske Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009o) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Gearhameen Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009p) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Glaskeelan Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009q) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Kerry Blackwater Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009r) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Leannan Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009s) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Licky Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009t) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Mountain Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009u) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Munster Blackwater Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009v) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Newport Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009w) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Nore Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009x) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Owencarrow Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009y) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Owenea Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009z) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Owenmore Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009aa) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Owenriff Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2009ab) Freshwater Pearl Mussel Sub-basin Management Plans Report on Morphological Monitoring and Catchment Walkover Risk Assessments in the Ownagappul Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

North South (NS) 2 Project (2010) *Freshwater Pearl Mussel Sub-basin Management Plans: Background Documentation, Literature Review*. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Background%20Documents/Literature%20Review/

Ross, E.D. (2009a) *Rapid Assessment of* Margaritifera margaritifera *(L.) populations in Ireland: Rivers assessed in 2008.* Unpublished report to National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009b) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Caragh. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009c) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Clodiagh. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009d) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Cloon. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009e) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Currane. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009f) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Gearhameen. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009g) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Kerry Blackwater. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009h) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Licky. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009i) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Munster Blackwater. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009j) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenmore. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Ross, E.. (2009k) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Monitoring of the Freshwater Pearl Mussel in the Owenagappul. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2008) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Aughavaud Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2008/2009) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Owenmore Catchment. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009a) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Ballymurphy Catchment, Co. Carlow. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009b) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Bundorragha Catchment, Co. Carlow. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009c) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Cappul (Currane) Catchment, Co. Kerry. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009d) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Cummeragh (Currane) Catchment, Co. Kerry. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009e) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Clady Catchment, Co. Donegal. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009f) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Shannon Estuary (Cloon) Catchment, Co. Clare. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009g) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Dawros Catchment, Co. Galway. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009h) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Eske Catchment, Co. Donegal. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009i) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Glaskeelan Catchment, Co. Donegal. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009j) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Leannan Catchment, Co. Donegal. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009k) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in Newport Catchment, Co. Mayo. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009l) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Owencarrow Catchment, Co. Donegal. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009m) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Owenea Catchment, Co. Donegal. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Williams, L. (2009n) NS II Freshwater Pearl Mussel Sub-basin Management Plans: Report on Biological Monitoring of Surface Water Quality in the Owenriff Catchment (Corrib Sub-catchment), Co. Galway. Unpublished Report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Other

Anonymous (2004) Margaritifera margaritifera*: Stage 1 and Stage 2 survey guidelines*. Irish Wildlife Manual No. 12. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin Ireland. [**Note this IWM is under revision to incorporate Stages 3 and 4**]

http://www.npws.ie/sites/default/files/publications/pdf/IWM12.pdf

Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. and Regan, E.C. (2009) Ireland Red List No. 2 – Non-Marine Molluscs. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland. http://www.npws.ie/publications/redlists/

Moorkens, E.A. (1995) *Mapping of proposed SAC Rivers for* Margaritifera margaritifera. *A Report for the National Parks and Wildlife Service on work carried out from August to October 1995 (in two volumes). Volume 1*. National Parks and Wildlife Service, Dublin.

Moorkens, E.A. (1995) *Mapping of proposed SAC Rivers for* Margaritifera margaritifera. *A Report for the National Parks and Wildlife Service on work carried out from August to October 1995 (in two volumes). Volume 2*. National Parks and Wildlife Service, Dublin.

Moorkens, E.A. (1999) *Conservation management of the freshwater pearl mussel* Margaritifera margaritifera *Part 1: Biology of the species and its present situation in Ireland.* Irish Wildlife Manual No. 8. Dúchas, The Heritage Service, Department of Arts, Heritage, Gaeltacht and the Islands, Dublin.

http://www.npws.ie/sites/default/files/publications/pdf/IWM8.pdf

Moorkens, E.A. (2000) *Conservation management of the freshwater pearl mussel* Margaritifera margaritifera *Part 2: Water quality requirements.* Irish Wildlife Manual No. 9. Dúchas, The Heritage Service, Department of Arts, Heritage, Gaeltacht and the Islands, Dublin. [**Note this IWM is now considered out-of date. See draft SBMPs for further information**]

http://www.npws.ie/sites/default/files/publications/pdf/IWM9.pdf

Moorkens, E. (2006d*) Research aspects of proposed* Margaritifera durrovensis *captive breeding programme in Fanure, Roscrea*. Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E. (2006e) *Preliminary assessment of River Nore tributaries for potential translocation areas for extant adult and captive bred Nore pearl mussels* Margaritifera durrovensis*.* Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E. (2010) *Progress Report on* Margaritifera durrovensis *captive breeding*. Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E. (2011c) *Summary of Captive Breeding progress 2005-1010.* Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E. (2011d) *Report on* Margaritifera durrovensis *captive breeding Phase 1 (September 2010 - April 201).* Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E. (2012g) *Report on* Margaritifera durrovensis *captive breeding Phase 2 (April 2011 – May 2012).* Unpublished report to the National Parks and Wildlife Service, Dublin.

Moorkens, E.A., Killeen, I.J. and Ross, E. (2007a) *Margaritifera margaritifera* (the freshwater pearl mussel) conservation assessment. July 2007. In: *The Status of EU Protected Habitats and Species in Ireland; Backing Documents, Article 17 Forms, Maps; Volume 1*. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin. pp 100-148.

http://www.npws.ie/publications/eu-conservation-status

Moorkens, E.A., Killeen, I.J. and Ross, E. (2007b) *Margaritifera durrovensis* (the Nore freshwater pearl mussel) conservation assessment. July 2007. In: *The Status of EU Protected Habitats and Species in Ireland; Backing Documents, Article 17 Forms, Maps; Volume* 2. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin. pp 841-882.

http://www.npws.ie/publications/eu-conservation-status

Monaghan, F. (2011a) *A survey of the upland and peatland grazing impacts in commonage and private land in the Lower Bundorragha catchment; a freshwater pearl mussel SAC catchment*. A report to National Parks and Wildlife Service of the Department of Arts, Heritage and Gaeltacht.

Monaghan, F. (2011b) *A survey of the upland and peatland grazing impacts in commonage and private land in the Lower Dawros catchment; a freshwater pearl mussel SAC catchment*. A report to National Parks and Wildlife Service of the Department of Arts, Heritage and Gaeltacht.

Monaghan, F. (2011c) *A survey of the upland and peatland grazing impacts in commonage and private land in the Lower Owenriff catchment; a freshwater pearl mussel SAC catchment*. A report to National Parks and Wildlife Service of the Department of Arts, Heritage and Gaeltacht.

Monaghan, F. (2012) *Catchment Assessment Report Manual*. Unpublished report to the National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin.

http://www.npws.ie/sites/default/files/publications/pdf/Manual%20for%20the%20Assessment%20of%20FPM%20catchments%202012.pdf

Morgan, G. (2011) *Bundorragha River Turbidity Monitoring (August 2011 to April 2012). Interim Report. December 2011.* Unpublished Report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Morgan, G. (2012) *Bundorragha River Turbidity Monitoring (August 2011 to April 2012). 2nd Interim Report. February 2012*. Unpublished Report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Morgan, G. (2013) Bundorragha *River Continuous Turbidity Monitoring (August 2011 to April 2013). Final Report. November 2013*. Unpublished Report to the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

National Parks and Wildlife Service (2008) *The status of EU protected habitats and species in Ireland*. Department of the Environment, Heritage and Local Government, Dublin.

http://www.npws.ie/publications/eu-conservation-status

NPWS (2013a) *The Status of Protected EU Habitats and Species in Ireland. Overview Volume* 1. Unpublished Report, National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

http://www.npws.ie/publications/search?title=article+17

NPWS (2013b) *The Status of EU Protected Habitats and Species in Ireland.* Species Assessments Volume 3, Version 1.0. Unpublished Report, National Parks and Wildlife Services, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. 65-86.

http://www.npws.ie/publications/search?title=article+17

Ross, E.D. (1999) *A survey of four rivers in the south-west of Ireland for the freshwater pearl mussel,* Margaritifera margaritifera *(L.).* Unpublished Report, Duchas, the Heritage Service (National Parks and Wildlife Services), Ireland

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Galway
Ireland

05 February 2016

Re: Strategic Environmental Assessment Draft Scoping Report Plan for Forestry and Freshwater Pearl Mussel in Ireland

Dear Mr Watson

Thank-you for the emails dated 11 December 2015 and 08 January 2016 enclosing the draft scoping report for Forestry and Freshwater Pearl Mussel in Ireland. The Department of the Environment Northern Ireland (DOE NI) have considered the documentation and our opinions are set out below.

We consider the only transboundary issue that will require consideration for this plan could be effects on groundwater. We consider that the assessment should consider any potential impact on groundwater quality and quantity.

Some baseline information, e.g. monitoring results where available, can be obtained by emailing waterinfo@doeni.gov.uk

Regional screening information on geology, hydrogeology, aquifers and groundwater are available from the GSNI geoindex: http://mapapps2.bgs.ac.uk/GSNI_Geoindex/home.html - select map theme 'Hydrogeology'

Further information is available from: http://maps.ehsni.gov.uk/wmuviewerplan2/ as well as documents published in support of the second River Basin Plans in December 2015: https://www.doeni.gov.uk/publications/date/2015/date/2015 using 'groundwater' as a key word.

Please contact the SEA Team at seateam@doeni.gov.uk should you have any queries or require clarification.

Yours sincerely

M. Hammond.

Dr Mark Hammond
SEATeam@doeni.gov.uk
mark.hammond@doeni.gov.uk

John Staunton

To: Declan Lawlor
Subject: RE: 150913 - SEA Draft Scoping Report: Plan for Forestry & Freshwater Pearl Mussel in Ireland

From: Declan Lawlor [mailto:Declan.Lawlor@loughs-agency.org]
Sent: 15 February 2016 15:20
To: Michael Watson <mwatson@mccarthykos.ie>
Subject: RE: 150913 - SEA Draft Scoping Report: Plan for Forestry & Freshwater Pearl Mussel in Ireland

Hi Michael

Many thanks for your initial letter and emails.

Firstly, the Loughs Agency welcomes the opportunity to comment on the SEA Draft Scoping Report.
Having looked through the document, I feel that the scope, level of detail and proposed approach for the SEA are appropriate. Whilst none of our freshwater catchments in Donegal or Louth are believed to contain populations of freshwater pearl mussel, the Agency would welcome the contents of the proposed plan for Forestry and Freshwater pearl Mussel in Ireland, indeed many of the objectives to safeguard Freshwater Pearl Mussel will also directly benefit fisheries, particularly salmonids.

Thanks again for contacting the Loughs Agency in your scoping phase.

Best regards
Declan

Dr Declan Lawlor, CEnv,MCIEEM, MIFM, MIEnvSc,
Environmental Officer

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Mr Michael Watson
McCarthy Keville & O'Sullivan Ltd
Block 1, G.F.S.C
Moneenageisha Road
Galway

5th February 2016 Our Ref: SCP151212.1

Re: Plan for Forestry and Freshwater Pearl Mussel in Ireland

Dear Mr Watson,

I refer to and acknowledge your correspondence on behalf of the Department of Agriculture, Food and the Marine (DAFM), dated 10th December 2015, in relation to the Strategic Environmental Assessment Scoping for the Plan for Forestry and Freshwater Pearl Mussel in Ireland. Specific comments in relation to the Scoping report are provided in Attachment I.

We acknowledge that the Plan will consist of a series of measures to be considered, on a case by case basis, for individual forestry related proposals within Freshwater Pearl Mussel (FPM) Catchments. In particular, specific measures will be established to protect the 8 priority FPM Catchments. It will also be important to ensure these measures will also be applied to protect FPMs outside of those priority catchments. This will reflect the protected status of the species under the Habitats Directive (and Water Framework Directive). The Plan needs to ensure that specific measures/requirements to ensure the protection and maintenance of FPMs and associated high water quality status.

While the granting of forestry activities (such as afforestation, forest road construction, thinning, aerial fertilisation or clear felling and re-forestation) is proposed to be carried out at an individual forest "plan" level, we recommend that the Plan takes into account the potential for adverse environmental effects at a catchment level including cumulative effects, and also considers catchment level mitigation and monitoring measures.

A tiered approach to assessing and selecting mitigation and monitoring aspects would be beneficial and should be considered. More strategic objectives, targets and indicators and mitigation should be considered in terms of how to protect FPM Catchment areas, in association with other significant relevant plans including the series of FPM Sub Basin Management Plans (SBMPS), WFD RBMP etc.

At a forest plan level, more detailed objectives, targets, indicators and mitigation measures should be more spatially specific, in terms of protecting specific environmental features associated with particular forestry activities. These should also ensure consistency with the overall objectives to maintain and conserve the FPM provided for under higher level plans/programmes also.

It will be important to ensure that, where appropriate, the FPM SBMPs (DAHG, 2010) are integrated at both a catchment and a forest plan level, to protect and where possible improve the conservation status of FPM both within the 8 priority catchments and the other 19 catchments also. The status of these FPM SBMPs should also be clarified.

Close collaboration and coordination with the NPWS /EPA/Inland Fisheries Ireland (and other relevant stakeholders) should be considered, in terms of establishing a suitable monitoring programme, appropriate indicators and determining the "assimilative capacity" for particular FPM sub-catchments.

Relationship with Other Plans and Programmes
The relationship with other key plans/programmes within the DAFM should be described (including in particular Food Wise 2025, Forest Policy Review, Forestry Programme and the Rural Development Programme, WFD RBMBs, CFRAMS for example). A list of plans which should be considered in terms of baseline data or potential indirect or direct influence on the Plan is provided in Attachment II.

In particular, the relationship and influence of the Draft Freshwater Pearl Mussel Sub Basin Management Plans (FPM SBMPs) (DEHLG, 2010), should be further clarified. Given that they reflect the 27 FPM subcatchments, the relevant aspects of these Plans should be integrated as appropriate in the Plan. Catchment-specific aspects, where forestry activities occur outside of the Priority catchment areas, given that they are still protected under Annex II of the Habitats Directive should also be reflected in the Plan.

In addition to the specific comments provided below, Attachment II includes potential useful environmental resources, environmental reports and suggested high level plans, programmes and strategies to consider also.

Given the nature of the Plan and various organisations which will be influenced by it, it may be useful, in preparing the SEA and Plan, to consider convening a scoping workshop with statutory environmental authorities and relevant key stakeholders.

The Plan should include commitments that all forestry measures will be compatible with existing environmental objectives and that there are no adverse significant environmental impacts resulting from the forestry measures proposed.

The Plan should also consider developing a set of outcome-based indicators as part of the implementation of the Plan. These could be used to demonstrate linkages between investment through the Plan and positive environmental outcomes in areas including water quality, resource efficiency and climate resilience.

SEA WebGIS Search and Reporting Tool
The EPA WebGIS Search and Reporting application is an online GIS based web application that allows users to explore, interrogate and produce an indicative report on key aspects of the environment in specific geographic areas. These reports are indicative and will provide an overview of key aspects of the environment within a specific plan area. This may be used to inform the SEA screening and scoping stages for Plans and Programmes with particular reference in the first instance to the land use sector, though it is also applicable to other sector plans. It may be accessed via www.edenireland.ie

Environmental Authorities
Under the SEA Regulations *(S.I. No. 435 of 2004)*, as amended by *S.I. No. 200 of 2011*, notice should also be given to the following:

- The Minister for the Environment, Community & Local Government
- Minister for Agriculture, Marine and Food, and the Minister for Communications Energy and Natural Resources, where it appears to the planning authority that the

plan or programme, or modification of the plan or programme, might have significant effects on fisheries or the marine environment

- where it appears to the competent authority that the plan or programme, or amendment to a plan or programme, might have significant effects in relation to the architectural heritage or to nature conservation, the Minister for Arts, Heritage and Gaeltacht Affairs

Should you have any queries or require further information in relation to the above please contact the undersigned. I would also be grateful if an acknowledgement of receipt of this submission could be sent electronically to the following address: sea@epa.ie.

Yours Sincerely,

Tadhg O'Mahony
Senior Scientific Officer
SEA Section
Office of Environmental Assessment
Environmental Protection Agency
Regional Inspectorate
Inniscarra, County Cork

Specific Comments on the Scoping Report
Plan for Forestry and Freshwater Pearl Mussel in Ireland

Chapter 1 – Introduction and Background

We note in *Section 1.1 – Overview* that the Plan is being prepared as part of the National Strategy for the conservation of Freshwater Pearl Mussels (FPM). The status of this strategy should be clarified in the Plan.

In *Chapter 1.2.2 Legal Protection*, with regard the requirement for applicants to adhere to the Code of Best Forest Practice, it should be described how individual applications are assessed and considered in the context of the potential impact at a catchment scale. Applying a catchment approach provides a coordinated and integrated approach to protection of FPM on a wider scale.

With regards the undertaking (by the Forest Service) of post-activity authorisation checking to ensure the conditions of the consent have been satisfied, it would be useful in the context of establishing a baseline, that information recorded in terms of compliance and frequency of checks carried out is described.

Chapter 2 – Content and Context of the Plan

We suggest that consideration is given to including a requirement to carry out WFD Assessments, (a management tool to selecting options/activities), when considering sites/consent applications. Guidance in this regard is available from Northern Ireland's Environment Agency in terms of application of best practice and can be consulted at: https://www.doeni.gov.uk/publications/guidance-note-carrying-out-water-framework-directive-assessment-environmental-impact

We note the various proposed components of the CFMPs. The identification of key additional potential sources of pollution within each catchment other than forestry should also be considered in terms of the scope of the preparation of the SEA / AA and also in relation to potential cumulative effects.

With regards water quality assessment tools available, the Agency has established a WFD Application which is available on the Environmental Data Exchange Network (www.edenireland.ie) website which should be considered by the DAFM / Forest Service, in the plan preparation and in the licensing and consent of forest related activities.

It is noted that the SEA processes will be undertaken taking into account relevant European Court of Justice Judgements. Including a reference / consideration of the implications of ECJ Case C−461/13 should be considered in this regard:

> *"Member States are required — unless derogation provided for by the directive is granted — to refuse authorisation for an individual project where it may cause a deterioration of the status of a body of surface water or where it jeopardises the attainment of good surface water status or of good ecological potential and good surface water chemical status. The Court also ruled that deterioration of the status means that such deterioration is established as soon as the status of at least one of the quality elements, within the meaning of Annex V of the WFD, falls by one class, even if that fall does not result in a fall in classification of the body of water as a whole. However, where the quality element concerned is already in the lowest class, any deterioration of the element would constitute deterioration in status"*

In subsection 2.2.2 *Overview of proposed Requirements Element of the Proposed Plan*, we welcome the commitment to updating the existing FPM Requirements to take account of on-going research, including the recommendations of the Hydrofor project. Incorporating the findings of relevant

research will assist in identifying relevant aspects and FPM Requirements requiring updates, including for example, existing work practices or updating the relevant requirements. Relevant research findings should also be considered when updating mitigation measures, management practices or requirements, and associated monitoring in order to minimise (or avoid if possible) nutrient and sediment loss during clear felling operations for example.

Chapter 3 – Strategic Environmental Assessment
The SEA process also provides a mechanism to integrate environmental considerations into the Plan preparation from the outset and inform the planning process. It would be useful to consider including this additional aspect and benefit of the SEA Directive in *Section 3.2.3 Environmental Assessment and Preparation of Environmental Report*.

The Agency has prepared SEA Process and Scoping Guidance which will be useful to consider in the preparation of the SEA and Plan. Guidance on the *integration of Climate Change into SEA* (EPA, 2015) and *Developing and Assessing Alternatives in SEA* (EPA, 2015) and guidance on the integration of environmental considerations is also available on the EPA site at http://www.epa.ie/pubs/advice/ea/#.Vq9vd9CvlaQ.

Chapter 4 – Key Environmental Issues
In *Section 4.2 Threats*, the potential implications of climate change should also be taken into account, In terms of potential effects of increased temperatures in summer, and potential increased rainfall and storm related events in winter, which may affect water quality, bank-side erosion/siltation and resultant impacts on biodiversity.

The monitoring and maintenance of existing drains beneath forest canopy opening directly into watercourses should be carried out to ensure they are appropriate to minimise runoff and associated water quality issues.

In relation to native woodland created on strategically selected sites adjoining watercourses etc. described in *Section 4.3 Opportunities*, there is merit in describing the criteria used to identify these sites.

Through implementing a water-related ecosystems services approach, the Plan can enhance the services and associated benefits which can be obtained, through promoting protection of water quality, habitat and species and provide additional functions such as recreation, tourism and amenity and flood alleviation.

In terms of opportunities for community engagement in developing appropriate measures to protect the FPM, the integrated catchment management approach being implemented in the IRD Duhallow Life Project 'Integrated Catchment Management Approach' would be worth considering and promoting in the Plan.

4.4 Biodiversity and Flora and Fauna
In addition to the FPM SBMPs, the Plan should include consideration of interactions with other key relevant biodiversity related plans such as the National Biodiversity Action Plan and relevant County Biodiversity Action Plan(s), where available. This would be important, particularly in relation to habitats and species of particular significance and objectives/actions that may interact with the objectives/measures of the Plan.

Where SAC/ SPA Management Plans exist, these should also be considered in detail in terms of both synergies and likely conflicts with proposed forestry related activities. Additional aspects other than FPM to consider in the AA and SEA process include potential impacts of the forestry measures/practices on other designated habitats or protected species such as hen harrier populations.

The assessment criteria for the biodiversity related objective in *Table 5.5 Proposed Strategic Environmental Objectives* should also include criteria related to undesignated sites that are of conservation importance, and species of conservation importance that occur in dispersed populations across the wider landscape.

4.7 Water – the assessment of water related aspects should consider biological and chemical status and also the hydrological regime of water bodies, and also take account of any available trend information in water quality in particular. The Plan should seek to focus on those measures required to meet the more demanding requirements of Favourable Conservation Status for FPM populations and should be informed by the 2nd cycle of WFD RBMP, currently under preparation and any related catchment / sub-catchment commitments.

It is recommended that strong links are made between the forestry measures proposed and the WFD specifically by focussing on 'forestry-mitigating WFD measures'.

We also note that the Nore FPM subbasin is not currently considered a priority catchment on the basis of the prioritisation methodology employed. Given that this catchment contains the critically endangered protected species *Margeritifera Durovensis*, the Plan needs to ensure that robust mitigation measures are applied in any forest related activities/applications which may arise in this catchment area in particular.

In particular, high status waters need to be afforded adequate protection and the Plan should include specific measures to ensure high status water bodies are not compromised. Within CFMP catchments, where existing forestry developments have potential to impact on high or good status sites, more stringent controls may be required for clear-felling and harvesting related consents.

It would be useful to consider use of '*Natural Water Retention Measures'*, where appropriate, to deliver benefits in relation to WFD, Flooding and habitats. Further information in this regard is available at: http://nwrm.eu/measures-catalogue

The national CFRAMS programme (and associated individual CFRAMS and Flood Risk Management Plans – in preparations) should be taken into account; in particular in relation to the potential impact which flood risk management/ alleviation options may have on FPM catchments and associated water quality impacts in forestry areas. These (and possible associated interrelationships) should be reflected in forestry-related consenting procedures and associated assessments, restrictions and conditions.

Chapter 5 – Key Scoping Issues

When considering the identification, selection and assessment of environmental criteria in the SEA, specific "environmental significance" criteria should be applied in determining the relative significance of impacts identified relative to the level at which the Plan is set. The EPA emphasises the need to avoid planting on environmentally sensitive land in the absence of suitable forestry management and mitigating measures.

Alternatives

The approach to assessing the alternatives should include cumulative, synergistic, direct/indirect, positive/negative and temporal issues (short, medium and long term). It is possible that, rather than a single option being identified in the Plan as preferable, a suite of suitable relevant options may be chosen. Alternatives should ensure that a strong emphasis is placed on achieving/maintaining WFD High Status in water bodies which is critical to support FPM populations.

In considering and assessing alternatives, the alternatives proposed should be reasonable and realistic, clearly described and should be set at the appropriate strategic level at which the outputs from the

Plan will be implemented. Alternatives should be assessed against the relevant environmental objectives established for the key environmental aspects of the environment likely to be significantly affected. Clear justification should be provided for the selection of the preferred alternative/ combination of alternatives.

Mitigation of significant effects
Where significant adverse effects are identified associated with the implementation of the outputs from the Plan, there should be a clear link with relevant and appropriate mitigation measure(s). The emphasis should, in the first instance, be on avoidance of significant adverse effects where possible.

Monitoring Proposals
Monitoring arrangements should be clearly set out along with responsibilities, frequency of monitoring, analysis, and reporting on monitoring. Monitoring arrangements should be sufficiently flexible so as to be able to react to unforeseen / unexpected events. Maximum use should be made of existing environmental monitoring programmes. To this effect, the results of the significant environmental monitoring required under the Water Framework Directive with respect to water quality should be used..

The monitoring arrangements and related monitoring programme for the implementation of the outputs of the Plan should include relevant and appropriate thresholds which should trigger when remedial action should be undertaken for the particular aspect of the environment being monitored.

The monitoring of "Habitat Quality" should be also considered, as appropriate, in relation to the biodiversity/flora/fauna environmental criteria.

Section 5.2 Relationship with Legislation and Other Plans and Programmes should also take into account the National (Climate Change) Mitigation Plan, currently being prepared. In addition FoodWise 2025 and the associated Implementation Plan (DAFM) should also be taken into account.

Potential transboundary significant effects that may arise should be considered and should include commitments where relevant to collaborate and co-ordinate forestry related activities and associated authorisations and monitoring at a plan level with the relevant Northern Ireland authorities.

The level at which this plan operates in the planning hierarchy of the DAFM should be described in the context of other high level plans and programmes. The level of engagement and inclusion of specific concerns from other key stakeholders such as the NPWS should be described.

The inclusion in section *5.3 Strategic Environmental Objectives, Indicators and Targets,* of *Table 5.5 Proposed Strategic Environmental Objectives* is noted. It should be ensured that the assessment criteria considered are at an appropriate level and of specific relevance to the Plan. The targets and indicators and the monitoring programmes of the SEA should also be integrated and sufficiently flexible to provide for any specific sub-basin(s) monitoring requirements.

In *Table 5.5 Proposed Strategic Environmental Objectives,* Biodiversity, Flora and Fauna should also include the following under the third bullet point as follows "…Maintain or restore protected species, **including the FPM,** to favourable conservation status"

Similarly, under 'Water', the third bullet point should be updated as follows "…*Improve water body status to at least good status, as appropriate to achieve/maintain the* ***WFD quality status required to support and sustain*** **FPM**"

ATTACHMENT II(a) : Some Useful Environmental Resources

Environmental Criteria	Selected Resources
State of Environment	http://www.epa.ie/irelandsenvironment
Surface Water	http://www.wfdireland.ie/index.html http://www.epa.ie/pubs/reports/water/waterqua/ https://www.edenireland.ie/ (EPA WFD Application)
Ground Water	http://j.mp/gsigroundwater http://www.epa.ie/downloads/pubs/water/ground/ https://www.edenireland.ie/ (EPA WFD Application)
Drinking Water	http://www.epa.ie/pubs/reports/water/drinking/
Waste Water	http://www.epa.ie/pubs/reports/water/wastewater/
Bathing Water	http://www.epa.ie/pubs/reports/water/bathing http://splash.epa.ie/#
Marine	http://www.marine.ie/Home/site-area/home/home
Biodiversity	http://www.npws.ie/guidance-appropriate-assessment-planning-authorities http://www.npws.ie/publications http://maps.biodiversityireland.ie/#/Home
Flood Prevention and Management	www.floodmaps.ie www.cfram.ie
Air	http://www.epa.ie/pubs/reports/air/quality/
Climate	http://www.environ.ie/en/Environment/Atmosphere/ClimateChange/ http://www.epa.ie/pubs/reports/research/climate/
Waste Management	http://www.epa.ie/pubs/reports/waste/
Radon	http://www.epa.ie/radiation/radonmap
Energy Conservation	www.sei.ie
Landscape Character Assessment	http://www.heritagecouncil.ie/
Geology / Geomorphology	http://www.gsi.ie/Mapping.htm
Transportation	https://www.nationaltransport.ie/planning-policy/ http://www.nra.ie/environment/
SEA	www.edenireland.ie (SEAGIS Reporting Tool and WFD Application) http://www.epa.ie/pubs/advice/ea/
EIA	http://www.environ.ie/en/DevelopmentHousing/PlanningDevelopment/EnvironmentalAssessment/EIASEAGuidance

ATTACHMENT II (b):
Suggested High Level Plans/Programmes/Strategies (PPS) to Consider*

Environmental Criteria	Suggested High Level Plans/Programmes/Strategies (PPS)
National	- National Spatial Strategy (DECLG) - National Development Plan (DECLG) - Rural Development Programme (DECLG) - National CFRAMS Programme (DECLG) - National Bioenergy Plan - being prepared (DCENR) - Food Harvest 2020 / FoodWise 2025 (DAFM) - National Forestry Programme / Forestry Policy Review (DAFM) - Seafood Operation Programme / Strategic Aquaculture Programme (DAFM) - National Peatland Strategy, SAC Raised Bog Management Plan (DAHG) - National Biodiversity Plan (DAHG) - Water Services Strategic Plan (Irish Water) - Capital Investment Programme (Irish Water) - State of the Environment Report 2012 (and 2016 Report being prepared) (EPA)
Regional	- Regional Planning Guidelines - River Basin Management Plans (and Programme of Measures) - Relevant CFRAMS - Pollution Reduction Programmes for Shellfish Waters - Regional Waste Management Plans - Shannon Integrated Framework Plan (SIFP) - County Renewable Energy / Wind Energy Strategies
Other	- Relevant County Development Plans - Any relevant transboundary sectoral plans or land use plans that may influence or be influenced by this Plan.

Note: *Plan-makers should consider and identify key relevant PPS in the SEA. List of Plans is indicative only and some may not always be relevant to a particular plan.

Appendix 2-2

Key Points of Scoping Responses

Review of Scoping Responses

No.	Consultee Main Comment	Planned/Implemented Response
	Department of Arts, Heritage and the Gaeltacht	
1	There will be a need for an appropriate level of archaeological assessment if works are to take place in the vicinity of recorded monuments, near protected wrecks or on or near water courses. It is therefore recommended that this Department is consulted with regard to any potential works located at or near archaeological monuments or wrecks or any works which will significantly affect watercourses such as rivers, streams or lakes. This will enable the Department to make an informed archaeological recommendation before works proceed.	▪ This is already part of application process for technical approval, so will be incorporated into the procedure for each site. This plan is designed specifically for improving the water quality in catchments containing FPM.
2	The Department notes that in Cultural Heritage, architectural heritage is described as a subset to archaeological heritage in Section 4.12 and with regard to the Heritage Act (1995). The Department's observation is that this section should refer to architectural heritage separately in the subsection and with reference to the primary legislation that protects it namely Part IV of the Planning and Development Act 2000 and the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.	▪ Noted. This will be addressed in a separate section.
3	Mention should be made of the local authorities' Records of Protected Structures and Architectural Conservation Areas (to which the 2000 Act relates) and to this Department's National Inventory of Architectural Heritage (to which the 1999 Act relates).	▪ Noted. These data will be referenced.
4	In the Department's view this sub-section (architectural heritage) needs to be rewritten.	▪ Noted. There were extensive edits made to improve this.
5	On the basis of the documents circulated through this consultation process, the Department remains unclear as to how the plan will contribute to the restoration of the freshwater pearl mussel and its habitat to favourable conservation status.	▪ Noted. The plan has details regarding this, as described in section 6, with some relevant research in section 5.
6	The scope of the ecological implications of forestry for the pearl mussel that are proposed to be addressed in the Plan, and in revisions to the	▪ The scope of environmental implications, particularly hydrological, was widened to ensure

No.	Consultee Main Comment	Planned/Implemented Response
	Appropriate Assessment Procedure (AAP), needs to be broadened, particularly (but not only) in considering the hydrological impacts arising from current and future forestry operations.	that this will be brought into the new procedure
7	The proposed Plan for Forestry and Freshwater Pearl Mussel in Ireland, as described in the documents received December 2015-January 2016 does not appear to contain, nor is it proposed to contain, detailed, scientific risk assessments of forestry in the catchments	▪ As stated in section 4 of the plan, the risk assessment has been developed further, and includes a combination of site visits and GIS based desk assessment, EIA screening, AA screening, public consultation, referral to various statutory consultees and objector's appeals system. Any site activity that obtains consent must adhere to the code of best forest practise.
8	"It is not proposed to include or present a strategic plan for forestry in the catchments	▪ The plan is strategic in nature, so individual plans are not being created for each catchment.
9	As a result (of 6,7 and 8 above), there is, as yet, insufficient detail available to conduct a strategic environmental assessment (SEA) and appropriate assessment (AA) of this draft plan	▪ The above points (6, 7 and 8) have been dealt with to ensure a complete assessment of the draft plan
10	The Department would also welcome clarification on the mechanism that will be used by the Forest Service to ensure that this Plan, and relevant findings of the SEA and AA, to inform any amendments to the Forestry Programme 2014-2020 that may be needed to allow it to achieve its objective. This question similarly arises in relation to Coillte's developing Business Area Unit Plans and the assessments that these are likely to require in order to comply with Article 6 of the Habitats Directive and the national transposing legislation.	▪ The Forestry Programme contains specific provisions to protect water quality and aquatic habitats and species, under the package of measures to develop new areas of native woodland and to restore existing native woodland (including the conversion of conifer forests to native woodland). ▪ The Business Area Unit Plans have their own SEA/AA being carried out.
11	The documents provided to this Department refer interchangeably to "the Plan" (Plan for Forestry and Freshwater Pearl Mussel in Ireland) and to "CFMPs" (Catchment Forest Management Plans). This would benefit from some clarification from the Forest Service in due course.	▪ This has been clarified through the draft plan
12	the Nore Freshwater Pearl Mussel captive breeding programme has been	▪ Noted

No.	Consultee Main Comment	Planned/Implemented Response
	terminated and that there are no Nore pearl mussels (Margaritifera margaritifera) outside of the River Nore. Consequently, reference to extinction 'in the wild' is inappropriate, as extinction of the Nore population would mean extinction of the taxon.	
13	While it advocated captive breeding as an on-going measure for the Nore, the 2011 Conservation Strategy also cautioned that the Nore pearl mussel breeding programme had "proven extremely challenging technically and the chances of success are low", and highlighted failures in Margaritifera captive breeding from across Europe. More detailed reflection of the status of Margaritifera margaritifera in the EU as reported in 2013 would be of benefit.	▪ Noted in Section 2.4 under species info page. Captive breeding also mentioned in Section 2.6, but failure of breeding programme was not mentioned.
14	See the detailed species assessment for freshwater pearl mussel published in: NPWS (2013). The Status of EU Protected Habitats and Species in Ireland. In particular, attention is drawn to the text on pressures and impacts, highlighting the importance of hydrological and morphological impacts, as well as impacts for sedimentation and nutrient-enrichment. Site-specific information on pressures and impacts on freshwater pearl mussels is available from the many NPWS monitoring reports. See also: findings of the Interreg IVa project Practical Implementation of Freshwater Pearl Mussel Measures and on-going KerryLIFE project.	▪ Noted in Section 2.3. The plan will aim to deal with these factors throughout. Section 5 deals with Kerrylife, Interreg, etc.
15	It should be noted, that the 2013 Habitats Directive Article 17 report concluded that the future prospects of the species are as follows: "All of these considerations combined with the current bad status of the species' population and habitat quality and the on-going pressures from sectors such as agriculture and forestry, mean that the future prospects are considered bad."	▪ This has been noted in Section 2.3.
16	These sections omit reference to the responsibilities of the Forest Service pursuant to Regulation 27 of the European Communities (Birds and Natural Habitats) Regulations 2011. This Regulation gives effect to the	▪ Noted

No.	Consultee Main Comment	Planned/Implemented Response
	obligations of Article 6 (2) of the Habitats Directive. These should be used to inform the development of the Catchment Management Plans to ensure its compliance with same.	
17	It is not this Department's current understanding that the Forest Service undertakes a field inspection for every application submitted, as implied in this statement. The Department would welcome clarification on this as it has implications for recommendations it may make in future submissions on revisions to the Forest Service's Appropriate Assessment Procedure.	▪ Noted and clarified. The risk assessment has been developed further, and includes a combination of site visits and GIS based desk assessment, EIA screening, AA screening, public consultation, referral to various statutory consultees and objector's appeals system.
18	The Department recalls that the Forestry Programme 2014-2020 also commits that, as part of its environmental mitigation measures, decisions on applications where Annex I habitats, Annex I birds or Annex II species may be affected will be informed by an ecological assessment. The Plan for Forestry and FPM and the revisions to the AAP should also reflect how this commitment is being operationalised and demonstrate how they will inform decision-making and assessment obligations. The "post-activity checks" referred to in S1.2.3 should also be expanded on	▪ Plan now states that a combination of various methods is used to assess each individual site. This includes a combination of field inspection and GIS-based desk assessment, EIA Screening (and EIA, if required), AA Screening (and Appropriate Assessment, if required), public consultation, referral to various statutory consultees, and an objector's appeals system ▪ Post-activity check information expanded to include consequences of failing these checks
19	The Department notes that some of the text in these Sections is out-of-date (eg conservation status of the Bundorragha which has been unfavourable since 2012). The Forest Service should use the most up-to-date scientific information and data available for the Environmental Report and Natura Impact Statement.	▪ The text regarding the Bundorragha has been updated. The latest information has been incorporated into the document throughout.
20	"The Plan will need to address a broader range of impacts arising from forestry than solely diffuse pollution issues if it is to achieve the commitment referred to above, and these will also need to be assessed for the purposes of the SEA and AA.	▪ The plan does not account for both diffuse and point sources of pollution from forestry. Currently, only diffuse forestry sources are referred to. Point sources are referred to in section 2.5, but only relating to quarries, sand and gravel pits and wastewater treatment plants.

No.	Consultee Main Comment	Planned/Implemented Response
21	"S2.1.2 refers to the units of change for the CFMPs as being individual applications submitted for consent/license to, e.g. afforest, forest road construction, etc., which suggests a reactive rather than a proactive or strategic approach to protecting the FPM. Such a reliance on the implementation of the Forest Service's AAP at the project level means that: 1. There is no strategic plan for the management of on-going and potential impacts arising from existing conifer plantations, 2. There is no strategic plan to prevent further forestry impacts from future afforestation and other operations, 3. The cumulative impacts of forestry are not or cannot be strategically assessed."	▪ The restructuring of the forest footprint over time via the implementation of the plan is strategic in nature.
22	"S2.1.2 sets out a number of the likely key components of the CFMPs. The Department recommends further useful components for inclusion as follows: A. Expansion of the scope of the proposed mapping exercise to include i.) Incorporation of the maps of the habitat of the freshwater pearl mussel to which the site's conservation objectives apply. ii.) the identification of areas where riparian or other habitats will or may need to be restored to achieve those objectives." "B. Research and development programme e.g. to test, trial and demonstrate the efficiency of mitigation and restoration measures, to further develop understanding of the effects of forestry on the environment." C. Application of appropriate ecological and hydrological expertise to all relevant stages of decision-making e.g. in S2.1.2 The Department is concerned that site assessments could be made in the absence of ecological and possibly hydrological advice, and potentially in the absence of Natura Impact Statements and Appropriate Assessments. As well as this use of expertise at the practical operation level, the Department is concerned as to whether and how the necessary expertise will be used in	▪ A i: This is incorporated into the description ▪ A ii: This will be addressed in the consenting process. ▪ B: Projects such as Kerrylife and CROW do already assess these factors. ▪ C: The use of the Site Risk Form will highlight any sites with potential for issues, thereby allowing them to be given priority for inspection by a relevant expert. ▪ D: The afforestation of lands with native woodland is shown to have beneficial effects on water quality. This is discussed in Section 5 of the plan (Research).

No.	Consultee Main Comment	Planned/Implemented Response
	scientific risk assessments at the strategic planning level, and how these will then inform site-level assessments. "D. The commitment to identify individual forest sites in which to initiate and effect change would also benefit from an explanation as to how this will be operationalised, and how it will contribute to the restoration of the species and avoid any further deterioration from forestry"	
23	The revised forms were extended to cover the entire catchment (i.e. not just the 6km hydrological limit) for the priority catchments. The risk assessment methodology was improved at that time, and a greater emphasis placed on appropriate training, however, the Department continues to have concerns on the following aspects of the Requirements, notably: 1. There is a need for improved consideration of the available scientific literature and further input from specialists in hydrology, soil science and engineering, 2. There is a need for suitably qualified individuals (notably hydrologists and ecologists) to undertake the risk assessment, 3. They would benefit from further linkages between the risks and the appropriate management and mitigation responses, 4. There is a need for testing of the efficacy of the recommended management and mitigation measures, "5. The residual risks require further consideration," 6. There is a need for the inclusion of guidelines on the production of long-term, strategic plans for the forest unit, 7. There is a need for consideration of other qualifying features of SAC and SPA, or other protected species, 8. There is a need for further analysis of "in-combination with other plans and projects" and cumulative effects, 9. There is a need to develop a more considered analysis of the information submitted by an applicant and the making of a determination that no adverse effects on site integrity will arise, e.g. including expanding and	1. The new plan accounts for the findings of the scientific literature. It has been reviewed to check that it is consistent with the latest scientific knowledge. 2. It is proposed that specialists (e.g. ecologists) will visit site where appropriate to carry out a site specific assessment prior to afforestation. 3. The plan contains information which links the risks to the associated response 4. See 3 above 5. The plan is designed to ensure that the current situation for FPM is not worsened as a result of forestry practices. It is also hoped that in some cases the situation may improve as a result of the plan. Any potential negative effects of the plan would need to be assessed on a site-by-site basis and appropriate mitigation measures would be applied. 6. Noted 7. Although the plan is designed to protect the FPM populations, it is likely that by ensuring high water quality, that other species and habitats are likely to improve. The modification to any sites as a result of implanting the plan would require an AA

No.	Consultee Main Comment	Planned/Implemented Response
	applying indicators for effects on site integrity, elaborated on further below. 10. The level of site-specific detail documented is likely to be insufficient to inform an Article 6 (3) assessment or to provide the necessary information for site managers and operators.	screening assessment, which would assess on a site-by-site basis if tere might be any impacts on a designated site. 8. See 7 above 9. The plan stipulates that an AA screening will be carried out for each site. This will assess if the implementation of the plan will have any effect on any designated site. A suitable qualified person will carry out a site inspection to assess potential effects 10. The plan stipulates in Section 7 (step 3) that an AA screening will be carried out for each site. Any required information must be provided to carry out such.
24	With specific reference to the derivation and use of the 6km hydrological zone, the Forest Service should be cognisant of the fact that this does not constitute the full extent of the potential zone of influence of forest operations on FPM populations and does not ensure that there is no reasonable scientific doubt remaining as to whether adverse effects will arise on the integrity of a site, as stated in S2.2.1. With regard to it being informed by "the distance over which the effects of sediment trap overflow have been observed", this Department is of the view that this is not a robust basis for concluding that no effects will arise further down the watercourse, as once the sediment is in the system, it will eventually work its way downstream and reach a FPM population or suitable FPM habitat and contribute to deteriorating conditions for the species.	▪ The plan has been modified to include full catchments, rather than the 6km zones.
25	It is also noted that it was informed by "uncertainty with regard to P dynamics in Irish FPM streams (i.e. lack of site-specific data)"- this rather indicates that a more precautionary approach is required, including	▪ The plan has been modified to include full catchments, rather than the 6km zones.

No.	Consultee Main Comment	Planned/Implemented Response
	assuming an influence the entire distance downstream rather than a selected distance.	
26	The Department recommends that the objective of the revision process is more explicit in its intention to ensure compliance with Article 6(3) of the Habitats Directive and national transposing legislation, to address the points set out in these observations for the previous Section, and to reflect relevant developing jurisprudence and best practice.	▪ The objective of the SEA & AA process is to ensure that the implementation of the Plan does not threaten the achievement of the conservation objectives for the SACs involved, namely *"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."* Best available knowledge will be used to achieve this.
27	The Department seeks clarification of how the conservation objectives, particularly the site-specific conservation objectives (SSCOs) for the freshwater pearl mussel, will be used to inform the development of the Plan/CFMPs and the Appropriate Assessment thereof.	▪ Site specific assessments will be carried out for each forestry site, along with site visits. These will be used to ensure the SSCOs are not negatively impacted as a result of the plan
28	The Department notes that the submitted Screening for Appropriate Assessment includes consideration of a limited range of criteria that may indicate "Likely changes to European sites". It is recommended that these be expanded to include a more comprehensive set of indicators and to reflect the matters raised in this submission.	▪ The screening assessment utilises a precautionary approach given the lack of detailed project level specific information within the Plan Implementation Zones. Any likely direct or indirect impacts of a proposal, alone and in combination with other plans and projects, on European Sites by virtue of the following criteria: size and scale, land-take, distance from the European Site or key features of the site, resource requirements, emissions, excavation requirements, transportation requirements and duration of construction, operation and decommissioning will be considered at the project level.
29	"The Natura Impact Statement and the Forest Service's Appropriate Assessment must consider the current unfavourable condition of the	▪ The plan is designed solely to prevent forestry causing any degradation of habitat quality for

No.	Consultee Main Comment	Planned/Implemented Response
	populations and their habitat, particularly the risk that forest operations could: 1. Prolong the poor condition of the freshwater pearl mussel habitat 2. Result in further deterioration in freshwater pearl mussel habitat condition 3. Increase the area of freshwater pearl mussel habitat negatively affected And in so doing: 1. Prevent juvenile recruitment, owing to unsuitable juvenile habitat condition 2. Cause stress to adult mussels resulting in reproductive failures 3. Cause mortalities of adult mussels, impacting population size 4. Result in an extended 'gap' in the population's age profile, impacting population size and future reproductive potential 5. Increase the patchiness of mussel distribution, impacting future reproductive potential. In particular, the hydrological impacts of forestry will require careful assessment."	FPM, and to ensure that forestry does not prevent the habitat quality from improving. Each site will be assessed individually to ensure that any activities being carried out therein as a result of the current plan will not result in any impact negatively on the aquatic habitats. Furthermore the measures incorporated in the plan is likely to improve water quality in the catchments.
30	The Forest Service's attention is drawn to hydrological risk assessment methods developed by the Interreg IVa project Practical Implementation of Freshwater Pearl Mussel Measures, the Technical Group of which both this Department and the Forest Service were members.	▪ These methods were consulted in the making of the current plan
31	The Department also seeks clarification as to how the best-practice forestry hydrological risk assessments under development by the KerryLIFE project will be incorporated into the Plan and the Appropriate Assessment of the same.	▪ Section 5 (Research) describes the KerryLIFE project and a number of other relevant research projects, which are used to inform the now proposed plan.
32	The Forest Service is advised that, as well as preparing an NIS, a public authority is required to complete a determination as to whether its proposed plan would adversely affect the integrity of a European site, and this must be completed before a decision is taken to approve or undertake the plan.	▪ The current SEA is assessing the overall environmental impact of the proposed plan. This will include impacts to designated sites, though the impacts to individual designated sites will not be assessed.

No.	Consultee Main Comment	Planned/Implemented Response
33	The Department would also welcome an opportunity to discuss the current form of the referral process between the NPWS and this Department	▪ Noted
34	The role of an AA should be expanded as it goes beyond that of solely assessing impacts but is rather a key part of an authority's decision-making process, as it limits the discretion of authorities to consent to plans that may or will adversely affect Natura 2000 sites. Please also note the obligation to complete a determination, pursuant to Regulation 42(11).	▪ Noted
35	This Section does not reflect the statutory consultation required with the Minister for Arts, Heritage and the Gaeltacht when a public authority prepares or commissions a Natura Impact Statement.	▪ Noted
36	"For biodiversity, flora and fauna, the scope of the SEA should include: - All nature conservation sites, including European sites, sites protected under national legislation, National Parks etc.; - Species of wild flora and fauna, including rare and protected species and their habitats; Annex IV (Habitats Directive) species of flora and fauna, and their key habitats (i.e. breeding sites and resting places), which are strictly protected wherever they occur, whether inside or outside sites, (including data on rare and protected species from NPWS, the National Biodiversity Data Centre, BirdWatch Ireland, etc.); - Other species of flora and fauna and their key habitats which are protected under the Wildlife Acts, 1976-2000, wherever they occur - 'Protected species and natural habitats' as defined in the Environmental Liability Directive (2004/35/EC) and European Communities (Environmental Liability) Regulations, 2008, including: - Birds Directive – Annex I species and other regularly occurring migratory species, and their habitats (wherever they occur) - Habitats Directive – Annex I habitats, Annex II species and their habitats, and Annex IV species and their breeding sites and resting places (wherever they occur) - Stepping stones and ecological corridors including nature conservation	▪ Noted

No.	Consultee Main Comment	Planned/Implemented Response
	sites (other than European sites), habitat areas and species' locations covered by the wider obligations of the Habitats Directive. - All watercourses, surface water bodies and associated wetlands, including floodplains and flood risk areas."	
37	The Environmental Report is required to contain environmental protection objectives. For biodiversity, flora and fauna, these should integrate with the objectives and obligations of other directives	▪ Noted
38	It is recommended that the most up-to-date data and information available from the NPWS website should be accessed and used at each successive stage of the plan-making process.	▪ The latest available data was used in the preparation of the plan.
39	"The Department recommends that the following plans are also analysed for potential and likely cumulative effects: - Coillte's Business Area Unit Plans - Inland Fisheries Ireland's National Strategy for Angling Development - National Climate Change Adaptation and Mitigation Plans - Irish Water's Lead Mitigation and Sludge Plans, amongst others."	▪ Noted
40	it is possible that the current screening exercise has not fully identified or considered all the impacts that will arise from the proposed Plan. This subsequently undermines the robustness of the conclusions that all potentially affected European sites have been identified. This will need to be revisited as the contents of the Plan develop.	▪ Any forestry related works being carried out will require screening on an individual site-by-site basis. This will assess any potential impacts on Natura 2000 sites.
41	European sites that may be affected by the proposed Plan were identified. The identification of impacts arising from the Plan should be revisited in view of these observations, and as the contents of the Plan itself develops. Their effects on European sites and other ecological receptors should then be assessed to inform the SEA and AA. As also set out earlier in this document, the possible and likely changes that may arise to European sites should also be revisited and expanded, as well as the indicators for adverse effects on site integrity.	▪ Noted.
	▪ **Environmental Protection Agency**	

No.	Consultee Main Comment	Planned/Implemented Response
1	Specific measures will be established to protect the 8 priority FPM Catchments. It will also be important to ensure these measures will also be applied to protect FPMs outside of those priority catchments. The Plan needs to ensure that specific measures/requirements to ensure the protection and maintenance of FPMs and associated high water quality status.	• The plan has been modified to include all 27 catchments at a similar level of protection.
2	While the granting of forestry activities is proposed to be carried out at an individual forest "plan" level, we recommend that the Plan takes into account the potential for adverse environmental effects at a catchment level including cumulative effects, and also considers catchment level mitigation and monitoring measures.	▪ The consideration of other plans and projects will be included in the site specific screening. The plan aims to develop catchment-wide mitigation measures to reduce negative impacts from forestry on waterways
3	A tiered approach to assessing and selecting mitigation and monitoring aspects would be beneficial and should be considered. More strategic objectives, targets and indicators and mitigation should be considered in terms of how to protect FPM Catchment areas, in association with other significant relevant plans including the series of FPM Sub Basin Management Plans (SBMPS), WFD RBMP etc.	▪ Noted.
4	At a forest plan level, more detailed objectives, targets, indicators and mitigation measures should be more spatially specific, in terms of protecting specific environmental features associated with particular forestry activities. These should also ensure consistency with the overall objectives to maintain and conserve the FPM provided for under higher level plans/programmes also.	▪ The plan will include site specific assessments which will identify key areas and conservation objectives for each site.
5	It will be important to ensure that, where appropriate, the FPM SBMPs (DAHG, 2010) are integrated at both a catchment and a forest plan level, to protect and where possible improve the conservation status of FPM both within the 8 priority catchments and the other 19 catchments also. The status of these FPM SBMPs should also be clarified.	▪ The plan will provide for measures over and above the national best practice to ensure that the FPM are not impacted adversely as a result of the forestry activities. The 8 priority catchments have been removed, and the protection will be afforded to all 27 catchments.
6	Close collaboration and coordination with the NPWS /EPA/Inland Fisheries	▪ The plan contains information relating to

No.	Consultee Main Comment	Planned/Implemented Response
	Ireland (and other relevant stakeholders) should be considered, in terms of establishing a suitable monitoring programme, appropriate indicators and determining the "assimilative capacity" for particular FPM sub-catchments.	monitoring procedures. Feedback received from these bodies during scoping has been used to compile this overall plan.
7	"The relationship with other key plans/programmes within the DAFM should be described"	▪ The relationship of the plan with other plans/projects and policies has been described in detail in the ER
8	In particular, the relationship and influence of the Draft Freshwater Pearl Mussel Sub Basin Management Plans, should be further clarified. Given that they reflect the 27 FPM subcatchments, the relevant aspects of these Plans should be integrated as appropriate in the Plan. Catchment-specific aspects, where forestry activities occur outside of the Priority catchment areas, given that they are still protected under Annex II of the Habitats Directive should also be reflected in the Plan.	▪ These sub-basin management plans have been taken into account in the FPM plan. The 8 priority catchments have been removed, with the same level of protection now afforded to all 27 catchments.
9	Given the nature of the Plan and various organisations which will be influenced by it, it may be useful, in preparing the SEA and Plan, to consider convening a scoping workshop with statutory environmental authorities and relevant key stakeholders.	▪ It was considered that scoping of the plan was sufficient in obtaining input from the relevant bodies
10	The Plan should include commitments that all forestry measures will be compatible with existing environmental objectives and that there are no adverse significant environmental impacts resulting from the forestry measures proposed.	▪ The plan is designed to ensure that environmental conditions are not degrading (or being prevented from improving) as a result of forestry activities, particularly for the FPM. It is also designed to be compatible with the existing plans
11	The Plan should also consider developing a set of outcome-based indicators as part of the implementation of the Plan. These could be used to demonstrate linkages between investment through the Plan and positive environmental outcomes in areas including water quality, resource efficiency and climate resilience.	▪ Noted.