Project title: Sustainable land use management for the conservation of freshwater pearl mussel

Project acronym: LIFE Kerry (KerryLIFE)

Program strand: Nature

Expected start date: 01/07/2014

Expected end date: 31/12/2019

Language of the proposal: English (en)

The project will be implemented in the following member state
Ireland South West

List of Beneficiaries
Name of the **Co-ordinating** Beneficiary:
Dept of Arts, Heritage and the Gaeltacht (DAHG)

Name of the **Associated** Beneficiaries:
Dept of Agriculture, Food and Marine - Forest Service (FS-DAFM)
Dept of Agriculture, Food and Marine - Nitrates, Biodiversity & Engineering Division (DAFM)
Coillte Teoranta (Coillte)
Teagasc (Teagasc)
South Kerry Development Partnership Ltd. (SKDP)

List of Co-Financiers
Not applicable

A7 - **Other proposals submitted for LIFE funding**

Question 1. Have you or any of your associated beneficiaries already benefited from previous LIFE co-financing? (please cite LIFE project reference number, title, year, amount of the co-financing, duration, name(s) of coordinating beneficiary and/or partners involved)

Department of Arts, Heritage and the Gaeltacht - DAHG (National Parks and Wildlife Service)

LIFE09 NAT/IE/000222, Demonstrating Best Practise in Raised Bog Restoration in Ireland, 2009, €1,290,797.00 EU co-financing, 5 years, Coillte Teoranta as coordinating beneficiary and National Parks and Wildlife Service as partners.

LIFE04 NAT/IE/000125, Farming for Conservation in the Burren, 2004, €1,672,865.00 EU co-financing, 5 years, National Parks and Wildlife Service as coordinating beneficary and Teagasc and Burren Irish Farmers Association as partners.

LIFE96 NAT/IRL/003240, SPAs in Ireland - Management planning, monitoring, auditing of management and land acquisition for SPAs in Ireland, 1996, €1,513,474.86 EU co-financing, 3 years, National Parks and Wildlife Service as coordinating beneficiary.

LIFE95 NAT/IRL/000822, candidate SAC's - Development of management plans and emergency actions aimed at candidate SAC's, 1995, €879,800.00 EU co-financing, 4 years, National Parks and Wildlife Service as coordinating beneficiary.

LIFE94 NAT/IRL/000407, Extension of the 2nd Phase of the protection of habitats of Community importance under Council Directives 79/40/EEC and 92/43/EEC, 1994, €900,000.00 EU co-financing, 1 year, National Parks and Wildlife Service as coordinating beneficiary.

LIFE93 NAT/IRL/012200, Protection of habitats of Community importance under Council Directives 79/409/EEC and 92/43/EEC (2nd phase), 1993, €3,500,000.00 EU co-financing, 4 years, National Parks and Wildlife Service as coordinating beneficiary.

LIFE92 NAT/IRL/013500,Conservation of habitats of Community importance in Ireland under the Birds and Habitats Directives (1st phase), 1992, €2,500,000.00 EU co-financing, 3 years, National Parks and Wildlife Service as coordinating beneficiary.

LIFE92 ENV/IRL/000028, Marine Coastal Zone Management: Identification, description and mapping of biotopes, 1992, €2,080,155.60 EU co-financing, 3.5 years, National Parks and Wildlife Service as coordinating beneficiary.

Teagasc

LIFE04 NAT/IE/000125, Farming for Conservation in the Burren, 2004, €1,672,865.00 EU co-financing, 5 years, National Parks and Wildlife Service as coordinating beneficary and Teagasc and Burren Irish Farmers Association as partners.

LIFE00 NAT/IRL/007128, Termoncarragh - Restoration Management for Annex I Birds at Termoncarragh Lake SPA, 2000, €584,041.00 EU co-financing, 4 years, BirdWatch Ireland as coordinating beneficary and Teagasc as partners.

LIFE93 ENV/IRL/003116, Promotion of the Adoption of Farm Nutrient Management Policy,1993, 2 years, €340,380.23 EU co-financing, Teagasc as coordinating beneficiary.

Coillte Teoranta

LIFE09 NAT/IE/000222, Demonstrating Best Practise in Raised Bog Restoration in Ireland, 2009, €1,290,797.00 EU co-financing, 5 years, Coillte Teoranta as coordinating beneficiary and National Parks and Wildlife Service as partners.

LIFE05 NAT/IRL/000182, Restoring Priority Woodland Habitats in Ireland, 2005, €1,304,861.00 EU co-financing, 4 years, Coillte Teoranta as coordinating beneficiary.

LIFE04 NAT/IE/000121, Restoring Raised Bog in Ireland, 2004, €1,875,000 EU co-financing, 4 years, Coillte Teoranta as coordinating beneficiary.

LIFE02 NAT/IRL/8490, Restoring Active Blanket Bog in Ireland, 2002, €3,146,770 EU co-financing, 5.5 years, Coillte Teoranta as coordinating beneficiary.

Question 2. Have you or any of the associated beneficiaries submitted any actions related directly or indirectly to this project to other European Union financial instruments? To whom? When and with what results ?

Not applicable.

Question 3. For those actions which fall within the eligibility criteria for financing through other European Union financial instruments, please explain in full detail why you consider that those actions nevertheless do not fall within the main scope of the instrument(s) in question and are therefore included in the current project Maximum characters (4,309/5,000).

The KerryLIFE project proposes a demonstration project that will contribute to the implementation of the objectives of the Habitats and Birds Directive, as required under LIFE+ Nature. The KerryLIFE objectives are currently more closely aligned to the requirement and objectives of the LIFE+ Nature fund than to any other EU funding instrument.

The proposed project is not eligible for funding under the Cohesion Fund, the Competitiveness and Innovation Fund, the Fisheries Fund or the Social Fund, as it does not align with the objectives of these funding instruments. While opportunities might logically be sought through the Common Agricultural Policy (CAP), these funds are not appropriately designed for the freshwater pearl mussel catchments, for a variety of reasons.

The CAP is delivered in two pillars. The first pillar, the European Agricultural Fund for Guarantee (EAFG), is focused on direct payments to farmers under the Single Payment Scheme (SPS). The second pillar, the European Agricultural Fund for Rural Development (EAFRD), is focused on rural development and agri-environmental schemes. Both funding instruments are not currently suitable, as the baseline requirements, measures and supports are not adequately tailored to the requirements of the freshwater pearl mussel and its aquatic environment. However, the Project Management Group will monitor the development of the new Rural Development Programme in order to assess whether any of the actions or part of the actions become eligible for financing by the EAFRD once the RDP is adopted.

Under SPS, cross-compliance rules state that minimum levels of maintenance must be "sufficient to prevent deterioration of grazed vegetation across forage area" and be kept "within a sustainable level to avoid overgrazing". Regarding sustainable levels to avoid overgrazing the levels are not sufficient to address scrub control, cross-compliance rules for SPS (Regulation EC 73/2009) state that "appropriate measure must be adopted to prevent the establishment of invasive species onto forage/arable areas that would result in the land being incapable of agricultural production". There is currently no guidance on what are "appropriate measures" to be adopted in Natura 2000 areas.

The KerryLIFE project aims to develop a system for the sustainable farming of freshwater pearl mussel catchment through the testing, evaluation and demonstration of optimal management techniques for the farming system. The actions proposed will tailored land use management in order to achieve the requirements of the water-dependent species and will have an additional benefit in describing and supporting terrestrial biodiversity.

The Project Management Group which will oversee the project will develop the recommendations and prescriptions which may be adapted to similar farming systems in future agri-environment schemes. Thus this project has significant potential to inform future policy decisions and in the development of new agri-environment measures, thereby assisting Ireland in fulfilling its obligations under EU Rural Development Policy and the EU 2020 Biodiversity Strategy as well as obligations under Natura 2000.

Appropriate management under agri-environment schemes is currently difficult to achieve in freshwater pearl mussel catchments. Agri-environmental schemes require that “sustainable optimal stocking levels” are maintained. However, there is no current guidance on what constitutes “sustainable/optimal levels” (again to achieve favourable conservation status) that support sustainable land use to reduce sediment and nutrient losses to freshwaters from farmland. Therefore, a new approach is required for successful management of the land for the conservation of the freshwater pearl mussel. It is not possible to design and implement a satisfactory agri-environment scheme until we can demonstrate, test, evaluate and disseminate optimal grazing and management regimes. Therefore the EAFRD is not considered as a suitable current funding source.

Actions (C1, C4 and C5) in combination with other concrete conservation actions, will develop measures to deliver favourable conservation condition for freshwater pearl mussel and their habitat that exceed the current requirement of cross compliance and current agri-environmental schemes.

Declaration of support from the Competent Authority

Woodlands of Ireland

Ring of Kerry Quality Lamb Group Society Ltd

Kerry County Council

Environmental Protection Agency

The Heritage Council

Inland Fisheries Ireland

Irish Farmers Association

Irish Creamery Milk Suppliers Association

B1 - Summary Description of the Project

Project title: Sustainable land use management for the conservation of freshwater pearl mussel

Project objectives: (Characters: 2,346/2,500)
The Caragh and Blackwater catchments host the two largest populations of freshwater pearl mussel (*Margaritifera margaritifera*) in Ireland, each supporting in excess of 2,750,000 adults. Currently, the recruitment is insufficient to maintain the adult populations into the future and both are classified in unfavourable condition.

The species has particularly stringent requirements, demanding high water clarity and low nutrient concentrations, higher than in most other aquatic species. It is adversely affected by siltation and by excessive algal cover.

The major causes of the unfavourable conservation condition of both the Caragh and Blackwater freshwater pearl mussel populations are regarded as diffuse sediment and nutrient losses associated with agriculture and forestry.

This project will demonstrate land use management for conserving freshwater pearl mussel populations of international importance. The project fully recognises the critical role farmers and forest-owners play in conserving the species and KerryLIFE will work collaboratively with these stakeholders. The concrete conservation actions in KerryLIFE will include drainage management to reduce sediment and nutrient loads, retrofitting and creating riparian woodland, restructuring commercial conifer plantations to long-term protective woodland, using sensitive conifer harvesting. The project will also demonstrate low impact livestock husbandry including low intensity grazing and nutrient management regimes.

The demonstration and long term delivery of sustainable land use practices will be contingent to a large extent on engaged local stakeholders. To that end, KerryLIFE will particular focus on a suite of complimentary actions, to demonstrate the value of conserving of freshwater pearl mussel to local community and key end users.

The objectives of KerryLIFE are:
- To demonstrate effective conservation measures that will restore the freshwater pearl mussel to favourable conservation condition in the Caragh and Blackwater catchments.
- To enhance awareness and understanding of the freshwater pearl mussel amongst local stakeholders.
- To demonstrate sustainable management techniques for farming and forestry in freshwater pearl mussel catchments.
- To provide guidance for farming and forestry practices that support the conservation of freshwater pearl mussels.

Actions and means involved: (Characters: 2,081/2,500)

A range of complementary measures will be undertaken to deliver the project objectives.

A management structure consisting of a locally-based Project Team, supported by and reporting to a Project Management Group and Project Stakeholder Group will be established to oversee the administration and implementation of the project actions.

Raising the local awareness of the ecology and conservation values of freshwater pearl mussels will be achieved through the delivery of a school educational programme, end-user training workshops, demonstration visits and other public events. Specific actions will be undertaken to extend the reach of KerryLIFE into the broader community by pursuing added value initiatives in relation to tourism and product branding. Regular project updates will be posted on the project website and an active media campaign will be rolled out.

Linkages will also be established with the wider national and international scientific communities, and other closely related projects to ensure the utilisation of best available science. Publications and project reports will be used to disseminate key findings, and a project conference will be convened to provide information to all stakeholders.

Detailed management plans will be prepared for all project farms and forests to address the threats to the freshwater pearl mussel of diffuse siltation, nutrient enrichment and hydrological change. Farm and Forest Advisors, Project Scientific Advisor, and hydrologist will work on the ground farmers and forest-owners to agree these bespoke plans.

Efficiency and effectiveness of the project in delivering on the objectives will be closely evaluated through regular monitoring of the (i) freshwater pearl mussel and its habitat and (ii) implementation of the management plans.

KerryLIFE will identify the necessary sectoral support mechanisms required to conserve freshwater pearl mussels into the future. The relevant Government Bodies, all of whom are partners to KerryLIFE, will utilise the project outputs in the formulation of future national policies and strategies.

Expected results (outputs and quantified achievements): (Characters: 1,809/2,500)

The expected results and outputs of the KerryLIFE project include:

An improvement in the condition of the habitat of the freshwater pearl mussel through a reduction in siltation and eutrophication

Increased recruitment of juvenile mussels to the population which will support achievement of favourable conservation condition

Reduced losses of silt and nutrients from forest and farm project sites

Greater awareness and understanding of freshwater pearl mussels amongst the local community and key stakeholders

A school educational programme delivered to 12 national and five secondary schools in the project area

A well designed and informative website

Establish a pearl mussel tourist walkway

The successful implementation of approximately 25 farm and 10 forest management plans

The sustainable management of farm (2500 ha) and forest (485 ha) drainage systems

The provision of 20 alternative drinking water facilities on farms

The establishment 15 ha of native woodland

The management of 10 ha of existing broadleaf woodland

The conversion of 15 ha to native broadleaf woodland

The restructuring of 175 ha of commercial plantations into long-term retention woodland

The provision of at least ten training workshops and ten demonstration events to farmers, forest-owners and other catchment users

The distribution of four best practice guides for a diverse range of end-users involved in catchment management hosting over 10 million freshwater pearl mussels

A report on the feasibility of local marketing initiatives and the establishment of a local supplier and consumer network

The publication of an AfterLIFE Conservation Plan for the Caragh and Blackwater freshwater pearl mussel catchments.

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Description of species / habitats issues targeted by the project: (Characters: 6,995/10,000)

The target species of this project is the freshwater pearl mussel, *Margaritifera margaritifera* (L.), Species Code 1029 which is listed on Annex II and Annex V of the EU Habitats Directive 92/43/EEC.

It is a bivalve, which is a type of mollusc with a body that is almost completely enclosed between a pair of shells. For most of its life it is a filter feeder and large quantities of water are pumped through the animal's siphons, food particles are trapped and passed to the mussel's mouth. The freshwater pearl mussel burrows to two-thirds of its shell depth, and is almost sessile in nature; some individuals never move after they reach maturity. The species is particularly notable in that individuals can grow to very large sizes relative to the other freshwater molluscs, building up thick, calcareous valves, in rivers that are oligotrophic, with low levels of calcium. Shell building is consequently very slow and individuals often live to over a hundred years of age.

Freshwater pearl mussels have a complex reproductive cycle with separate male and female animals. Reproduction occurs when sperm are released into the open water via the male's exhalent siphon in June, and are carried to the eggs via the female's inhalant siphon. Following fertilisation within the female's brood chambers, the eggs develop into a larval stage known as glochidia. Glochidia are temporarily brooded in the female's gills from June each year, and are then released into the open water in high numbers in an event lasting one to two days between July and September. The glochidia must then be inhaled and attach to the gills of their intermediary host within 24 hours, i.e. *Salmo salar* or *Salmo trutta*. The glochidia that survive on the fish develop into juvenile mussels. They fall off in early summer (normally June) and bury themselves into gravel on the river bed for approximately five years, until large enough to withstand the flow of open water, moving stones and fish predation. High levels of mortality are associated with each stage of the life cycle, however, the juvenile stage living in the river bed is the most sensitive stage. Freshwater pearl mussels mature between seven and 15 years of age, and can have a prolonged fertile period lasting well into old age.

Freshwater pearl mussels in Ireland are restricted to oligotrophic, acid to neutral waters of rivers flowing over granite or sandstone bedrock, often downstream of oligotrophic lakes. The species requires stable cobble and gravel substrates, with very little fine material. Where fine sediment is absent from the river bed, free water exchange occurs between the open river and the water within the gravel substrate (the interstitial zone). This facilitates continuous, high oxygen levels essential for juvenile survival.

There are just over 100 populations of freshwater pearl mussel in the Ireland, some of which include two or more rivers in close enough proximity to one another. They are widely distributed in Ireland, being especially frequent in the west. The most recent population estimate of freshwater pearl mussel adults in Ireland is 12,000,000.

Within the project area, the estimated populations are 2,800,000 in the Caragh catchment and 2,760,000 in the Blackwater Catchment, summing to 46 % of the Irish adult mussel population and, in turn, 21 % of the estimated EU population (Moorkens, pers. comm.).

The conservation condition of the Caragh and Blackwater freshwater pearl mussels was assessed in 2009 and again in 2011. On both occasions, the mussel populations and their

habitat were assessed as unfavourable using the objectives and targets on the Third and Fourth Schedules to *Statutory Instrument* (*S.I.) No. 96 of 2009*. Juvenile recruitment was found to be insufficient to sustain the adult population in both the Caragh and Blackwater.

In the Caragh, a significant decline was noted in population condition between 2009 and 2011, including significant losses of adult mussels and no juvenile mussels of 30 mm or smaller (approx. five-years-old) in 2011. The principal cause of the Caragh decline is siltation and linked hydromorphological changes, with strong silt plumes recorded and a significant loss of dissolved oxygen with depth in the substratum (redox). Nutrient enrichment is also a factor and the targets for macroalgal and macrophyte cover were exceeded.

In contrast, the Blackwater demonstrated a slight improvement between 2009 and 2011, with no loss of adults or evidence of non-natural adult deaths in 2011, and some, but insufficient, juvenile recruitment (3.4 % of the population smaller than 30 mm, where the target is 5 %). The mussel habitat in the Blackwater failed for both siltation and macroalgae.

Siltation causes water quality and in-stream changes, affecting mussels in many ways and at all life cycle stages. Silt that infiltrates the riverbed blocks water exchange between the river and the substrate. This reduces the oxygen supply in the substrate and causes juvenile deaths. Siltation also leads to adult mortality through direct ingestion. Turbid water causes adult mussels to clam up and stop filtering, causing oxygen starvation. Deposited sediment provides a rooting medium for macrophyte growth that can further smother the juvenile habitat and trap sediment. Silt can also negatively affect the fish species that host the mussel glochidial stage (Levasseur *et al.*, 2006), however there is no evidence that changes in juvenile salmonid populations have contributed to the decline of the freshwater pearl mussel in Ireland. The transport of silt through the river in suspension or as 'bed load' also increases riverbank and riverbed erosion, further exacerbating the changes to the mussel's habitat.

Nutrient enrichment promotes growth in aquatic plants, particularly macroalgae (typically filamentous species) and rooted higher plants (macrophytes). Macroalgal growth is stimulated by the dissolved nutrients nitrogen and, especially, phosphorus. Increases in macrophyte cover require both rooting medium (silt) and dissolved or particulate nutrients. Both macroalgae and macrophytes block water exchange between the river and the riverbed, disrupting the oxygen supply and leading to juvenile deaths. In severe cases, dense algal growths lead to night time oxygen depletion and the death of adult mussels. Deoxygenation of the river water and riverbed is exacerbated when the plants die and decompose in situ.

As noted above, **hydrological and morphological changes** are a significant part of the story of the decline of the freshwater pearl mussel. The extensive drainage of land to increase its productivity for agriculture and forestry, as well as to facilitate development, has changed the water flow patterns in rivers. Flood flows have become more frequent and powerful, causing erosion of riverbeds and riverbanks and causing direct loss through wash-out of mussel habitat. Summer flows have become lower and droughts more frequent, exposing mussels to the air and increasing sedimentation and enrichment of mussel habitat. Drains and their on-going maintenance are sources of fine sediment and provide direct pathways for both silt and nutrients to the mussel's habitat.

Explain how the project can be considered a climate change adaptation project: (Characters: 15/2,000)
Not applicable

Name of the project area: (Characters: 156/200)
Caragh freshwater pearl mussel catchment (within the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment Special Area of Conservation)

Surface area (ha): 13368

Surface description (max. 100 chars):
Mountainous area characterised by peatlands, farmland, forests, rivers and lakes

SPA: **NATURA 2000 Code:**
SAC/SCI/pSCI: X **NATURA 2000 Code:** IE000365

Other protection status according to national or regional legislation: (Characters: 111/500)
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment proposed Natural Heritage Area (pNHA)

Main land uses and ownership status of the project area: (Characters 814/1,000)
The principal land uses within the Caragh freshwater pearl mussel catchment are low-intensity agricultural production, particularly cattle and sheep, commercial forestry, peat extraction for fuel, tourism, angling and rural housing. The approximate proportions of the land types and uses are: 60 % peat bogs and heath (used for grazing sheep and locally, peat extraction), 30 % grasslands (used primarily for sheep and cattle grazing), 6 % forestry, and the remaining 4 % comprising lakes, infrastructure and rural settlements. Most of the Caragh catchment is under multiple private ownership (95 %), while approximately 5 % is owned by the Coillte Teoranta (the state company charged with managing public forests commercially in Ireland).

Scientific description of project area: (Characters: 9,878/10,000)
The Caragh catchment drains part of the Iveragh peninsula in the south-west of Ireland and ranges in altitude from ca. 1000 m above sea level (A.S.L.) in the south-east to 20 m A.S.L. in the north, where the main river channel enters Lough Caragh. The system is characterised by an extensive river network and includes a number of oligotrophic lakes, notably Cloon Lough and Lough Acoose. The main tributaries of the Caragh River include the Meelagh and Dromalonhurt, which drain from the west, the Caraghbeg from the east, and the Owenroe from the south-west of the catchment.

The geology of the catchment is Devonian Old Red Sandstone of three recognised types: green, purple and grey sandstone. The river system occupies glacially deepened valleys, draining the western side of Magillycuddy's Reeks and the northern slopes of a spine of mountains that forms the backbone of the Iveragh peninsula, including the 773 m high Mullaghanattin peak. The valley floors are relatively broad and flat and are flanked by steep slopes rising from 200 m to 700 m. The Caragh freshwater pearl mussel catchment is dominated by peaty soils, including blanket peat, peaty gleys and peaty podzols, and out-cropping rock, with some pockets of mineral alluvium in the valleys. The podzols are generally strongly leached and an iron pan is often present.
As is typical for the south-west of Ireland, the Caragh freshwater pearl mussel catchment has a pronounced oceanic climate with high rainfall (up to 3,600 mm per year at higher altitudes), high humidity, cool summers and mild winters. Rainfall is distributed fairly evenly over the year, with between 200 and 250 wet days (>1 mm rainfall) each year. River discharge shows

a rapid response to rainfall in the catchment, as a result of the steep slopes and generally impermeable nature of the peaty topsoils. Flash floods occur at frequent intervals throughout the year.

The water chemistry of the Caragh system is soft and slightly acidic to circum-neutral, and low in dissolved nutrients. The vegetation of the catchment includes: lowland and mountain blanket bog; flush; wet heaths; semi-natural wet grassland; improved grassland; native woodland; and conifer plantations.

The Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment Special Area of Conservation is an extensive area that encompasses the Iveragh peninsula and the Paps Mountains, stretching from Millstreet in the east to Waterville in the west. It is the most mountainous region in Ireland and includes Carrauntoohill (1039 m A.S.L.), the highest mountain peak in the country. The underlying geology is almost entirely Old Red Sandstone. Glacial processes have shaped the sandstone into characteristic ridges and valleys.

The SAC is selected for the following EU Habitats Directive Annex I habitats:

- 3110, Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- 3130, Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- 3260, Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- 4010, Northern Atlantic wet heaths with *Erica tetralix*
- 4030, European dry heaths
- 4060, Alpine and Boreal heaths
- 5130, *Juniperus communis* formations on heaths or calcareous grasslands
- 6130, Calaminarian grasslands of the *Violetalia calaminariae*
- 6410, *Molinia* meadows on calcareous, peaty or clavey-silt-laden soils (*Molinion caeruleae*)
- 7130, Blanket bog (*active only)
- 7150, Depressions on peat substrates of the *Rhynchosporion*
- 91A0, Old sessile oak woods with *Ilex* and *Blechnum* in British Isles
- 91E0, Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) *
- 91J0, *Taxus baccata* woods of the British Isles *

(* indicates priority habitats).

The site is also selected for the following species listed under Annex II of the Habitats Directive:

- 1024, *Geomalacus maculosus* Kerry Slug
- 1029, *Margaritifera margaritifera* Freshwater Pearl Mussel
- 1065, *Euphydryas aurinia* Marsh Fritillary
- 1095, *Petromyzon marinus* Sea lamprey
- 1096, *Lampetra planeri* River Lamprey
- 1099, *Lampetra fluviatilis* Brook Lamprey
- 1103, *Alosa fallax* Killarney Shad
- 1106, *Salmo salar* Atlantic Salmon

- 1303, *Rhinolophus hipposideros* Lesser Horseshoe Bat
- 1355, *Lutra lutra* Otter
- 1421, *Trichomanes speciosum* Killarney Fern
- 1833, *Najas flexilis* Slender Naiad

Farming in the Caragh catchment is dominated by extensive cattle and sheep rearing (Kramm *et al.,* 2010). Cattle husbandry is mainly characterised by small herds (<30 animals) and out-wintering of cattle with associated supplementary feeding is common. Out-wintering increases the risk of poaching (cutting up of the ground surface by livestock) near supplementary feeding stations and access points. The improved grasslands are often cut for silage production. Animal wastes are typically spread onto the silage-stubble following cutting in mid- to late-summer providing a limited window of opportunity for the application of animal wastes. This can lead to difficulties in the safe land-spreading of animal wastes in wet summers. Chemical fertiliser, in particular high nitrogen-fertilisers, is applied early in the season to promote grass growth prior to lambing. The risk of nutrient export to aquatic systems is further increased by the generally coarse sandy nature of the soils. Many of these soils have a very low capacity to retain nutrients as they are coarse textured with a low fine earth fraction. This combined with the high precipitation in the catchment inevitably results in the loss of nutrients to aquatic zones.

Sheep rearing operations are characterised by recently-constructed animal housing and large areas of improved grassland. The process of improving land generally involves removing field boundaries and scrub, ploughing, de-stoning, heavy applications of inorganic fertilisers and reseeding. On some farms the sheep flock (or a portion of it) is housed through the winter period, while on other farms, the ewes may be housed for a short period prior to lambing. Animals are typically released onto improved grassland shortly after lambing and subsequently moved to upland areas for summer and autumn grazing.

Less intensive sheep production is typified by having little or no animal housing and very little improved grassland. In these cases, sheep are likely to be kept out all year round, a practice that generally requires supplementary feeding (normally concentrates, occasionally hay or silage) over a long period from winter until early summer. Lambing on the hill is generally avoided, where possible, as casualty rates can be high. Though less intensive, there are significant risks associated with these operations as sheep are out on the uplands (characterised by unstable, peaty soils) in all seasons. This can lead to poaching, soil erosion and vegetation change, e.g. increased dominance of Purple Moorgrass (*Molinia caerulea*). All of these increase the risk of sediment losses to aquatic zones. Supplementary feeding may also change foraging behaviour, with increased forage utilisation near access or feeding points with consequent risks of localised soil erosion and nutrient export.

Forestry covers 5 % of the Caragh catchment. Initial establishment of commercial forests in the catchments was conducted by the State in the 1960/70s (and currently managed by Coillte), followed by private forest planting, from the mid 1980s onwards. Within the Caragh catchment, the ratio of public (Coillte) to private forestry is 62:38. Forest stands are concentrated to the north and east of the Caragh catchment. Principal conifer species include Sitka Spruce (*Picea sitchensis*), Lodgepole Pine (*Pinus contorta*) and Japanese Larch (*Larix kaempferi*), with small areas of other conifer species and assorted broadleaves (typically native broadleaves in semi-natural woodland). Commercial forest plantations in the catchment occur typically on peat and peaty podzol soils and on steep slopes, often in close proximity to aquatic zones and freshwater pearl mussel populations. The conifer forest

lifecycle or rotation is typically 40 years. Establishment and management of conifer forests generally involves ground preparation, drainage, fertiliser application, road construction, thinning, clearfelling and replanting. Many of these operations can act as a significant potential source of both silt and/or nutrient input into aquatic zones. Erosion risk is especially high during forestry operations such as road construction, crop establishment and clearfelling, during which soils are exposed or damaged. Periodic, piecemeal clearfelling in both catchments can work in combination to cause episodic nutrient and sediment spikes and a gradual deterioration in water quality.

A number of small, fragmented, semi-natural broadleaf woodland are also found throughout the catchment, most of which are located along riparian corridors. Although limited in scale, these play a largely beneficial role in mitigating negative impacts to freshwater pearl mussel populations, especially where they act as fully functional buffers with respect to hydrological integrity. These semi-natural remnants are typical of 'ancient' riparian woodland, occurring along aquatic corridors. They generally comprise of Birch (*Betula pubescens*), Willow (*Salix* spp.), Alder (*Alnus glutinosa*) and other native trees and shrubs typical of riparian woodland communities. Elsewhere on free draining slopes small pockets of acidophillous oak-woodland occur, which are dominated by Sessile Oak (*Quercus petraea*) and Holly *(Ilex aquifolium*).

Importance of the project area for biodiversity and/or for the conservation of the species / habitat types targeted at regional, national and EU level (give quantitative information if possible): (Characters: 4,791/10,000)

Moorkens (2010) presented an analysis of the Irish SAC populations of freshwater pearl mussel, the condition of their habitat and the pressures impacting upon them. Moorkens (2010) identified that the largest populations with some, but insufficient, recruitment were found in extensively managed catchments dominated by low-intensity agriculture and forestry, with low human population density. These catchments also lacked urban population centres and industries. In these catchments, changing agricultural practices and recent forestry operations (notably clearfelling) were the main causes of deterioration in the condition of the freshwater pearl mussel habitat and populations. Although both the freshwater pearl mussel populations and their habitat were in unfavourable condition in the Caragh catchment, Moorkens (2010) considered that this population represented one of the most restorable, with the best chance of a long-term future for the species in Ireland. The 27 freshwater pearl mussel populations were assigned to nine priority classes, with the most restorable in priority class one and those closest to extinction in priority class nine (Moorkens, 2010). The Caragh population is one of three priority class one populations and is ranked in second position nationally.

Moorkens (2010) advocated a conservation strategy that prioritised the implementation of all necessary catchment measures for the eight priority class one and priority class two populations. Diffuse losses of fine sediment and nutrients from agriculture and forestry were the dominant pressures identified across the eight catchments. The most urgent challenge for freshwater pearl mussel conservation is, therefore, the development and implementation of effective and cost-efficient measures for reducing diffuse losses of sediment and nutrients from forestry and farming.

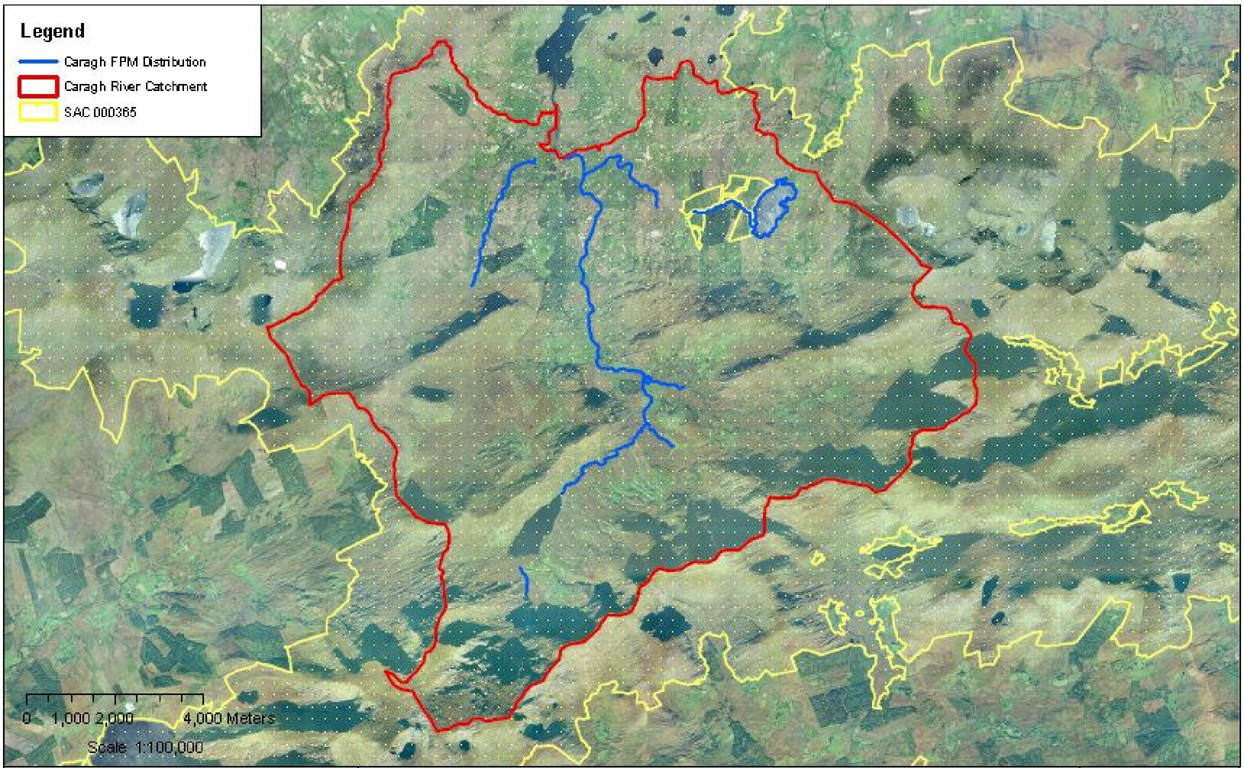
The Caragh draft Sub-basin Management Plan (SBMP) identified agricultural activities and forestry as the main pressures impacting on the freshwater pearl mussel populations (DEHLG, 2010 a).

Owing to their priority class one status and the predominance of agricultural and forestry pressures, the Caragh catchment is considered one of the area's most urgently in need of measures to reduce pollutant losses from these sources. The pressures impacting on the Caragh catchment are also typical of those found across all the eight prioritised catchments and, hence, the actions developed through this project will have direct applicability to all the prioritised catchments.

The Caragh freshwater pearl mussel catchment has a very large freshwater pearl mussel population that has been well documented over the past 13 years or so. Freshwater pearl mussels were first recorded from the Caragh River in ca. 1906. A full survey of the Caragh and its tributaries - the Meelagh, Caraghbeg, Owenmore and Owbeg Rivers was undertaken in 1999 (Ross, 1999). In all, freshwater pearl mussels were found to be present in 22.6 km of river channel within the catchment. It is estimated that there is a population of ca. 2.8 million mussels in the Caragh River, making it one of the most important rivers for this species in the world. The population is larger than any other population in Ireland. The density of the mussels varies with habitat suitability, but some stretches have very abundant mussel beds (Ross, 1999). The Caragh River population has a good distribution of size classes, although the number of juveniles and younger mussels are below the required criteria and therefore, the population is in unfavourable condition (Ross 2004, 2005, 2009, 2011). Sedimentation and nutrient enrichment of the freshwater pearl mussel habitat is responsible for the unfavourable condition (DEHLG, 2010 a). Moorkens (2009) projected that the population will be extinct within a generation if habitat quality is not improved.

The reasons that the Caragh freshwater pearl mussel catchment was chosen as a project area can be summarised as follows:

- The Caragh population is ranked as one of the top three most restorable freshwater pearl mussel populations in Ireland and is, therefore, a priority for conservation measures.
- The freshwater pearl mussel population is large, widespread, has some recruitment and represents over 23 % of the national population and is therefore a highly significant part of the European population.
- Actions are urgently required in the Caragh freshwater pearl mussel catchment to reduce losses of fine sediment and nutrients from forestry and farming sources.
- The freshwater pearl mussel has been identified as a national conservation priority.
- The actions developed for the Caragh catchment through the project will have direct applicability to the remaining eight priority freshwater pearl mussel catchments in Ireland.



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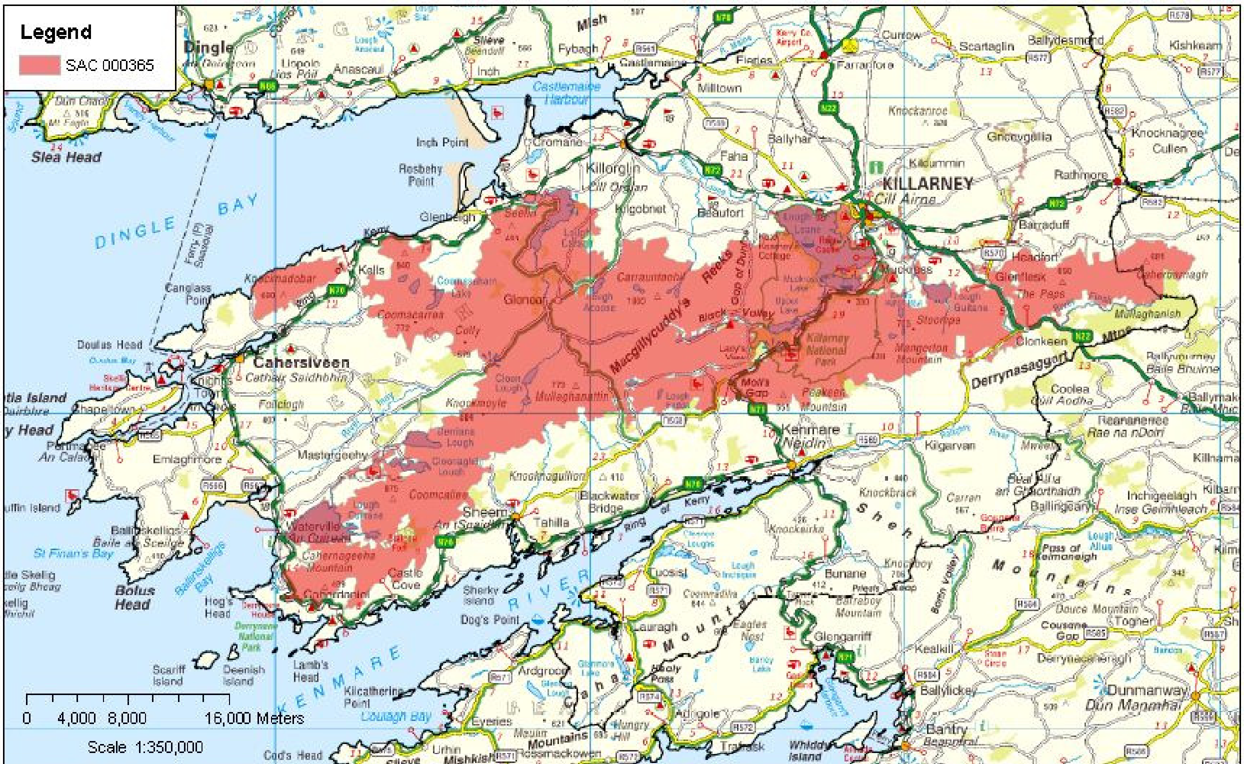
Kerry Pearl Mussel LIFE+ Project Map 2: Caragh River Catchment

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha arna léarscáiliú ach nod garshuíomhach ginearálta. Féadfar athbhreithniú a dhéanamh ar theorainneacha na gceantar comhartháithe. Macasamhail d'ábhar na Suirbhéarachta Ordanáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208).



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Kerry Pearl Mussel LIFE+ Project **Map 1a: Location SAC 000365**

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha arna léarscáiliú ach nod garshuíomhach ginearálta. Féadfar athbhreithniú a dhéanamh ar theorainneacha na gceantar comhartháithe. Macasamhail d'ábhar na Suirbhéarachta Ordanáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208).

Name of the project site:
Blackwater Catchment (coincides with the Blackwater River (Kerry) Special Area of Conservation).

Surface area (ha): 8831

Surface description (max. 100 chars):
Mountainous area characterised by peatlands, farmland, forests, rivers and lakes

SPA: **NATURA 2000 Code:**
SAC/SCI/pSCI: X **NATURA 2000 Code:** IE002173

Other protection status according to national or regional legislation: (Characters: 153/500)
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment proposed Natural Heritage Area
Dromlusk Bog proposed Natural Heritage Area 00352

Main land uses and ownership status of the project area: (Characters: 640/1,000)
The principal land uses within the Blackwater Catchment are agricultural production, particularly cattle and sheep, commercial forestry, peat extraction for fuel, tourism, angling and rural housing. The approximate proportions of the land types and uses are; 55 % peat bogs and heath (used for grazing sheep and locally, peat extraction), 26 % grasslands (used primarily for sheep and cattle grazing), 14 % forestry, and the remaining 5 % comprising lakes, infrastructure and rural settlements. The Blackwater Catchment is mainly within multiple private ownership (ca. 93 %), while approximately 7 % is owned by the State Forest Company, Coillte.

Scientific description of project area: (Characters: 3,083/10,000)
The Blackwater catchment is located to the south of the Caragh catchment on the Iveragh peninsula in County Kerry. The river flows from north to south, discharging to the Kenmare River estuary. Two principal tributary rivers, the Kealduff and the Derreendarragh, drain into the Blackwater River. These rivers are characterised by a high-density network of tributary streams. The source of the Blackwater River is at an altitude of ca. 600 m A.S.L. and the river traverses ca. 10 km before it reaches the sea. Although fewer and smaller in area than those in the Caragh catchment, oligotrophic lakes (Loughs Brin, Fadda and Beg) are also found in the Blackwater catchment.

The watershed between the Blackwater and Caragh catchments is formed by the spine of mountains running from east to west across the Iveragh peninsula, incorporating peeks such as Knockaunanattin and Mullaghanattin. The lower Blackwater flows through a flat, low-lying glaciated valley that is fringed by steep slopes.

The underlying geology of the Blackwater catchment is Devonian Old Red Sandstone, which is overlain by blanket peat throughout much of the area. Outcropping rock is frequent. Peaty podzols and peaty gley soils predominate, with some mineral alluvium in the valley bottoms.

The climate, hydrology and water chemistry of the Blackwater Catchment are very similar to the Caragh freshwater pearl mussel catchment described earlier.

The principal habitats within the Blackwater catchment are upland grassland and various types of heaths. The grassland is improved to varying degrees, especially in the lower parts of the catchment. Common plant species of the unimproved grassland include Matgrass (*Nardus stricta*), Purple Moor-grass (*Molinia caerulea*) and Common Bent (*Agrostis capillaris*). On the more peaty, acidic soils, the grassland grades into dry and wet heaths. Where the peat is deeper blanket bog has developed, though much of this is now cutaway. Deciduous woodland occurs along the upper stretches of the Kealduff River and also along the lower part of the Blackwater River, with smaller isolated pockets elsewhere in the catchment. The principal tree species are Downy Birch, Willow, Hazel (*Corylus avellana*) and Oak (*Quercus petraea*), the latter especially along the main Blackwater River corridor.

The main land-uses within the catchment are agricultural, mostly grazing and forestry. Forestry comprises 14% of the land area of the Blackwater catchment and is dominated by coniferous plantations similar in species composition to those in the Caragh catchment.
The Blackwater (Kerry) River candidate SAC selected for a single Habitats Directive Annex I habitat, 4030, European dry heaths. The site is also selected for the following species listed on Annex II of the same directive:

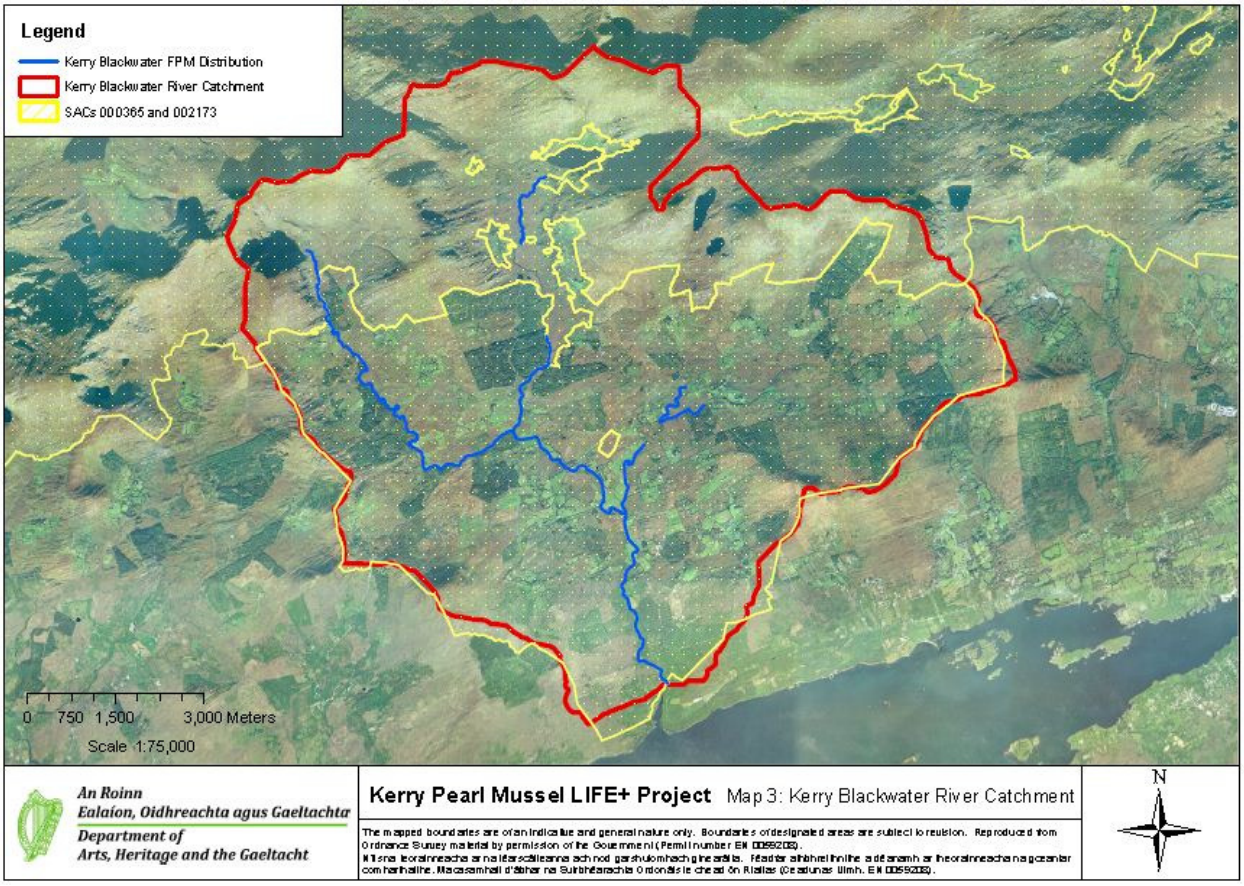
- 1024, *Geomalacus maculosus* Kerry Slug
- 1029, *Margaritifera margaritifera* Freshwater Pearl Mussel
- 1106, *Salmo salar* Atlantic Salmon
- 1303, *Rhinolophus hipposideros* Lesser Horseshoe Bat
- 1355, *Lutra lutra* Otter

Importance of the project area for biodiversity and/or for the conservation of the species / habitat types targeted at regional, national and EU level (give quantitative information if possible): (Characters: 2,991/10,000)
The reasons that the Blackwater catchment was chosen as a project area are summarised as follows:

- The Blackwater population is ranked as one of the top three most restorable freshwater pearl mussel populations in Ireland and is, therefore, a priority for conservation measures
- The Blackwater freshwater pearl mussel population is large, widespread, has some recruitment and represents 23 % of the national population
- Actions are urgently required in the Blackwater catchment to reduce losses of fine sediment and nutrients from forestry and farming sources
- The freshwater pearl mussel has been identified as a national conservation priority
- The actions developed for the Blackwater catchment in this project will have direct applicability to the remaining eight priority freshwater pearl mussel catchments in Ireland

Records from Stelfox (Jackson 1925) indicate that freshwater pearl mussels have been known from the Blackwater since the early 19th century. However, the size and importance of the Blackwater population was not recognised until the mid 1990s. A comprehensive survey of freshwater pearl mussels in the River Blackwater and its main tributaries, the Kealduff and Derreendarragh Rivers, was undertaken in 1999 and concluded that the river supported a very large mussel population. It was estimated at 2.76 million individuals, with locally very high densities in all three rivers (Ross 1999). Further surveys were carried out in 2004 and 2005 to gather quantitative data on mussel density, size/age distribution, level of juvenile recruitment and characteristics of the mussel habitat within the River Blackwater and its tributaries. The baseline monitoring survey recorded an average density of 14.5 individual mussels per m^2

(Ross 2004) confirming the presence of a large population. This compares favourably with data from a representative sample of Scottish rivers with functioning, viable freshwater pearl mussel populations, where average density values ranged from 0.27 to 30.01 individuals per m^2 (Hastie *et al.* 2000). In very high-density areas in the River Blackwater and its tributaries, the average number of mussels was 58 individuals per m^2 and the maximum number of mussels recoded was 248 per m^2 (Ross 2006). Comparison of results of shell length frequency between 1999, 2004 and 2011 indicated that the population remained relatively stable and had not suffered any major decline during the intervening period (Ross 2011). Based on the population size, distribution, densities and structure (which indicated some recent recruitment), the Blackwater ranks as one of the most important freshwater pearl mussel rivers both in Ireland and Europe. However, recruitment is below levels required to achieve a sustainable population and therefore, the population is in unfavourable conservation condition. It is projected that the population will decline appreciably if habitat quality is not improved in the short and medium term.


Legend
Kerry Blackwater FPM Distribution
Kerry Blackwater River Catchment
SACs 000365 and 002173
0 750 1,500 3,000 Meters
Scale 1:75,000
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Kerry Pearl Mussel LIFE+ Project Map 3: Kerry Blackwater River Catchment
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
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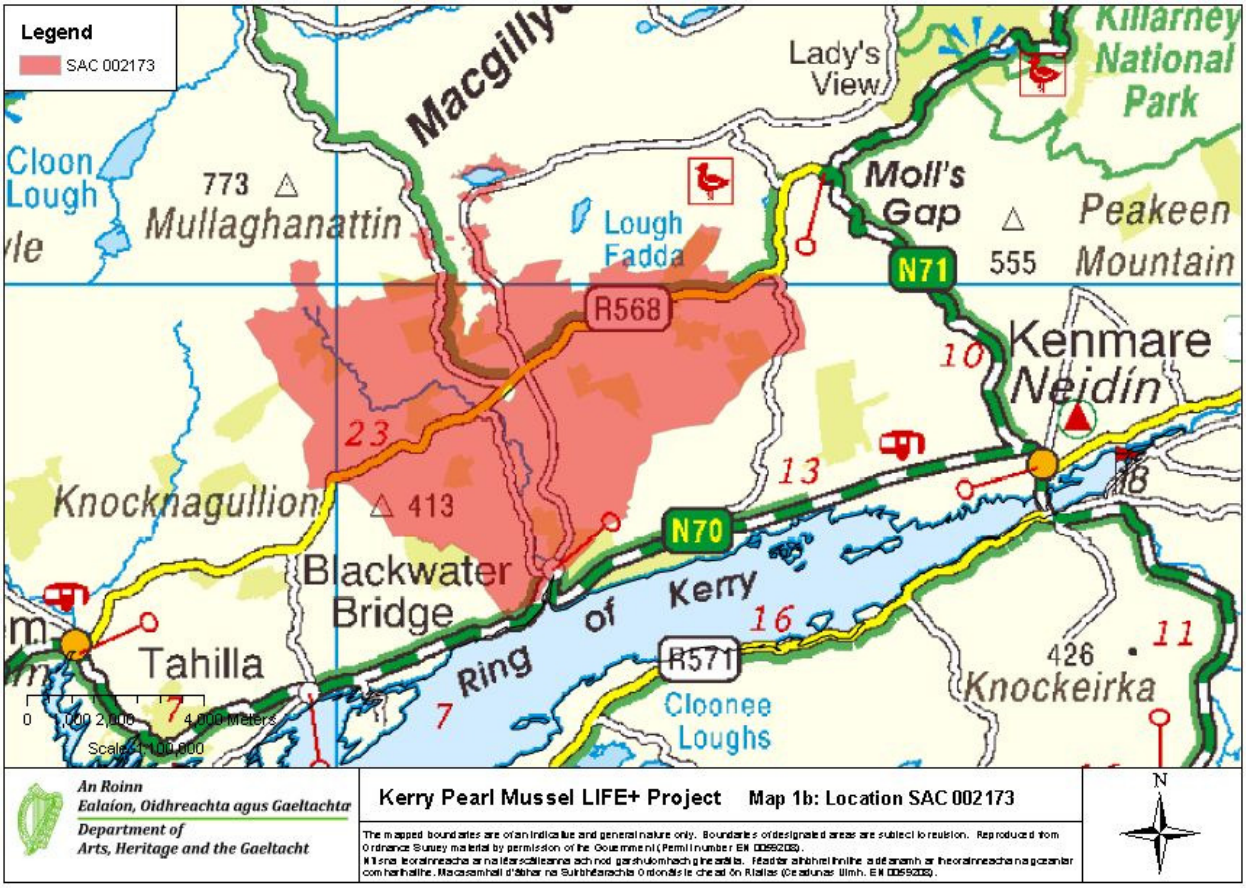
Legend
SAC 002173
Macgillycuddy's Reeks
Lady's View
Killarney National Park
Cloon Lough
773
Mullaghanattin
Lough Fadda
Moll's Gap
555
Peakeen Mountain
N71
R568
10
Kenmare
Neidín
23
13
Knocknagullion
413
N70
Blackwater Bridge
Ring of Kerry
16
R571
426
11
Knockeirka
Tahilla
7
Cloonee Loughs
0 1,000 2,000 4,000 Meters
Scale 1:100,000
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Kerry Pearl Mussel LIFE+ Project Map 1b: Location SAC 002173
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
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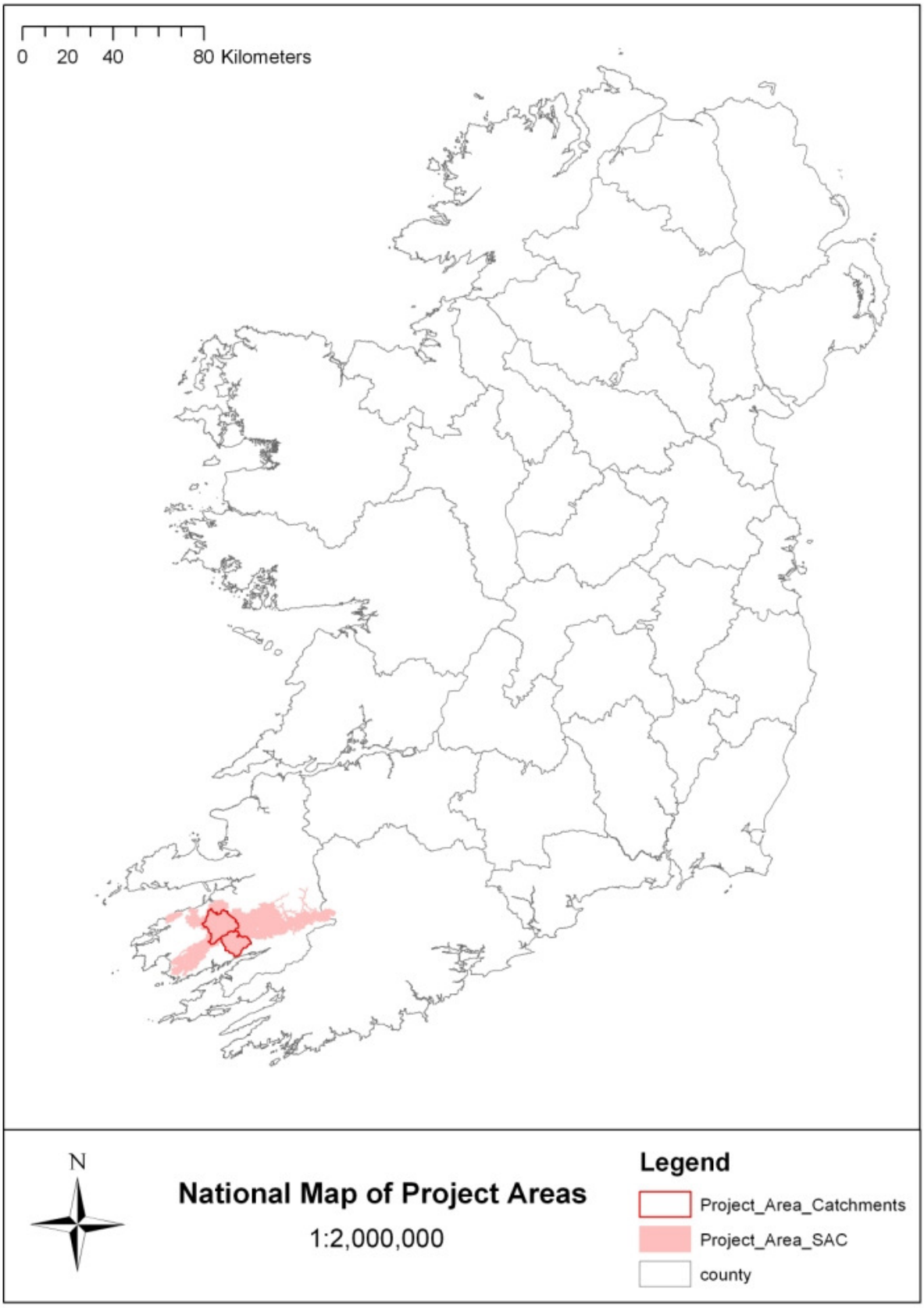
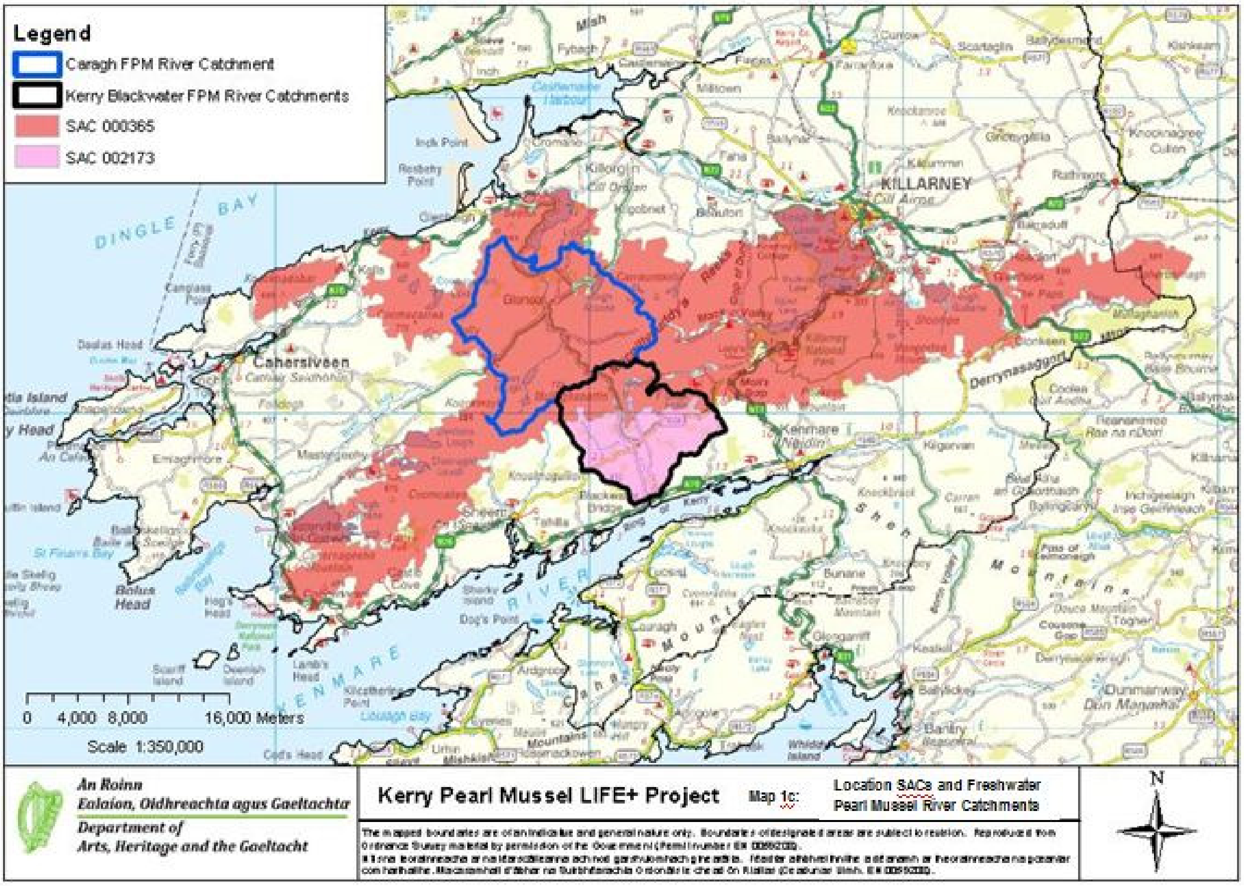

0 20 40 80 Kilometers
N
National Map of Project Areas
1:2,000,000
Legend
Project_Area_Catchments
Project_Area_SAC
county


Legend
Caragh FPM River Catchment
Kerry Blackwater FPM River Catchments
SAC 000365
SAC 002173
0 4,000 8,000 16,000 Meters
Scale 1:350,000
DINGLE BAY
KILLARNEY
Cahersiveen
Kenmare
KENMARE RIVER
An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht
Kerry Pearl Mussel LIFE+ Project
Map 1c:
Location SACs and Freshwater
Pearl Mussel River Catchments
N

Description of species / habitats issues targeted by the project: (Characters: 7,196/10,000)

The target species of this project is the freshwater pearl mussel, *Margaritifera margaritifera* (L.), Species Code 1029 which is listed on Annex II and Annex V of the EU Habitats Directive 92/43/EEC.

It is a bivalve, which is a type of mollusc with a body that is almost completely enclosed between a pair of shells. For most of its life it is a filter feeder and large quantities of water are pumped through the animal's siphons, food particles are trapped and passed to the mussel's mouth. The freshwater pearl mussel burrows to two-thirds of its shell depth, and is almost sessile in nature; some individuals never move after they reach maturity. The species is particularly notable in that individuals can grow to very large sizes relative to the other freshwater molluscs, building up thick, calcareous valves, in rivers that are oligotrophic, with low levels of calcium. Shell building is consequently very slow and individuals often live to over a hundred years of age.

Freshwater pearl mussels have a complex reproductive cycle with separate male and female animals. Reproduction occurs when sperm are released into the open water via the male's exhalent siphon in June, and are carried to the eggs via the female's inhalant siphon. Following fertilisation within the female's brood chambers, the eggs develop into a larval stage known as glochidia. Glochidia are temporarily brooded in the female's gills from June each year, and are then released into the open water in high numbers in an event lasting one to two days between July and September. The glochidia must then be inhaled and attach to the gills of their intermediary host within 24 hours, i.e. *Salmo salar* or *Salmo trutta*. The glochidia that survive on the fish develop into juvenile mussels. They fall off in early summer (normally June) and bury themselves into gravel on the river bed for approximately five years, until large enough to withstand the flow of open water, moving stones and fish predation. High levels of mortality are associated with each stage of the life cycle, however, the juvenile stage living in the river bed is the most sensitive stage. Freshwater pearl mussels mature between seven and 15 years of age, and can have a prolonged fertile period lasting well into old age.

Freshwater pearl mussels in Ireland are restricted to oligotrophic, acid to neutral waters of rivers flowing over granite or sandstone bedrock, often downstream of oligotrophic lakes. The species requires stable cobble and gravel substrates, with very little fine material. Where fine sediment is absent from the river bed, free water exchange occurs between the open river and the water within the gravel substrate (the interstitial zone). This facilitates continuous, high oxygen levels essential for juvenile survival.

There are just over 100 populations of freshwater pearl mussel in the Ireland, some of which include two or more rivers in close enough proximity to one another. They are widely distributed in Ireland, being especially frequent in the west. The most recent population estimate of freshwater pearl mussel adults in Ireland is 12,000,000.

Within the project area, the estimated populations are 2,800,000 in the Caragh catchment and 2,760,000 in the Blackwater Catchment, summing to 46 % of the Irish adult mussel population and, in turn, 21 % of the estimated EU population (Moorkens, pers. comm.).

The conservation condition of the Caragh and Blackwater freshwater pearl mussels was assessed in 2009 and again in 2011. On both occasions, the mussel populations and their

habitat were assessed as unfavourable using the objectives and targets on the Third and Fourth Schedules to *Statutory Instrument* (*S.I.) No. 96 of 2009*. Juvenile recruitment was found to be insufficient to sustain the adult population in both the Caragh and Blackwater.

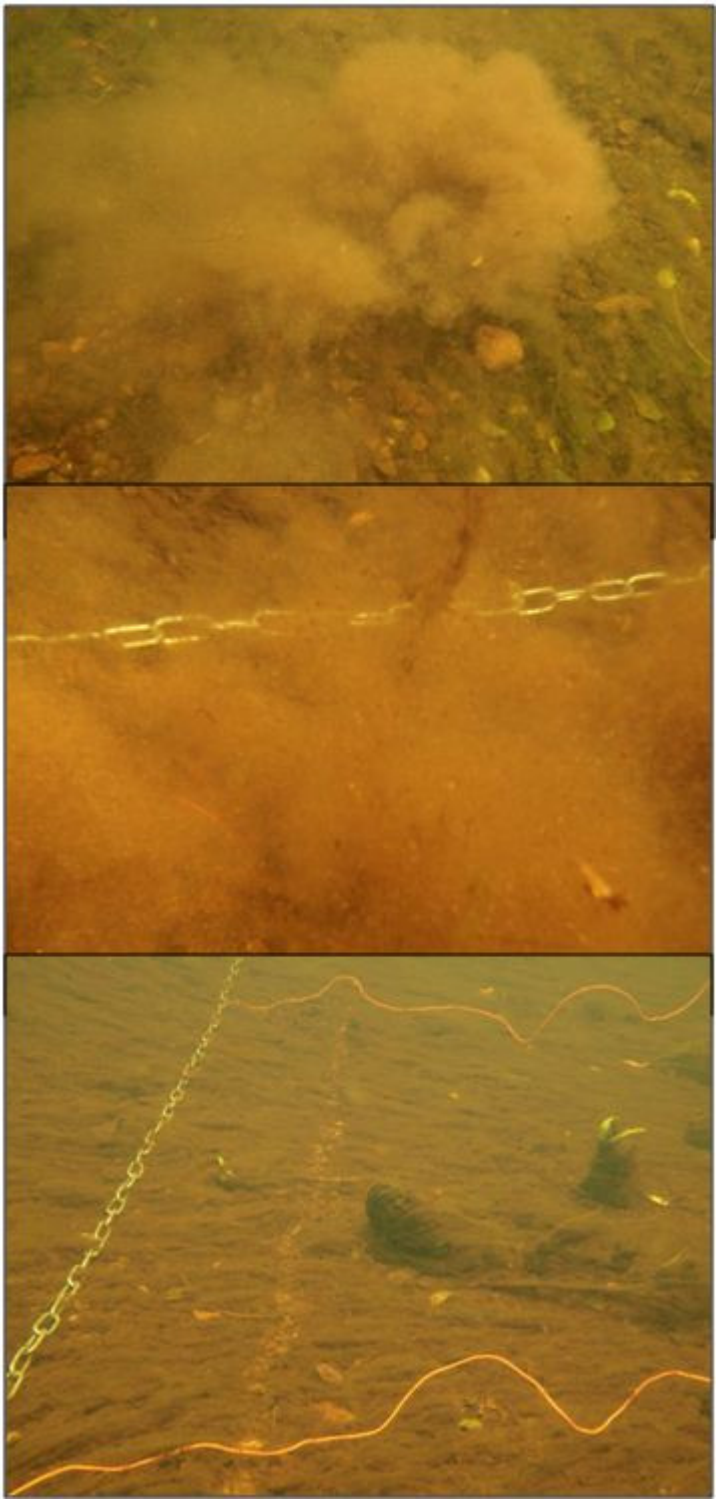
In the Caragh, a significant decline was noted in population condition between 2009 and 2011, including significant losses of adult mussels and no juvenile mussels of 30 mm or smaller (approx. five-years-old) in 2011. The principal cause of the Caragh decline is siltation and linked hydromorphological changes, with strong silt plumes recorded and a significant loss of dissolved oxygen with depth in the substratum (redox). Nutrient enrichment is also a factor and the targets for macroalgal and macrophyte cover were exceeded.

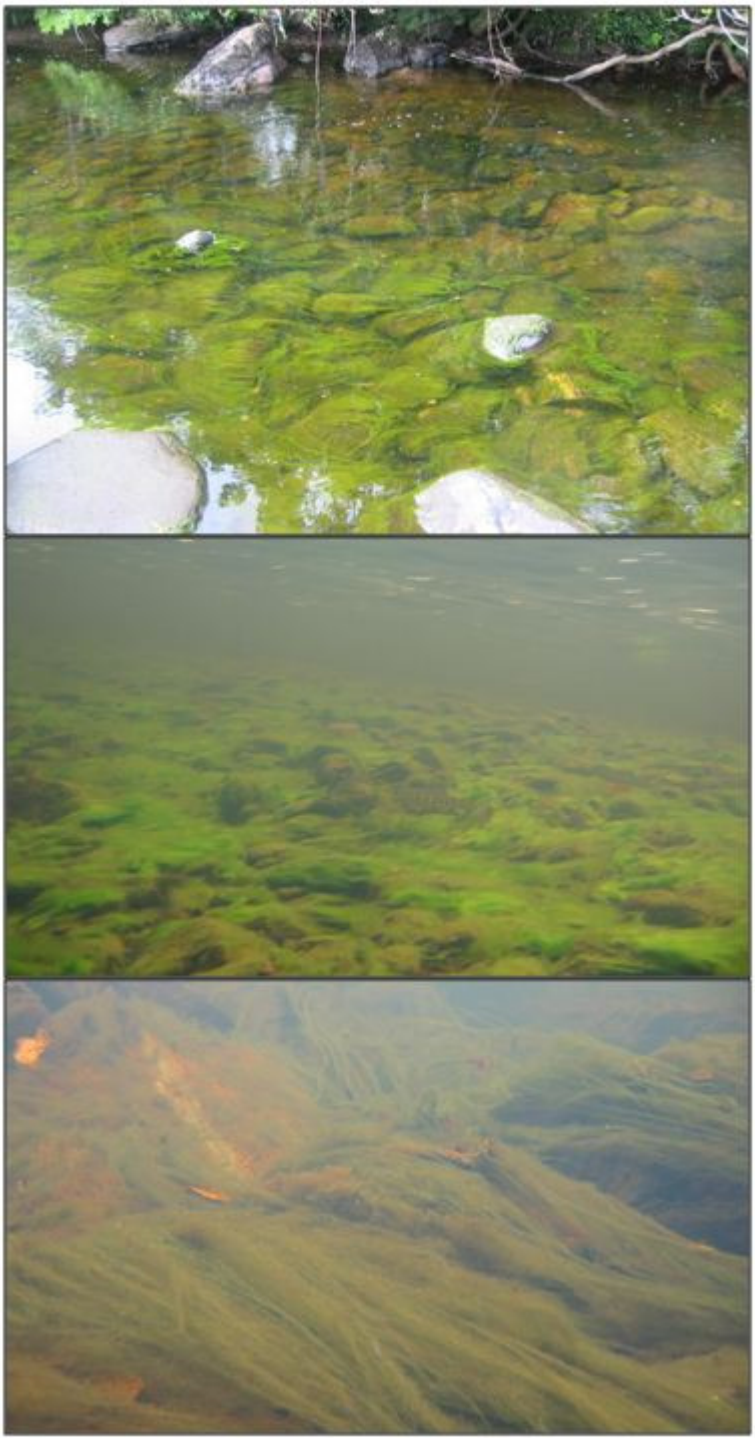
In contrast, the Blackwater demonstrated a slight improvement between 2009 and 2011, with no loss of adults or evidence of non-natural adult deaths in 2011, and some, but insufficient, juvenile recruitment (3.4 % of the population smaller than 30 mm, where the target is 5 %). The mussel habitat in the Blackwater failed for both siltation and macroalgae.

Siltation causes water quality and in-stream changes, affecting mussels in many ways and at all life cycle stages. Silt that infiltrates the riverbed blocks water exchange between the river and the substrate. This reduces the oxygen supply in the substrate and causes juvenile deaths. Siltation also leads to adult mortality through direct ingestion. Turbid water causes adult mussels to clam up and stop filtering, causing oxygen starvation. Deposited sediment provides a rooting medium for macrophyte growth that can further smother the juvenile habitat and trap sediment. Silt can also negatively affect the fish species that host the mussel glochidial stage (Levasseur *et al.*, 2006), however there is no evidence that changes in juvenile salmonid populations have contributed to the decline of the freshwater pearl mussel in Ireland. The transport of silt through the river in suspension or as 'bed load' also increases riverbank and riverbed erosion, further exacerbating the changes to the mussel's habitat.

Nutrient enrichment promotes growth in aquatic plants, particularly macroalgae (typically filamentous species) and rooted higher plants (macrophytes). Macroalgal growth is stimulated by the dissolved nutrients nitrogen and, especially, phosphorus. Increases in macrophyte cover require both rooting medium (silt) and dissolved or particulate nutrients. Both macroalgae and macrophytes block water exchange between the river and the riverbed, disrupting the oxygen supply and leading to juvenile deaths. In severe cases, dense algal growths lead to night time oxygen depletion and the death of adult mussels. Deoxygenation of the river water and riverbed is exacerbated when the plants die and decompose in situ.

As noted above, **hydrological and morphological changes** are a significant part of the story of the decline of the freshwater pearl mussel. The extensive drainage of land to increase its productivity for agriculture and forestry, as well as to facilitate development, has changed the water flow patterns in rivers. Flood flows have become more frequent and powerful, causing erosion of riverbeds and riverbanks and causing direct loss through wash-out of mussel habitat. Summer flows have become lower and droughts more frequent, exposing mussels to the air and increasing sedimentation and enrichment of mussel habitat. Drains and their on-going maintenance are sources of fine sediment and provide direct pathways for both silt and nutrients to the mussel's habitat.





B2d - Conservation problems and threats
Provide this information for those species and habitat types directly targeted by the project: (Characters: 9,982/10,000)

The Caragh and Blackwater Freshwater Pearl Mussel Sub-basin Management Plans identified the pressures impacting on the species in the two catchments and were used to provide the following detail on threats.

Threat 1: Restructuring and drainage of agricultural land
Description: Restructuring and drainage of agricultural land is the most significant threat to the freshwater pearl mussel in the project area. Restructuring involves changing the layout of farms by removal of field boundaries (e.g. hedgerows), re-contouring of land (e.g. levelling off hills), clearance of vegetation (e.g. scrub) and commencing to use uncultivated land for agriculture. Land drainage is the excavation of drainage channels to decrease the capacity of land to retain water and to increase its productivity. These activities result in increased erosion and transport of sediment and nutrients from land to the river.

Location: Restructuring and reclamation have occurred on low-lying land close to the main rivers, around farmsteads and on the moderately steep uplands. Drainage is widespread throughout the catchments.

Impact: These activities can have complex direct and indirect impacts on the freshwater pearl mussel, causing hydrological and morphological changes in rivers, increasing loads, providing a direct pathway for sediment and nutrients and resulting in siltation and nutrient enrichment of the mussel's habitat.

How will this be dealt with in the project: This will be addressed through the implementation of sustainable farm management plans with actions focussed on reducing soil erosion, nutrient inputs and managing drain networks appropriately. KerryLIFE will reduce land use intensity through tree planting and drain blocking where possible to reduce connectivity between land and rivers.

Threat 2: Riverbank erosion
Description: Riverbank erosion is one of the most significant pressures in both catchments, and a significant contributor to siltation and erosion of the habitat of the freshwater pearl mussel and to direct damage on its habitat. Bank erosion is a natural process, however changes in land use intensity have acted to significantly increase the rate of erosion.

Location: It occurs along the main Caragh and Blackwater rivers and their tributaries. It is closely associated with land reclamation works and land drainage.

Impact: It leads to direct and indirect impacts to freshwater pearl mussels, including erosion and loss of habitat and increased siltation of the river bed.

How will this be dealt with in the project: KerryLIFE will establish areas of permanent native woodland along unstable river banks and eroding riparian soils. Tree planting along channels reduces undercutting and slumping of the banks. Re-vegetation of riverbanks will dissipate energy during moderate to high flows, further reducing in-channel erosion. KerryLIFE will also install alternative water drinking facilities and animal fencing to prevent grazing and trampling of river banks.

Threat 3: Increased nutrient inputs to farms and specialisation of livestock systems
Description: Changes to traditional farm practices driven by external market, political and socio-economic forces (e.g. off-farm employment) and facilitated by new technologies and farm infrastructure (e.g. slatted houses) has led to an increase in nutrient inputs to farms. There has been specialisation of farm enterprises, particularly grazing regimes, and movement from traditional mixed farm systems (relying on native breeds of sheep and cattle) to the (continental-cross dominated) suckler cow systems. Pregnant suckler cows are usually less mobile in the challenging hill terrain and require supplementary feeding.

Location: Nutrient inputs on farms have concentrated in the low-lying areas that have been reclaimed for silage production or permanent pasture. Typically, animal wastes (slurry) generated during housing are spread on these fields. Chemical fertiliser is also applied to achieve nutrient balance and increase productivity, particularly when re-seeding.

Impacts: Increased importation of chemical fertilisers to farms, increased production of slurry and changing livestock management result in increased losses of nutrients (nitrogen and especially phosphorus) in particulate and dissolved forms to rivers. These lead to damage to mussels from increased macroalgal and macrophyte production.

How threat will be dealt with during project: Nutrient inputs will be managed and reduced through the implementation of farm nutrient management plans. Systems will be devised to reduce the generation of animal slurry and to increase the efficiency of nutrient recycling. Vegetation buffers such as in-field grass buffers, hedgerows and areas of native woodland will also be established with potential to intercept nutrients. In forests, natural regeneration and long-term retention areas will mitigate losses during harvesting and establishment of coniferous forests.

Threat 4: Inappropriately sited conifer plantations
Description: Conifer plantations typically occur on peaty, erodible soils and often on steep slopes or close to rivers. These forests are managed under the clearfell silvicultural system, with a crop cycle of approximately 40 years involving drainage, ground preparation, planting, fertiliser application, road construction, firebreak management, thinning, clearfell harvesting, further ground preparations and replanting. Many of these operations can result in significant sediment and/or nutrient losses. Erosion risks are especially high during drainage, ground preparations, crop establishment, road construction and clearfell harvesting, when soils are exposed or damaged. Nutrient losses are high at planting/re-establishment (fertiliser applications) and after harvesting (decay of brash-small diameter wood).

Location: Conifer plantations are distributed widely throughout the Blackwater catchment, but are concentrated in the north and east of the Caragh catchment.

Impacts: Inappropriately sited conifer plantations result in siltation and enrichment of freshwater pearl mussel habitat. They also contribute to hydrological and morphological changes in rivers.

How threat will be dealt with during project: KerryLIFE will restructure areas of conifer plantation into permanent long-term retention, mixed woodland and convert the most vulnerable parts to native woodland. Alternative silvicultural systems e.g. continuous cover silviculture and firebreak management will be trialled to reduce sediment and nutrient losses.

Threat 5: Vegetation damage and soil erosion
Description: Vegetation damage and soil erosion (i.e. poaching, tussocks, etc.) has resulted from changes in the livestock types and their management. Vegetation damage increases soil exposure and weathering, resulting in increased losses of sediment from land to rivers.

Location: Localised vegetation damage and soil erosion can occur on any part of the farm however it is most strongly associated with supplementary feeding stations, access points and upland and peatland areas.

Impact: Vegetation damage and soil erosion contribute significantly to siltation of freshwater pearl mussel habitat. They can also result in enrichment, through losses of soil-bound nutrients. Bare soil can generate faster runoff and contribute to hydrological and morphological changes in rivers.

How threat will be dealt with during project: A grazing and supplementary feeding strategy will be implemented as part of each farm management plan to improve vegetation condition and reduce soil erosion.

Threat 6: Lack of host fish
Description: Larval freshwater pearl mussels spend up to 11 months on the gills of juvenile salmonid fish. An absence or low density of juvenile salmonids could, therefore, prevent the species completing its life-cycle.

Location: There is no evidence that a lack of host fish is a threat to the species in the Blackwater or Caragh. Survey work for the SBMPs in 2008 and 2009 detected glochidial attachment on juvenile Atlantic salmon and juvenile fish numbers were judged to be sufficient to support mussel recruitment in both catchments.

Impact: A lack of host fish could mean that recruitment was inhibited at the glochidial stage.

How threat will be deal with during project: All KerryLIFE concrete actions to reduce sediment and nutrient impacts, as well as any to mitigate hydrological impacts will also benefit fish populations in the rivers. Inland Fisheries Ireland (IFI) is a project Supporter and KerryLIFE, with the help of IFI and local angling interests will conduct further, detailed assessment of any potential threats associated with host fish.

Threat 7: Non-agricultural/forestry pollution sources
Description: The SBMPs identified two other significant threats in the Caragh and Blackwater catchments, namely peat-cutting and septic tanks.

Location: A small amount of peat-cutting has been noted in the upper Owenroe sub-catchment of the Caragh. Unsewered properties are distributed throughout the two catchments, but density is greatest in low-lying areas along the river corridors.

Impact: Peat-cutting and domestic wastewater can contribute sediment and nutrients to water and cause siltation and enrichment of freshwater pearl mussel habitat.

How threat will be deal with during project: A comprehensive national management strategy for peatlands is being progressed which should ameliorate the peat-cutting issue. The national

septic tank inspection regime will result in the necessary repairs and up-grades to domestic wastewater systems. The project team and its external assistants, along with Beneficiaries and Supporters will carefully track changes in these and emerging pressures. This will ensure that, where necessary, there is an appropriate response to these other threats. It will also allow detection of impacts on the freshwater pearl mussel from threats outside of the project sites, which will be important in demonstrating the effectiveness of the project's concrete actions.

B2d Previous conservation efforts
***Previous conservation efforts in the project area and/or for the habitats/species targeted by the project: (Characters: 9,256/10,000)**

I Habitats Directive

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora), as transposed by the European Communities (Birds and Natural Habitats) Regulations, *S.I. No. 477 of 2011*, has as its aim to contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora.

The Habitats Directive requires that Special Areas of Conservation (SAC) be designated to protect listed natural habitats and species of Community Interest, and that measures be taken to maintain or restore those habitats and species at favourable conservation status. Annex II of the Habitats Directive lists the species of Community Interest and includes the water-dependent freshwater pearl mussel (*Margaritifera margaritifera*).

Ireland has designated 19 SACs for the freshwater pearl mussel that include 75 % of the national population. 27 individual populations are protected within the 19 SACs. The Caragh and Blackwater were designated as SAC and are part of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Site Code IE000365) and Blackwater River (Kerry) SAC (Site code IE002173).

The freshwater pearl mussel populations within the SAC network are protected by Part XAB of the Planning and Development (Amendment) Act, 2010 and Regulation 42 of *S.I. No. 477 of 2011*, in accordance with Article 6(3) of the Habitats Directive.

II Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) is the most important piece of European water legislation. It establishes a new, integrated approach to the protection, improvement and sustainable use of Europe's rivers, lakes, transitional waters, coastal waters and groundwaters. The WFD requires the production of a River Basin Management Plan (RBMP) for each River Basin District (RBD), with a programme of measures to achieve the Directive's environmental objectives.

As the freshwater pearl mussel is a fully water-dependent animal, any SAC designated for the protection of the species is listed on the WFD Register of Protected Areas and the environmental objectives of the WFD require compliance with any standards or objectives necessary to the conservation of the species.

The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, *S.I. No. 296 of 2009* established specific objectives for freshwater pearl mussel SAC. These were additional to the European Communities Environmental Objective (Surface Waters) Regulations *S.I. No. 272 of 2009* and:

(i) Set environmental quality objectives for the habitats of the 27 freshwater pearl mussel

populations named in the First Schedule to the Regulations;
(ii) Required the production of Sub-basin Management Plans (SBMPs) with programmes of measures to achieve these objectives; and
(iii) Set out the duties of public authorities in respect of the SBMPs and associated programmes of measures.

Regulation 6 detailed the work necessary for the preparation of the SBMPs, specifically:

a) baseline monitoring of the freshwater pearl mussel populations and their habitats, and assessment of their status in accordance with the Third and Fourth Schedule to the Regulations; and
b) investigative monitoring to, where necessary, identify the pressures and their sources, which have led to unfavourable conservation condition of the freshwater pearl mussel.

This work has now been completed. The SBMPs include

a) Detailed description and analyses of the catchment-specific pressures that represent a risk to the freshwater pearl mussel,
b) Comprehensive assessments of the condition of the freshwater pearl mussel and its habitat, as well as information on water quality and WFD status,
c) Catchment-specific objectives, and
d) A comprehensive programme of measures to mitigate the identified pressures and impacts, and restore the freshwater pearl mussel to favourable condition.

Whilst clear remedial programmes of measures exist and are being pursued nationally to address point source and diffuse pressures, including those from wastewater sources, there remains a clear need to demonstrate the effectiveness of measures to address site-specific pressures arising from farming and forestry. It is intended that KerryLIFE will fulfil this requirement.

III Wildlife Act

The freshwater pearl mussel was given protected faunal species status under the Wildlife Act (1976 and 2000) by *S.I. No. 112 of 1990*. This makes pearl fishing illegal and protects the species and its habitat from direct damage and disturbance. Licences are required to photograph, film, survey and capture the freshwater pearl mussel in Ireland. The aims of the Wildlife Act, generally, are to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims.

IV Conservation Strategy

A detailed freshwater pearl mussel conservation strategy was developed in line with Moorkens (2010) and the Irish Prioritised Action Framework, which identifies the species as of the highest national conservation priority, to aid in the prioritisation of the SBMP Programmes of Measures. The national conservation strategy advocates the full implementation of measures in those catchments where:

a) The mussel population is closest to favourable conservation status and, thus, has the greatest chance of demonstrating a recovery (using the criteria set out in the Third Schedule to *S.I. No. 296 of 2009*);

b) The mussel habitat is most likely to demonstrate improvements in the ecological quality objectives set out in the Fourth Schedule to *S.I. No. 296 of 2009*;
c) The impacting pressures are best understood and, therefore, the measures are expected to be effective.

Prioritisation will allow for the effectiveness of the pearl mussel measures to be fully and properly tested and, more importantly, will give the greatest chance that some of the largest pearl mussel populations in Ireland and the world will return to favourable conservation condition in the short to medium term.

By prioritising the implementation of measures in catchments where the confidence in their likely effectiveness is highest, the national conservation strategy ensures that the maximum benefit will be gained.

The Caragh and Blackwater freshwater pearl mussel are given the highest priority (priority class one) under the conservation strategy and rank second and third of the 27 SAC populations.

The overall aim of this project is to assist in the implementation of the farming and forestry measures detailed in the Caragh and Blackwater SBMPs.

V Commonage Framework Plans

Commonage Framework Plans were produced between 1999 and 2000 for the commonage lands in the Caragh and Blackwater catchments. The purpose of these plans was to arrest degradation in the uplands and peatlands caused by overstocking. Destocking of areas where erosion was occurring was prioritised. A general objective for degraded commonages was to initiate the restoration of appropriate vegetative growth and the recolonisation of bare ground. The Commonage Framework Plans aimed to establish environmentally sustainable grazing regimes for the commonages, including an overall destocking percentage for damaged commonages, an overall grassland management plan and measures for habitat protection. The Commonage Framework Plans also provided for the exclusion of the use of fertilisers, plant protection products, ploughing, re-seeding, planting of trees and other prohibitions or additional work deemed necessary. The Commonage Framework Plans set out:

- specific environmental objectives by which to measure and assess progress;
- a stocking regime giving periods when stock should be withdrawn or reduced; the stocking regime also set out procedures to avoid localised overgrazing in any part of the commonage;
- a schedule of environmental restrictions to be observed for the commonage or for landscape features, to protect watercourses, to protect peatlands and to restore the environmental value to the land.

Implementation of the Commonage Framework Plans was achieved through the Rural Environmental Protection Scheme and the NPWS Farm Plan Scheme.

VI Surveys

A full freshwater pearl mussel survey of the Caragh and its tributaries, the Meelagh, Caraghbeg, Owenmore and Owbeg Rivers, was undertaken by NPWS in 1999. A similar survey of freshwater pearl mussels in the River Blackwater and its main tributaries, the Kealduff and Derreendarragh Rivers, was undertaken at the same time (Ross 1999). Full baseline monitoring was conducted by NPWS in the two rivers in 2004, including the establishment of permanent count areas (fixed transects), to gather quantitative data on mussel density, population size and age profile, level of juvenile recruitment and characteristics and condition of the mussel habitat. Repeat monitoring of the two freshwater pearl mussel populations and their habitat was conducted in 2005, 2009 (for the SBMPs) and 2011. The results of the various surveys of the freshwater pearl mussel in the Caragh and Blackwater systems have been summarised in Section B2c.

B3 EU added value of the project and its actions:

Maximum characters: (9,946/10,000)

Convention on Biological Diversity

The eleventh meeting of the Conference of the Parties in 2012 marked the move from policy-making to implementation. A number of important decisions were adopted of relevance to biodiversity. Against that background, some urgent steps and actions need to be undertaken by the EU, with a view not only to implement its commitments in the CBD context and to implement the EU Biodiversity Strategy, but also to enable the EU to maintain its leadership on biodiversity protection at international level. Of relevance to the CBD, its Aichi targets and Ireland National Biodiversity Plan 2011-2016, KerryLIFE will make a suite of significant contributions including

- Local awareness of biodiversity and the steps they can take to conserve and use it sustainably (Aichi Target 1),
- Pursue positive incentives for the conservation and sustainable use of freshwater habitats and their species (Aichi Target 3),
- See Governments Bodies, business and stakeholders at all levels taking steps to implement plans for sustainable production (Aichi Target 4),
- Arrest degradation and fragmentation of freshwater pearl mussel habitat will be significantly reduced (Aichi Target 5),
- Contribute to the sustainable management of agriculture and forestry (Aichi Target 7),
- Seek to ensure pollution from excess nutrients has been brought to levels that are not detrimental to freshwater pearl mussel catchments (Aichi Target 8),
- Make a significant contribution towards ensuring areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape (Aichi Target 11),
- Work to ensure the decline of freshwater pearl mussels has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained (Aichi Target 12),
- See a freshwater ecosystem that provides essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of local communities (Aichi Target 14), and
- Take account of and ensure the traditional knowledge and practices of local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of local communities, at all relevant levels (Aichi Target 18).

EU 2020 Biodiversity Strategy

The EU 2020 Biodiversity Strategy is aimed at reversing biodiversity loss and speeding up Europe's transition towards a resource efficient and green economy. It outlines a series of targets where action is required and these have very much guided and informed the approach to the KerryLIFE project. To that end, KerryLIFE will

- Contribute to the good management of Natura 2000 (Target 1, Action 1),
- Work closely with stakeholders to increase their awareness (Target 1, Action 3),
- Provide payments to farmers and forest-owners to deliver environmental public goods (Target 3, Action 8),

- Integrate quantified biodiversity targets tailoring action to regional and local needs and facilitate collaboration and cooperation amongst farmers and forest-owners to protect biodiversity (Target 3, Action 9), and
- Establish management plans for forest-owners integrating biodiversity measures (Target 3, Action 11 & 12).

The EU 2020 Biodiversity Strategy also envisages the full engagement and commitment of a wide variety of stakeholders. This ethos has been fully internalised in the KerryLIFE project which will

- further encourage collaboration between researchers and other stakeholders involved in spatial planning and land use management in implementing biodiversity strategies,
- see the active engagement and involvement of civic society, and
- work in the outermost region Europe to promote biodiversity conservation and sustainable use.

Natura 2000 & Water Framework Directives

KerryLIFE supports the implementation of the Habitats Directive with respect to the freshwater pearl mussel, *Margaritifera margaritifera* (L.), Species Code 1029 which is listed on Annex II and Annex V of the EU Habitats Directive 92/43/EEC. It specifically addresses the development of conservation measures to restore and maintain freshwater pearl mussels to favourable conservation status in Ireland.

The efforts of KerryLIFE to conserve the freshwater pearl mussel and its habitat will also contribute to the implementation of the Water Framework Directive and the Irish Sub-basin Management Plans.

KerryLIFE aims to reduce the adverse impact on water quality from forests and farms by demonstrating best management practise to improve the conservation status of freshwater pearl mussel populations. The project will target the unfavourable conservation condition of two of its largest populations and work to ensure that this species will not become extinct in the medium to long term. As the population in Ireland represents ca. 46 % of the total European freshwater pearl mussel population, Irish conservation efforts are vital regarding the future viability of this species.

The approach and measures adopted in this project in addressing farm and forest practises will be applicable to other freshwater pearl mussel catchments with similar climatic, geological and geographic conditions, e.g. rest of Ireland, the United Kingdom and Northern Ireland, etc.

The KerryLIFE project will also improve the knowledge base regarding successful, sustainable land use management by engaging key landowners/stakeholders, sharing their expertise and increasing awareness. The project has a clear demonstration element, the results of which can be extended to other areas with water quality dependant species and/or habitats. The demonstration of a tested output based management programme can also be used in the future development of agri-environment and forestry schemes.

In the implementation of the conservation actions, the project will ensure management practices do not have a detrimental effect on other species of conservation concern that are present, and will rather seek to improve the conservation status of these species e.g.

- 1024, *Geomalacus maculosus* Kerry Slug

- 1029, *Margaritifera margaritifera* Freshwater Pearl Mussel
- 1065, *Euphydryas aurinia* Marsh Fritillary
- 1106, *Salmo salar* Atlantic Salmon
- 1303, *Rhinolophus hipposideros* Lesser Horseshoe Bat
- 1355, *Lutra lutra* Otter
- 1421, *Trichomanes speciosum* Killarney Fern
- 1833, *Najas flexilis* Slender Naiad

In particular, measures to improve water quality will be of benefit to the lakes in the two catchments, all of which are naturally oligotrophic, as well as the estuaries downstream. The rare and scarce freshwater plants that will benefit from water quality improvements include the scarce *Subularia aquatica* and the HD Annex II and the Flora (Protection) Order (1999) *Najas flexilis*, both of which are known from Loughs Caragh and Acoose.

Many actions, particularly drain-blocking, will benefit blanket bog, wet heath and wet grassland habitats. Actions to reduce grazing pressures will be beneficial to peatland species, such as *Hammarbya paludosa* and *Eriophorum gracile* (both known from the Caragh catchment), wet grassland/lake edge species such as *Carum verticillatum*, (found near Loughs Caragh and Acoose) and *Spiranthes romanzoffiana* (near Lough Caragh) and the scarce riparian plant *Wahlenbergia hederacea* (both the Caragh and Blackwater catchments). Reduced grazing pressure in the uplands will in aid the conservation of sensitive and rare montane species and communities. In these regards, there are significant synergies between the project actions and the Commonage Framework Plans for the project area.

Actions that include the planting of native tree species will be designed to assist in the expansion of threatened native woodland types, particularly alluvial forests. The actions will help increase connectivity between patches of natural/semi-natural habitats and will benefit associated species, such as the otter and lesser horseshoe bat.

The Kerry slug, *Geomalacus maculosus*, is a strictly protected HD species principally found in deciduous woodland, on blanket bog and heath, and on lake-shores. The species requires high humidity, shelter and food (including lichens, algae, fungi and mosses). Project actions will benefit the species in both catchments:
- Expansion of the area under native woodland,
- Appropriate management of coniferous forests,
- Reduced grazing pressure will improve the condition of the Kerry slug's blanket bog and heath habitats (increased humidity, less disturbance, etc.).

Measures to control mechanisms by which animal waste reaches water, e.g. fencing livestock out of rivers and changes to slurry-spreading practices, will reduce the risk of contamination by faecal matter and will increase the 'security' of the drinking water supplies in the catchments (Page *et al.*, 2009).

Both rivers discharge to designated shellfish growing areas, the Caragh to Cromane Shellfish Area and the Blackwater to the Kenmare River/Sneem/Ardgroom Shellfish Area. Pollution Reduction Programmes were established for these Shellfish Areas in order to protect and improve water quality and, in particular, to ensure compliance with the standards and objectives established in law (*S.I. No. 268 of 2006* and Directive 2006/113/EC). Shellfish standards have been set for suspended solids, metals, pH and dissolved oxygen. Actions to reduce pollutant-loss (particularly sediment and faecal coliform) to water through the project

will support the achievement of the objectives of the two Pollution Reduction Programmes.

B3 Socio-Economic Effects of the Project: (Characters: 9,169/10,000)

KerryLIFE will contribute positively to the socio-economic fabric of the Caragh and Blackwater catchments in South Kerry. This economy is dominated by i) agriculture and forestry, and ii) tourism. Farming/forestry is the principal activity accounting for 25% of the local employment according to Kerry County Development Board. This percentage is higher than elsewhere in the county and the country, where agriculture accounts for 19%, highlighting the importance of agriculture in the project area.

The Caragh and Blackwater catchments have been farmed traditionally for centuries, but in the last 30 years market pressures, development and undifferentiated rural development policies have led to the changing of agricultural practices. The increased levels of stocking alongside inconsistent labour supplies has resulted in new management systems that rely heavily on the use of machinery, farm buildings, fertilisers and silage production. As a result, the traditional breeds of hardy cattle that once dominated the Caragh and Blackwater catchments have largely been replaced by continental breeds that are less well adapted to the challenging hill terrain and require supplementary feeding in an intensive setting.

There has been a trend towards declining numbers of people involved in farming. The BioUp Project highlighted the main cause of the decline was due to the lack of successors, primarily resulting from the unappealing nature of a lifestyle which does not provide sufficient economic returns for future generations. Current policy and the current markets support and value the most productive farms, leaving farmers in less favourable areas to try and supplement their income with off-farm work or leaving farming altogether. Up to 50% of farmers in the region have been required to seek off-farm employment resulting in less time for farming and contributing to the intensification of the farm enterprise. The ageing population of farmers is also a major concern on the project area. Many farmers are farming because it is a family tradition and hope to continue to do so but this will be contingent on the economic viability of farming on marginal lands (Kramm 2010). KerryLIFE will demonstrate that farming for conservation is also feasible by supplementing income linked with ecological outputs, such as landscape and a healthy freshwater pearl mussel population rather than conventional market value products e.g. beef or lamb.

KerryLIFE strongly recognises the central role of farming and forestry in the maintenance and conservation of rural economies and the management of Natura 2000 sites. Without the farmers, biodiversity will suffer significantly and without a means of earning an income from the land, farmers will be forced to find alternative sources of income ultimately resulting in land abandonment or under management. KerryLIFE aims to demonstrate farm and forest management practices that combine traditional knowledge and modern innovation to achieve the long term conservation of freshwater pearl mussel but in a manner designed to enhance the viability of farm enterprises. KerryLIFE will increase awareness of the value of the work of farmers in the catchments as going beyond simply their agricultural outputs and provide the necessary training and education to young farmers in how to farm for conservation.

KerryLIFE has been developed in partnership with the local rural development company - South Kerry Development Partnership (SKDP). KerryLIFE is therefore ideally positioned to maximise the potential of using the Rural Social Scheme in providing assistance to the farmers in carrying out the conservation actions and addressing the under employment

present. This has several advantages which address the current decline of farming on the region. The Rural Social Scheme provides work to underemployed farmers in their area of expertise with the added value of teaching these farmers principles and methods of conservation. This will equip them (as well as the site owners) with the skills and knowledge to carry on farming for conservation on their own land, or elsewhere.

During this project, every effort will be made to involve landowners in carrying out the main operations that will be undertaken. In order to supplement farm income, KerryLIFE will be working with marketing specialists throughout the project to develop and market products from the farms involved in the project such as beef and sheep. This will tap into consumers' willingness to pay for products which have a particular identify, and are linked to traditional and environmentally sensitive products. KerryLIFE will work closely with the Ring of Kerry Quality Lamb Group to develop a freshwater pearl mussel linked farm product. Establishing links between the local economy and the adjoining urban areas in Killarney and Kenmare will provide additional opportunities. The development of a brand for local farm produce and the area will occur under the auspices of KerryLIFE to complement and promote sustainable farming in freshwater pearl mussel catchments (e.g. conservation grade beef and lamb). A network of local producers and consumers will also be developed to support this initiative.

The Caragh and Blackwater catchments form part of the region's most important tourist attraction, the Ring of Kerry, which is a popular tourism destination, especially for outdoor activities. Tourism in South Kerry is reliant on the quality of the natural and cultural landscape that is in turn dependent on farming traditions practiced in the project area. As part of KerryLIFE, the popular 'Kerry Way' long distance walking route which passes through the project area will be extended on project farms and project forests. This walkway will be used to promote the conservation of the freshwater pearl mussel and management of Natura 2000 sites. KerryLIFE also aims to support the extension and marketing of the farm and forest based tourism opportunities such as landscape photography opportunities, wildlife tourism, archaeology and cultural amenities, all of which can help diversify the choice available to visitors and which can contribute to increasing the impact of tourism locally within the project areas and in the wider region.

KerryLIFE project offices and staff will be based in the project area and will support local businesses by sourcing office equipment and supplies locally. This will ensure that the money spent will support the local rural economy of South Kerry, help engender local skills and knowledge regarding conservation activities, and cultivate a 'conservation culture' in the region.

It is expected that the KerryLIFE project will have significant positive socio-economic effects on the communities living in the Caragh and Blackwater catchments. As the project is a collaborative partnership between the Project Beneficiaries and local farmers and forest-owners the 'bottom-up' approach adopted in the projects conception, design and implementation will generate a sense of stewardship at a local scale. If successful, this would represent a change in farming practice toward the proactive conservation of the freshwater pearl mussel, which is currently absent. Improvements in the local economy will have many knock on social benefits in the Caragh and Blackwater catchments. Farming is the cohesive fabric of the Caragh and Blackwater, knitting together not only the community but the natural landscape. KerryLIFE will help to further promote a sense of community and will organise several community events such as public meetings, celebratory events. KerryLIFE will assist in promoting a strengthened sense of place and social identity and this will contribute to an

enhanced civic responsibility towards protecting the environment. Supporting the community economically will also safe guard cultural traditions and natural heritage of the area. Several of the KerryLIFE actions will secure leisure and amenity opportunities such as the walkway and angling, positively contributing to healthy lifestyles. KerryLIFE is also investing significantly in education and training. This will provide an opportunity for local stakeholders, in particular farmers, foresters and other practitioners within the community to up-skill.

In summary, KerryLIFE will

- increase the prominence of farming, forestry and tourism measures in the project that will inject direct financial capital into the local economy,
- enhance the development of a sustainable, diverse, conservation farming and forestry model that places a value on the alternative products such as landscape enhancement and a healthy pearl mussel population,
- create employment (project team, sub-contractors and tourism-related jobs),
- develop related tourism initiatives including the provision of a freshwater pearl mussel dedicated walking trail integrated into the Kerry Way walking trail as well as farm produce branding,
- make a positive contribution to the future of these marginal communities, and
- make an invaluable contribution to the heritage and natural environment of South Kerry.

B3 Best practice character of the project: (Characters: 15/10,000)

Not applicable.

B3 Demonstration character of the project: (Characters: 5,462/10,000)

KerryLIFE has been developed on the principle that land users do not set out to damage or disturb species in their environment. However, national and European social and economic drivers combined with local cultural practices have with time contributed to the emergence of land use practices that are less than compatible with the conservation of threatened species such as freshwater pearl mussel populations. Through this unique partnership, KerryLIFE will collaborate with key stakeholders to demonstrate direct technical and ancillary support measures for freshwater pearl mussel conservation.

At a technical level, KerryLIFE has been designed to demonstrate conservation measures to address multiple diffuse sources of sediment and nutrients from farms and forests and which will contribute to the restoration of favourable conservation condition of resident freshwater pearl mussel populations in the Caragh and Blackwater catchments.

In the first instance, it will demonstrate the value of adopting a risk-based approach to developing site-specific management plans (25 farm and 10 forest plans) for individual land owners. This management planning system will demonstrate how the sources and pathways of sediment and nutrient losses from individual farms and forests can be reduced through a series of integrated farming and forestry measures.

Successful measures will be demonstrated in relation to
- drain management,
- stabilising riparian sediment sources using broadleaf planting
- establishment of in-field buffer strips using grass and hedgerows,
- developing grazing and supplementary feeding management strategy,
- reduction of farm nutrient inputs,
- alternative drinking water facilities for livestock,
- restructuring of commercial plantations to long-term retention woodlands,
- transformation of clearfell commercial forests to continuous cover forestry, and
- firebreak management.

The setting up of a project team and a project office in the project area will provide in situ oversight of the technical elements of the work programme. More importantly however, this will demonstrate the value that a locally-based project team can play in extending the social reach of the project within peripheral rural communities. KerryLIFE recognises the critical role farmers and forest-owners play in conserving the freshwater pearl mussel and the project will collaborate with them to change attitudes and mindsets towards conservation. The value of pursuing complementary indirect supports will be demonstrated particularly in the areas of added value product branding and tourism.

Monitoring of project actions is crucial to determining the success of the project actions. Due to the lag-time anticipated between the introduction of the conservation action and the recovery of the pearl mussel population the KerryLIFE project will develop and validate new monitoring techniques. This innovative and adaptive approach will enable the development of rapid vegetation monitoring methods for farm and forest in freshwater pearl mussel catchments. Efficiency and effectiveness of the project in delivering on the objectives will be closely evaluated through regular monitoring of the (i) freshwater pearl mussel and its habitat

and (ii) implementation of the management plans. The critical indicator of the success of the KerryLIFE will determined through an improvement in juvenile and adult pearl mussel habitat that contributes to achieving favourable conservation condition.

The knowledge acquired during KerryLIFE will inform the development of best farming and forestry practices in relation to freshwater pearl mussel populations and their habitats. The KerryLIFE actions will thus be available for wider geographic application and particularly as relevant in other freshwater pearl mussel priority catchments. The actions carried out will be evaluated so that the techniques and methods used can be transferred to other freshwater pearl mussel catchments, as well as other highly sensitive freshwater habitats and species, including those listed on the Annexes to the Habitats Directive and high status sites under the Water Framework Directive. Farm and forest demonstration sites will be set up to facilitate training of farmers, forest-owners, practitioners (e.g. forest-owners, ecologists and contractors), regulators, and project beneficiaries. There are currently no demonstration sites available in Ireland to show farmers and forest-owners how they can contribute to the conservation of the freshwater pearl mussel. A school education programme will also be implemented to demonstrate the value of a community-based approach to addressing this issue.

The KerryLIFE project aims to assess the effectiveness of the methods and ultimately to encourage other stakeholders to use the techniques / methods demonstrated in halting the decline of the freshwater pearl mussel and restoring the pearl mussel population and habitat to favourable conservation condition in the project area. It aims to create a blue print for farming in freshwater pearl mussel catchments, through which farmers can earn a decent living from the land and continue their longstanding role of producers of quality food and custodians of a wonderful heritage and landscape. In demonstrating an effective approach to the conservation of freshwater pearl mussel populations, KerryLIFE will also have added benefits of maintaining and halting biodiversity in the wider region.

B3 Efforts for reducing the project's "Carbon footprint": (Characters: 1,842/10,000)

The carbon footprint of the project comprises a combination of direct emissions from the energy and fuel used, and indirect emissions from those embodied in the goods and services consumed in the delivery of the project.

The direct emissions arising from the project mainly relate to transport, principally the use of motor vehicles. Efficient project planning will aim to minimise emissions from fuel use by reducing unnecessary trips and car pooling. The Project Team will be based in the project area to minimise travel.

Meetings between the Project Team, management groups and project beneficiaries will be held, where possible, through phone - or video conferencing, or at locations that involve the lowest overall travel and public transport usage. Energy use in the office environment will be addressed through energy saving policies and by using energy efficient appliances.

There are also emissions embodied in all the goods and services consumed to deliver the project. Therefore, a green procurement policy which considers the life cycle impacts of the products used will reduce indirect emissions associated with the project.

Emissions are also associated with waste management technologies. Therefore, when project equipment or materials reaches the end of their life a waste hierarchy will be followed. Assessment of re-use and recycling/composting options will be carried out before disposal. Therefore, recycling of disposed consumables will also occur as far as is possible.

Some of the emissions in the project will be offset through destocking and the reduction in the amount of chemical fertilisers and pesticides used. In addition the establishment of native broadleaf woodland and the restructuring of commercial plantation to permanent mixed long-retention woodland will result in a net increase in sequestered carbon.

B4 - Expected constraints and risks related to the project implementation and how they will be dealt with (contingency planning): (Characters: 6,534/10,000).

Name of constraint: Lack of engagement of agricultural stakeholders with KerryLIFE

Expected influence: In the past, the Natura 2000 designation process pursued in Ireland has been less than satisfactory in terms of the level of meaningful engagement with stakeholders and local communities. This has fostered a culture of discontent amongst local communities and stakeholders and a perception that Natura 2000 is about impeding and preventing their traditional practices and, therefore, presents a clear threat to their existence and that of following generations. In such an antagonistic climate, there has been little meaningful engagement with stakeholders and land users concerning land use management to facilitate the freshwater pearl mussel management in designated catchments. The less than charismatic nature of freshwater pearl mussel does not assist its plight. Since effective management can only be delivered in collaboration with and through local stakeholders and land users, KerryLIFE will only be successful if public and land user engagement is successful.

How constraint will be overcome: In 2012, the Beneficiaries to KerryLIFE brought a bus of farmers to visit the BurrenLIFE project and engage with its Project Team and participating farmers to develop understanding of how nature conservation efforts can benefit local communities. The Project Beneficiaries organised three town hall meetings, attended by hundreds of local farmers, in the project area to discuss the KerryLIFE project and listen to the farmers' views on the scope and content of the KerryLIFE plans. These interactions have substantially enhanced the quality of the application, and represent the first steps in building confidence between Government Bodies, key land users and the local community. KerryLIFE is now frequently discussed amongst the farming community in the project area and, if funded, the Project will build upon this excellent start to consolidate the relationship between land owners and managers and Government Bodies. This will be achieved through stakeholder and community representation on the Project Management and Stakeholder Groups, through a collaborative and individual farm-led approach to planning and management. A substantial public education and value-added element has been integrated into KerryLIFE to complement the nature of indigenous farm enterprises. The involvement of a local community-led development company as a project beneficiary as well as representative farming organisations will be seen as crucial to changing existing culture and perceptions.

Name of constraint: Climate conditions

Expected influence: Climate conditions are not considered to be a significant constraint or risk to project implementation. While both catchments are subject to frequent and high rainfall, this will not hamper the implementation of concrete conservation actions on farms or forests. High cloud cover, high water levels and rapid flow changes can present a challenge to river monitoring.

How constraint will be overcome: Concrete actions on farms and in forests will be well planned and timed to avoid any potential weather problems. The Beneficiaries have significant experience of physico-chemical, freshwater pearl mussel and other biological monitoring in these and similar catchments throughout Ireland and do not consider that climate will impair the project's ability to demonstrate the effectiveness of the concrete

actions. In particular, the constant presence of the Project Team within the catchments will ensure that river monitoring can respond to local climate conditions.

Name of constraint: Project Management

Expected influence: It is acknowledged that the project management for KerryLIFE will be challenging, owing to its multidisciplinary nature, the number of Beneficiaries involved, the large project team and the number of external assistants. Ineffective project management could delay or hamper the implementation of project actions.

How constraint will be overcome: A clear, practical project management structure has been designed (action F1), comprising four essential components: the Co-ordinating Beneficiary; the Project Management Group; the Project Team; and the Project Stakeholder Group. The roles of the participants have been clearly defined, in particular the Co-ordinating Beneficiary's overall responsibility for the project and the Project Team's operational responsibility. The project is reliant on the input of specialised expertise by all Beneficiaries. More than one professional member of staff in each Beneficiary has and will continue to be involved in KerryLIFE in order to ensure continuance and quality of necessary expertise. Factors extraneous to the control of the project may impinge upon the success of, or confidence in, the project. To counteract this possibility and in accordance with best practice for project management, the Project Management Group will undertake a comprehensive risk assessment at the outset of the project. A risk register will be established and frequently reviewed by the Group to control and monitor the overall project plan. The involvement of a wide range of specialist stakeholders is key to the successful implementation of KerryLIFE and the project management structure designed, is the most efficient method to manage a project of this multidisciplinary nature.

Name of constraint: Licensing and permissions

Expected influence: A delay in securing necessary licences or permissions could delay or hamper the implementation of Project actions.

How constraint will be overcome: The licensing and permissions that will be required by the project are

1. Licences to photograph, film and survey/monitor the freshwater pearl mussel under the Wildlife Acts. The Co-ordinating Beneficiary is the licensing authority in this regard and all members of staff responsible for evaluating such licence applications are involved in the implementation of KerryLIFE.
2. Grants to plant native woodland and licences to fell trees. The Associated Beneficiary Forest Service-DAFM is the relevant authority in this regard and all inspectors responsible for evaluating such applications are involved in the implementation of KerryLIFE.
3. It is possible that some activities may require consent from the Minister for Arts, Heritage and the Gaeltacht. This is not expected to present any difficulties to the project as DAHG is the Co-ordinating Beneficiary.

As a result, it is not considered that licensing and permissions should hamper project implementation.

B5 Continuation and valorisation of results

Q1 Which action will have to be carried out or continued after the end of the project (Characters: 2,692/5,000)

KerryLIFE will as a result of the concrete conservation actions evaluated under this project demonstrate an effective suite of conservation measures necessary to meet the ecological requirements of the freshwater pearl mussel in the Caragh and Blackwater catchments.

Agricultural actions will need to continue to be implemented by participating stakeholders after KerryLIFE. However, these will need to be undertaken by all relevant farmers in the Caragh and Blackwater catchments where possible to deliver implementation of effective agricultural practices at a catchment level.

The knowledge acquired during KerryLIFE will inform the development of best farming practices in relation to freshwater pearl mussel populations and their habitats. The KerryLIFE actions will thus be available for wider geographic application and particularly as relevant in other freshwater pearl mussel priority catchments.

Forest support measures include a long-term commitment to continue premia (annual payment) for between 4 to 15 years after the completion on the KerryLIFE project. Forestry actions such as long-term retention woodland also entail a long-term commitment as the management plans to implement these systems are long-term in nature, i.e. over at least one life cycle/forest rotation. Once established, these silvicultural systems will be continued, with control applied, as relevant, under the 1946 Forestry Act. In addition, the forestry operations (e.g. sensitive harvesting techniques) and silvicultural systems (e.g. long-term retention woodland) trialled within KerryLIFE project will be considered for inclusion by the Forest Service if successful, in other catchment-based forest plans (including those for the eight priority freshwater pearl mussel catchments) and for inclusion in future guidelines, procedures and requirements governing forestry generally.

Ongoing scientific monitoring of the conservation condition of freshwater pearl mussel in the Caragh and Blackwater catchments, as well as other populations nationally will be necessary.

Complementary actions designed to maximise the economic sustainability of farm enterprises engaged in management practices complementary to the favourable conservation condition of freshwater pearl mussel will need to be further developed and underpinned in the area.

Dissemination of project findings will continue after project termination, through the website, scientific publications, media exposure and information pamphlets. The beneficiary organisations will continue to train their staff and private forest and farm planners and managers in the development and implementation of conservation actions for the freshwater pearl mussel.

Q2: How will this be achieved? What resources will be necessary to carry out these actions? (Characters: 4992/5,000)

The long term value of KerryLIFE will be realised if there is a collaborative, risk-based, management planning approach to the successful implementation of land use practices in freshwater pearl mussel catchments.

DAHG and DAFM will need to work in partnership with farmers to explore the medium to longer term continuation of the effective measures implemented through KerryLIFE and appropriate funding instruments will be necessary for any recurring management through an appropriate post-LIFE programme. Ireland has a clear track record in ensuring follow-up to LIFE projects such as this, as illustrated by BurrenLIFE, and a similar approach will be adopted for the KerryLIFE project as appropriate. DAFM has responsibility for the development and implementation of the RDP under the CAP including the development and design of support measures for agri-environment programmes. DAFM are involved at present in developing an agri-environment/climate scheme under Regulation (EU) No 1305/2013 of the European Parliament and of the Council. Under Article 77, Ireland is required to conduct a thorough and independent ex-ante evaluation, a SWOT analysis, a needs assessment and extensive consultation in developing the next RDP and any potential agri-environment scheme to be included therein. Measures to be included in the RDP must flow from this development process and justification of the needs selected to be addressed in the RDP must be referenced and evidenced within the SWOT and needs assessment process. The threat to the freshwater pearl mussel has been identified in Ireland's Prioritised Action Framework and is therefore being closely considered as part of this process. However, until the ex-ante evaluation is complete, DAFM is precluded from giving an absolute commitment regarding a pearl mussel measure under the RDP 2014-2020. While noting this, it is anticipated that the next agri-environment scheme will include measures targeting conservation of pearl mussels, e.g. Ireland's Rural Development Programme 2014–2020 Draft Consultation Paper published on 15th January 2014 specifically references priority actions for pearl mussel. Under KerryLIFE, specific actions and a multidisciplinary approach can be tested to develop a range of optimum actions and best practices for the conservation of this important species. Therefore, KerryLIFE will output valuable additional information which can then be incorporated into a pearl mussel measure during the next RDP (in successive phases) and in subsequent programmes. As one of the Beneficiaries, DAFM is ideally placed to ensure that the output from KerryLIFE can be integrated into future agri-environment/climate scheme, thus ensuring the direct transfer of knowledge from the LIFE project.

Appropriate forestry measures implemented during KerryLIFE will continue under the auspices of the Forest Service. Mechanisms such as premium payment inspections (up to year 20 for new native woodland) and the control of thinning and felling under the 1946 Forestry Act, will be used to ensure that the appropriate management of treated forest sites (including new areas of native woodland) will continue in the medium and long term. The application of similar forestry measures focussed on freshwater pearl mussel will continue to be facilitated and supported by the Forest Service in mussel catchments through its regulatory procedures (i.e. felling control) and grant support mechanisms, which includes premium payments for up to 10 years after the project end. KerryLIFE will inform future Coillte operating practices in mussel catchments. The long term sustainability of results arising from KerryLIFE for private forests and farms will be an important aspect of the AfterLIFE. Two key mechanisms will apply to ensure the long-term sustainability of results and to secure ongoing adherence to the

prescriptions regarding forests on private land, namely: (i) scheme terms and conditions; and (ii) felling control. For example, any landowner planting land under KerryLIFE with funding under the Native Woodland Establishment Scheme must protect and maintain the young native woodland throughout the premium cycle (currently 20 years). Failure to do so will result in the owner becoming liable for any grant and premium paid up to that point. Secondly, the medium to long term retention of that woodland will be secured through the felling licence system under the 1946 Forestry Act. In effect, any felling licence application received for an area previously planted as a native woodland under KerryLIFE must take cognisance of the origin of that woodland, and any felling licences issued will be linked to suitable practices which are based on continuous cover silviculture and compatible with the original role of the woodland. Illegal felling and clearance is an offence and owners will be liable to persecution.

DAHG will revise the Sub-basin Management Plans for the Caragh and Blackwater SAC to incorporate project findings.

Q3: Protection status under national/local law of sites/species/habitats targeted (if relevant): (Characters: 1,305/5,000)

The freshwater pearl mussel is protected under:

a) The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) as transposed by the European Communities (Birds and Natural Habitats) Regulations, *S.I. No. 477 of 2011*. The freshwater pearl mussel is listed on Annex II and Annex V of the Directive
b) The Caragh and Blackwater catchments were designated as SAC and are part of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Site Code: IE000365) and Blackwater River (Kerry) SAC (Site code: IE002173) respectively.
c) The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations (*S.I. No. 296 of 2009*), which:
   - set environmental quality objectives for the habitats of the 27 freshwater pearl mussel populations named in the First Schedule to the Regulations
   - required the production of SBMPs with programmes of measures to achieve these objectives
   - set out the duties of public authorities in respect of the SBMPs and associated programmes of measures.
d) The Wildlife Act, 1976 and the Wildlife (Amendment) Act, 2000. The freshwater pearl mussel was given protected faunal species status under the Wildlife Act, 1976 (Protection of Wild Animals) Regulations, 1990, *S.I. No. 112 of 1990*).

Q4: How, where and by whom will the equipment acquired be used after the end of the project? (Characters: 1,078/5,000)

Office equipment e.g. computers and high-tech office equipment purchased during the project will belong to the co-ordinating beneficiary after the project ends.

Field and monitoring equipment e.g. redox meters, turbidity sondes, flow meters, rain gauges camera, fish-eye lens will be passed on to local field staff of the co-ordinating beneficiary for on-going monitoring of project actions.

Agricultural and forestry infrastructure installed under concrete conservation actions, e.g. fencing, drain dams / baffles, feeding troughs, feed storage bins, water troughs and water drinking facilities will be left *in-situ* on project farms and forest for the continued use by the project participant after the project ends.

Tourism infrastructure e.g. stiles and way markers associated with the walkway will also be left *in situ* for use by recreation users.

Q5: To what extent will the results and lessons of the project be actively disseminated after the end of the project to those persons and/or organisations that could best make use of them (please identify these persons/organisations)? (Characters: 4,196/5,000)

The dissemination of documents prepared as part of the project include the production of four best practice management guides and six information pamphlets as listed in the expected outcomes. These documents will be based on the information gathered during KerryLIFE. In addition, an annual newsletter and a 5-10 page layman's report will be prepared that will present the project, its objectives, actions, progress and results to the general public. Copies will be available to all the stakeholders involved in the project and to land users and community groups in other freshwater pearl mussel catchments.

This information will be placed on the project website. The project's website (Action E2) will promote the project and raise the profile of the freshwater pearl mussel, its ecology and management requirements. It is envisaged that the website will have links to the beneficiaries' websites to increase the dissemination of project information and results. The information will be widely disseminated to farming and forestry professional bodies and representative organisations, and farm and forestry advisory staff in Ireland and also, upon request, to other organisations/bodies/stakeholders. The website will be maintained by the Co-ordinating Beneficiary until its activity drops below a pre-determined usage level. This will allow access to all scientific publications, reports and information pamphlets (Action E8). Paper copies will also be available through the beneficiaries, and electronic copies of the project main outputs will continue to be made available through the DAHG website, once the project's website is no longer being maintained.

The project team will also speak at relevant conferences about the project in order to highlight it to a wider audience. In addition, technical/scientific reports on project findings will be disseminated / published in relevant journals, such as Tearmann (The Irish Agri-Environment Journal).

Additional information obtained on habitat and species distribution will be forwarded to DAHG and/or recording and data management bodies in Ireland, such as the National Biodiversity Data Centre (NBDC). Details of the findings will be forwarded to other local authorities with freshwater pearl mussel catchments so that any relevant information obtained can be successfully integrated into the management of other catchments.

Teagasc will incorporate the KerryLIFE findings into their wider advisory programme and continue using the demonstration farms as necessary after the project period. The demonstration farms may be incorporated into the Teagasc BETTER Farm programme which co-ordinates the research and advisory resources of the organisation to effectively transfer usable knowledge from research to practicing farmers.

Presently there is a knowledge deficit and related lack of confidence by stakeholders which limits the effectiveness of improved management systems as may be considered necessary for freshwater pearl mussel in the Caragh and Blackwater catchments. The outcomes of KerryLIFE will fill that deficit and enable this approach to be implemented on other farms in the project area and also in other pearl mussel catchments in Ireland. This has been shown to be the best method of encouraging and facilitating the adoption of new technology and practices and is a vital component in the BETTER Farm programme.

The Forest Service will incorporate the findings of the tree planting on farms into their wider training programmes. The Forest Service will amend the criteria for the Native Woodland Scheme to incorporate the findings of the KerryLIFE project in using broadleaf planting to stabilise and reduce sediment sources in freshwater pearl mussel catchments. Project demonstration sites will be used to effectively transfer usable knowledge from the project to practicing forest workers and forest inspectors.

Coillte will incorporate successful methods (e.g. of restructuring of coniferous plantations into long-term retention woodland) demonstrated in the project to other priority catchments. Project demonstration sites will be used to effectively to transfer usable knowledge from the project to practicing forest workers and forest inspectors.

A. Preparatory actions, elaboration of management plans and/or of action plans

A1 Project start-up, Project Team and Project Office

Beneficiary responsible for implementation: (Characters: 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters: 121/500)
FS-DAFM, DAFM, Coillte, Teagasc, SKDP. All beneficiaries will play an important role in setting up the KerryLIFE project.

Description (what, how, where and when) (Characters: 4,363/10,000)
What and how – The **Project Management Group**, comprising at least one representative of each of the six project beneficiaries and participating farmers/forest-owners, will manage the project, including the tasks of recruiting the project team and securing office space.

Project Team
A dedicated, multi-disciplinary, four person **Project Team** will be recruited by the Co-ordinating Beneficiary for the operation and implementation of the project. The team will comprise a Project Team Leader, Project Scientific Advisor, Project Farm Advisor, and Project Administrator. All staff will be employed on fixed-term temporary, whole-time contracts and will be based in a project office within the project area.

The role of each Project Team member is outlined below:
The Project Team Leader will lead the overall co-ordination of the project and management of the Project Team. The Project Team Leader will be the figurehead and public face of the project. He/she will have strong communication, negotiating and influencing skills to establish the necessary network required to deliver the successful implementation of the project. The Project Team Leader will establish the necessary management and administrative systems, including in particular health and safety guidelines, within which the Project Team will operate. He/she will take direct responsibility for the management of the Project Team and lead the interaction of the project with key stakeholders and the local community. He/she will also take ownership of the reporting functions internally and externally. The Project Team Leader will report directly to the DAHG, for overall project operation and monitoring purposes, and to the Project Management Group in terms of planning, implementation, management and monitoring of the individual project actions.

The Project Scientific Advisor will be responsible for providing scientific and technical support to all areas of the project. Key tasks will include developing and overseeing the scientific monitoring programmes, procuring external scientific support as necessary, analysing and reporting on scientific outputs, and providing ongoing technical support to the public awareness programme. The Project Scientific Advisor will also ensure that there are robust Quality Assurance and Quality Control (QA/QC) systems established, where necessary.

The Project Farm Advisor will be responsible for providing advice to participating farmers. Key tasks will include preparing farm management plans, managing the implementation of the agricultural concrete conservation actions, monitoring the implementation and impacts of the farm plans, evaluating of the cost-effectiveness of agricultural actions, reporting on action outcomes, providing ongoing technical input to the public awareness programme and on-

going stakeholder engagement.

The Project Administrator will be responsible for providing administrative support to the Project Team, as well as the day-to-day financial management and office operations (clerical, administrative and secretarial responsibilities). Key tasks will include administrative support to the Project Team, application of necessary financial and system controls, preparation of monthly and annual financial reports for the Project Team Leader, communications with stakeholders, general office duties, and management of the project website.

Training requirements for the Project Team will be assessed as part this action and will focus on areas such as project management up-skilling, health and safety, GIS training, website management and media relations, freshwater pearl mussel surveying, working in freshwater pearl mussel rivers, and other necessary scientific monitoring methods.

A Project Office will be established especially for the project in newly leased offices in the project area to accommodate project staff. Existing premises will be leased and all necessary equipment will be purchased to equip the office including computers, printers, scanners, photocopier, projectors, telephone, broadband connection, GPS equipment and cameras.

Where - The Project Team will work from a dedicated Project Office in the project area.

When - This preparatory action will run from 01/07/2014 until the Project Team are recruited and the Project Office has been opened. It is expected to take 5 months to complete this action - 30/11/2014.

Reason why this action is necessary (Characters: 1,152/2,000)
A dedicated Project Team is required to ensure the effective and timely delivery of project actions. A project that seeks to support the conservation of the freshwater pearl mussel must be embedded in the local community in order to maximise project visibility and presence. The experiences of the project beneficiaries have highlighted that a dedicated, locally–based Project Team and office are essential components in the effective delivery and demonstration of concrete conservation actions for this type of project. The project office will provide dedicated workspace for the Project Team and act as a centre for the dissemination and communication activities of the project. This is essential with respect to the partnership approach inherent in the project.

The multi-sectoral nature of the issues being targeted by this project requires the establishment of a multi-disciplinary team for the duration of the project. Where additional expertise or technical support is required (e.g. hydrological or forest advice) for defined time periods or for specific tasks, these will be procured by the Project Team through an open and transparent process.

Expected results (quantitative information when possible) (Characters: 536/2,000)
- A four person Project Team will be recruited within five months of the project start date - 30/11/2014
- A project office will be set up within 5 months of the project start date - 30/11/2014)
- The necessary administrative and financial control systems will be established
- An agreed health and safety management regime will be implemented
- A detailed project delivery management plan will be produced

- The Project Team reporting procedures will be established and agreed
- Effective and sustained stakeholder engagement will be achieved

Project deliverable products
NA

Project milestones
Opening of Project Office - 30/11/2014
Project Team recruited - 30/11/2014

A2 Preparation of farm management plans

Beneficiary responsible for implementation: (Characters: 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters: 28/500)
DAFM, SKDP, Teagasc, FS-DAFM

Description (What, How, Where, When) (Characters: 7,633/10,000)
What - 25 farm management plans will be developed to reduce sources of sediment and nutrients from farms in the Caragh and Blackwater catchments.

How - In the preparation of the KerryLIFE application there has been significant engagement with the local farming community and their representatives. Site visits have been undertaken to the BurrenLIFE Demonstration Farms by local farmers and several meetings involving hundreds of local farmers have been convened in the project area in the preparation of this application. In addition, the Co-ordinating Beneficiary has allocated over €50,000 during 2013 for the development of an agricultural risk assessment protocol to underpin the KerryLIFE farm planning process.

During KerryLIFE, farmers will be encouraged to become involved in the project through public meetings (Action E1) and farm visits. A database of farmers who express an interest in participating in the project will be compiled.

The selection will be based on specific criteria and risk assessment developed by the Project Team, in collaboration with the Project Stakeholder Group and the Project Management Group.

Farm management plans will be drawn up for each project farm. The preparation of the farm management plan will involve documenting current farm management practices and carrying out comprehensive field-by-field surveys. This will be done by the Project Farm Advisor and Project Scientific Advisor, together with the farmer. Consultation with the farmer in developing the farm plan will ensure local knowledge and management experience will be incorporated into the plan. The key tasks in developing the plan will include

1. Documenting management practices
2. Habitat mapping
3. Source mapping
4. Pathway mapping
5. Risk assessment
6. Selection of concrete conservation actions
7. Production of farm management plan

1. Documenting management practices: Current farm management practices will be documented by the Project Farm Advisor in consultation with the farmer. It is important to know and understand a farm well before management changes are recommended. On-site farm visits with the farmer will assist in this process. Information such as stocking rates, stock types, grazing periods, feeding regimes, forage utilisation patterns and fertiliser application will be assessed. This assessment will also need to take into account relevant farm

operations, such as silage production, animal housing infrastructure, slurry and fertiliser use, the availability of spread-lands, drainage history, drain maintenance and land reclamation works, e.g. ploughing, re-seeding and re-contouring.

2. Habitat mapping: A survey of the habitats present on each farm will be surveyed and classified using Fossitt (2000) by the Project Scientific Advisor and Project Farm Advisor. This survey will include an assessment of the condition of the habitats present.

3. Source mapping: Source mapping will identify critical source areas for sediment and nutrients on the farm. Typically, 80 % of losses are associated with 20 % of the area. All sources of sediment and nutrients on the farm will be mapped by the Project Farm Advisor and Project Scientific Advisor. Soil surveying and sampling will be carried out to form the basis of nutrient management planning and to identify critical source areas of sediment.

4. Pathway mapping: Hydrological pathways, e.g. streams, rivers, field drains, overland surface flows, etc., will be mapped by the hydrologist and farmer. The hydrologist will also identify sources of hydrological pressures (e.g. eroding drains). Desktop GIS data and ground truthing will be combined to address this measure and incorporated into management plans.

5. Risk assessment: The Project Team, including the hydrologist, will combine the desk study and the field data gathered in steps in 1 to 4 to identify critical source and transport areas for sediment and nutrients. In particular, risk factors such as slope, eroding drains, and soil type and stability will be taken into account. Other potential sources not evident at the time of the field survey that are identified during the desk-based surveys will also be incorporated into the risk assessment.

6. Selection of Concrete Conservation Actions: Arising from the above, the Farm Advisor and the farmer will meet to discuss the options regarding the most applicable concrete conservation actions (Actions C1 to C6). The Project Team will encourage the uptake of source reduction measures, followed by pathway interception measures.

7. Production of farm management plans: The Project Farm Advisor will draft the farm plans that will include details of current farm practises and operations, environmental and ecological data, maps and images, and recommendations regarding future management practises. The farm plan will include a sediment and nutrient reduction strategy. The farm plans will include a resource map of the farm and a description of the concrete conservation (Actions C1 to C6) and monitoring (Actions D6) actions to be undertaken. It will also outline the work programme, timeframes and costs for each project farm. In addition, the plans will detail specific locations where one or more concrete conservation action is required. The farm management plan will be agreed with the owner subsequent to consultation with him/her. The implementation of farm management plans will be subject to regular monitoring (Action D6) in order to ensure the effective implementation of concrete conservation actions and to incorporate any changes required as a result of monitoring actions and lessons learned during the course of the project. This will facilitate an adaptive management approach to the implementation of the plans and the associated delivery of the project conservation objectives at project sites.

The farm plans will be produced in a user friendly, concise format based on a clear format of maps and tables. The farm map will include;

- location of sources and pathways of sediment and nutrients on the farm

- permanent infrastructure
- agreed grazing management strategy
- agreed nutrient management strategy, and
- locations of concrete conservation actions (e.g. drain management locations, buffer strips etc.)

Tables will be drawn up to support the above and will outline the work programme and timeframes to implement the project actions.

All project farmers will be required to sign up to the plans and commit to implementing the project actions for the project duration. Each plan will include a contract between the project and the participating farmer outlining the roles and responsibilities of each party, the duration of the agreement and sanctions/procedures in event of the agreement being breached. In the farm plan (via the LIFE Convention) the farmer will undertake not to take any action that would compromise the project and will engage with the relevant stakeholders in delivering the AfterLIFE Conservation Plan.

The impact of the concrete conservation actions on the freshwater pearl mussel population and habitat will be monitored using a combination of biological and physical indicators (Actions D1 to D5).

Where - The farm management plan will adopt a whole farm approach. 25 farms covering an approximately 2,500 ha of farmland from a total of 301 farms in the Caragh and Blackwater catchments will be selected. The final number of participating farms will depend on the level of interest and the agreed project site selection process.

When - Farm management plans will be drawn up in the first 18 months of the project. It is expected that all farm management plans will have commenced implementation by 31/12/2015.

Reasons why this action is necessary: (Characters: 1,725/2,000)
KerryLIFE aims to work closely with farmers and other experts to demonstrate the necessary measures required to sustainably farm, which will support the conservation of the freshwater pearl mussel. The KerryLIFE project will develop a template for farming that can, subsequently be applied in other farms in the Caragh and Blackwater, and also in other nationally important pearl mussel catchments.

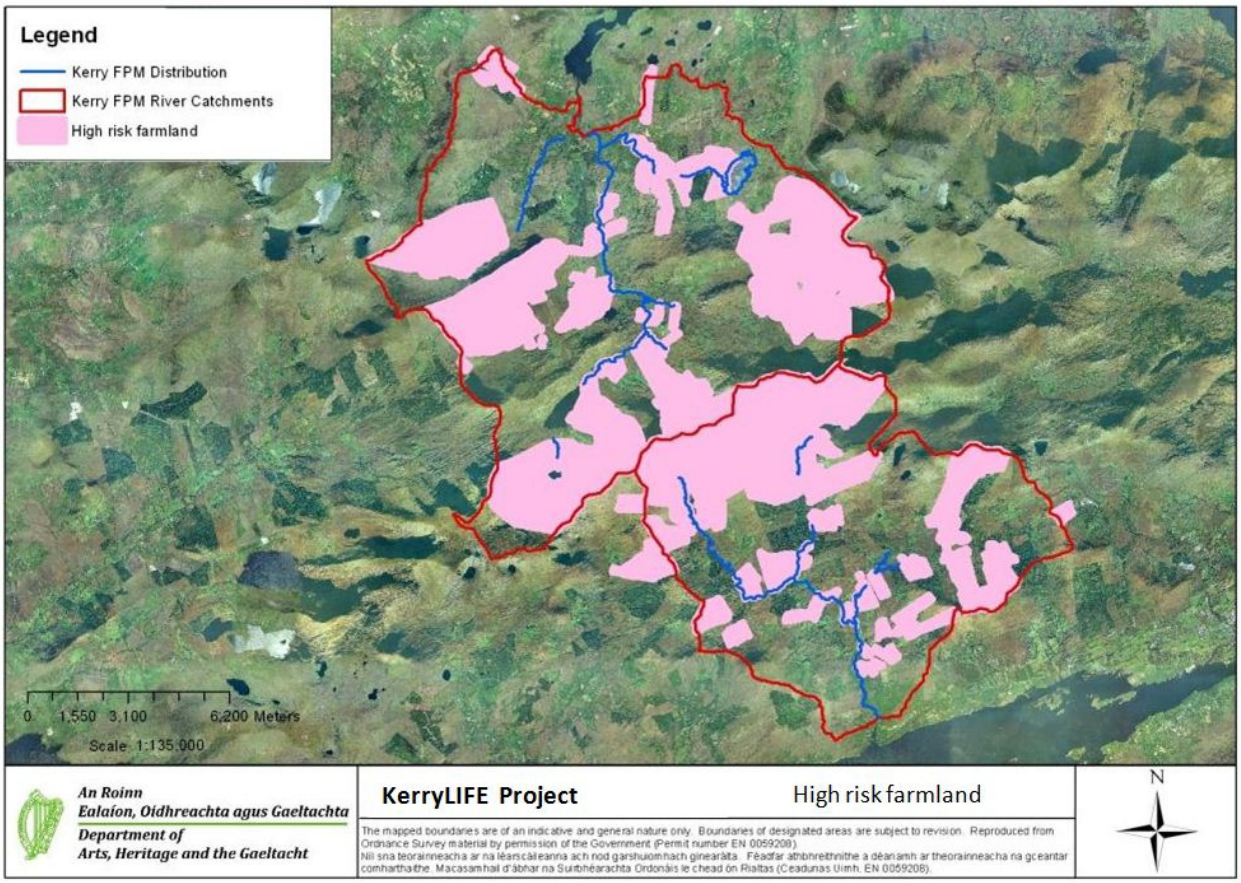
Farm planning is important as every farm is different and must be treated differently. It is important to be familiar with a farm before changes in management practises can be recommended. A whole farm planning and management approach is required as the management of sediment and nutrients from critical source areas is dependent on the availability of support areas (e.g. alterative spread lands) on other parts of the farm.. Farm management plans will be designed to reduce sources of sediment and nutrients across the entire farm and will attempt to intercept losses before entering watercourses. The reduction in sediment and nutrient loading will contribute to an improvement in the condition of the pearl mussel habitat. This action will ensure that the farmer has input into the farm planning process as he/she has the best knowledge of his/her own land and the required skills and experience to farm for conservation of the freshwater pearl mussel. The Farm Plan will also ensure that the farmer is fully aware of the plan requirements and is committed to the delivery of the agreed project actions. An annual review process for the plans will also facilitate the

demonstration of the values of an adaptive management process to the delivery of conservation objectives for farms in freshwater pearl mussel catchments.

Expected results (quantitative information when possible): (Characters: 214/2,000)
This action will produce a minimum of 25 farm management plans that extend over approximate area of 2500 ha to facilitate the proper implementation of concrete conservation and monitoring actions on project farms.

Project deliverable products
Farm management plans for 25 project farms -31/03/2016

Project milestones
Commenced implementation of farm management plans in each catchment - 31/08/2015



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

KerryLIFE Project High risk farmland

N

A3 Preparation of forest management plans

Beneficiary responsible for implementation: (Characters: 7/500)
FS-DAFM

Responsibilities in case several beneficiaries are implicated: (Characters: 28/500)
Coillte, DAHG, Teagasc, SKDP

Description (what, how, where and when) (Characters: 6,488/10,000)
What - Forest management plans will be developed to reduce sources of sediment and nutrients from forests in the Caragh and Blackwater catchments.

How - In the preparation of the KerryLIFE application, eight publically-owned forests for inclusion in the project have been identified. Privately-owned project sites will be identified through direct engagement with forest-owners.

The preparation of the forest management plan will involve documenting forest management practices and carrying out comprehensive compartment-by-compartment forest surveys. Consultation with the public/private-owner in developing the forest management plan will ensure local knowledge and management experience will be incorporated in the plan. The key tasks that will be addressed are:

1. Documenting management practices
2. Source mapping
3. Pathway mapping
4. Risk assessment
5. Selection of concrete conservation actions
6. Production of forest management plans

1. Documenting management practices: Current and past forest management practices will be reviewed and assessed by the forest advisor and Project Scientific Advisor with input from the forest owner. Information such as species composition, stand age, fertiliser applications, thinning regime, and site access will be collated to inform the assessment.

2. Source mapping: Source mapping will identify critical source areas for sediment and nutrients in the forest. All sources of sediment and nutrients in the forest will be mapped by the forest advisor and Project Scientific Advisor. Soil surveying will be carried out to assess erodibility and/or nutrient retention, and to evaluate crop stability with respect to windthrow risk.

3. Pathway mapping: Pathway mapping of the forest drainage network, streams, rivers, wetlands, and subsurface flows will be completed by the hydrologist. The hydrologist will also identify sources of hydrological pressures.

4. Risk assessment: The Project Team, together with the project forest advisor and project hydrologist, will assess field data collected in Steps 1 to 3, to identify critical source areas for sediment and nutrients and transport areas within the forest. In particular, risk factors such as slope, eroding drains, crop stability, silvicultural system, proximity to rivers/aquatic zones, and soil type will be taken into account. Other potential sources not evident at the time of the

field survey, identified during the desk-based survey will also be incorporated into the risk assessment

5. Selection of Concrete Conservation Actions: Arising from the above surveys and investigations, the forest advisor, Project Scientific Advisor and forest-owner will meet to discuss the most applicable concrete conservation actions (Actions C1, C7, C8 and C9).

6. Production of forest management plans: The forest advisor will draft the forest management plans that will detail (i) the concrete conservation actions to be implemented during KerryLIFE and (ii) recommendations regarding future management practices.

The forest management plan will include a resource map of each forest on a compartment-by-compartment basis and a concise description of the project actions to be undertaken in each compartment. The forest management plan will outline the work programme, timeframes and costs for each compartment. This will be agreed subsequent to consultation with the forest-owner. The implementation of forest management plans will be subject to regular monitoring (Action D6) in order to ensure the effective implementation of concrete conservation actions and to incorporate any changes required as a result of monitoring actions and lessons learned during the course of the project. This will facilitate an adaptive management approach to the delivery of the project conservation objectives at project sites.

The forest management plans will be produced in a user-friendly and concise format based on clearly presented maps and tables. The plan will include a series of maps of the forest property and will include

- past cultivation and drainage patterns
- permanent infrastructure (roads, turning bays, firelines, etc.), and
- the location of where concrete conservation actions will be implemented (e.g. drain management, cable harvesting)

The design of the forest management plan will be developed by the Project Team.

Project sites will be mapped and assessed by the Project Team annually. The map and plans will also detail those areas where one or more concrete conservation action(s) may need to be implemented. A simple concise format based upon maps and tables will be developed.

Forest-owners will be required to sign up to the plans and commit to implementing the project actions for the project duration. Each plan will include a contract between the project and the participating forest owner outlining the roles and responsibilities of each party, the duration of agreement, and procedures in the event of the agreement being breached. Within the forest plan the owner will commit (via the LIFE Convention) not to take any action that would compromise the project and will engage with the relevant stakeholders in delivering the AfterLIFE conservation plan.

The impact of concrete conservation actions on the freshwater pearl mussel population will be monitored using a combination of biological and physical indicators (Actions D1 to D5). The implementation of the forest management plans will also be monitored (Action D6).

Where - The KerryLIFE project has primarily concentrated on publically-owned forests despite only accounting for approximately 60% of the forestry in either catchment. This principal reason for this approach is that the publically-owned forest has or is approaching maturity and harvesting whereas the privately-owned forest is younger and does not represent

the same level of risk in the short term. The forest management plan will adopt a whole forest property approach. Forest management plans will be prepared for 8 publically-owned forests, covering 485 ha and a minimum of 2 privately-owned plans covering approximately 30 ha. The final number of privately-owned participating forests will depend on the level of interest from private forest-owners. Participation will be encouraged by the Project team and the Teagasc Forestry Advisor.

When - Forest management plans will be drawn up in the first 18 months of the project. It is expected that implementation of the forest management plans will have commenced by 31/07/2015 and will be completed by 30/09/2019.

Reason why this action is necessary (Characters: 1,179/2,000)
KerryLIFE aims to work closely with forest-owners and other experts to demonstrate the necessary measures required in managing forests, which will support the conservation of the freshwater pearl mussel. The KerryLIFE project will develop a template for restructuring forests that can, subsequently be applied in other forest properties in the Caragh and Blackwater, and also in other nationally important pearl mussel catchments. Forest management plans are required to facilitate the proper implementation of concrete conservation and monitoring actions in project forests in order to reduce sources of sediment and/or nutrients and to intercept losses before they reach watercourses within each of the 10 forest properties. Comprehensive management plans are necessary to achieve this by providing the Project Team and forest-owners with a summary of the specific actions planned for each project site. Management plants will set the template for restructuring forests in a way that protects the freshwater pearl mussel and enhance its habitats, while also facilitating compatible and appropriate production forestry, as an appropriate economic land use with the project area.

Expected results (quantitative information when possible) (Characters: 166/2,000)
The production of eight forest management plans covering 485 ha of publically-owned forests and a minimum of two privately-owned forests covering approximately 30 ha.

Project deliverable products
Forest management plans for 10 project forests - 31/12/2015

Project milestones
Commenced implementation of forest management plans - 30/09/2015

C Concrete conservation actions

C1 Drain management

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters: 161/500)
Coillte, Teagasc, DAFM, FS-DAFM, SKDP. Listed beneficiaries are expected to contribute expertise to the delivery of this action as reflected in Actions A2 and A3.

Description (what, how, where and when) (Characters: 4,165/10,000)
What - Drains are one of the most critical sources of sediment loss. Farms and forests in the Caragh and Blackwater catchments are characterised by a dense network of field drains that were installed to improve productivity on wet soils and in an area of high precipitation. Once installed, drains require ongoing maintenance, including the removal of silt, vegetation and other obstructions, and the repair of damaged banks. This action aims to significantly reduce sediment losses from drains by slowing and impeding water flows through the drainage network, in particular eroding drains on farms and in forests.

How - Critical source and transport areas for sediment and/or nutrients, identified by the risk assessment and mapped in the farm and forest management plans (Actions A2 and A3) will be targeted for drain management. Drain management will be achieved using a combination of novel and existing options, which will reduce drain erosion and slow flows including

- Installation of dams or baffles to slow flows and reduce the erosive force of water
- Restructuring drains by establishing interception/cross drains,
- Creation of effective and functioning vegetated buffer zones
- Creation of side ponds
- Diverting drains
- Changing, reducing or phasing out of drain maintenance
- Allowing the deterioration of existing drains
- Blocking of drains

The location and design of the selected drain management option will be site-specific and will be determined with the technical input of the hydrologist.

The farm and forest management plan will detail a programme of drain management and maintenance on the project sites. Ongoing management and maintenance works such as dam repair and sediment removal from the drains will be carried out by the farmer or forest-owner.

Sediment losses will be monitored and the results used to inform and adapt site management, and the farm and forest management plans. The hydrologist will inform the design of all drain and sediment management regimes.

Where - This action will be implemented within the targeted SCIs in drains identified as critical source areas and high risk pathways for sediment and nutrient losses from farms and forests to freshwater pearl mussel habitat. It is expected that approximately 1,000 locations across 25 farms (or 2,500 ha) and 500 locations across 10 forest properties (515 ha) will be addressed. This action will be used in combination with other farm and forestry actions to

create effective buffer zones that will serve to prevent direct discharge of collected surface water into streams and rivers.

When - This action will commence within six months of implementation of the farm and forest management plans, and will continue throughout the lifetime of the plans. A schedule of drain management works will be outlined in the respective farm and forest management plans (Actions A2 and A3). The implementation will be closely monitored to ensure high standards are achieved.

This action has been designed to demonstrate whether broad theoretical principles and techniques on catchment management and sediment/nutrient reduction are effective at farm, forest, field and critical source area scales. The action is new to the freshwater pearl mussel, and new to the project areas and equivalent catchments. The potentially repeatable parts of this action are ongoing management and maintenance works to be carried out by the farmer or forest-owner. However these elements have a clear and important demonstration value, are not already carried out prior to the start of the project and, if required after the end of the project, will not be at the same level of intensity or necessarily using the same techniques or materials. This action will be subject to detailed monitoring (D actions) to evaluate its effectiveness, as well as to inform adaptive management throughout the project and the final design of effective best practice methodologies. The project will demonstrate whether the action is effective and could be used in the project area or elsewhere in future, whether any elements would need to recur in the future and, if so, the frequency, intensity and methods for such repeat action.

Reason why this action is necessary (ref. to threat being addressed): (Characters: 1,423/2,000)
Drains are one of the most critical sources of sediment loss. Drainage systems can accelerate the delivery of sediment and nutrients from land to watercourses, by acting as a preferential flow route. Field and forest drainage results in the soils and sub-soils of the drainage channels being opened up to erosion, increasing the load of fine and coarse sediments to surface waters. By causing changes to the hydrological regime, drainage also increases the erosive power of rivers, causing further changes in the hydrological regime. This leads to erosion of the freshwater pearl mussel habitat and of river banks, resulting in further sedimentation. Drains also shorten the distance between the sediment source and the freshwater pearl mussel habitat. They are amongst the most significant pathways for sediment and nutrient transport from farming and forests to freshwater pearl mussel habitats. Careful drain management will be employed at all project farm and forest sites. The creation of effective and functioning buffers will reduce sediment losses to watercourses. Effective management of drains reduce the hydrological connectivity between source areas of sediment and freshwater pearl mussel populations, and will also minimise erosion and sedimentation in rivers. Enhanced management of drains will reduce the hydrological connectivity between sediment and nutrients source areas and the freshwater pearl mussel.

Expected results (quantitative information when possible) (Characters: 1,855/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project lifetime across 5% of the occupied freshwater pearl mussel habitat in the two systems (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of project concrete actions. Therefore, it is not possible to accurately predict the improvement in

freshwater pearl mussel habitat or in juvenile recruitment delivered by each concrete action. The extensive monitoring programme and multidisciplinary nature of the project will, however, ensure that the effectiveness of each of the actions in improving the conservation condition of the species will be robustly and scientifically demonstrated.

This action aims to reduce erosion and transport leading to reduced sediment losses from farms and forests. The outputs from this action will be
- the management of drains at 1,000 locations on project farms and 500 locations in project forests
- a significant reduction in sediment losses from eroding drains on farms and in forests from at least 50% of drain locations subject to this concrete action
- reduced nutrient losses from at least 10 % of drain locations subject to this concrete action
- the creation of effective and functioning vegetated buffer zones in at least 20 % of locations targeted
- the mitigation of hydrological change by reducing erosion in rivers at 20 % of locations targeted
- Reduced connectivity between farm/forest and the river and an increase in sediment retention in the catchment in at least 50% of locations targeted
- Effective and appropriately designed drain maintenance programmes to support these measures over the longer term.

Project deliverable products
NA

Project milestones
NA

C2 Stabilising riparian sediment sources using broadleaf planting

Beneficiary responsible for implementation: (Characters: 7/500)
FS-DAFM

Responsibilities in case several beneficiaries are implicated: (Characters: 31/500)
DAHG, Coillte, Teagasc, DAFM, SKDP.

Description (what, how, where and when) (Maximum Characters: 7,952/10,000)
What - This action aims to use native broadleaf woodland to stabilise channel banks and unstable soil in critical source areas on farms and in forests.

How - This action will be achieved using the following three approaches:
1. Establishment of new native woodland on farms
2. Management of existing native woodland on farms and in forests
3. Conversion of conifer forest areas to native woodland

1. Establishment of 15 ha of native woodland on farms: Critical source areas for sediment and/or nutrients, identified during the risk assessment process, and mapped in the farm management plan (Action A2), will be targeted for the establishment of new long-term native woodland. This will create a protective, physical buffer between aquatic zones and farming activities. The location and design will be specified by the forest advisor, Project Farm Advisor, Project Scientific Advisor and hydrologist, and will be closely linked to natural landforms and contours. The woodlands will be fenced or otherwise protected to prevent grazing and browsing by livestock and wildlife. On-going management of the woodland (e.g. replacement of dead trees, removal of invasive species) will be carried out or sub-contracted by the farmer.

2. Management of 10 ha of existing native woodland on farms and in forests: Existing native woodland mapped in the farm and forest management plans (Actions A2 and A3), will be enhanced and expanded. The aim of existing woodland management is to stabilise eroding soils on riverbanks and drain edges, in addition to other areas identified by the risk assessments and critical sources of sediment loss. Natural regeneration will be supplemented with planting of native tree species, where necessary. Tree planting will be targeted at the most vulnerable areas of the woodland. Any standing trees that are considered unstable or at risk of windthrow will be either pollarded (i.e. manually cutting back the crowns of trees in order reduce their exposure and prevent windthrow) or coppiced (i.e. cutting trees back to the stump to promote new growth, multiple shoots and a more stable tree). Farmers and forest owners will directly sub-contract the management of existing native woodland to a private contractor.

3. Conversion of 15 ha of commercially-managed conifer forest to native woodland: Critical source areas for sediment and/or nutrient losses in conifer plantations will be identified by the risk assessment process and mapped in the forest management plans (Action A3). These will be targeted for conversion to native woodland. Conifers will be sensitively harvested by ring-barking, using manual felling or the careful use of harvesting machines. Timber will only be extracted where ground disturbance and soil erosion can be avoided. Where the risks of sediment loss with timber harvesting are too great, trees will be left to decompose *in situ*, i.e. 'felled-to-waste'. Non-native invasive species and regenerating conifers will be controlled manually with strimmers and slash hooks. The native woodland will subsequently be

established through planting or natural regeneration, or a combination of both, using species mixtures that reflect the most appropriate native woodland type(s) for each site. Trees will be protected from grazing animals (predominantly through fencing), and the areas maintained to facilitate the emergence of a native woodland canopy.

The Project Team will assist the farmers and forest owners in establishing and managing these native woodland sites. Coillte and the Teagasc forest advisor will monitor before, during and following all operations to establish native woodland. The project forest advisor in conjunction with the landowner will determine the species selection. Tree species appropriate to site conditions and chosen to maximise protective, conservation and biodiversity benefits will be selected. In essence, species mixtures will reflect the most appropriate native woodland type(s) for each site. All broadleaf trees planted will be of native provenance and, where possible, local provenance.

Many native tree species are especially vulnerable to grazing and browsing, and are frequently damaged by livestock, goats and deer. Erection of livestock fences and, in particular, deer-proof fencing, can be expensive and cause significant ground disturbance on sensitive soils. Various alternative protective measures to prevent browsing by livestock and deer will also be trialled to assess their practicality, effectiveness and cost efficiency. A number of methods will be used including 'Aborguards' (plastic tree shelters up to 1.6 m in height), portable 'A-frame' fencing and lop-and-top (where the 'brash', or branches, twigs and needles from felled conifer trees, is placed around the base of the planted broadleaf sapling to block access by grazers), as well as stock proof fencing.

Areas of long-term woodland have potential to act as buffer zones, by permanently trapping and utilising sediment and nutrients lost from up-slope parts of the catchment. Buffer zones act by slowing overland flow, filtering the water through ground vegetation and encouraging infiltration to soil, thus trapping fine sediment and allowing nutrient up-take. Wooded buffer zones can also remove excess nutrients from sub-surface flows, on account of the presence of tree roots. For a buffer zone to function, therefore, water from up-slope areas must move through the buffer zone as overland flow and/or sub-surface flow. However, surface water currently by-passes many farmed or forested riparian areas of the Caragh and Blackwater through farm and forest drains. The hydrologist will assess the sediment and nutrient buffering potential of all newly-converted native woodland to be established in the project. Where possible, the hydrologist and forest advisor, in conjunction with the landowner, will design a drain management programme to minimise silt and nutrient losses through the drainage network in either the farm or forest. This programme will be incorporated into these areas of native woodland, for example, by creating localised wetlands within natural hollows in an effort to reinstate natural hydrological conditions. Effectively, the drain management programme will divert flow from drains through the woodland to maximise the woodland's buffering potential.

Careful drain management will be employed at all native woodland sites, especially where conifer felling or site preparation could lead to sediment loss. This may include drain-blocking or creating settlement ponds (Action C1) and, where necessary, silt fences or other sediment management techniques. Permanent drain blocking will be used where possible to break the hydrological connectivity between the woodland and the river and to reduce hydrological impacts in the receiving rivers. Sediment and nutrient losses will be monitored and the results used to inform and adapt site management and the farm and forest management plans. The hydrologist will inform the design of all drain and sediment

management regimes.

Where - New areas of native woodland will be established within the targeted SCIs in critical source areas (e.g. along eroding riverbanks, or on unstable soils) on project farms. Exiting native s will be enhanced and expanded in both project farms and forests. Existing conifer forest in critical areas adjoining streams and rivers will be converted to native woodlands in farm forests.

When - The establishment of new native broadleaf woodlands on farms will take place in late winter/spring each year from 2015 on, following the preparation of the farm management plans. Management of existing native woodlands will commence in 2015 and continue throughout the project, under the farm and forest management plans. The conversion of existing conifer forest areas to permanent native woodlands will commence in 2015. Harvesting operations will be restricted to the drier months (preferably April-October).

Reason why this action is necessary: (Characters: 1,829/2,000)
The primary purpose of this action is to stabilise significant sediment sources on farms and in existing woodland, in particular eroding riverbanks. Riverbank erosion is one of the most significant pressures in the Caragh and Blackwater catchments and a significant contributor to siltation and erosion of the habitat of the freshwater pearl mussel. Conversion of these critical source areas of sediment to native woodland will permanently stabilise the areas and significantly reduce fine sediment loss. Where accompanied by appropriate drain blocking measures, native woodlands will provide the added potential benefit of buffering sediment and nutrient losses from adjacent and up-slope field systems and forests.

Strategic, targeted tree planting at vulnerable locations along channels also reduces undercutting and slumping of the banks. The re-vegetation of riverbanks will help to dissipate the energy during moderate to high flow events, further reducing in-channel erosion.

Other benefits include a stable, diverse vegetation cover adjoining rivers, physical buffers between aquatic zones and adjacent land uses, their natural ability to regulate hydrological patterns, and the provision of direct inputs into aquatic ecosystem, i.e. leaves, twigs, insects, etc.

An additional, value-added benefit of new native woodland is the enhancement of biodiversity. Specifically, native tree planting may contribute to the conservation objectives for Habitats Directive Annex I native woodland habitats and for rare and threatened species. In particular, the expansion of native birch woodland will be especially beneficial, as it is home to two rare invertebrate species - the White Prominent moth and a click beetle - in the Caragh catchment. Both of these species are extinct in Great Britain and extremely restricted in Ireland.

Expected results: (Characters: 1,926/2,000)
Overall, the project's concrete actions are expected to deliver an improvement across 20% of the freshwater pearl mussel habitat and an improvement in juvenile recruitment across 5% of the occupied habitat in the Caragh and Blackwater. The extensive monitoring programme and multidisciplinary nature of the project will ensure that the effectiveness of the action in improving the conservation condition of the species will be robustly and scientifically demonstrated. The expected results are:

- 40 ha of high nature conservation value woodland functioning as a protective buffer for the freshwater pearl mussel
- Establishment of 15 ha of new native woodland
- Enhancement and management of 10 ha of existing native woodland
- Conversion of 15 ha of privately-owned conifer plantations to permanent, native woodland
- Reduced sediment losses from at least 50% of riparian locations subject to this action
- Mitigation of hydrological impacts at 20% of locations targeted
- Reduced nutrient losses/transport through at least 10% of riparian locations subject to this action
- Demonstration of the efficacy of native woodland in stabilising eroding river banks
- Trialling and demonstrating alternative drain management systems in buffer zones planted with native woodland to minimise sediment and nutrient buffer losses, e.g. the reinstatement of small natural wetland habitats, and subsequent integration with existing drainage systems, for the settling out for sediments and the capture of nutrients
- Trialling of alternative methods for protecting young native broadleaves from browsing, while minimising ground disturbance
- Contributing to achieving the conservation objectives for Habitats Directive Annex I woodland habitats
- Provision of habitat for rare and threatened plant and invertebrate species
- Creation of habitat and feeding grounds for birds and mammals
- Increasing ecological connectivity at a wider, landscape level

Project deliverable products
NA

Project milestones
NA

C3 Establishment of in-field buffer strips

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters: 31/500)
Teagasc, FS, DAFM and SKDP

Description (what, how, where and when) (Characters: 2,961/10,000)
What - Restructuring agricultural land through the removal of hedgerows and field boundaries has resulted in the creation of long, uninterrupted field systems where surface water run-off is unimpeded, resulting in the erosion of soils and the transport of nutrients from the catchment to watercourses. This action will reinstate 2,100 m of field boundaries, i.e. in-field grass buffer strips and/or hedgerows and re-lay 600 m of existing hedgerows.

How - In-field grass buffer strips will be established along contours to interrupt surface run off. The width of grass buffers will be determined on a site-by-site basis by the Project Team with technical advice provided by the hydrologist. In-field grass buffers strips will be fenced on both sides to exclude grazing animals in order to enable dense grass growth. Fencing will be erected by the farmer as part of the farm plan (Action A2). Light grazing will be allowed to prevent vegetation succession. Grazing will only occur during the summer months; all livestock will be removed 6-8 weeks before the end of the growing season. Alternatively, mechanical mowing will be carried out periodically during the growing season.

Hedgerows will be established where feasible, by planting bare root transplants in the dormant season, i.e. November to March. Existing hedges will be restored, enhanced and repaired using traditional management techniques.

Where - In-field grass buffer strips will be established within the targeted SCIs to intercept and reduce surface run-off, thereby interrupting the hydrological connectivity between fields and rivers.

When - This action will commence within six months of the finalisation of the farm management plans (Action A2). Farm management plans will run until 30/09/2019.

This action has been designed to demonstrate whether broad theoretical principles and techniques on catchment management and sediment/nutrient reduction are effective at farm, field and critical source area scales. The action is new to the freshwater pearl mussel, and new to the project areas and equivalent catchments. The potentially repeatable parts of this action are light grazing to prevent vegetation succession and mechanical mowing during the growing season. However these elements have a clear and important demonstration value, are not already carried out prior to the start of the project and, if required after the end of the project, may not be at the same level of intensity or using the same techniques or materials. This action will be subject to detailed monitoring (D actions) to evaluate its effectiveness, as well as to inform adaptive management throughout the project and the final design of effective best practice methodologies. KerryLIFE will demonstrate whether the action is effective and could be used in the project area or elsewhere in future, whether any elements would need to recur in the future and, if so, the frequency, intensity and methods for such repeat action.

Reason why this action is necessary (Characters: 1,187/2,000)
Restructuring of land for agriculture has created long overland flow paths on farms. These increase the risk of sediment and nutrient transport to rivers, as well as contributing to negative hydrological changes. In-field grass buffers and hedgerows will intercept, interrupt and disperse overland flows and at the same time, promote infiltration in the soil. In-field buffer strips can also reduce phosphorous losses by slowing run-off. Division of the landscape into smaller constituent parcels will also aid livestock management on the farm and contribute to the implementation of grazing and supplementary feeding strategies (Actions C4). This action will contribute to increasing the retention of sediment in the terrestrial portion of the catchment, reducing the load of sediment to rivers, thereby reducing the threat of siltation of freshwater pearl mussel habitat.

A beneficial by-product of this action is that hedgerows will also provide important connectivity in the landscape for wildlife. Hedges serve as breeding, resting and feeding habitats, as well as corridors for birds, mammals and terrestrial invertebrates to travel, thereby enhancing biodiversity in the landscape.

Expected results (quantitative information when possible) (Characters: 1,759/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project's lifetime across 5% of the occupied freshwater pearl mussel habitat in the catchments (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of KerryLIFE concrete actions. The extensive monitoring programme and multidisciplinary nature of the project will ensure that the effectiveness of this action in improving the conservation condition of the species will be robustly and scientifically demonstrated.

This action is expected to establish 1,500 m of in-field grass buffer strips and up to 1,200 m of new and reinstated hedgerow buffers. It will result in
- Reduced overland flow through at least 50% of locations subject to this concrete action leading to decreased sediment and nutrient losses to rivers
- Reduced sediment losses from/transport through at least 50% of locations subject to this concrete action
- Reduced nutrient losses/transport through at least 10% of locations subject to this concrete action
- Increased infiltration of drainage water and greater on-farm nutrient cycling
- Mitigation of hydrological impacts at 20% of locations targeted by slowing overland surface water flows to rivers
- Creation of smaller field systems that facilitate alternative grazing practices
- Increased landscape connectivity
- Increased habitat and feeding grounds for wildlife, in particular, birds and invertebrates
- Reinstatement of field systems and layout, facilitating enhanced livestock management
- High nature conservation value hedgerow habitat.

Project deliverable products
NA

Project milestones
NA

C4 Grazing and livestock management

Beneficiary responsible for implementation: (Characters 4/500)
DAHG
Responsibilities in case several beneficiaries are implicated: (Characters: 22/500)
Teagasc, DAFM, SKDP

Description (what, how, where and when) (Characters: 6,667/10,000)
What - Changes to traditional farm practices driven by external market, political and socio-economic (e.g. off-farm employment) forces and facilitated by new technologies and farm infrastructure (e.g. slatted houses) has led to specialisation of farm enterprises. This has, in particular, changed grazing regimes, from the traditionally diverse range of mixed farm systems (relying largely on native breeds of sheep and cattle) to the suckler cow based systems that prevail today (continental-cross dominated). The larger cattle breeds are usually less mobile, especially in the challenging terrain of the Caragh and Blackwater. This has resulted in a concentration of more intensive farming activities in the relatively more fertile, low-lying parts of farms. These continental crosses are also less hardy and require housing and/or supplementary feeding if out-wintered.

How - Critical source and transport areas for sediment and/or nutrients identified by the risk assessment process and mapped in the farm management plans (Actions A2) will be targeted in order to reduce sediment losses. A grazing and supplementary feeding management strategy will be developed for each farm to reflect the different habitats present, their condition and grazing capacity. New and existing livestock management practices will be implemented on project farms as part of the grazing and supplementary feeding strategy such as

- Changing livestock type
- Encouraging traditional cattle breeds (e.g. Aberdeen Angus, Galloway, Kerry Cattle Dexter and Dromfhionn)
- Implementing sustainable grazing levels
- Reducing overall stocking levels
- Establish alternative feeding station locations
- Changing the length of grazing season
- Changing grazing regimes across farm
- Reducing the length of animal housing periods
- Providing additional equipment, e.g. feeding troughs to aid alternative livestock management
- Positioning of feed storage bins and/or round bales in field corners during good weather
- Minimising the use of silage and substitutes with concentrates, where necessary
- Feeding at locations remote from the farm complex or public roads in the early part of the supplementary feeding season, retreating back towards roads/access tracks as the season progresses
- Strategic deployment of supplementary feeding sites and mineral blocks to influence animal behaviour
- Regular re-positioning of feeding troughs and feeding stations
- Controlling access, including fencing to exclude livestock (temporarily or permanently) from critical source areas
- Relocating high risk access points, gateways or trackways

The grazing and supplementary feeding strategy will be prepared by the Project Farm

Advisor with the farmer as part of the farm management plan and will aim to achieve (i) a reduction in vegetation damage (ii) a reduction in bare soil, and (iii) a reduction in poaching incidences on each farm. Farm specific targets for sediment reduction will be set for each farmer and tiered incentive payment will be made if targets are achieved. The selected measures used to achieve the targets in reducing bare soil will be agreed by the Project Farm Advisor and the farmer, and the farm management plan will detail the necessary management operations required for the different parts of the farm. Time associated with additional livestock management will be capped at 45 hours per grazing season.

As part of encouraging traditional breeds, a sub-set of willing farmers will demonstrate the necessary husbandry required. The project team will document the inputs involved compared to the current breeds. Farmers will also be encouraged to switch part of their herd to traditional cattle and artificial insemination will be subsidised. This will assist in producing sufficient supply of traditional beef as part of the branding and marketing initiative proposed in Action E4.

To ensure implementation of the grazing and supplementary feeding strategy to a high standard, regular monitoring will be carried out by the Project Team and Project Farm Advisor (Action D6). The participant farmer will also receive a payment for the additional work required in the implementation of the grazing and supplementary feeding strategy and will receive a tiered incentive payment if the targets agreed with the Project Farm Advisor and Project Scientific Advisor are achieved. Payments will be made through the financial channels outlined in Action F4.

Where - This action will be implemented within the targeted SCIs in critical source areas identified during the preparation of farm management plans. This action will aim to target 375 ha across the 25 project farms. The grazing and supplementary feeding strategies will be farm specific as they are dependent on the livestock type and number, available grazing land, other farm infrastructure and the time each individual farmer can allocate to the measure. Measures will be implemented primarily to reduce sediment losses in critical source and transport areas of the farm identified in the assessments carried out in the preparation of the farm management plans (Action A2). Care will be taken to ensure that conservation support areas on the farm are not adversely affected (e.g. over-grazing of uplands or peatlands).

When - This action can commence once the farm management plan has been drawn up and finalised by the Project Team (Action A2). Farm management plans will run until 30/06/2019.

This action has been designed to demonstrate whether broad theoretical principles and techniques on catchment management and sediment/nutrient reduction are effective at farm, field and critical source area scales. The action is new to the freshwater pearl mussel, and new to the project areas and equivalent catchments. A number of elements of this grazing and supplementary feeding action are repeatable. However these elements have a clear and important demonstration value, are not already carried out prior to the start of the project and, if required after the end of the project, may not be at the same level of intensity or necessarily using the same techniques or materials. A range of novel and experimental approaches to grazing and livestock management are being trialled. This action will be subject to detailed monitoring (D actions) to evaluate its effectiveness, as well as to inform adaptive management throughout the project and the final design of effective best practice methodologies. KerryLIFE will demonstrate whether the action is effective and could be used

in the project area or elsewhere in future, whether any elements would need to recur in the future and, if so, the frequency, intensity and methods for such repeat action.

Reason why this action is necessary (Characters: 1,362/2,000)
Different grazing regimes can result in changes in the species and structural composition of vegetation, and in severe cases the vegetation is damaged or removed, exposing the soil to erosion. This action is aimed at reducing localised and diffuse sources of sediment associated with livestock management on farms. It will encourage farmers to return to rearing smaller, traditional breeds of cattle more suited to the climate and terrain. These traditional breeds will form the basis of the conservation grade beef product developed to supplement farm incomes. Changes in supplementary feeding practices of out-wintered livestock will aim to reduce localised poaching caused by livestock congregating at access points, gateways or feeding stations. Strategic positioning of feed across the farm during late summer will reduce the risk of ground disturbance, rutting and soil compaction associated with farm machine traffic, which can increase run-off rates. This action will reduce vegetation damage and soil exposure, and, therefore reduce sediment losses. Reduced siltation of waters will reduce sediment loads in rivers and sedimentation of the freshwater pearl mussel habitat. This action will also contribute to a reduction in nutrients bound to soil particles, reducing the likelihood of filamentous algal and macrophyte growth in the main river channels.

Expected results (quantitative information when possible) (Characters: 1,739/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project's lifetime across 5% of the occupied freshwater pearl mussel habitat in the catchments (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of KerryLIFE concrete actions. The extensive monitoring programme and multidisciplinary nature of the project will, however, ensure that the effectiveness of this action in improving the conservation condition of the species will be robustly and scientifically demonstrated.

This action will reduce sediment losses to aquatic zones associated with livestock husbandry through the implementation of grazing and supplementary feeding strategies on up to 25 farms. The following results are expected:
- Significant reduction in vegetation damage and soil erosion across 375 ha of farmland, leading to a decrease in siltation of freshwater pearl mussel habitat
- Reduced sediment losses from at least 50% of farmland locations subject to this concrete action
- Reduced nutrient losses/transport through at least 10% of locations subject to this concrete action
- Demonstration of the effectiveness of alternative grazing practices on 25 farms in protecting water quality and the freshwater pearl mussel
- Demonstration of the effectiveness of alternative supplementary feeding strategies in reducing bare soil cover on 25 farms
- Reduced overall stocking levels
- The establishment of 100 alternative feeding station locations
- Re-location of up to eight high risk access points, gateways and trackways

Project deliverable products
NA

Project milestones
NA

C5 Reduction of farm nutrient inputs

Beneficiary responsible for implementation: (Characters 4/500)
DAHG
Responsibilities in case several beneficiaries are implicated: (Characters: 19/500)
DAFM, Teagasc, SKDP

Description (what, how, where and when) (Characters: 4,512/10,000)
What - Changes to traditional farm practices have led to specialisation of farm enterprises. This has been achieved through the re-cycling of organic fertilisers and the application of inorganic, chemical fertilisers on farmland. Investment in farm infrastructure (e.g. slatted houses) has facilitated intensification of farm management practices, generating increased volumes of animal waste from livestock housing. Nutrient loss from farmland is high owing to high rainfall, frequency of storms and poor nutrient retention of many soils. These factors have contributed to nutrient enrichment and a decline in water quality in the Caragh and Blackwater rivers. A nutrient reduction strategy will be implemented on project farms to achieve a balanced farm nutrient budget, designed to minimise nutrient loss/maximise up-take and to demonstrate sustainable nutrient management regimes. This is necessary to ensure the conservation of the freshwater pearl mussel.

How - Critical source areas and transport routes for nutrients identified in the risk assessment process and mapped in the farm management plans (Actions A2) will be targeted to achieve reductions in farm nutrient inputs in order to achieve a balanced nutrient budget across the farm enterprise. This action will aim to target 375 ha across the 25 project farms. New and existing nutrient management techniques will be implemented on project farms such as:
- Reducing fertiliser (organic and inorganic/chemical) application rates
- Modifying time and location (e.g. alternative spread lands) of fertiliser applications
- Switching from slurry to farmyard (solid) manure
- Using silage fields as 'finishing land' for lambs
- Changing the length of the grazing season
- Changing grazing regimes across farms
- Reducing the length of animal housing periods
- Reducing overall stocking rates
- Exporting waste, if appropriate.

The nutrient reduction strategy prepared by the Project Farm Advisor as part of the farm management plans will aim to achieve a balanced nutrient budget for each farm. Farm specific targets will be set for each farmer and tiered incentive payment will be made if targets are achieved. The selected measures used to achieve the targets agreed between the farmer and the Project Farm Advisor will be outlined in the farm management plan.

To ensure implementation of the nutrient management strategy to a high standard, regular monitoring will be carried out by the Project Team and Project Farm Advisor (Action D6). The participant farmer will receive a payment for the additional work required in the implementation of the grazing and supplementary feeding strategy, and will receive a tiered incentive if targets agreed with the Project Farm Advisor and Project Scientific Advisor are achieved.

Where - This action will be implemented on a whole-farm basis within the targeted SCIs. Measures will be implemented primarily in inputs to critical source and transport areas of the

farm identified in the assessment carried out in the preparation of the farm management plans (Action A2). Care will be taken to ensure that the conservation support areas (e.g. alternative spreadland) on the farm are not adversely affected.

When - This action will commence within six months of the finalisation of the farm management plans (Action A2). Farm management plans will run until 30/09/2019.

This action has been designed to demonstrate whether broad theoretical principles and techniques on catchment management and nutrient reduction are effective at farm, field and critical source area scales. The action is new to the freshwater pearl mussel, and new to the project areas and equivalent catchments. A number of the actions required in the farm-specific nutrient reduction strategies may be repeatable. However all of these have a clear and important demonstration value, are not already carried out prior to the start of the project and, if required after the end of the project, will not be at the same level of intensity or necessarily using the same techniques or materials. This action will be subject to detailed monitoring (D actions) to evaluate its effectiveness, as well as to inform adaptive management throughout the project and the final design of effective best practice methodologies. KerryLIFE will demonstrate whether the action is effective and could be used in the project area or elsewhere in future, whether any elements would need to recur in the future and, if so, the frequency, intensity and methods for such repeat action.

Reason why this action is necessary (Characters: 673/2,000)
This action is necessary to reduce losses of dissolved nutrients (nitrogen and especially phosphorus) from farms to rivers. The most effective way of managing nutrient losses is through reduction at source. Intercepting nutrients along pathways is much less effective, as any nutrients taken up by macroalgae or macrophytes is released or recycled as plant material decays. Nutrient losses from farms are mainly associated with slurry application of animal waste generated by the housing of livestock during the winter period. Vegetation buffers such as in-field grass buffers, hedgerows, and areas of native woodland will also be established to increase nutrient uptake.

Expected results (quantitative information when possible) (Characters: 1,450/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project's lifetime across 5% of the occupied freshwater pearl mussel habitat in the catchments (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of KerryLIFE concrete actions. The extensive monitoring programme and multidisciplinary nature of the project will ensure that the effectiveness of this action in improving the conservation condition of the species will be robustly and scientifically demonstrated.

This action is expected to achieve:
- Significant reductions in dissolved nutrients, in particular phosphorus, to water from project farms, leading to a reduction in nutrient enrichment
- Reduction in losses of dissolved phosphorus from at least 50% of farmland locations subject to this concrete action
- Demonstration of the effectiveness of novel nutrient planning methods for catchments with high rainfall and challenging physical settings such as the Caragh and Blackwater
- Reduction in the volume of slurry generated

- Reduction in the rate of inorganic/chemical fertiliser applied
- Reduction in direct losses to water associated with fertiliser application
- Increased on-farm cycling of nutrients
- Reduction in overall stocking rates

Project deliverable products
NA

Project milestones
NA

C6 Alternative drinking water facilities for livestock

Beneficiary responsible for implementation: (Characters 4/500)
DAHG
Responsibilities in case several beneficiaries are implicated: (Characters: 19/500)
Teagasc, DAFM, SKDP

Description (what, how, where and when) (Characters: 2,636/10,000)
What - At some locations, livestock continue to have access to rivers for drinking purposes where there is no alternative supply. Livestock, especially cattle entering watercourses, result in the destabilisation of the bank channel, bank collapse, fouling of water from animal excreta, the trampling of freshwater pearl mussels and the disturbance of their habitat.

How - Drinking water facilities (e.g. nose pumps, drinking water troughs, rain catchers, etc.) will be installed in fields that do not have water supply, identified during the preparation of the farm management plan. In addition, the hydrologist will explore the potential of using the exiting drainage network to supply water to these new facilities and/or design alternative novel approaches. Drinking water facilities will be located away from watercourses to minimise sediment and nutrient losses associated with congregating livestock. Current access points will be fenced to exclude livestock from the river. Planting of broadleaves (Action C2) will be undertaken, where necessary, to stabilise channel banks and localised, disturbed soils.

Where - This action will be implemented within the targeted SCIs on project farms where the lack of alternative water facilities is resulting in bank destabilisation and erosion adjacent to and upstream of freshwater pearl mussel populations.

When - This action will commence within six months of the implementation of the farm management plans and will continue throughout the lifetime of the plans.

This action has been designed to demonstrate whether broad theoretical principles and techniques on catchment management and sediment/nutrient reduction are effective at farm, field and critical source area scales. The action will trial a number of new methods and technologies, is new to the freshwater pearl mussel, and new to the project areas and equivalent catchments. All elements of this action have a clear and important demonstration value, are not already carried out prior to the start of the project and, if required after the end of the project, will not be at the same level of intensity or necessarily using the same techniques or materials. This action will be subject to detailed monitoring (D actions) to evaluate its effectiveness, as well as to inform adaptive management throughout the project and the final design of effective best practice methodologies. KerryLIFE will demonstrate whether the action is effective and could be used in the project area or elsewhere in future, whether any elements would need to recur in the future and, if so, the frequency, intensity and methods for such repeat action.

Reason why this action is necessary (Characters: 598/2,000)
Riverbank erosion is one of the most significant pressures in the Caragh and Blackwater catchments and a significant contributor to siltation and erosion of the habitat of the freshwater pearl mussel. The provision of alternative drinking water facilities will discontinue the practice of animals accessing watercourses for drinking, thereby reducing the risk of riverbank destabilisation. In addition, this action will prevent direct fouling of water from excreta and trampling of freshwater pearl mussels. Fencing allows for the recovery of riparian

vegetation helping to maintain bank stability.

Expected results (quantitative information when possible) (Characters: 1,185/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project's lifetime across 5% of the occupied freshwater pearl mussel habitat in the catchments (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of KerryLIFE concrete actions. The extensive monitoring programme and multidisciplinary nature of the project will, however, ensure that the effectiveness of this action in improving the conservation condition of the species will be robustly and scientifically demonstrated.

This action will result in:
- The installation of approximately 20 water facilities on project farms
- Demonstration of novel and alternative drinking water facilities
- Reduction in sediment losses from at least 50% of locations subject to this concrete action
- A 100% reduction in livestock damage to mussels and their habitat in locations subject to this concrete conservation action
- A 100% reduction in cattle urination and defecation on pearl mussel locations

Project deliverable products
NA

Project milestones
NA

C7 Restructuring of commercial conifer forests to long-term retention woodland

Beneficiary responsible for implementation: (Characters: 7/500)
FS-DAFM
Responsibilities in case several beneficiaries are implicated: (Characters: 31/500)
Coillte, Teagasc, DAHG, SKDP

Description (what, how, where and when) (Characters: 8,983/10,000)
What - 175 ha of high risk conifer forests currently managed under the clearfell system will be permanently removed from commercial production and restructured into long-term retention woodland. This will result in the creation of mixed-age broadleaf or conifer-dominated woodland, managed for the protection of water quality and the freshwater pearl mussel, as well as for biodiversity purposes generally.

How – Restructuring to long-term retention woodland, firstly, requires removal of at least some of the standing conifer crop and, secondly, achieving a mixed-species and mixed-aged crop through natural regeneration, planting and management over time.

At all sites chosen, sensitive tree felling techniques will be employed. These will range from ring-barking and manual felling at the most sensitive sites, to the use of low-ground pressure machinery in conventional felling systems. Ring-barking is the removal of bark, approximately 50 cm above ground level all the way around the trunk/bole resulting in the gradual death of the tree. Manual felling uses a chain saw to directionally fell trees. Small-scale specialist machinery (such as a 'Iron Horse') designed to spread its weight more evenly across the ground (thereby leading to less soil compaction and other disturbance), will also be trialled at sensitive harvesting sites.

Two approaches to restructuring to long-term retention woodland will be adopted, depending on risk assessment, especially with reference to the existing forest road infrastructure: (1) where roads already exist, timber may be extracted (2) where no road infrastructure exists and/or the risk of soil disturbance due to timber extraction is too great, felled trees will be left *in situ* in the forest.

<u>(1) Where road infrastructure exists</u>
Harvesting of timber by clearfelling can potentially cause significant soil disturbance and lead to silt losses to water. The decomposition of harvest residue, such as needles, twigs and branches (otherwise known as 'brash') left on-site after felling can also result in significant nutrient losses to water over several years. Under the conventional clearfell system, the brash is used to protect temporary machinery routes, known as 'racks', along which the harvester and forwarder (machine for transporting the felled timber over the site to a central collection point for subsequent collection and haulage) travels. Where a forest property that is being restructured to long-term retention woodland has an adequate forest road infrastructure present, a risk assessment on the potential impacts of timber extraction will be conducted. If the associated potential risks are deemed to be sufficiently low, the standing conifer crop will be felled and extracted using sensitive techniques, such as cabling or sensitive ground-based forwarding machinery or cable extraction systems.

Cable extraction systems involve the transport of timber within the forest by means of steel cables, the load being partially or entirely lifted off the ground. Cabling minimises or eliminates the impacts of machinery on soils. Trees will be cut using a combination of

suitable harvester machines and manual (chainsaw) felling. Cut trees will be removed from the fell location to a stable landing area by a motorised winch carriage on the steel cable.

Manual felling will also be carried out in high-risk areas where machinery access is not possible. Felling-to-waste (i.e. where the felled trees are to be left to decompose *in situ*) will generally be the norm though, where ground conditions allow, timber may be extracted using sensitive methods, i.e. the 'Iron Horse'. Machinery will not operate within identified critical source areas for sediment, except in exceptional instances where the long-term gain outweighs any short-term risk.

Low-ground pressure machinery, such as the 'Iron Horse' will be used where appropriate to fell, process and extract trees in high-risk settings (such as in sensitive riparian zones).

The sensitive use of the conventional harvester and forwarder combination will also be employed in low and medium risk settings. Here, it will be supplemented by manual felling-to-harvester to reduce the soil disturbance, such as compaction, rutting and erosion, caused by the combined machine movements of both the harvester and forwarder. Supplementary manual felling-to-machine will also result in fewer extraction racks and the availability of more brash per rack to give extra ground protection. The size/weight of extraction loads will also be reduced to further lessen ground disturbance.

Brash will be carefully managed to provide maximum soil protection and to minimise the risks of nutrient losses from decaying material after harvesting to local watercourses.

Restructuring of these harvested sites will rely primarily on natural regeneration of conifers and broadleaf species. Supplementary tree planting will be carried out in critical source and transport areas to accelerate stabilisation of the soil and complement natural regeneration. Planting will be undertaken by hand, or with the aid of a manual auger or spade. Where possible, mechanical interventions will be avoided. Areas will be fenced, as necessary, to keep out grazing animals and subsequently monitored (Action D5). Manual vegetation control will be required on a periodic basis to promote tree growth (Action D5). Vegetation management will be kept to a minimum and will mainly involve the control of non-native invasive species and competing ground vegetation preventing tree establishment.

(2) Where no forest road infrastructure exists

The installation of forest roads and associated drains poses significant risks owing to ground disturbance, importation of construction material and alternation of the site's hydrology. Consequently, on forest sites where an adequate forest road infrastructure does not exist, timber will not be extracted, but will be felled-to-waste and allowed to decompose *in situ*.

On sensitive sites the option of leaving trees standing poses an additional risk. As trees mature and increase in height and diameter, there is an increased risk of 'windthrow'. Windthrow is where the force of the wind acting on the top/crown of a tree causes it to be uprooted. Windthrow uplifts the root plate, leading to erosion of the exposed soil and sub-soil. It is important, therefore, to manage trees that may be susceptible to windthrow.

Individual or small groups of trees on saturated soils that are vulnerable to windthrow will be manually felled-to-waste or ring-barked. Fallen trees will be cut into logs/sections, where necessary, to promote vegetation regeneration. These sites, in particular those areas with felled and ring-barked trees, will be inspected regularly.

As felling will be minimal in these areas, and trees left *in situ*, they will be managed as non-commercial, long-term retention conifer woodland. Limited numbers of broadleaf trees may be planted to increase diversity, under the guidance of the forest advisor in consultation with the forest owner.

The harvesting options for each forest site will be detailed in the forest management plan (Action A3). Options will be determined by the environmental conditions, identified during the site investigations and desk study, and the site risk assessment process, with the risk of windthrow being a major consideration.

Careful drain and sediment management will be employed before, during and after any harvesting activities, including drain-blocking, creating settlement ponds (Action C1) 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.

The harvesting and extraction will be sub-contracted to a competent and experienced contractor by negotiated contract. Coillte, together with the contractor and the project team will carry out continuous monitoring before, during and following harvesting, extraction and restructuring operations.

Where - Long-term retention woodland will be established in the targeted SCIs within publically-owned forest in critical sediment source areas identified in the forest management plans (Action A3).

When - Tree harvesting and extraction will commence following the completion of the forest management plan for each property (Action A3). Restructuring operations will be implemented in Years 2 to 4. Management will be carried out in years 2 to 5.

Reason why this action is necessary Characters: 1,313/2,000)
Clearfelling and other operations, such as ground preparation and road construction, that form part of the current silvicultural system, carry attendant risks of compaction and other soil disturbances that can lead to significant losses of sediment to water. Fertilisation of the crop during the first rotation, as well as the decomposition of needles and branches remaining on site following clearfelling, can lead to significant losses of dissolved and particulate nutrients. In high risk settings, the cumulative negative impacts of harvesting and re-establishment on a 40-year cycle will not be effectively mitigated by measures such as sediment trapping and buffer zone creation. Removing all or parts of high risk plantations from commercial production is the only alternative. The establishment of permanent, long-term retention woodland in critical source areas will significantly reduce the risk of on-going and future sediment and nutrient loss. Long-term retention woodland will subsequently develop as mixed (native broadleaves and conifers), uneven-aged forests managed for biodiversity and the protection of water quality. This less intensive land-use will ensure that future impacts on pearl mussel populations will be minimised, principally through the avoidance of the

clearfell/replanting cycle.

Expected results (quantitative information when possible) (Characters: 1,476/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project's lifetime across 5% of the occupied freshwater pearl mussel habitat in the catchments (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of KerryLIFE concrete actions. The extensive monitoring programme and multidisciplinary nature of the project will, however, ensure that the effectiveness of this action in improving the conservation condition of the species will be robustly and scientifically demonstrated.

This action will result in:
- The removal of (175 ha) commercial conifer plantations in high-risk settings and their permanent restructuring into long-term retention woodland for the protection of water quality and the freshwater pearl mussel
- Reduced sediment losses from at least 50% of commercial forest operations subject to this concrete action.
- Reduced nutrient losses from at least 10% of commercial forest operations subject to this concrete action
- Demonstration of the effectiveness of alternative harvesting systems
- Demonstration of the effectiveness of alternative drain management in forests
- Demonstration of the effectiveness of a variety of methods for converting even-aged conifer plantations into mixed-aged and mixed species woodland

Project deliverable products
NA

Project milestones
NA

C8 Transformation of conventionally clearfell managed commercial forests to continuous cover forestry

Beneficiary responsible for implementation: (Characters 7/500)
Coillte
Responsibilities in case several beneficiaries are implicated: (Characters: 31/500)
FS-DAFM, Teagasc, DAHG, SKDP

Description (what, how, where and when) (Characters: 2,890/10,000)
What - The transformation of semi-mature conifer plantation to continuous cover forestry will be trialled as an alternative to the clearfell silvicultural system typically practiced in Ireland. Continuous cover forestry allows forest owners to manage forests for sustainable timber production in sensitive areas and entails the frequent harvesting of single trees and/or small groups of trees to transform even-aged conifer forests to uneven-aged forests. Continuous cover forestry relies on natural regeneration to 'recruit' new trees into the open spaces among the retained trees. Some enhancement planting may be required to fill spaces. Continuous cover forestry requires the installation of permanent tracks at regular intervals throughout the forest compartment, in order to allow machinery access to extract the timber. Furthermore, the additional installation of the required forest road infrastructure and associated drainage could pose a significant sedimentation risk due to ground disturbance, importation of construction material and alternation of the hydrology of the site. Hence, continuous cover forestry will only be trialled to assess its suitability under conditions typical in freshwater pearl mussel catchments.

How - The transformation from a clearfell to a continuous cover system is gradual. As part of this trial, specific interventions will be implemented to begin the transformation from an even-aged, semi-mature conifer forest (c. 15 year old, first or second crop rotation, conifer plantations) to uneven aged forest. The forest advisor in consultation with Coillte will design a clear programme for the transformation to continuous cover forestry, and will select and mark the trees to be felled as part of the initial thinning. The required road and track infrastructure, its density and the associated drainage will also be planned and implemented in a small section of the site. The practicality and impacts of installing such infrastructure will be assessed before, during and following implementation. The forest advisor, Coillte staff and the hydrologist will undertake full monitoring and assessment to demonstrate the feasibility of the continuous cover forestry in freshwater pearl mussel catchments.

Where - The transformation of suitable forest to continuous cover will be demonstrated within the targeted SCIs in at least one 20 ha forest, which meets the required conditions. The site(s) will have a conifer crop of c. 15 year old, with good site stability, appropriate soil type and access. Continuous cover forestry trial sites will be located away from very high-risk areas of the catchments.

When - The continuous cover forestry demonstration will be implemented in Year 2 of the project on sites identified as meeting the criteria following detailed site investigation carried out in the preparation of the forest management plans (Action A3).

Reason why this action is necessary (Characters: 1,078/2,000)
Continuous cover forestry is at an early stage of development in Ireland. It is universally perceived as the application of a more environmentally-sensitive silvicultural regime and as a practical alternative to conventional clearfelling and replanting. This action aims to

demonstrate and evaluate the feasibility of implementing continuous cover forestry in high rainfall areas, characterised by sensitive soils, as in freshwater pearl mussel catchments in the south-west of Ireland. Continuous cover avoids the complete removal of the forest canopy during harvesting and, thus, avoids the exposure of bare soil and significant losses of sediment to waters. Continuous cover forestry also avoids the episodic nutrient losses associated with decomposition of branches and needles (brash) left on site following clearfelling. In addition, the opening of the canopy through frequent thinning increases the light reaching the forest floor, thus promoting the development of ground and understory vegetation, which will further reduce erosion and increase the up-take of nutrients.

Expected results (quantitative information when possible) (Characters: 1,464/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project's lifetime across 5% of the occupied freshwater pearl mussel habitat in the catchments (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of KerryLIFE concrete actions. The extensive monitoring programme and multidisciplinary nature of the project will, however, ensure that the effectiveness of this action in improving the conservation condition of the species will be robustly and scientifically demonstrated.

It is expected that continuous cover forestry will be trialled on at least one 20 ha forest within the project area, away from high-risk locations. This action will:
- Demonstrate the effectiveness of continuous cover forestry in high rainfall areas
- Demonstrate the effectiveness of continuous cover forestry on sensitive soils
- Demonstrate the practical environmental issues associated with construction and maintenance of the road and rack infrastructure required by continuous cover forestry
- Result in a reduction in sediment losses from at least 30% of commercial forest operations subject to this concrete action
- Result in a reduction in nutrient losses from at least 5% of commercial forest operations subject to this concrete action

Project deliverable products
NA

Project milestones
NA

C9 Firebreak management

Beneficiary responsible for implementation: (Characters 7/500)
Coillte
Responsibilities in case several beneficiaries are implicated: (Characters: 28/500)
FS-DAFM, Teagasc, DAHG, SKDP

Description (what, how, where and when) (Characters: 2,624/10,000)
What - The action aims to trial alternative methods of firebreak management within the targeted SCIs that avoid the need to remove all ground vegetation by 'grubbing out' with machinery and, thus, to reduce sediment loss to water. Firebreaks are mandatory for all forests and typically comprise a six metre wide strip around the perimeter and within forest properties to prevent the spread of fire. Firebreaks require regular maintenance every three to four years, usually with heavy machinery.

How - Two alternative methods will be trialled and demonstrated.
1. Controlled burning
2. Establishment of a willow firebreak

1. Controlled burning: A system of controlled, low-temperature burning will be trialled along three, 500 m length x 6 m wide firebreaks (0.3 ha each). This method removes the plant litter accumulated from the previous seasons, without burning the current new growth. Frequent burning ensures less dead plant material accumulates and that the temperature and extent of the fire can be readily controlled. Through controlled, regular removal of the flammable, dead plant material, the risk of accidental and uncontrolled fire events in firebreaks are minimised and the conifer crop protected.

2. Establishment of a willow firebreak: Year-old willow cuttings (*Salix cinerea* and *S. aurita*) will be 'struck' into the soil every metre in pure groups along three, 500 m length x 6 m wide firebreaks (0.3 ha each). In the following year, the willow will be coppiced, i.e. cut back as low to the ground as possible, to encourage a more stable tree with multiple shoots and continuous ground cover. The aim is to ensure the soil of the firebreak is stable, while minimising the production of flammable leaf litter. Tussocks of Purple Moor Grass (*Molinia caerulea*), in particular, produce large quantities of dry litter that can be blown into the conifer crop when ignited. The development of *Molinia* tussocks will be suppressed by the willows. Willows, in turn, produce less flammable leaf litter. The aim is to develop an effective, low-maintenance firebreak management system that minimises sedimentation risk.

Firebreaks will be inspected regularly to ensure that fire risk is being minimised and to assess the efficacy of the action. Sediment losses will be monitored before, during and following the establishment of firebreaks (Action D3 and D5) and will inform the on-going management of the firebreak trials.

When - This measure will be trialled in Year 2 of the project at a suitable location that will be identified during site investigations carried out in preparing the forest management plans (Action A3).

Reason why this action is necessary (Characters: 726/2,000)
Forest plantation firebreaks are installed and maintained by 'grubbing out' all vegetation around the forest perimeter and along linear strips within forest plantations. This exposes soil

to erosion during rainfall events, with a serious consequent risk of generating sediment-laden runoff. Machine traffic required to carry out the operation also may cause compaction and erosion, especially on unstable, saturated, peaty soils. This action aims to trial and evaluate alternative, effective firebreak systems for use in freshwater pearl mussel catchments with the associated goal of minimising sediment loss to water. The outcome of the trial and any recommendations will be documented in an information pamphlet (Action E8).

Expected results (quantitative information when possible) (Characters: 1,452/2,000)
Overall, the project's concrete conservation actions are expected to deliver an improvement across 20% (or c. 10 km) of the freshwater pearl mussel habitat in the Caragh and Blackwater systems. In addition, an improvement in juvenile recruitment is expected during the project's lifetime across 5% of the occupied freshwater pearl mussel habitat in the catchments (or c. 2.5 km). Such improvements will be cumulative, resulting from the combination of KerryLIFE concrete actions. The extensive monitoring programme and multidisciplinary nature of the project will, however, ensure that the effectiveness of this action in improving the conservation condition of the species will be robustly and scientifically demonstrated.

It is expected that alternative firebreak systems will be trailed and demonstrated along six 500 m lengths of firebreak, covering an area of 0.3 ha each. The findings of the trial will be published as a practical guide (Action E8).

The expected results are
- Demonstration of the efficacy of a novel controlled burning firebreak management system
- Demonstration of the efficacy of a novel willow firebreak system
- Production of an information pamphlet on the implementation of alternative firebreak management systems
- Reductions in sediment losses from at least 50% of locations subject to this concrete action, as a result of the elimination of vegetation damage and ground disturbance caused by conventional firebreak management

Project deliverable products
NA

Project milestones
NA

D. Monitoring of the impact of the project actions (obligatory only if there are concrete conservation actions)

D1 Mussel monitoring
Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated:
NA

Description (what, how, where and when) (Characters: 3,889/10,000)
What - The achievement of favourable conservation status for the freshwater pearl mussel is of central importance in the context of the EU Habitats Directive and is the focus of this project. This action will evaluate the impact of project actions on the conservation condition of the freshwater pearl mussel population in the Caragh and Blackwater catchments. Standard monitoring methodologies developed by DAHG will be used to assess population condition using the indicators and targets set out in the Third Schedule of *S.I. No. 296 of 2009*.

How/Where - Monitoring of large, widespread and dense populations of freshwater pearl mussels such as the Blackwater and Caragh involves the following three elements
1. Fixed permanent counts
2. Juvenile quadrats
3. Distribution survey

1. Fixed permanent counts: The number of adult mussels will be counted in transect areas. As abundances are amongst the highest known in Ireland, 24 transects were established in the Blackwater and 18 in the Caragh in 2004 as part of baseline monitoring surveys (see accompanying maps). A minimum of six permanent transects per catchment will be monitored three times during the project. The location of selected transects will be chosen based upon the distribution of the project sites and will be best placed to monitor the effects of the concrete conservation actions.

2. Juvenile quadrats: Field survey of 50 x 50 cm quadrats will be carried out in areas of suitable habitat for juvenile mussels. All adult and juvenile mussels within each quadrat will be counted and measured (shell length), yielding information on population demographics. This method will be particularly useful for detecting improvements in the freshwater pearl mussel habitat that result from the project actions. The effects of reduced sedimentation and eutrophication of the habitat can be detected through recruitment of young mussels to the population within two to three years. Juvenile quadrats will be counted at the nearest suitable habitat downstream of project sites.

3. Distribution survey: The broad distribution of the population within the catchment will be monitored, to check for extensions and contractions in its range. The broad distribution will be monitored in each catchment at least twice during the project, concentrating efforts in the channels nearest the project farm and forest sites.

DAHG will directly sub-contract the freshwater pearl mussel monitoring to specialist surveyors through external assistance. The DAHG operates a six-year monitoring cycle. This means that the Caragh and Blackwater populations are routinely monitored once every six-years and are next due for monitoring in 2017. For the duration of this project, the DAHG

will supply additional freshwater pearl mussel monitoring days for the Caragh and Blackwater, through its contracts to supply national monitoring. A minimum of four days freshwater pearl mussel monitoring per catchment will be provided each survey conducted during the project.

When - Monitoring of the effectiveness of the project concrete conservation actions using freshwater pearl mussels will be conducted three times over the duration of the project. Monitoring will occur in 2014 and 2019, exclusively for the project, while both rivers will be surveyed in 2017, as part of the routine national monitoring programme of the freshwater pearl mussel which DAHG aims to complete once every six years. Reports of the monitoring results from each survey will be prepared.

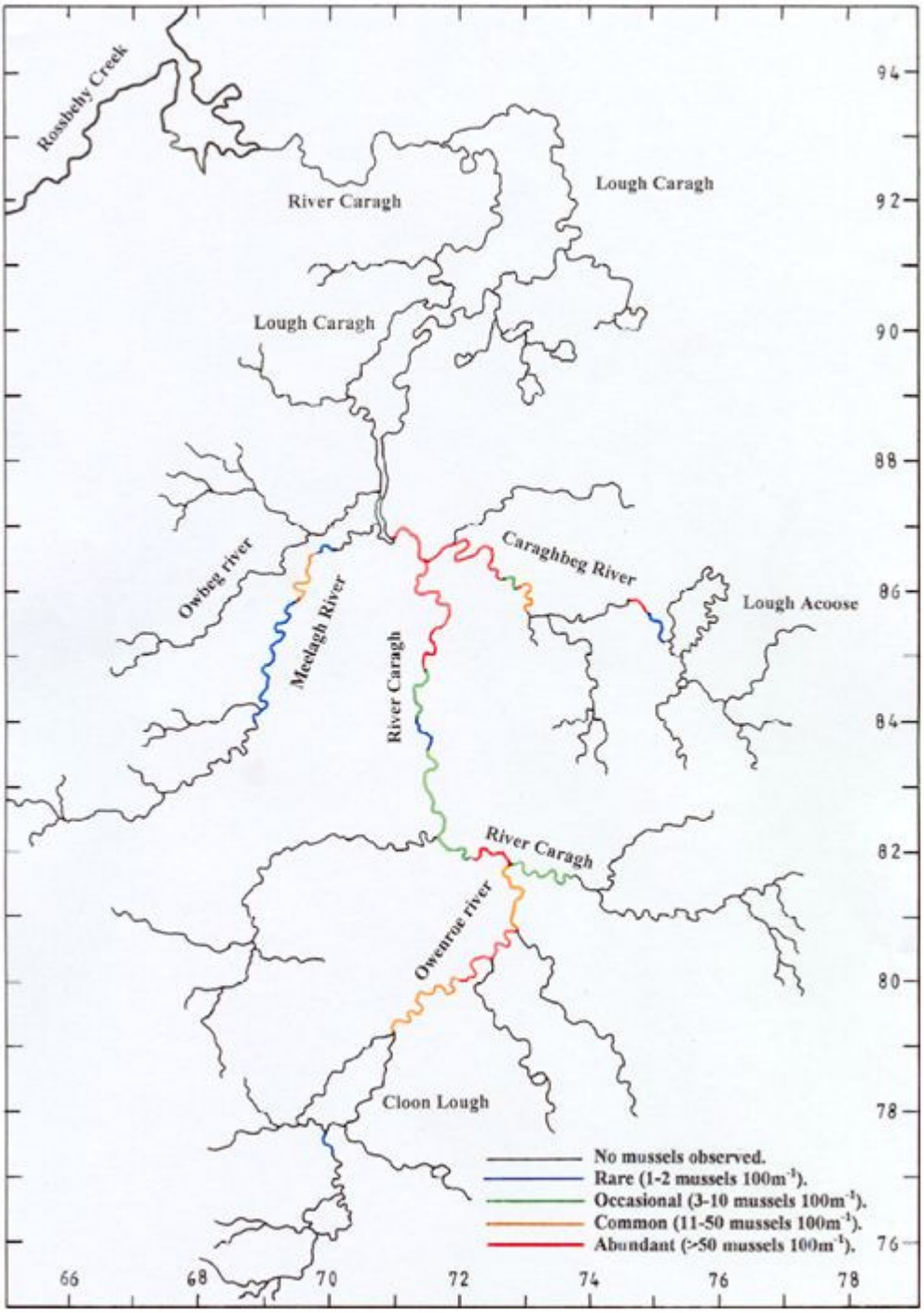
Mussel monitoring data will be closely scrutinised by the specialist freshwater pearl mussel surveyors who conduct the monitoring and by the Project Team. Where issues arise, the Project Team will be alerted as soon as possible and project actions adapted as necessary. Consequently, information from the mussel monitoring action will be used to re-design/redirect actions on project farms and forests.

Reason why this action is necessary (Characters: 500/2,000)
This action is will provide an assessment of changes in the condition of the freshwater pearl mussel population, at or downstream of the project farms and forests, and will be ultimate indicator of the success of the concrete conservation actions implemented as part of the forest and farm management plans (Actions A2 & A3). Regular monitoring will enable the project to closely track improvements in the condition of the freshwater pearl mussel population and to adapt project actions as necessary.

Expected results (quantitative information when possible) (Characters: 599/2,000)
- Detailed assessments of the impact of the project concrete conservation actions on the freshwater pearl mussel population.
- Close tracking of any improvement in the freshwater pearl mussel population resulting from the implementation of concrete conservation actions.
- Modification of concrete conservation actions, as required.
- Three reports on the condition of the freshwater pearl mussel population at or downstream of project farm and forest sites.
- Contribution to the final report and project findings, in particular the assessment of the effectiveness of the concrete conservation actions.

Project deliverable products
Three reports on the freshwater pearl mussel population - 31/12/2019

Project milestones
NA


Rossbehy Creek
River Caragh
Lough Caragh
Lough Caragh
Owbeg river
Meelagh River
River Caragh
Caraghbeg River
Lough Acoose
River Caragh
Owenrue river
Cloon Lough
No mussels observed.
Rare (1-2 mussels 100m-1).
Occasional (3-10 mussels 100m-1).
Common (11-50 mussels 100m-1).
Abundant (>50 mussels 100m-1).
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84
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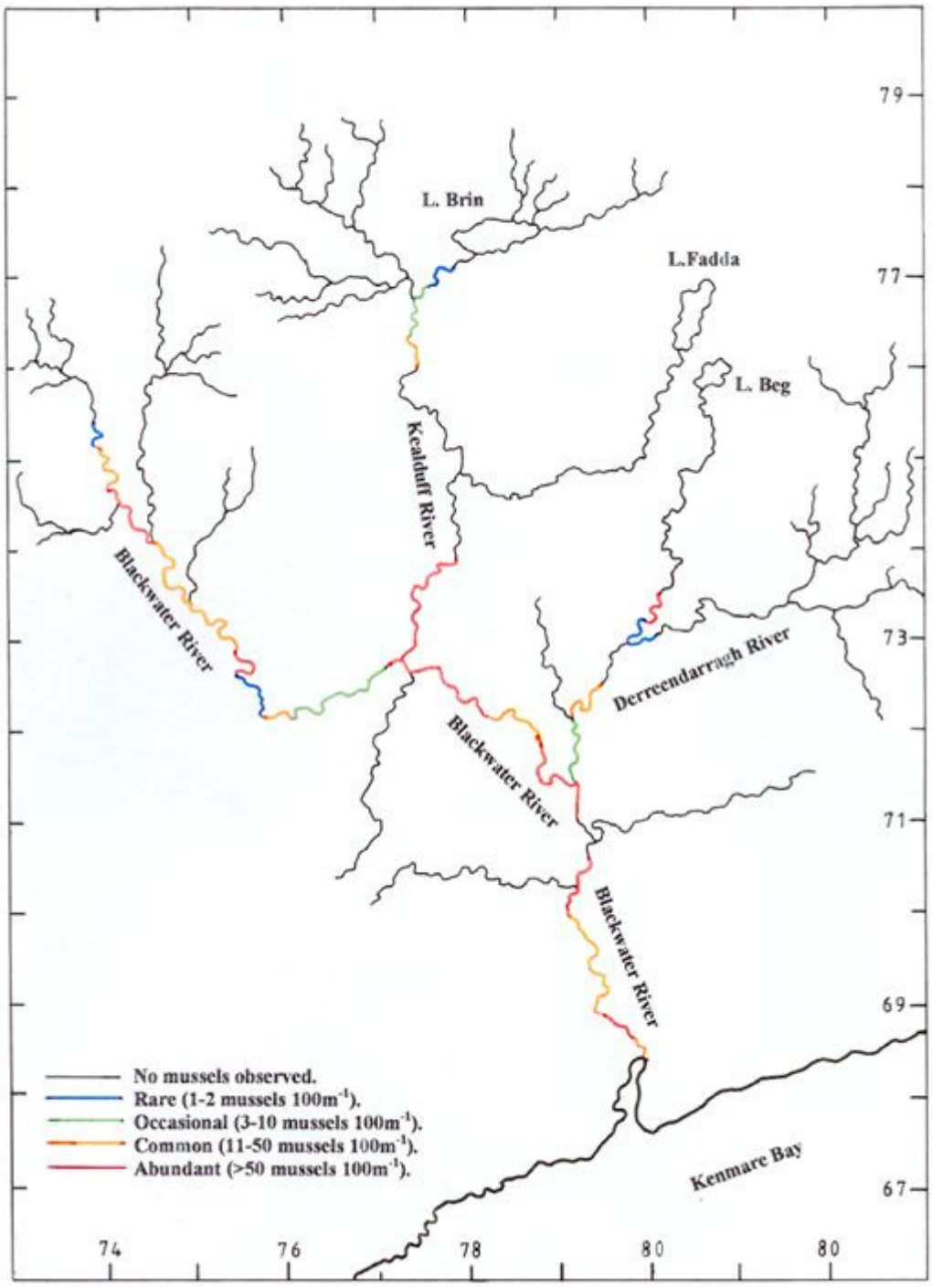
L. Brin
L.Fadda
L. Beg
Kealduff River
Blackwater River
Blackwater River
Derreendarragh River
Blackwater River
Kenmare Bay
No mussels observed.
Rare (1-2 mussels 100m-1).
Occasional (3-10 mussels 100m-1).
Common (11-50 mussels 100m-1).
Abundant (>50 mussels 100m-1).
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D2 Biological monitoring of freshwater pearl mussel habitat

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 0/500)
NA

Description (what, how, where and when) (Characters: 3,768/10,000)
What - This action will evaluate the effect of project actions on the conservation condition of the habitat of the freshwater pearl mussel and evaluate the effectiveness of actions designed to reduce nutrient loss to water. The Fourth Schedule of *S.I. No. 296 of 2009* sets out the indicators and targets for assessing the conservation status of the habitat of the freshwater pearl mussel. This monitoring action pertains to the biological indicators and targets, namely:

- Filamentous algae (must be absent or trace (<5 %))

- Macrophytes - rooted higher plants (must be absent or trace (<5 %))

- Macroinvertebrates (WFD Ecological Quality Ration (EQR) ≥ 0.90)

- Phytobenthos (Diatoms) (WFD EQR ≥ 0.93)

How - Filamentous algal and macrophyte cover will be monitored at all freshwater pearl mussel monitoring stations (Action D1). In addition, regular (at least weekly) monitoring will be undertaken during the growing season by the Project Team, supported by DAHG staff. Standard methods will be employed (Moorkens, 2013, in prep., North South 2, 2009, Ross, 2011 a and b).

Targeted macrophyte surveys will be undertaken by a specialist contractor, in conjunction with the Project Scientific Advisor, to assess the effects of specific concrete conservation actions where a significant reduction in nutrient concentrations is expected in the receiving rivers. The Mean Trophic Rank methodology will be used (Holmes, 1999).

Routine WFD monitoring for macroinvertebrates and phytobenthos (diatoms) is conducted by the EPA in the catchments every three years. The results of these surveys will be used to assess the effectiveness of the nutrient reduction project actions. Additionally, specialist sub-contractors will be employed to undertake targeted macroinvertebrate monitoring, to assess the effects of specific concrete conservation actions where a significant reduction in nutrient concentrations is expected in the receiving rivers. The standard EPA Q methodology will be used (McGarrigle *et al*, 2002, McGarrigle, Clabby and Lucey, pers. comm., ISO 7828:1985, *S.I. No. 258 of 1998* and *272 of 2009*). The diatom tool is currently being modified for low alkalinity rivers such as the Caragh and Blackwater and, therefore, will not be deployed for the more targeted monitoring utilised in the project.

Where - Biological monitoring of freshwater pearl mussel habitat will be undertaken at permanent monitoring stations, at, up-stream and down-stream of project farm and forest sites.

When - Monitoring of the biological indicators of the freshwater pearl mussel habitat will be carried out annually for the duration of the project. Filamentous algal and macrophyte cover will be monitored at selected stations regularly (at least weekly) during the growing season by the Project Scientific Advisor. Macrophyte surveys will be undertaken at least once before implementation of the relevant concrete conservation actions and, thereafter, every second year, between mid-June and mid-September by a sub-contractor. Targeted macroinvertebrate survey will be conducted at least once before implementation of the relevant concrete conservation action and, thereafter, every second year by a sub-contractor. Filamentous algal and macrophyte cover will be monitored by the Project Team, with the support of DAHG staff, and will also be carried out during freshwater pearl mussel population and habitat condition surveys under action D1, D3 and D4.

Freshwater pearl mussel habitat monitoring data will be closely scrutinised by the Project Team and the specialist surveyors and used to re-design/redirect actions on project farms and forests, as necessary. The high frequency of filamentous algal and macrophyte monitoring will ensure a rapid response to any unexpected nutrient releases.

Reason why this action is necessary (Characters: 481/2,000)
Monitoring of filamentous algae, macrophytes and macroinvertebrates will provide assessments of changes in the condition of the freshwater pearl mussel habitat at and downstream of project farms and forests, and will be key indicators of the success of concrete conservation actions aimed specifically to reduce nutrient impacts. The monitoring will enable the project to closely track the condition of the freshwater pearl mussel habitat and to adapt project actions as necessary.

Expected results (quantitative information when possible) (Characters: 717/2,000)
- Detailed assessments of the impact of specific project actions on the habitat of the freshwater pearl mussel population
- Close tracking of any improvements in the condition of the freshwater pearl mussel habitat resulting from the implementation of project actions
- Modification of concrete conservation actions, as required
- Five annual reports on the biological monitoring of freshwater pearl mussel habitat compiling all available filamentous algae, macrophytes, and macroinvertebrate survey results from the previous survey period
- Contribution to the final report and findings, in particular on the assessment of the effectiveness of the project actions on the condition of the freshwater pearl mussel habitat.

Project deliverable products
Five annual reports on the freshwater pearl mussel population - 31/12/2019

Project milestones
NA

D3 Sediment and flow monitoring

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 32/500)
Teagasc, Coillte, DAFM, FS, SKDP

Description (what, how, where and when) (Characters: 6,396/10,000)
What - This action will evaluate the impact of project actions on the conservation condition of the habitat of the freshwater pearl mussel and evaluate the effectiveness of actions designed to reduce sediment loss to water. Sediment monitoring will be divided into four main elements

1. Sediment measurements in watercourses
2. Novel methods for monitoring sediment losses on land and in drains
3. Sediment provenance
4. Flow monitoring

How -

1. Sediment measurements in watercourses: Sediment measurements in watercourses (e.g. drains, streams and rivers, including at freshwater pearl mussel habitat) will be achieved using a combination of fine sediment cover, redox-potential and turbidity monitoring.

Standard NPWS methods for measuring fine-sediment cover and redox-potential will be employed (Moorkens, 2013, in prep., North South 2, 2009). Differences in redox-potential between the water column and the substrate (gravels) are used as a proxy for oxygen availability and to assess the level of clogging of the interstices by silt in freshwater pearl mussel habitat. Redox-potential is measured in the open water and at 5 cm depth in the substratum and, for freshwater pearl mussel habitat, the loss of redox potential should be less than 20 %. Redox surveys will be undertaken by the Project Team, in particular the Project Scientific Advisor, with support from DAHG staff.

Turbidity measurements will be carried out in rivers using data loggers, known as 'turbidity sondes'. These data loggers measure turbidity expressed as Nepholometric Turbidity Units (NTU), as well as specific conductivity and temperature, and will be set to record at regular intervals, e.g. every fifteen-minutes. Regular inspections (every three to four weeks) will be necessary to replace batteries, for calibration, general maintenance and to up-load data. On each site visit, grab samples will be taken for pH, temperature, suspended solids and turbidity. Water-level/flow meters will be deployed with at least some of these turbidity sondes.

2. Novel methods for monitoring sediment losses on land in drains: A wide range of concrete conservation actions will be implemented by the project to reduce sources and intercept sediment along the pathway to the river. Novel methods for assessing the effectiveness of these actions are likely to be delivered through the project, based on the advice of the hydrologist and other specialists. These will be designed to quantify the reduction in sediment losses at, or in close proximity to the specific concrete conservation action. These methods

will be used where there is a risk that the positive benefits of the concrete conservation action will be masked by cumulative effects or unforeseen impacts.

Proven methods developed by other projects, such as the on-going Northern Ireland Environment Agency and Donegal County Council INTERREG-funded, Freshwater Pearl Mussel project, will also be deployed, including sediment weighing and particle size fractionation of sediment.

3. Sediment provenance: Sediment provenance is a novel approach for the quantitative determination of sediment provenance over a range of temporal and spatial scales. Sediment provenance will be used to identify sources of sediment on project farms and forests, and elsewhere in the catchment as necessary. Sediment provenance will be used to inform the development and review of farm and forest management plans and to increase the effectiveness of the concrete conservation actions being implemented. This work will be undertaken by a PhD Research Assistant supervised by Teagasc and a suitable third level institute.

4. Flow Monitoring: Flow monitoring will be deployed in drains and at pearl mussel habitat, based upon advice from the hydrologist and mussel expert, to monitor the effectiveness of the actions to mitigate hydrological changes (e.g. drain management and buffer strips to reduce flow rates). Flow monitoring of reference condition and impacted pearl mussel habitat, as well as downstream of project sites, will also be undertaken. Baseline data on precipitation will be collected in advance of the implementation of these concrete conservation actions using automated rainfall gauges that will remain in situ for the duration of the project.

Where - Fine-sediment cover and redox-potential surveys will be monitored at all freshwater pearl mussel monitoring stations (Action D1) and at targeted locations (upstream and downstream) of project sites. The location of the turbidity sondes will be determined by the Project Team in consultation with the hydrologist and linked to project sites. Furthermore, two additional turbidity sondes will be used as 'roving data loggers', deployed at locations suitable to monitor the effectiveness of specific actions. Sediment fingerprinting and provenance will be carried out in approximately three sub-catchments which coincide with farm project sites. Flow monitoring will be deployed upon the advice of the hydrologist. Automated rain gauges will be located in relevant sub-catchments for the duration of the project.

When - Fine-sediment cover and redox-potential will be monitored throughout the duration of the project. Regular (at least weekly) monitoring will be undertaken by the Project Team and DAHG staff at permanent monitoring stations, and before, during and after the implementation of project actions. Turbidity monitoring will be undertaken continuously throughout the project, at carefully chosen sites designed to detect the responses from the implementation of concrete conservation actions. Sediment provenance investigations will be undertaken in the first three years of the project, and will inform the development and review of farm and forest plans. Flow monitoring will be undertaken prior to the implementation of project actions and at regular intervals, as determined by the hydrologist. Flows at pearl mussel monitoring stations will be undertaken at the beginning of the project and again at the end of the project to detect any improvement in hydrological regime.

Sediment and flow monitoring data will be closely scrutinised by the Project Team and the specialist surveyors and used to re-design/redirect actions on project farms and forests, as

necessary. The high frequency of fine-sediment cover, redox-potential and turbidity monitoring will ensure a rapid response to any unexpected sediment releases.

Reason why this action is necessary (Characters: 1,074/2,000)
A key cause of the decline in pearl mussel populations is lack of recruitment brought about by sedimentation of their habitat and the loss of juvenile mussels. This action is necessary to assess the effectiveness of the concrete conservation actions designed to reduce sediment losses from project farms and forests and to adapt project actions as necessary. A range of monitoring approaches is required to detect and quantify the reductions in sediment losses; including monitoring at the location of concrete conservation actions, along the pathway and at the pearl mussel habitat itself. Sediment provenance investigations will help to identify and quantify the sources of sediment on project farms and forests. Fine sediment cover and redox-potential will be monitored to assess improvements in the condition of adult, and in particular, juvenile mussel habitat. Turbidity and flow monitoring will provide a clear assessment of the changes in sediment loads and transport within watercourses. This action will also monitor changes in hydrological regime in watercourses.

Expected results (quantitative information when possible) (Characters: 1,530/2,000)
It is expected that several of the concrete conservation actions will contribute to a reduction in sediment losses to water, particularly Actions C1, C2, C3, C4 and C6 on project farms and Actions C7, C8 and C9 on project forests. Fluctuations in sediment loading are expected in the early phase of the project, especially where forest harvesting takes place. Thereafter, a gradual reduction in sediment load is expected, which will continue after the end of the project. The expected results from this action are

- Assessment and quantification of the effectiveness of concrete conservation actions to reduce sediment loss to water
- Monitoring the changes in sediment losses from farm and forest sites resulting from concrete conservation actions
- Monitoring the changes in the transport of sediment in watercourses that result from concrete conservation actions
- Close tracking of reductions in siltation of mussel habitat that result from concrete conservation actions
- Identification of the origin and relative importance of sediment sources on farms and forests and other land use types
- Modification of concrete conservation actions, as required
- The development and adaptation of novel methods to monitor sediment losses at source and along pathways
- Annual reports on turbidity monitoring
- Annual reports on redox-potential in juvenile pearl mussel habitats
- Input to the final report and regarding findings on the assessment of the effectiveness of the project actions on the condition of freshwater pearl mussel habitat.

Project deliverable products
Annual reports on redox-potential of juvenile pearl mussel habitat - 31/12/2019
Annual report on turbidity monitoring - 31/12/2019

Project milestones
NA

D4 Water chemistry

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
FS-DAFM, DAFM, SKDP, Teagasc, Coillte

Description (what, how, where and when) (Characters: 2,630/10,000)
What - This action will evaluate the effectiveness of project actions to reduce nutrient losses to water from the project sites. Water chemistry monitoring will also be used to assess nutrient losses during specific operations linked to the implementation of concrete conservation actions, e.g. balanced nutrient budget on farms (Action C5) and the harvesting of conifers (Action C7).

How - Owing to the rapid biological uptake of dissolved nutrients in these relatively nutrient poor systems and because of the dilution likely from other parts of the sub-catchments, it will be difficult to detect changes in nutrient concentrations (even where auto-samplers to be deployed). Consequently, water chemistry monitoring will generally be deployed where the location and scale of the actions are likely to produce detectable changes in nutrient concentrations (such as large clearfells or where significant changes in slurry management occur). Grab sampling will be used and sampling effort will be in response to rainfall and operations, rather than at set time intervals. Effort will be concentrated on sampling rising floods, particularly in late summer and autumn, and after operations such as fertiliser applications. Samples will be taken before and after actions are implemented, and upstream and downstream of the project sites. Routine water chemistry monitoring will also be conducted at a catchment level at least four times each year.

Samples will be sent to an experienced, reputable laboratory capable of analyses to low limits of detection (this is particularly important for nutrients). The parameters analysed will depend on the concrete conservation action being monitored and will include total phosphorus, molybdate reactive phosphorus, total nitrogen, total oxidised nitrogen, ammonia, nitrate, alkalinity, colour and dissolved organic carbon. Sampling will be conducted by the Project Scientific Advisor, with support from the Project Team, DAHG, DAFM-FS Teagasc and Coillte staff, if necessary.

When / Where - Seasonal baseline and routine water chemistry monitoring will be undertaken at permanent monitoring stations in each catchment. Most of the water chemistry monitoring will be targeted spatially and temporally to maximise the chances of detecting a response from the concrete conservation actions.

Monitoring will commence prior to the implementation of concrete conservation actions on project farms and forests. It is expected that 500 samples will be taken over the duration of the project. The Project Scientific Advisor will be responsible for designing a robust water chemistry monitoring programme.

Reason why this action is necessary (Characters: 780/2,000)
Baseline monitoring of water chemistry at a catchment level is required to track any background changes over the lifetime of the project that could otherwise mask a response to project actions. Targeted water chemistry monitoring is necessary to quantity the

effectiveness of nutrient-reducing concrete conservation actions, such as nutrient management on farms (Action C5). This action is necessary to monitor reductions in nutrient losses due to project actions and to record temporary increases in nutrient losses that may occur following the conifer clearfelling required to implement forestry concrete conservation actions, and the application of fertiliser on farms. It will be used to inform adaptation of project concrete conservation actions where necessary and possible.

Expected results (quantitative information when possible) (Characters: 614/2,000)
- Quantification of the effectiveness of nutrient-reducing concrete conservation actions
- Close tracking of nutrient losses to waters associated with fertiliser and slurry applications on farms
- Close tracking of nutrient losses to waters associated with the harvesting of conifers
- Contribution to the assessment of the effectiveness of concrete conservation actions to reduce sediment loss and transport in water (suspended solids monitoring)
- Annual report on water chemistry monitoring
- Input to the final report and project findings, in particular on the assessment of the effectiveness of the project actions

Project deliverable products
Annual report on water chemistry - 31/12/2019

Project milestones
NA

D5 Vegetation monitoring

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
DAFM, FS-DAFM, Teagasc, Coillte, SKDP

Description (what, how, where and when) (Characters: 4,889/10,000)
This action will evaluate the effectiveness of project actions to reduce sediment and nutrient losses to water from project sites by monitoring bare soil and vegetation cover. Standards assessment methods will be used or new methods developed to assess vegetation cover, structure and species composition, as necessary. The action will track the success of vegetation recovery and the reduction of bare soil.

Vegetation Survey: Vegetation surveys will be carried out to record changes in vegetation in and around drains (Action C1), in-field grass buffers strips and hedgerows (Action C3), at alternative drinking water facilities (Action C6), supplementary feeding stations (Action C3) and other areas of the farm, as required. Vegetation surveying will also be used in forests following felling and in buffer zones. Baseline data will be collected prior to the commencement of project concrete conservation actions and quadrats will be resurveyed in Years 3, 4 and 5. It is expected that there will be 100 sampling locations on project farms, 4 per farm and 40 sampling locations on project forest sites, 5 per forest.

Habitat condition assessments: General habitat condition assessments carried out as part of the preparation of the farm management plans will be used as a baseline to monitor the effectiveness of grazing regimes in reducing bare soil and promoting vegetation recovery. Assessments will be repeated each year in order to closely track the changes in habitat condition and vegetation cover. This will facilitate an adaptive management approach regarding livestock grazing regimes (Action C4). Examples of variables to be included are
- percentage bare soil
- percentage *Nardus stricta*

Habitat assessment will be carried out on each of the 25 participating farms covering an area of approximately 2,500 ha.

Biomass: Monitoring changes in vegetation biomass, species composition and/or vegetation structure to track responses to actions in reducing nutrient inputs will be explored.

Natural regeneration: Annual monitoring of natural regeneration of trees and shrubs and the development of ground cover vegetation in long-term retention forests, in native woodland areas, and in continuous cover forest trial sites will be undertaken using standard vegetation survey techniques (e.g. Purser *et al.,* (2012), O'Neill *et al.,* 2011). Browsing pressure will be assessed based on the survival rates of broadleaves, to evaluate the effectiveness of different protection measures, e.g. 'Aborguard' tree-guards, A-frames, brash barriers, and stock-proof fences. Monitoring of natural regeneration will be undertaken at 15 locations.

Aquatic and amphibious vegetation: The cover abundance of aquatic and amphibious vegetation will be assessed in the vicinity of drains that have been altered / dammed (Action

D1). Monitoring will be carried out at 50 locations on project farms and 25 locations in project forests.

Fixed-point photography: Baseline fixed-point photography will be carried out on project sites prior to the commencement of a number of concrete conservation actions, in order to track the changes in vegetation during and following the implementation of actions. It will also be used to provide a record of vegetation condition at a landscape scale. The fixed point photography will be repeated annually for the duration of the project at representative project sites. A camera with a fish-eye lens will be used to track changes in the opening of the forest canopy as part of the implementation of the continuous cover forest trial (Action C8) and beneath ring-barked trees (Action C7). Permanent transects will be established to monitor changes in ground and understory vegetation in relation to opening of the canopy. Fixed point photography monitoring will be carried out at 5 locations within the continuous cover forest trial and on a selection of 5 farms to track changes in habitat condition.

The Project Scientific Advisor, together with the Project Farm Advisor and forest advisor will be responsible for designing a novel and robust vegetation monitoring programme to evaluate the effectiveness of the various project actions that aim to reduce sediment and nutrient loss by promoting vegetation cover. Vegetation monitoring data will be closely scrutinised by the Project Team and used to re-design/redirect actions on project farms and forests, as necessary. Vegetation monitoring will be particularly important to KerryLIFE's adaptive management approach to farm and forest planning.

When - Baseline monitoring data (e.g. habitat mapping and habitat condition assessment) will be carried out as part of survey work during the preparation of farm and forest management plans. Additional vegetation monitoring will commence after the completion of the farm and forest management plans (Actions A2 and A3) and will continue for the duration of the programme until the 31/12/2019

Reason why this action is necessary (Characters: 975/2,000)
Vegetation monitoring will test the effectiveness of the concrete conservation actions at reducing sediment and nutrient losses from farms and forests and will be used to adapt project actions as necessary. Targeted monitoring linked to concrete conservation actions and will be assessed against baseline data. By demonstrating that permanent vegetation cover with diverse structure and species composition has been established, this monitoring will quantify the success of the concrete conservation actions in reducing the risk of exposure and weathering of bare soil. Good vegetation cover enhances the retention of sediment in the catchment and promotes nutrient up-take by vegetation, thereby reducing losses of sediment and nutrient to rivers and consequent negative impacts on the freshwater pearl mussels. The action will also deliver new, rapid vegetation monitoring methods for farms and forests, subject to specific measures adapted for the freshwater pearl mussel.

Expected results (quantitative information when possible) (Characters: 1384/2,000)
- Quantification of the effectiveness of concrete conservation actions to promote vegetation cover and reduce bare soil exposure
- Modification of concrete conservation actions, as required
- Close tracking of changes in vegetation structure and composition on 25 project farms and 10 project forests

- Development of new, rapid vegetation monitoring methods for farms and forest in freshwater pearl mussel catchments
- Use of fixed-point photography to track changes in vegetation structure, composition and soil cover in farms and forests
- Close tracking of changes in habitat condition in fields where grazing and supplementary feeding strategies have been implemented
- Monitoring changes in plant biomass, structure and species composition in fields due to a reduction in nutrient inputs
- Monitoring aquatic and amphibious vegetation in and around drains subject to concrete conservation actions to slow water flow and trap sediment
- Monitoring of tree survival rates in newly-established native woodland
- Monitoring of natural regeneration in long-term retention woodland areas, continuous cover forest trials and native woodland areas
- A report on the efficacy of browsing protection measures for trees
- Input to the final report and project findings, in particular on the assessment of the effectiveness of the project actions in reducing losses of sediment and nutrients to water.

Project deliverable products
A report on the efficacy of browsing protection measures for tress - 31/12/2019

Project milestones
NA

D6 Monitoring the implementation of farm and forest management plans

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 146/500)
Teagasc, FS-DAFM, DAFM, Coillte and SKDP - All beneficiaries will be responsible for the monitoring the implementation of farm and forest actions.

Description (what, how, where and when) (Characters: 4,596/10,000)
What - This action will monitor the completion of tasks required to implement concrete conservation actions on project farms and forests. Each farm and forest management plan will include maps and time-bound tables/Gantt charts detailing the tasks required to implement the agreed concrete conservation actions. Implementation monitoring will include record-keeping by the farmer and forest owner and dedicated site visits by the Project Team. Implementation monitoring will be used to redirect the tasks and actions on farms and forests, as necessary.

How - A rigorous implementation monitoring programme will confirm that tasks have been completed correctly, in a timely fashion and to a high standard. Implementation monitoring will include two distinct elements: (1) monitoring and record keeping by the farmer/forest owner; and (2) monitoring by the Project Team.

1 Implementation monitoring and record keeping by the farmer/forest owner
Farmers and forest-owners will be required, as per farm/forest management plans to carry out inspections of the concrete conservation actions implemented on project farms/forests. This will include inspecting infrastructure, including dams/baffles in drains, fences, newly planted trees and water troughs, to ensure they are functioning properly. It will also include regular checks for vegetation damage, soil erosion and nutrient loss, e.g. at supplementary feeding stations, in-stream buffer strips, new areas of riparian native woodland and slurry spread lands. Farmers/forest owners will be required to respond, where necessary, for example, in carrying out repairs and maintenance works, and informing the Project Team of significant incidents. The farmer/forest owner will keep written records of inspections, repairs and other related actions.

Farmers and private forest owners will receive a small remuneration (€15/hour up to a maximum of €480 per annum) for time spent on implementing, monitoring and record keeping. This will be based on simple time and activity sheets detailing the time spent on inspection of concrete conservation actions and their effectiveness, conducting unscheduled maintenance and repairs and keeping the associated records. It will also include time spent facilitating the implementation of monitoring by the Project Team. Time and activity sheets will be submitted in October of each year and checked against the Project Team's records. Payments will be made under the standard procedures as outlined in the Financial Management procedure (Action F4). Any time that exceeds the €480 limit per year will be a contribution from the participant farmer/private forest owner to the project.

2 Implementation monitoring by the Project Team
The Project Team will monitor the implementation of farm and forest management plans on an ongoing basis on all project sites. This monitoring will be led by the Project Scientific

Advisor and Project Farm Advisor, assisted as required, by the Project Leader, forest advisor, hydrologist and project beneficiary staff. It will confirm that concrete conservation actions have firstly, been implemented, and secondly, implemented to a very high standard. Concrete conservation actions will be inspected during implementation. Dedicated implementation monitoring visits will also be scheduled by the Project Team, to coincide with the completion of important tasks under the farm or forest management plans. Informal, unscheduled visits may also occur from time to time to support implementation monitoring. Implementation monitoring will monitor the tasks required to complete all concrete conservation actions (Actions C1-C9), for example, checking that infrastructure installed is of the correct type, that it is in the correct location and is functioning effectively, ensuring slurry spreading is in line with the nutrient management plan, and that livestock are moved to the correct location in a timely fashion. . It will provide immediate feedback to the Project Team and the participating farmer/forest owners and initiate any necessary adaptive management.

Where - Implementation monitoring of the concrete conservation actions will be carried out on all project farms and forest sites.

When - This monitoring will be conducted from the time that concrete conservation actions commence implementation, following the completion of farm and forest management plans. It is expected that this action will start in the spring of 2015 and will continue for the duration of the programme until 30/09/2019. The frequency and timing of monitoring will be dictated by the actions implemented.

Reason why this action is necessary (Characters: 1,409/2,000)
Implementation monitoring is required to ensure that all tasks agreed and outlined in the farm and forest management plans (Actions A2 and A3) are fully completed and documented, on time, in the locations specified and to a high standard. Regular monitoring is also necessary to ensure that any unforeseen problems encountered are rapidly corrected and to redirect activities as necessary. Without implementation monitoring, the effectiveness of project concrete conservation actions cannot be assessed. Implementation monitoring has the added benefits of ensuring the knowledge and experience of farmers and forest owners is captured fully by the project. It also ensures regular contact between the Project Team and farmer/forest owner, which will foster a close working relationship. Maintaining a continuous line of communication will be very important to ensuring that proposed concrete conservation actions are being implemented properly and that farm and forest management plans are reviewed and adapted as necessary.

It is a central tenet of this project that the knowledge and management skills of the local farmer is a resource of considerable importance, both in terms of implementing and assessing the conservation actions proposed. It is essential that this knowledge and associated skills are incorporated into the project findings, particularly the instruction manuals and best practice guides.

Expected results (quantitative information when possible) (Characters: 602/2,000)
This action will result in
- A system of implementation monitoring to ensure full compliance with the farm and forest management plans
- Records of the completion of tasks necessary for the implementation of project concrete conservation actions
- Records of unforeseen problems, maintenance and repairs

- Review and adaptation of the farm and forest management plans, where necessary
- Documentation of the time involved in the implementation of project concrete conservation actions

Information necessary for the assessment of the efficacy, practicality and cost-efficiency of concrete conservation actions

Project deliverable products

NA

Project milestones

NA

D7 Evaluation of cost-effectiveness of project actions and socio-economic impacts of project

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
SKDP, FS-DAFM, DAFM, Teagasc, Coillte

Description (what, how, where and when) (Characters: 3,869/10,000)
What - This action will carry out an assessment of (1) the cost-effectiveness of each of the concrete conservation actions and (2) an evaluation of the socio-economic impact of the KerryLIFE project in the Caragh and Blackwater catchments.

1. Cost-effectiveness analysis: The cost-effectiveness of concrete conservation actions will be achieved by assessing a) the relative costs (e.g. inputs such as labour and materials) involved in implementing the project actions and b) the environmental outcomes arising from their implementation as demonstrated by monitoring of the freshwater pearl mussel and their habitat e.g. conservation value such as a reduction in sediment and nutrient losses to surface water and freshwater pearl mussel habitat. The costs of implementing the project actions will be collected on an ongoing basis by the Project Team as part of routine financial management and project participants will be required to keep a log of the time spent in implementing each of the various actions to account for labour. The effectiveness of the concrete conservation actions will be assessed using the diverse range of monitoring methods outlined in Actions D1 to D6. Together these datasets will form the basis of the cost-effectiveness analysis.

In addition, a key aspect of this task will be to assess the attitudes of project participants toward the project actions, especially the concrete conservation actions implemented on their farms and forests, e.g. the practicality and economic implications of new land-use practises, and the social impacts with respect to future land management. Attitudinal surveys will be undertaken to assess changes in project participants and other stakeholders at the beginning of the project and toward the end of the project. The cost-effectiveness and the attitudinal surveys will be sub-contracted to a socio-economic analyst, who will be responsible for designing and analysing the data generated.

2. Socio-economic study: A study into the socio-economic impacts of the KerryLIFE project on the Caragh and Blackwater catchments will be carried out to quantify the benefits of the project to the local community. This assessment will integrate the findings of the cost-effectiveness analysis and will evaluate other benefits such as ecosystem services e.g. clean water supplies, added-value initiatives such as the branding of local produce and tourism opportunities. The study will use a survey-based valuation technique (choice experiment approach) to estimate the value of the positive externalities generated by the project. This evaluation will employ a suite of non-market valuation techniques including non-monetary valuation methods (revealed and stated preference approaches), and environmental economic techniques based on monetary metrics. This action will document the socio-economic profile of the local community htrough attitudinal surveys (towards inter alia nature conservation, awareness and acceptance of the benefits of the Natura 2000 network and the KerryLIFE project) to facilitate an assessment of the socio-economic impacts at catchment level.

How/who – The integration of this work into an assessment of the socio-economic impact of the project actions will be overseen by the Project Team Leader. The assessment of attitudinal change in participants' toward the sustainable management of this Natura 2000 site will take place in Year 1 and Year 5 through the use of structured questionnaires and stakeholder surveys. External assistance will be used to design the survey methodology and evaluate the data, whilst the Project Team, SKDP and Teagasc will collate data with input from farm/forest owners.

When - Information gathered under this action will be informed by conservation actions. This action will commence in 2015 and will continue for the duration of the programme until 31/12/2019.

Reason why this action is necessary (Characters: 1,427/2,000)
This survey will be necessary to assess the impact and effectiveness of the actions undertaken from a socioeconomic perspective, particularly in terms of input costs, and outputs. This will be critically important in determining the degree to which these actions will be undertaken by other farmers and forest owners in the region and elsewhere in Ireland, and what costs are involved in the wider application of these systems into the future. It will also allow for the monitoring of project results and allow comparison with initial objectives and expected results. As with most industries, agriculture and forestry are driven primarily by economic realities specific to these sectors. However, livelihoods are also increasingly affected by the off-farm economy. With the growing number of part-time farmers in Ireland, the socio-economic implications of conventional and novel farming systems are under even greater scrutiny by farmers eager to develop more labour-efficient, profitable systems. The provision of high quality information such as that which will be generated through this action will be of major interest to participating farmers, but also those in the wider Caragh and Blackwater communities. This will contribute towards assessing the cost-effectiveness of the successful measures implemented in KerryLIFE, and subsequently, will be an important factor in encouraging farmer and forest-owner participation.

Expected results (quantitative information when possible) (Characters: 191/2,000)
This action is expected to produce two reports
- A report on the cost-effectiveness of project actions, and
- A report on the socio-economic impact of the KerryLIFE project to the project area.

Project deliverable products
Report on socio-economic impact of project - 31/12/2019
Report on cost-effectiveness of project actions - 31/12/2019

Project milestones
NA

D8 Evaluation of the impacts of project actions on ecosystem functions

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 31/500)
FS-DAFM, DAFM, Teagasc, Coillte

Description (what, how, where and when) (Characters: 2,863/10,000)
What - This action will carry out an assessment of the impacts of concrete conservation actions on the ecosystem functions in the Caragh and Blackwater river catchments arising from the KerryLIFE project.

How - The action will be achieved by consolidating the data and results over the lifetime of the project, in particular those gathered under the monitoring actions D1-D6. The multidisciplinary monitoring programme will ensure a comprehensive assessment of the impacts of project actions on ecosystem functions in the Caragh and Blackwater catchments. Information on the following aspects of the aquatic ecosystem will be key in this assessment

- Freshwater pearl mussel population data (e.g. transect data, juvenile monitoring and distribution surveys - Action D1) and freshwater pearl mussel habitat condition data (e.g. filamentous algae, macrophytes, macroinvertebrates, and phytobenthos - Action D2 and redox-potential - Action D3) will provide critical information on the functioning of the river ecosystem. Freshwater pearl mussels are considered to be a keystone and indicator species of oligotrophic river ecosystems such as the Caragh and Blackwater rivers.

- Sediment and flow monitoring (Action D3) will be used to assess the impact of the project actions on addressing levels of sediment and hydrological change, and on the ecological functioning of the aquatic systems.

- Water chemistry monitoring (Action D4) will assess nutrient levels and will be used in conjunction with the biological monitoring to assess the impact of project actions on the ecological functioning of the aquatic system.

- Fisheries data from Inland Fisheries Ireland, and biological and physico-chemical data from the Environmental Protection Agency and Kerry County Council will be incorporated into the assessment of the impact of project actions on the ecological function of the aquatic ecosystems.

In addition, the impact of the project actions on the condition of the habitats present on farms and forests will be monitored through vegetation monitoring (Action D5) and through implementation monitoring of project actions (Action D6). DAHG will provide expertise on biodiversity in the wider, non-aquatic ecosystem for this study. This will provide information on the overall ecosystem functions of the terrestrial habitats on farms and forests which are expected to benefit indirectly through the implementation of project actions.

The integration of this work into an assessment of the impacts of the project actions will be carried out by the Project Scientific Officer and the Project Farm Advisor.

Where - This assessment will address the impacts of project actions ecosystem functions in both the Caragh and Blackwater freshwater pearl mussel catchments.

When - This action will commence in 2015 and will continue for the duration of the programme until 31/09/2019.

Reason why this action is necessary (Characters: 539/2,000)
As well as being a required output for a LIFE+ project, the assessment of the KerryLIFE project on the ecosystem function will ensure a comprehensive evaluation of the project objectives and project actions on the project area as a whole. It will also provide information on the indirect benefits to other species and habitats not targeted directly by the project actions. This study will also make an important contribution to the wider understanding of ecosystem goods and services as required under Ireland's National Biodiversity Plan.

Expected results (quantitative information when possible) (Characters: 211/2,000)
This action is expected to produce a report on the impact of the KerryLIFE project actions on the ecosystem functions in the Caragh and Blackwater catchments. This report will be delivered with the Final Report.

Project deliverable products
Report on impact project actions on the ecosystem functions - 31/12/2019

Project milestones
NA

E1 Project launch, public meeting and events

Beneficiary responsible for implementation: (Characters: 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters: 132/500)
SKDP, DAFM, FS, Teagasc, Coillte. All beneficiaries will play an active role in the organisation and promotion of the public events.

Description (what, how, where and when) (Characters: 3,032/10,000)
What /Where - The KerryLIFE project will be officially launched to coincide with the opening of the Project Office and the launch of the project website. The launch will be held in the project area or at a suitable nearby venue. A schools competition to design a project logo will be run to coincide with the project launch.

Two public meetings will be held to raise awareness of the project amongst stakeholders and the wider community (local farming and forestry organisations, community groups, etc.). One meeting will be held in each of the two catchments which will provide background information about the project, its vision and objectives. These meetings will introduce the freshwater pearl mussel, its ecology, life cycle, threats and conservation significance at a national and international level. The Project Team and representatives of the project beneficiaries will also be introduced to the community. Farmers, forest-owners, local community groups, forestry and farm organisations will be invited and it is envisaged that these meetings will provide an opportunity to encourage stakeholders to participate directly in the project. Public meetings will be held annually to update the local community on the project progress.

An annual community celebration event will be held, bringing together farmers, forest-owners, conservationists, local interest groups and others within the Caragh and Blackwater communities to celebrate the project, the life cycle of the freshwater pearl mussel, and farming and forestry. In particular, the emphasis regarding the annual event will be to encourage as many local people living in the Caragh and Blackwater catchments to attend. The annual celebration will be held to coincide with an existing and popular traditional cattle fair held in June each year. This fair is well attended, especially as local farmers show their pedigree cattle and sheep. The project will dovetail with this event in order to highlight the freshwater pearl mussel and the KerryLIFE project. In addition, a challenge Gaelic football match between local players in both catchments will be one of the key events. This annual celebration will embrace numerous strands of the unique culture of the area.

All of these public events will aim to increase public awareness of the project and to promote the crucial role played by the European Union in funding conservation projects that benefit local communities.

How - The Project Team will be responsible for the organisation of the project launch and public meetings, with support from all project beneficiaries. The Project Team will work closely with the local community in promoting and organising the annual celebration event.

When - The project launch and initial public meetings will be held within the first six months of the project, following the appointment of the Project Team (Action A1). Information meetings will be held annually to update the community on progress. The annual celebration

event will be held in the summer (June) from 2015 to 2019.

Reason why this action is necessary (Characters: 1,199/2,000)
Unlike many other rare or threatened species, the freshwater pearl mussel generally goes unnoticed amongst the general public, locally and indeed nationally. The freshwater pearl mussel's sedentary behaviour and instream lifecycle means it is rarely seen or discussed. As a result, considerable effort is required to raise awareness of the species, its ongoing decline and its conservation requirements.

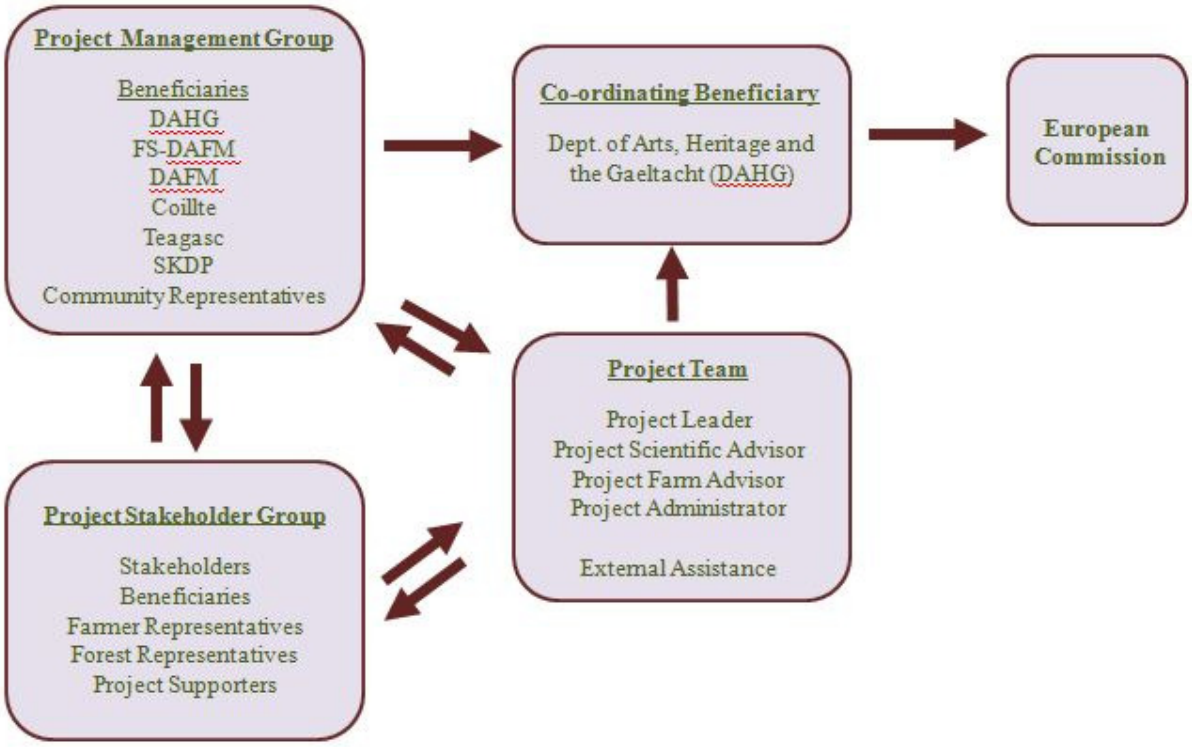
This action underpins the project's key aims of enhancing awareness of the freshwater pearl mussel and encouraging engagement of all the key stakeholders with the conservation of its habitat in the Caragh and Blackwater catchments. It will be important in achieving 'buy-in' locally and fostering a partnership approach to the project. The annual celebration event will promote a sense of community pride and local identity, linked to the freshwater pearl mussel. In terms of the local economy, this event will be a significant tourist attraction that will be widely promoted throughout the region. The official launch of the project and annual celebration events will also provide opportunities to promote the project locally, regionally and nationally, through the media campaign (Action E3).

Expected results (quantitative information when possible) (Characters: 343/2,000)
- The official launch of KerryLIFE project
- The official opening of the Project Office (Action A1)
- The official launch of the KerryLIFE website
- Two public meetings in the first six months of the project,
- 12 public meetings / information evenings in 2015-2019 and
- An annual celebration event held in summer each year between 2015 and 2019.

Project deliverable products
NA

Project milestones
NA

KerryLIFE management structure



E2 KerryLIFE website

Beneficiary responsible for implementation: (Characters: 4/500)
SKDP

Responsibilities in case several beneficiaries are implicated: (Characters: 32/500)
DAHG, DAFM, FS, Teagasc, Coillte

Description (what, how, where and when) (Characters: 2,888/10,000)
What - A dedicated KerryLIFE project website will be developed to provide a dissemination platform for the project. The website will illustrate the unique ecology of the freshwater pearl mussel, its habitat requirements in the Caragh and Blackwater catchments and the role that the farming and forestry communities play in its conservation. It will also explain the project objectives, its structure and project plan, i.e. 'the what, where and how' of what is to be achieved. The website will be used to disseminate information on the progress and final results of all project actions. The project website will have targeted content for key stakeholders, including an interactive schools educational element. A news bulletin board will be hosted on the website to advertise local events and to generate discussion on issues of interest to the local communities.

A summary of the project, including the name and contact information of the Co-ordinating and Associated Beneficiaries, will be posted on the KerryLIFE website and made available to the general public (Art. 13.7 of the Common Provisions).

A links page will be included in the website regarding freshwater pearl mussel conservation and other relevant projects throughout Europe.

How - The design, presentation and layout of the website will be sub-contracted to a specialised web designer in order to ensure that a professional and engaging site is developed. The LIFE logo will be prominently displayed on the website. The Project Team, with support from the project beneficiaries, will provide the initial website content. Once established the Project Administrator will be responsible for generating appropriate content and co-ordinating contributions from other Project Team members for addition to the website.

Updating the site will be carried out on a monthly basis and will include project updates, project publications, current images and a listing of upcoming project events. This information will be archived on the website over the course of the project. Social networking, e.g. Facebook, Twitter and You Tube, will be used to increase its accessibility and profile. In order to generate project outreach, the website will include an interactive section, where members of the general public can ask questions, post comments and highlight concerns about the project. These will be addressed by the Project Administrator on a monthly basis, subsequent to input from other Project Team members. The volume of hits to the website will be monitored and a proactive approach taken to increase accessibility over the life of the project, including through links with the project partners websites.

When - The project website will be operational by 31/12/2014 and will be maintained during the lifetime of the project. Following the completion of the project, the website will be hosted by the Co-ordinating Beneficiary (DAHG).

Reason why this action is necessary (Characters: 434/2,000)

A website is a simple, effective and accessible communication medium for distributing and accessing information. It is the perfect tool for raising awareness of the project and disseminating results to local, regional and international audiences.
The website will:
- offer easy access to a large volume of continually updated information
- ensure that this information is presented very professionally, with a strong interactive element.

Expected results (quantitative information when possible) (Characters: 81/2,000)
A well-designed, informative and interactive website that is regularly updated

Project deliverable products
NA

Project milestones
NA

E3 Media campaign

Beneficiary responsible for implementation: (Characters: 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters: 37/500)
SKDP, DAFM, FS-DAFM, Coillte, Teagasc

Description (what, how, where and when) (Characters: 8,155/10,000)
What - To improve public awareness of the project and to disseminate results, a range of media events will be organised throughout the lifetime of the project. Press releases for the media campaign will focus on, and include, *inter alia*:
- The importance of the freshwater pearl mussel in the Caragh and Blackwater catchments in a regional, national and international context
- The significance of the biodiversity of the Caragh and Blackwater catchments
- The critical role played by the farming and forestry communities in developing and maintaining the freshwater pearl mussels and biodiversity
- The changing nature of farming and forestry in the Caragh and Blackwater and the need to test and evaluate land management techniques in order to define optimal management practices to sustain the freshwater pearl mussel and the livelihoods of the community
- The development and implementation of ongoing support mechanisms to sustain the freshwater pearl mussel, biodiversity and the project objectives after project completion, and its relevance to the wider public in Irish society
- General interest articles on the built and natural heritage of the project area.

How - Media organisations will be invited to attend the project launch, public meetings, annual community celebration events, demonstration days, training workshops, conferences etc. A dedicated media pack will be circulated in advance of all these events. This campaign will target all areas of the media, i.e. television, radio, the internet, social media, newspapers, magazines, etc., at local, national and international levels, as appropriate.

The KerryLIFE project media campaign will be headed by the Project Team Leader, with the strong support of the South Kerry Development Partnership Ltd., which already has a significant media profile in the region. All Project Team members will contribute to the media campaign on an ongoing basis, providing technical, scientific, farming and forestry input for press releases, project communications, demonstration events and training workshops.

A full database of relevant media contacts will be compiled by the Project Team and will be used throughout the project to run a pro-active media campaign. A particular emphasis will be placed on local and national media groups with an established track record regarding environmental issues.

All KerryLIFE Beneficiaries have extensive experience and established networks in relation to the national and regional media. The Project Team will also collaborate closely with BurrenLIFE/Burren Farming for Conservation and AranLIFE (LIFE12/NAT/IE/995) teams at the outset to learn from their experiences.

The national media generally carries nationally-significant news stories and the Irish-speaking media outlets tend to take a particular interest in Irish and west of Ireland-based

events. The KerryLIFE project will be a nationally significant project of particular importance to small farmers and forest owners throughout Ireland. News items released through Government channels and/or with political attendance/support will usually be picked up by these national outlets

- English-speaking television, i.e. RTE1, RTE2, TV3
- Irish-speaking television, i.e. TG4
- English-speaking radio, i.e. Radio 1, 2FM, Today FM, Newstalk 106FM
- Irish-speaking television, i.e. Radio na Gaeltachta
- print media, i.e. Irish Times, Irish Independent, Irish Examiner, tabloids, etc.

There are also "particular interest" media outlets that will be targeted by KerryLIFE

- general interest national television programme Nationwide,
- agricultural national television programme Ear to the Ground,
- forestry and agriculture trade magazines, e.g. Irish Farmers Journal, etc.

Regional media can consist of

- English-speaking radio, i.e. Radio Kerry
- print media, i.e. The Kerryman, Kerry's Eye, Munster Express (to some extent)

The regional media cover news items in the south western region of Ireland, have a particular interest in Kerry-based news and general interest stories, and would have sections dealing with area-specific stories in each publication. These would be the main focus for the Project Team and a project of this importance would be of high interest to these media outlets. The South Kerry Development Partnership has a strong network here and will be ideally located to provide introductions to the Project Team and ongoing support with regional media.

Three broad phases are envisaged to the media campaign

1) If the application is successful, the Minister for Arts, Heritage and the Gaeltacht jointly with the Minister for Agriculture, Food and the Marine will issue a press release welcoming this important project with the full support of the European Union. It is expected this will be picked up by the national media outlets. Regional media are expected to cover the story extensively and interviews for the regional media are expected. This will serve to announce the project and provide a general introduction to the issues and how the help of the European Union was secured to resolve them, in collaboration with local stakeholders and communities.

2) Once the Project Team is in place, the media campaign will function at both a regional and national level, supported by the South Kerry Development Partnership. Since media interest generally functions around key anchor points, these will be comprehensively mapped out at the outset by the Beneficiaries and the Project Team; those identified to date include the following

- Official launch of the project in Kerry to be attended by Government Minister(s), local parliamentary representatives (TDs), local councillors, and community and stakeholder representatives. This will attract local, regional and national media interest
- A project logo competition will be undertaken amongst schools which will provide an opportunity to drive media interest locally and regionally
- The opening of the Project Office and introduction of the Project Team will be a key event primarily for the local media and will provide the first real opportunity to move to a more detailed level of information
- Announcement of public meetings, demonstration events, training days, etc.

- The annual Gaelic football challenge match to be instigated by the project for the "Pearl Cup" (Action E1), and the associated local festival, are expected to generate regional and national interest and provide a key opportunity to raise awareness
- Time has been factored in for each of the individuals in the Project Team to draft general interest articles concerning KerryLIFE, the conservation issues and its findings for regional and sectoral interest media outlets
- Action E4 will be the key anchor point for regional and national media engagement; however, many of the other E actions are expected to drive media interest regionally or nationally

3) KerryLIFE will need to serve as a stepping stone to lasting achievements. The media campaign will need to finish strongly not only in terms of disseminating the results to all stakeholders but in signposting, to some extent, the way forward for the successful elements of KerryLIFE into the AfterLIFE phase, i.e. mapping out the inheritance of the project. The details of this phase will to a large extent be determined by the findings of the project.

The proposed media campaign will also include:
- A pro-active, engaging project website using social media e.g. Facebook, Twitter, You Tube etc. (Action E2)
- Advertising planned public events in the local media, e.g. schools education programme, public meetings, annual celebration event, demonstration days and training workshops
- Dissemination of interim and final project findings through the publication of information pamphlets and best practice guides (Action E8)

Where - Media events will take place primarily within the Caragh and Blackwater catchments, however, the KerryLIFE media campaign will aim to maximise the reach of the project nationally and internationally using the project website and associated social media sites.

When - This action will start at the beginning of the project, 01/07/2014 and continue throughout the lifetime of the project until the 31/12/2019.

Reason why this action is necessary (Characters: 1,265/2,000)
The freshwater pearl mussel is a low-profile species that does not attract a great deal of public attention. Therefore considerable effort is required to raise awareness of the species and its conservation requirements. Building local awareness from the outset of KerryLIFE is very important in promoting widespread recognition of the importance and critical status of the freshwater pearl mussel. It is also important to widely publicise the project to national and international audiences, as the project design, objectives and results will be of considerable interest to stakeholders locally, elsewhere in Ireland and abroad. The KerryLIFE media campaign underpins one of the projects key aims which is to enhance awareness of the freshwater pearl mussel. This action will be important in getting 'buy-in' locally to focus on the freshwater pearl mussel, through increasing awareness of its ecology and habitat. A well run media campaign that raises awareness of the freshwater pearl mussel and promotes the project, its objectives, actions and results. This is vital in ensuring the restoration of the species to a favourable conservation condition and to fostering a caring attitude towards the environment and the conservation of threatened species generally.

Expected results (quantitative information when possible) (Characters: 1,093/2,000)

It is expected that a proactive media campaign will deliver
- An improvement in the awareness of key stakeholders of the importance of the Caragh and Blackwater freshwater pearl mussel populations at a regional, national and international scale
- A greater awareness and understanding of the ecology, habitat requirements and conservation problems and threats contributing to the decline of the freshwater pearl mussel
- Highlighting the critical role farmers and forest-owners have in maintaining and restoring the freshwater pearl mussel
- Recognition of the additional environmental benefits, e.g. enhanced biodiversity, protection of water quality, that will be delivered through the project
- Promoting the benefits of the Natura 2000 network
- Promoting the value of conservation projects to Irish society
- The creation of a database of relevant media contacts
- Press releases and dedicated media packs
- Publicity of project events, e.g. project launch, public meetings, public events, schools educational programme, training workshops, etc.
- Dissemination of project results and findings.

Project deliverable products
NA

Project milestones
NA

E4 Added value, product branding and tourism

Beneficiary responsible for implementation: (Characters 4/500)
SKDP

Responsibilities in case several beneficiaries are implicated: (Characters: 37/500)
DAHG, DAFM, FS-DAFM, Teagasc, Coillte

Description (what, how, where and when) (Characters: 5,124/10,000)
What / How - The future of farming in marginal agricultural areas such as in the Caragh and Blackwater catchments is dependent on building linkages between the tourism and farm sectors. Farming for conservation offers a range of new opportunities to the people who live and work in the Caragh and Blackwater. The KerryLIFE project will support and develop a number of initiatives that are complementary to the conservation of the freshwater pearl mussel, which will contribute to supporting the livelihood of future generations in the project area. These include

1. Development of a farm produce brand
2. Establishment of a consumer-supplier network
3. Provision of a walking trail, and
4. Developing farm-based tourism enterprises

1. Development of a farm produce brand (eco-label): With a view to diversifying and supplementing farm income, the KerryLIFE project will develop a conservation grade farm produce brand. This brand would apply to traditional breeds of cattle (e.g. Kerry Blue, Droimfhionn, Aberdeen Angus, Galloway and Shorthorns) and sheep which are farmed in a sustainable way as outlined and agreed in the farm management plans (Action A2). The smaller breeds of cattle are more suited to the challenging terrain of the Caragh and Blackwater, and reduce the risk of sediment and nutrient losses from farming enterprises. KerryLIFE and SKDP will work in close partnership with Caragh and Blackwater farmers to develop a conservation grade brand for sustainably produced beef and lamb products on participating farms. SKDP will lead this initiative, drawing on their past experience with the Ring of Kerry Lamb Quality Society. As part of the brand development, 1 to 2 animals per year from 5 farms will be monitored prior to being slaughtered. Daily weight gain, final weight and carcass weight will all be recorded in order to determine 'value of beef' produced. This information will be used to calculate the margin to the farmer relative to the inputs required e.g. (feed ration etc.). This information will have been collated under Action D6. KerryLIFE and SKDP will support and mentor the farmers in the added value stages of processing, packaging, marketing and produce retailing the in order to increase farm incomes. A taste preference study will also be carried out as part of the brand development. Links to the existing Ring of Kerry Quality Lamb Marketing Group will be used to maximise efficiencies.

2. Directory of local businesses: The KerryLIFE project will assist in establishing a network of producers and consumers through co-operative principals, which will support the primary economies of the Caragh and Blackwater catchments. The network will also support small scale producers in securing outlets for produce and other goods/services (e.g. marketing and stocking of local farm produce in the area's restaurants, guest houses and shops) by providing a directory of local businesses in the area. The Project Office will be used as a centre to facilitate this initiative. The Project Team will provide access to marketing advice and support entrepreneurs to establish new ventures.

3. KerryLIFE walking trail: The Recreation Officer in South Kerry Development Partnership (SKDP), together with the Project Team will develop a 'KerryLIFE' walking trail within the project area. This new walkway will link into the existing Kerry Way, which is Irelands longest (>200 km) and most popular walking trail. The new walking trail will pass through the project area covering a variety of terrain and will be 8-10 km in length. The KerryLIFE project will provide the necessary infrastructure to establish the walking trail, including the provision of stiles (structures which provide people a passage over a fence or boundary via steps, ladders or narrow gaps) and way-markers. Signage will be strategically placed to promote the freshwater pearl mussel and the KerryLIFE project along the trail. The maintenance of the walking trail will be managed during and following the end of the project by the SKDP / Kerry Way Programme.

4. Farm-based tourism infrastructure: The Caragh and Blackwater catchments are amongst the most scenic parts of Ireland, with a rich cultural heritage. A small amount of start-up capital will be provided to support farm-based tourism infrastructure.

When - The product branding development and marketing will commence in the first six months of the project and will continue throughout the project until 31/12/2019. The consumer-supplier network will be established in spring 2015 and will continue for the rest of the project. The KerryLIFE walking trail will be established in 2015 and will be maintained annually. Farm-based tourism initiatives such as scenic photography vantage points and heritage features will be developed from 2015 onwards. Notice boards for the local community and visitors to the project area will be erected at strategic locations to promote the freshwater pearl mussel and its ecology, the Kerry Pearl Mussel LIFE+ project, and the natural and cultural heritage of the area in spring 2015. The EU LIFE logo will be displayed on all notice boards.

Reason why this action is necessary (Characters: 982/2,000)
It is envisaged that this action will positively impact on farm and forest enterprises within the project area and the broader Iveragh region by supporting a more sustainable future system of agriculture in these catchments. If new markets for products (e.g. traditional beef and mountain lamb) can be sourced locally, nationally or internationally, this may present the opportunity for farmers to return to more environmentally sustainable extensive traditionally-based systems, and provide some Caragh and Kerry Blackwater farmers with the boost they need to continue farming into the future. Such initiatives would also be very valuable to remind the public of the importance of farming for nature conservation, and allow people to support farming through product purchase. The relevance of this action beyond the project lifetime will be to inform future branding and marketing initiatives in the region. It will also contribute to making local farm enterprises more economical.

Expected results (quantitative information when possible) (Characters: 535/2,000)
- Development and marketing of a conservation grade beef and/or lamb product
- Establishment of a KerryLIFE walking trail
- The establishment of a local consumer - supplier network
- Erection of notice boards at key locations within the project area.
- Establishment of farm-based tourism infrastructure, e.g. archaeological features, signage and viewing points
- Contribute to the diversification of the rural economy using natural resources

- Contribute to the creation of non-farm jobs in areas of food processing, packaging and marketing

Project deliverable products
NA

Project milestones

NA

E5 KerryLIFE demonstration farm and forest project sites

Beneficiary responsible for implementation: (Characters 7/500)
Teagasc

Responsibilities in case several beneficiaries are implicated: (Characters 199/500)
Coillte will be the responsible beneficiary for the demonstration sites on their lands. All beneficiaries - DAHG, FS-DAFM, DAFM and SKDP will play an active role in establishing demonstration sites.

Description (what, how, where and when) (Characters: 3,395/10,000)
What/Where - It is planned to establish four demonstration sites, i.e. two farms (one each in the Caragh and Blackwater catchments) and two forests (one privately-owned and one publically owned). These sites will be used to demonstrate the project actions and management practices required to conserve the freshwater pearl mussel. The demonstration farms will be selected from the project area based on their conservation status and significance, as well as the willingness of the owner to participate. The farms that best meet the criteria in each catchment will be nominated as demonstration site. Demonstration activities on nominated farms will be targeted at farmers in each catchment, as well as inter-catchment involvement.

On-farm demonstration events will focus on describing conservation-based agricultural practices that have been developed and implemented throughout the project. In particular demonstration events will highlight issues pertaining to a number of the conservation actions in this proposal, in particular focusing on matters relating to drain management techniques (Action C1), demonstrating the potential of native woodland in stabilising riverbanks (Action C2), developing optimal in-field grass buffer and hedgerow management (Action C3), reducing sources of sediment through developing sustainable grazing and livestock management strategies (Action C4), introduction of balanced nutrient management techniques on farms (Action C5) and demonstrating and developing alternative drinking water facilities (Actions C6).

Forest demonstration sites will focus on the challenges of managing existing forest using novel harvesting techniques and demonstrating methods for restructuring forest into protective long-term retention woodlands and continuous cover forestry.

Demonstration days will target farmers, forest-owners, forest contractors, scientists, regulators and interested individuals. Demonstration sites will be used in the delivery of ten training workshops (Action E6), ten demonstration events (Action E6), and ten school educational visits (Action E7).

The farm demonstration sites will be incorporated into the Teagasc Better farm scheme and will be continued to be used after the KerryLIFE project. In addition, the walkway (Action E4) is expected to pass through some of the demonstration farms and/or forest sites, which will afford the general public the opportunity to observe first hand, the practical conservation actions that are being implemented as part of the KerryLIFE project. Notice boards/signage will be erected at each demonstration site to describe the concrete conservation action. All notice boards will include the LIFE logo.

How - The Project Team together with Teagasc, Coillte and SKDP will identify demonstration sites within the project area. They will be selected to maximise the number and type of concrete conservation measures being demonstrated as well as the willingness of the owner to participate. The farmer and forest-owners that best meet these criteria will be nominated as demonstration sites. Payments will be made to farmers and forest owners for each event that are hosted on the demonstration sites.

When - These demonstration farms and forests will be selected by 30/09/2015 with measures in place by 30/06/2016. The KerryLIFE demonstration sites will be used throughout the lifetime of the project until 31/12/2019.

Reason why this action is necessary (Characters: 1,538/2,000)
Land management advice given to farmers to-date has been largely based on research generated elsewhere for productive, intensively managed parts of Ireland, i.e. the south-east region, which is of very limited relevance to the famers of the Caragh and Blackwater catchments. It is vital that well-informed practical mitigation measures on the most appropriate forms of land management for the conservation and protection of the freshwater pearl mussel are demonstrated effectively. This project will help address this shortcoming by providing practical, locally generated land management information on-site, to people involved in farming and forestry in these catchments. Demonstrating specific management practices on a farm and in a forest is the best way of convincing farmers and forest managers of their vital role in freshwater pearl mussel sustainability. The demonstration sites will allow farmers and forest-owners to see freshwater pearl mussel conservation management in a real-time, local farm and forest context.

Demonstration farm and forest sites will also:
- provide an excellent location for training courses and workshops (Action E7)
- promote conservation management locally in a manner that is well-established, relevant and familiar to local farmers (Action E7)
- encourage discussion on relevant issues, such as the practicality and costs of implementing measures, thus enhancing the relevance and acceptability of these actions elsewhere in other freshwater pearl mussel catchments
- host school children's field visits

Expected results (quantitative information when possible) (Characters: 496/2,000)
- The setting up of two KerryLIFE demonstration farms
- The setting up of two KerryLIFE demonstration forest sites
- The hosting of ten training workshops and ten demonstration days / events for farmers, forest-owners, forest contractors, scientists, regulators and interested individuals (Action E6)
- The hosting of ten school educational trips to project farms and forests (Actions E7)
- The erection of information notice boards at each demonstration site
- The hosting of media events (Action E3)

Project deliverable products
NA

Project milestones
NA

E6 Training workshops and demonstration events

Beneficiary responsible for implementation: (Characters 7/500)
Teagasc

Responsibilities in case several beneficiaries are implicated: (Characters 34/500)
DAHG, DAFM, FS-DAFM, Coillte, SKDP

Description (what, how, where and when) (Characters: 3,451/10,000)
What – Action E5 will identify one main demonstration farm in the Caragh and Blackwater catchments each and two demonstration forests (one privately-owned and one publically-owned) for use throughout the project. The demonstration farms and forests will be selected from project areas based on their conservation status and significance, as well as the willingness of the owner to participate. The farms that best meet the criteria in each catchment will be nominated as the demonstration site for that catchment.

The on-farm demonstration events will focus on describing the conservation-based agricultural practices that have been developed and implemented throughout the project. The events will be organised in close conjunction with the farmers involved, and will enlist the help of the Project Beneficiaries. At these events, the host farmers will play a key role in explaining how the different project actions have affected them, what they found of most benefit, how practical they thought each action was and possible suggestions as to how actions could be improved.

Forest demonstration sites will focus on the challenges of managing existing forest using novel harvesting techniques and demonstrating methods for restructuring forest into protective long-term retention woodlands and continuous cover forestry.

Ten training workshops and ten demonstration days will be held throughout the project duration. These events will be delivered to three main target audiences, (i) farmers and forest-owners, (ii) relevant practitioners, e.g. farm advisors, foresters (including contractors), and (iii) scientists, regulators and project beneficiaries. The training workshops and demonstration events will target local stakeholders. In addition, stakeholders from other fresh pearl mussel catchments throughout Ireland will be invited to attend these events.

A range of themes and management practices will be covered, e.g. knowledge-transfer to stakeholders about pearl mussels and how land use impacts the species, demonstrating the practical implementation of concrete conservation actions and assessing their efficacy in reducing sediment and/or nutrients. Social and economic impacts of the KerryLIFE project, especially the socio-economics of farming and forestry practices and their contribution to the regional economy, the cost-effectiveness of conservation actions, tourism opportunities and product brand development marketing will also be addressed. Demonstration days will be more informal events and will encourage peer learning between farmers and via farm walks and talks.

All demonstration events will feature appropriate signposting containing the LIFE logo and that of the Natura 2000 network.

How / Where - The Project Team will develop and deliver the training workshops in conjunction with project beneficiaries. The Project Team will enlist the technical input of

farming, forestry and conservation experts and regulators in developing training workshops. Training workshops hosted in the project area will consist of seminars, discussion groups and field excursions around the project area and to demonstration farms and forests (Action E5).

When - Demonstration days and training events will take place during different times of the year so that best management practices can be demonstrated in situ. Training workshops will commence in the spring 2015 and will continue to be run until the final year of the project - 30/09/2019.

Reason why this action is necessary (Characters: 1,644/2,000)
The best way to convince local farmers and forest-owners as to the efficacy of proposed conservation measures is to demonstrate them in a real-time, local farm or forest context. These demonstration days and training workshops will be vital to promote conservation management in a format that that is well established, relevant and familiar to the stakeholders.

An important objective of KerryLIFE is to demonstrate best practice to key stakeholders and land users. This will be achieved by providing demonstration days and sector-specific training workshops. This addresses the need for suitably designed training workshops on the application of best practise for the conservation of freshwater pearl mussels.

Training will facilitate an improved understanding of the pressures arising from land use activities on water quality and the freshwater pearl mussel. It is also necessary to disseminate the conservation measures, skills and experience gained during this project. Training will also promote robust conservation management locally in a manner that is well-established, relevant and familiar to local farmers and forest-owners. It will encourage discussion/exchange of ideas on relevant issues, such as the practicality of implementing measures, thus enhancing the relevance and acceptability of these actions for wider use in other freshwater pearl mussel catchments. This action will also foster a co-operative approach amongst all land users and stakeholders in the long-term management of the catchment to improve and restore the Caragh and Blackwater freshwater pearl mussel population and habitat to favourable conservation status.

Expected results (quantitative information when possible) (Characters: 134/2,000)
- The development of sectoral-specific training workshops
- Running of ten training workshop events
- Running of ten demonstration days

Project deliverable products
Four annual reports on workshops and demonstration events (2015-2019) - 31/12/2019

Project milestones
NA

E7 School educational programme

Beneficiary responsible for implementation: (Characters 4/500)
SKDP

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
DAHG, DAFM, FS-DAFM, Teagasc, Coillte

Description (what, how, where and when) (Characters: 1,499/10,000)
What / Where - A tailored schools educational programme will be developed and rolled out to all national and secondary school pupils from the Caragh and Blackwater catchments. This action provides an excellent opportunity to deliver a programme of interesting, engaging, multidimensional educational events to schoolchildren. Topics addressed will focus on ecology, life cycle, habitat requirements and conservation threats to freshwater pearl mussel. In addition, it will encompass broader environmental topics, such as biodiversity and water quality.

How - The school educational programme will be developed by the Project Team and will be delivered through a combination of classroom activities and field visits. The programme for younger pupils (five to 12 years) will include a series of games (e.g. treasure hunts, puzzles, etc.) and other fun and age-appropriate learning methods. The programme for secondary school pupils will include a strong emphasis on the importance of conservation.

During the early stage of the project, the Project Team will run a competition for school children of all ages to design a project logo. Prizes will be awarded to the winning school, as well as the winning pupil and runners up.

When - The educational programme will be delivered to National and Secondary School pupils during the school year (September to June). The development of the educational programme will start on 01/03/2015 and continue throughout the lifetime of the project until the 31/06/2019.

Reason why this action is necessary (Characters: 821/2,000)
This action underpins one of the projects key aims i.e. to enhance awareness of the freshwater pearl mussel among key stakeholders, including school pupils. A tailored education programme focusing on the ecology, threats and conservation requirements of the freshwater pearl mussel will be developed and delivered to local pupils. The education programme for schools will engage pupils directly with the freshwater pearl mussel and address the current 'low visibility' of this species. This should ensure that the freshwater pearl mussel is appreciated by increasing numbers of younger people, who will inform and influence their friends and family. This action will also help to foster a caring attitude towards the freshwater pearl mussel and the environment that will, in turn, follow through into future generations.

Expected results (quantitative information when possible) (Characters: 276/2,000)
The schools education programme is expected to deliver
- classroom sessions to at least 12 national and five secondary schools in the vicinity of project area,
- ten field visits to the project area and demonstration sites by pupils from schools in the vicinity of project area.

Project deliverable products
NA

Project milestones
First school education programme event completed - 30/06/2015

E8 Project publications

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 96/500)
FS-DAFM, Coillte, Teagasc, DAFM and SKDP will assist in the production of sectoral publications.

Description (what, how, where and when) (Characters: 2,942/10,000)
What - Six types of project publications will be produced to disseminate the findings of the project to farmers, forest-owners and stakeholders, including:
- Project brochure (x1)
- Newsletters (x4)
- Informational pamphlets (x4)
- Best Practice Guides (x4)
- Project Booklet (x1)
- Peer reviewed scientific papers (x3)

An information brochure will provide background information about the project, its vision, aims and objectives.

Annual newsletters will update stakeholders, particularly the Caragh and Blackwater communities, on project progress and upcoming events.

A series of short information pamphlets on conservation management will be produced, which demonstrate effective conservation actions and their applicability elsewhere in pearl mussel catchments.

A series of best practice guides for pearl mussel conservation management will be produced in order to disseminate the findings of the project to land managers operating in freshwater pearl mussel catchments and other high status water bodies.

A project booklet will be produced at the end of the project as part of the final project report to inform landowners, practitioners, relevant public authorities, academic institutions, non-public organisations and interested individuals of the key findings/results of the conservation actions implemented during the project (Action E10).

Scientific publications on project findings will be disseminated through relevant scientific, peer reviewed national and international journals.

How - The brochure, newsletters, best practice guides, booklets and scientific papers will be compiled and produced by the Project Team. Content will be reviewed by the Project Steering Committee prior to publishing. Appropriate text, images and graphics will be used to illustrate the project area, conservation actions and findings. The design and printing of the publications will be sub-contracted by the Project Team. The EU LIFE+ logo and funding will be fully acknowledged in all publications.

Where - Publications will be available through the project office (Action A1) and on the project website (Action E2). Sector specific material will also be posted on project

beneficiary websites where appropriate.

When - The project information brochure will be produced during the early phase of the project and published to coincide with the Official Launch of the KerryLIFE Project. Newsletters will be published towards the end of each year (between 2015 and 2018 inclusive). Information pamphlets will be produced sporadically throughout the lifetime of the project. Best practice guides will be prepared during the final two years of the project. The final report, including a layman's version of the main project findings = project booklet, will be published in December 2019. Scientific peer-reviewed publications will be prepared in throughout the project and at least three papers will be submitted to journals for review before the end of the project.

Reason why this action is necessary (Characters: 1,993/2,000)
This action is necessary in order to inform, promote and disseminate the project findings to stakeholders in Ireland, the EU and further afield. It is essential to raise awareness of the appropriate management techniques for the conservation of freshwater pearl mussels and Natura 2000 sites and the benefits and opportunities they provide to society, as well as awareness. It is important to initially engage stakeholders with freshwater pearl mussels through the information brochure, which will promote and increase public awareness of the species and the project. The newsletters are a means to update stakeholders each year of the projects progress.

Information pamphlets will clearly communicate the lessons learned from the project and will aim to encourage other stakeholders elsewhere to use the techniques and methods demonstrated by the project in appropriate locations. Pamphlets will be distributed to farmers, forest-owners and practitioners (e.g. farm advisors/foresters) through appropriate channels.

Best practice guides are necessary to provide clear, concise and practical information and instructions to land owners on how to implement effective mitigation measures on farms and in forests to achieve the conservation of freshwater pearl mussels. Best practice guides would also enable conservation measures to be implemented in other catchments.

Scientific publications in peer-reviewed journals are necessary to help disseminate project findings and to publicise project mitigation measures in scientific journals for researchers, practitioners and conservation managers. Raising the profile of the project through the publication of papers in peer-reviewed journals will also increase the confidence of national regulators in the project findings, thus helping to secure the future continuation of project actions beyond the life of the project.

The final report (project booklet) will present the project findings in layman's language at the end of the project (Action E10).

Expected results (quantitative information when possible) (Characters: 381/2,000)
A number of publications will be produced during the lifetime of the project, including
- One project information brochure
- One annual newsletter in 2015, 2016, 2017 and 2018 (four newsletters in total)
- Four information pamphlets
- Four best practice guides
- One project booklet in layman's terms as part of the final report (Action E10)
- Three peer reviewed scientific papers.

Project deliverable products
One project information brochure 31/07/2015
Four annual newsletters (2015-2019) - 31/12/2019
Four best practice guides - 31/12/2019
Four information pamphlets -31/12/2019
One project booklet - 31/12/2019
Three peer reviewed scientific papers submitter to journals - 31/12/2019

Project milestones
NA

E9 Project conference

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
DAFM, FS-DAFM, Coillte, Teagasc, SKDP

Description (what, how, where and when) (Characters: 626/10,000)
What/how/where/when - The Project Team will organise one major conference in the final year of the project. The theme of the conference will be 'Sustainable land use management for the conservation of freshwater pearl mussel'. The Project Team will present findings from this project. A range of local, national and international speakers (including experts identified through Action F2), as well as European Commission representatives, will be invited. Field trips within the two catchments and to project demonstration sites will be arranged as part of the conference. The conference will be held in winter 2018 / spring 2019.

Reason why this action is necessary (Characters: 766/2,000)
The main aims of the conference will be to:
- publicise the project,
- present final findings,
- present information on best practice being developed and implemented elsewhere, and receive feedback from representatives from other similar and related projects.

The conference will be a major publicity event aimed at disseminating project outcomes and ensuring that the successful practical measures developed will have the maximum possible impact in terms of uptake and impact. It is also important to demonstrate that these measures are applicable and transferable to other freshwater pearl mussel catchments.

This will be a very important exercise in informing others involved in the management of freshwater pearl mussel catchments, in Ireland and elsewhere in the EU.

Expected results (quantitative information when possible) (Characters: 118/2,000)
It is expected that an international conference will be organised in winter 2018 / spring 2019. Conference proceedings.

Project deliverable products
Conference proceedings - 30/09/2019

Project milestones
NA

E10 Project reporting

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
DAFM, FS-DAFM, Coillte, Teagasc, SKDP

Description (what, how, where and when) (Characters: 1,140/10,000)
What - The Co-ordinating Beneficiary will inform the European Commission regularly on the progress and achievements of the project through the submission of the following reports:
- an inception report within nine months of the project start date
- three mid-term reports
- a final report within three months of project end

How - All reports, in both paper and electronic form, will be simultaneously forwarded to the European Commission and the external monitoring team assigned to the project. A copy of the final report will also be submitted to all Member State authorities.

A layman's report will be produced in paper and electronic format at the end of the project (Action E8). It will be presented in English and be approximately 5-10 pages in length. The report will, as required, present the project, its objectives and its results to the general public.

When - The inception report will be produced in March 2015, while mid-term reports will be produced in September 2016, November 2017 and November 2018 respectively. The final report, which will include a layman's version of the projects findings, will be completed in December 2019.

Reason why this action is necessary (Characters: 1,082/2,000)
This action is necessary to meet the requirement to deliver progress reports to the LIFE-Nature team and to provide the wider public with a series of official annual updates on the progress of the project.

It is envisaged that the results and lessons learnt from the C and D actions will facilitate the development of a series of measures, which could effectively support the restoration of freshwater pearl mussels to favourable conservation condition and the conservation of the freshwater pearl mussel in priority catchments, thus securing the future of this species in Ireland. These measures will have been developed, tested and evaluated by the KerryLIFE project.

KerryLIFE will be ideally placed to provide practical support and information to the review of agri-environment schemes and the Rural Development Programme as part of the ongoing review and implementation of CAP. This can be achieved through effective consultation and/or integration of findings, where applicable, into future support measures for sustainable agri-environmental and forestry management practices.

Expected results (quantitative information when possible) (Characters: 188/2,000)
This action will produce

- an inception report by 31/03/1215,

- three mid-term reports in 30/09/2016, 30/11/2017 and 30/11/2018 and

- final report, including a layman's version, in 31/12/2019

Project deliverable products
Inception report - 31/03/2015
Mid-term report (No. 1) - 30/09/2016
Mid-term report (No. 2) - 30/11/2017
Mid-term report (No. 3) - 30/11/2018
Final report - 31/12/2019
Layman's version of final report - 31/12/2019

Project milestones
NA

F1 Project operation and management

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 147/500)
FS-DAFM, DAFM, Coillte, Teagasc and SKDP. All project beneficiaries will an important role in the management and steering of the KerryLIFE project.

Description (what, how, where and when) (Characters: 5,573/10,000)
What and how - The operation and management of the KerryLIFE Project will comprise of four essential components - i) the Co-ordinating Beneficiary, ii) the Project Management Group, iii) the Project Team, and iv) the Project Stakeholder Group.

The project management structure is summarised in the accompanying figure 'Project Management Structure' and organigramme 'Project Organigramme', which provides details of the roles and responsibilities of persons and organisations involved.

i) Co-ordinating Beneficiary: The Department of Arts, Heritage and the Gaeltacht (DAHG) will be the Coordinating Beneficiary for the project and will have overall responsibility for the project. The DAHG will provide two administrative staff members (Assistant Principal and Higher Executive Officer) to oversee administration of the project, as well as providing technical expertise toward steering the project. The Co-ordinating Beneficiary will administer the project funds on behalf of the Associated Beneficiaries. The DAHG has extensive project management experience, including in LIFE-funded projects, and it is envisaged that this approach will streamline and reduce overall project administration and, thus, associated management overheads. DAHG will also service supporting administrative processes required to underpin the technical work of the Associated Beneficiaries in implementing their respective Actions. DAHG will procure and manage the contracts for the Project Team, and the Project Team Leader will report directly to the DAHG regarding overall project operation and monitoring. DAHG will also chair the Project Management Group. DAHG will report directly to the European Commission on technical and financial progress. Details of Project reporting are outlined in Action E10.

ii) Project Management Group: The DAHG, as Co-ordinating Beneficiary, with the five Associated Beneficiaries - Department of Agriculture, Food and Marine - Nitrates, Engineering and Biodiversity Unit (DAFM), Department of Agriculture, Food and Marine - Forest Service (FS-DAFM), Teagasc, Coillte Teoranta and South Kerry Development Partnership Ltd. (SKDP), together with representatives of participating farmers/forest-owners, will make up the Project Management Group. Key staff members from all six Beneficiaries have worked closely in the preparation of this project application and will meet to formally establish the Project Management Group immediately if this LIFE funding application is successful. The Project Management Group will develop an overarching project plan and specify the requirements, tasks and deliverables for the procurement of the Project Team. The Project Management Group will manage the Project Team on an ongoing basis, in terms of project planning, implementation, management and monitoring. To that end, the Project Management Group will utilise a variety of staff members with key skill sets from each Beneficiary, as and when required. It is expected that there will be at least one Project Management Group meeting per year, the frequency and subject of Project Management

Group meetings will be task driven. The Project Leader will report regularly to the Project Management Group, with other Project Team members reporting and attending meetings as and when required.

iii): Project Team: A dedicated, four person KerryLIFE Project Team comprising a Project Team Leader, Project Scientific Advisor, Project Farm Advisor and Project Administrator will be appointed by the Co-ordinating Beneficiary for the duration of the project. Each of the Project Team members will be full time with the exception of the Project Administrator, who will work half time. Collectively, the Project Team will have day-to-day operational responsibility for the delivery of the project actions. The role of each member of the Project Team is detailed in Action A1. Staff roles, management and reporting structures within the project will be finalised with DAHG and Project Management Group once the Project Team is recruited. A breakdown of the time to be spent in each project action by the Project Team can be found in the project organigramme.

iv) Project Stakeholder Group: A Project Stakeholder Group of key local stakeholders will be established to provide support to the project. The membership of the Project Stakeholder Group will be decided once the Project Team is operational and engaging with stakeholders. The Project Stakeholder Group will include representatives of the local community, farming and forestry organisations, fisheries interests and relevant Public Authorities. Meetings of the Project Stakeholder Group will be attended by the Project Management Group and Project Leader, as well as other members of the Project Team as and when necessary. The Project Stakeholder Group will inform, support and advise on project actions. The Project Stakeholder Group will meet at least once per year and will play an important role in ensuring stakeholder engagement and disseminating project results.

Where - The Project Team will work out of a dedicated Project Office, which will be established within the project area (See Action A1). The Project Office will act as the centre for project dissemination and communication activities. Project Management Group meetings will take place in the Project Office or at other suitable venues nearby, as necessary. Project Stakeholder Group meetings will take place within the project area.

When - This action will be continuous from the start of the project on the 01/07/2014 until the end of the project 31/12/2019.

Reason why this action is necessary (Characters: 1,870/2,000)
The project management structure comprised of the Co-ordinating Beneficiary, the Project Management Group, the Project Team, and the Project Stakeholder Group will ensure the effective running of the project and successful completion of project actions.

The Co-ordinating Beneficiary will be responsible for the delivery of the project, including its financial management and reporting. The Project Management Group will oversee implementation of project actions by the Project Team. The Project Team will be responsible for the day-to-day operation of the project, including implementation and monitoring of all project actions. Each member of the Project Team will have a defined and complimentary set of skills and responsibilities necessary to deliver this multi-disciplinary project. The Project Stakeholder Group is essential to the smooth and effective functioning of the project, as it will support the partnership approach adopted by the KerryLIFE project and the co-operation between the project beneficiaries and key stakeholders. It will also provide a forum to deal with conflicts and complaints that may arise during the project.

The project structure will ensure the delivery of project actions as detailed in the project application. It will also foster and consolidate key partnerships and seek to develop and further expand the project actions beyond the lifetime of the project.

The Project Office will be a dedicated workspace for the Project Team and will house project equipment and facilitate project meetings. This office will be the headquarters for the project and will act as a centre for information dissemination to the local community and other stakeholders, while firmly establishing a presence within the project area. It will provide a focal point for the community, ensuring integration and co-operation in the delivery of project actions.

Expected results (quantitative information when possible) (Characters: 263/2,000)
This action will
- establish the necessary project management structures
- establish the Project Management Group
- establish the Project Stakeholder Committee
- host at least six Project Management Group meetings
- host at least six Project Stakeholder Group meetings

Project deliverable products
NA

Project milestones
Project Management Group formed - 31/08/2014
First meeting of Project Management Group completed - 31/08/2014
First meeting of Project Stakeholder Group completed - 31/12/2014

F2 Networking with other projects, including LIFE projects

Beneficiary responsible for implementation: (Characters 4/500)
DAFM

Responsibilities in case several beneficiaries are implicated: (Characters 176/500)
DAHG, FS-DAFM, Coillte, Teagasc, SKDP. Contacts from all project beneficiaries will be collated to assist the Project Team with the successful implementation of project actions.

Description (what, how, where and when) (Characters: 3,094/10,000)
What - Freshwater pearl mussels are threatened throughout their range and the future of remaining populations depends on specific management practices being implemented on a catchment wide basis. Much research and demonstration projects of relevance to the conservation of this species is ongoing elsewhere in Europe. As part of this multi-disciplinary project, a database of all relevant projects in Europe will be collated and linkages will be established between project personnel from different projects. Particular attention will be given to demonstration and best practice, and fundamental research projects that include the development of measures on farms and in forests in order to achieve high water quality and mitigate sediment, nutrients and hydrological impacts, as well as to attain freshwater pearl mussel conservation.

This action will be achieved through on-line web searches, literature reviews, and by establishing personal and direct contact with other Irish and EU projects. Subject to agreement, a list of links to these projects will be posted on the project website (Action E2). The project leaders / Project Beneficiaries will be contacted in the start-up phase of KerryLIFE to incorporate their expertise and experiences in addressing the issues with respect to achieving conservation of freshwater pearl mussel populations. Information generated over the course of the KerryLIFE project will be sent to other projects to ensure maximum uptake and impact, especially of the project findings, and to encourage their ongoing support and peer input. Communication will also be maintained with the relevant projects through the project newsletter (Action E8), conference participation (Action E9),and project reporting (Action E10), as well as via email and conference calls, when required. This action will establish lines of communication and direct links between the Project Team and other European projects. A provision is also made within this action to allow up to two visits by the KerryLIFE Project Team to other relevant projects either in Ireland or elsewhere in Europe. The focus of such visits will be to observe and learn from the practical implementation of catchment based measures to control sediment and nutrient loss and mitigate hydrological impacts from farming and forestry. Lessons learnt will be incorporated into the design and implementation of the project concrete conservation actions, where applicable.

In addition, one international conference / workshop will be attended by both the Project Team Leader and Project Scientific Advisor during the lifetime of the project, at which two papers will be presented. The theme of the conference selected for attendance and presentation of project findings will focus on catchment management, agri-environmental systems and forestry management.

When - This action will start in the early stages of the project (01/12/2015) and will continue for the duration of the project until 31/12/2019. It is expected that the project visits will take place in the first two years of the project by the 30/06/2016.

Reason why this action is necessary (Characters: 1,847/2,000)
As the KerryLIFE project has adopted a multi-disciplinary catchment-based, it is necessary to establish links and draw on the experiences from as wide a range of other relevant projects as possible. This will assist in ensuring the successful implementation of the concrete conservation actions towards restoring the Caragh and Kerry Blackwater freshwater pearl mussel populations and habitat to favourable conservation condition. In so far as is possible, information from a range of relevant Irish and European projects has already been incorporated into this proposal and linkages established between the beneficiaries and those personnel from these projects.

Through ongoing communication with other projects, it will be possible to keep abreast of new developments that may benefit the practical implementation of the project and ensure the best available science is used and to achieve value for money. It is also hoped that close communication will help avoid common pitfalls, thus ensuring the successful delivery of KerryLIFE. It is expected that the development of a database and the establishment of an informal network of freshwater pearl mussel and other relevant projects will improve the effectiveness and efficiency of both KerryLIFE and the linked projects. This action will also foster ongoing communication and information exchange throughout the duration of this project. The Project Team members' visit to relevant project sites will inform the development and implementation of practical and efficient concrete conservation actions and, through direct contact, establish good working relationships with key researchers and maximise project synergies. Attendance at an international conference/workshop will facilitate the exchange of ideas and information, as well as promoting and disseminating the findings of this project.

Expected results (quantitative information when possible) (Characters: 564/2,000)
The expected results from this action will include
- Development of a database of relevant projects,
- The establishment of an informal network of freshwater pearl mussel and other relevant projects in the EU,
- Up to two visits to relevant projects in the EU,
- Attendance at and presentation to a relevant international conference by two members of the Project Team,
- Internal reports on the lessons learnt from the site visits and international conference,
- Improved efficiency and effectiveness in the design and implementation of project concrete conservation actions.

Project deliverable products
Database of relevant projects - 31/12/2015

Project milestones
NA

F3 Development of the project data management systems

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
DAFM, FS-DAFM, Coillte, Teagasc, SKDP

Description (what, how, where and when) (Characters: 1,154/10,000)
What and how - In the early stages of the project, the Project Team will establish an appropriate data management system for the project. The system will be used to manage all project data, including project reports, publications, financial information, farm and forest management plans and other data. The data management system will allow information to be easily stored, retrieved, updated and analysed by the Project Team throughout the project.
KerryLIFE will generate a significant amount of practical information on the management of farms and forests and the implementation and monitoring of concrete conservation actions on project sites. This information will have a broad spatial, temporal and thematic spread and will be captured in Geographic Information System (GIS) and other relevant formats.

This system will be compatible with the Co-ordinating Beneficiaries existing data management and GIS systems. These databases will be continually updated and added to by the Project Team throughout the duration of the project.

When - This action will be continual from the start of the project on 01/07/2014 until the end of the project 31/12/2019.

Reason why this action is necessary (Characters: 1,255/2,000)
KerryLIFE will generate significant quantities of information, reports and data in a number of formats. A readily accessible integrated data management system is necessary to securely store these data and to maximise their potential use. The system will allow data to be easily stored, retrieved, updated and analysed by the Project Team throughout the project.

The Geographic Information System will be the key, central hub to ensure information generated by the preparatory, concrete conservation and the monitoring actions (A, C and D actions) are stored and used effectively. GIS are commonly used in catchment management, where mapping of the location and extent of features is required, as well as the integration of many different data sets. The GIS will be used to identify critical source areas for sediment and nutrient losses that are key drivers of the impacts on freshwater pearl mussel populations and habitats. The GIS will also allow the rapid production of maps for project sites. Maps are a key, efficient tool in farm and forest management planning. The GIS will also be very important in increasing public awareness and understanding of the species and the project, in the dissemination of project results, and in reporting (F actions).

Expected results (quantitative information when possible) (Characters: 382/2,000)
It is expected that an appropriate, integrated and multifunctional data management system will be established for the KerryLIFE project. This will include a dedicated Geographical Information System for the Caragh and Kerry Blackwater freshwater pearl mussel catchments, incorporating all relevant datasets currently available, and populated with data generated during this project.

Project deliverable products
NA

Project milestones
NA

F4 Financial management

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 37/500)
DAFM, FS-DAFM, Coillte, Teagasc, SKDP

Description (what, how, where and when) (Characters: 2,087/10,000)
What - An effective system of financial management will be a critical element in the efficient running and functioning of this project. In the first instance, monies drawn down under this project will be lodged to a suspense account which will be allocated its own unique account number. Within the internal budget system of the Department of Arts, Heritage and the Gaeltacht, provision will be made for the amount of co-funding expenditure required to be paid out to the project.

How – At the outset of the project, the Co-ordinating Beneficiary in conjunction with the Project Management Group will establish the necessary financial management structures. The Co-ordinating Beneficiary will be responsible for overseeing financial management and the Project Team. In particular, the Project Leader and Project Administrator will take charge of day-to-day financial management. Appropriate training will be provided to staff within the Co-ordinating Beneficiary and Project Team, as necessary. At operational level, the Project Administrator will certify all items of expenditure for payment, and ensure compliance with the internal financial control systems of the Co-ordinating Beneficiary. The Project Administrator will be responsible for maintaining a comprehensive analysis of all project expenditure. This analysis will include projected expenditure over the course of the project. The Project Administrator will report to the Project Team Leader.

Who – The Project Administrator will have a major role to play in the financial management of the project. Responsibilities include maintaining up-to-date account books and the retention of appropriate supporting documentation for all expenditure, income and revenue for the project, including invoices and receipts, Timesheets and related documents will be used to calculate overheads. The Project Team Leader will have overall responsibility for the financial management of the project on an ongoing basis.

When - This action will be continual from the start of the project on the 01/07/2014 until the end of the project 31/12/2019.

Reason why this action is necessary (Characters: 276/2,000)
This action is required to ensure the proper and efficient financial management of the project. The project partners will be fully aware at all times of the financial reporting requirements of the project, and the proper financial management of this project will be delivered.

Expected results (quantitative information when possible) (Characters: 305/2,000)
An efficient, accountable and transparent financial system will be established at the outset of the project. Up to-date books of account and the retention of appropriate supporting documentation for all expenditure, income and revenue, including invoices, receipts, timesheets and documents will be filed.

Project deliverable products

NA

Project milestones
NA

F5 Independent audit

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 0/500)

Description (what, how, where and when) (Characters: 445/10,000)
What - An independent auditor, nominated by the Co-ordinating Beneficiary will verify the financial statements that will be provided to the European Commission. This audit will not only take account of Irish legislation and accounting rules, but also certify that all costs incurred respect to the LIFE+ Common Provisions.

When - This action will take place in the latter half of the final year of the project and will be completed by 31/12/2019.

Reason why this action is necessary (Characters: 322/2,000)
This action is required by LIFE+ Nature to verify the financial statements produced as part of the project. It will also be responsible for verifying financial statements with respect to national legislation and accounting rules, and certifying that all costs incurred respect the LIFE+ standard administrative provisions.

Expected results (quantitative information when possible) (Characters: 56/2,000)
An independent financial audit of the KerryLIFE project.

Project deliverable products
Auditor's report - 31/12/2019

Project milestones
NA

F6 After-LIFE Conservation Plan

Beneficiary responsible for implementation: (Characters 4/500)
DAHG

Responsibilities in case several beneficiaries are implicated: (Characters 205/500)
SKDP, DAFM, FS-DAFM, Teagasc and Coillte. All project beneficiaries will be involved in the development of the After-LIFE Conservation Plan for the Caragh and Blackwater freshwater pearl mussel catchments.

Description (what, how, where and when) (Characters: 3,907/10,000)
What/How - The Project Team, in consultation with the project beneficiaries and other relevant local stakeholders (e.g. those on the Stakeholders Committee), will develop an After-LIFE Conservation Plan as part of the final project report (Action E10).

The After-LIFE Conservation Plan will set out how actions initiated in the KerryLIFE project will continue in the years following project completion. It will also outline how the longer term management of the freshwater pearl mussel populations and habitats will be assured in the Caragh and Blackwater catchments.

The After-LIFE Conservation Plan will build on the recommendations and guidance derived from the project, specifically the appropriate support measures required to sustain the project's achievements, under relevant national policies and programmes, and under the Rural Development Programme. As required, the After-LIFE Conservation Plan will detail which actions will be carried out, where, when and by whom, as well as the sources of finance required. The knowledge acquired during KerryLIFE regarding sustainable farming and forestry practices in relation to freshwater pearl mussel conservation will be advocated in the Caragh and Blackwater catchments after project completion by the Teagasc agricultural and forestry advisory services and Forest Service Inspectors. The successful KerryLIFE project actions will also be made available for wider geographic application, particularly in other similar freshwater pearl mussel priority catchments nationally.

Forest support measures associated with the establishment and management of native woodland, and conversion from conifer forest to native woodland include a long-term commitment by the Forest Service to continue annual premium payments for between 4 and 15 years after the completion on the KerryLIFE project.

Publically-owned forests that have been restructured to long term retention forests will be retained as protective and environmental zones for the benefit of the freshwater pearl mussel. Long-term retention and continuous cover forest also entail a long-term commitment as the management plans to implement these systems are long-term in nature. Coillte and the Forest Service will undertake to continue and complete the continuous cover trials established under KerryLIFE. Once established, these silvicultural systems will be continued, with controls applied, as per the relevant provisions of the 1946 Forestry Act. In addition, the successful forestry operations and silvicultural systems trialled within KerryLIFE project will be considered for inclusion by the Forest Service, in other catchment-based forest plans (including those for the eight priority freshwater pearl mussel catchments) and for inclusion in future guidelines, procedures and requirements governing forestry generally.

Ongoing scientific monitoring of the conservation condition of freshwater pearl mussel by

DAHG in the Caragh and Blackwater catchments will occur at least every six years. Complementary actions designed to maximise the economic sustainability of farm enterprises engaged in management practices complementary to the favourable conservation condition of freshwater pearl mussel will continue after KerryLIFE project completion (e.g. marketing and branding initiatives, tourism infrastructure such as the walkway, etc.).

Dissemination of project findings will continue after project completion, through the project website, scientific publications, media exposure and information bulletins. The beneficiary organisations will continue to train their staff, private forest and farm planners, and land managers in the development and implementation of conservation actions for the freshwater pearl mussel.

When - As part of the preparation of the After-LIFE Plan, Form B5-Continuation/valorisation of the project's results after the end of the project will be re-visited and updated.

Reason why this action is necessary (Characters: 593/2,000)
As well as being a required output for a LIFE+ Project, the After-LIFE Conservation Plan will help to ensure the sustained delivery of the project's objectives once the project has been completed.
In addition, the wider application of successful farm and forestry action to other freshwater pearl mussel catchments will contribute toward the future viability of freshwater pearl mussel populations elsewhere in Ireland. The successful outcomes of KerryLIFE will influence future agricultural and forest policy, especially with respect to the conservation of freshwater pearl mussel populations.

Expected results (quantitative information when possible) (Characters: 200/2,000)
A completed After-LIFE Conservation Plan will form a discrete chapter of the final project report. The After-LIFE conservation Plan will be made available in English, in a paper and electronic format.

Project deliverable products
After-LIFE Conservation Plan - 31/12/2019

Project milestones
NA