DUHALLOW FARMING FOR BLUE DOT CATCHMENTS

BOOKLET OF MEASURES

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The European Agricultural Fund for Rural Development: Europe investing in rural areas

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

Contents

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Unreferenced photos courtesy of IRD Duhallow.

IRD Duhallow

IRD Duhallow are a rural development company serving the Duhallow region of North West Cork, Mid-Cork and South East Kerry. The environment has been one of IRD Duhallow's four pillars since the company's inception (Environment, Social, Cultural, Economic). Indeed, one of the first LEADER projects funded by IRD Duhallow was a baseline study of the Upper Munster Blackwater in the early 1990s.

The company has successfully completed two LIFE Nature projects, SAMOK LIFE (2010-2014) and RaptorLIFE (2015-2019), and is currently coordinating two EIP projects, the Duhallow Farming for Blue Dot Catchments EIP and the Owentaraglin River EIP.

Down through the years the company has coordinated several environmental projects through the LEADER programme including:

- The Duhallow Barn Owl Project
- Duhallow Barn Owl Monitoring and Awareness
- Duhallow Anaerobic Digestor Hub Feasibility Study
- Swifts in Duhallow
- Communities Planting for Biodiversity
- Duhallow Water Biodiversity Training
- River Feale Baseline Study
- Duhallow Conservation Volunteer Network.

Introduction

This booklet was produced by the IRD Duhallow Blue Dot team to raise awareness of the importance of measures implemented by the Duhallow Farming for Blue Dot Catchments EIP and the Owentaraglin River EIP project. The interconnection between farm and environment is becoming increasingly important to farming communities across Ireland and with this comes many changes. Words and phrases such as 'riparian planting', 'nutrient flow pathways', 'hedgerows' and 'multi-species swards' are becoming more and more a part of everyday vocabulary. But what do they actually mean? How do they benefit the environment and different habitats? How can they benefit the farmer? This booklet, using the lessons learned from IRD Duhallow's EIP projects, aims to answer these questions and provide farmers with a guide to measures that can be taken to improve water quality and biodiversity on their farms.

Blue Dot Catchments

In Ireland water quality is classified into five categories, these are represented on maps by a different colour dot: bad (red), poor (orange), moderate (yellow), good (green), high (blue). Under the Water Framework Directive all waterbodies in EU member states are required to achieve at least good ecological status by 2027. Furthermore, waterbodies are not to be allowed to degrade in status, thus those that were previously achieving high status on a regular basis must continue to do so. These are the high-status objective or "Blue Dot" waterbodies and should represent the best water quality. These sites are vital for the survival of the Freshwater Pearl Mussel and are important habitats for many other species such as the Atlantic Salmon and the Otter. Ireland still has a relatively high percentage of waterbodies achieving high status compared to most other European countries, however these have been rapidly declining in recent decades, a trend that urgently needs to be reversed. Many rivers in Duhallow are Blue Dot waterbodies, making the region a leader in the protection of our high-status waters.

EIP-Agri

The Agricultural European Innovation Partnership (EIP-AGRI) is an EU funding stream that was launched in 2012. It works to foster competitive and sustainable farming and forestry that 'achieves more and better from less'. It contributes to ensuring a steady supply of food, feed and biomaterials, developing its work in harmony with the essential natural resources on which farming depends. IRD Duhallow has successfully received funding for two EIP-Agri projects; the Duhallow Blue Dot Project and the Owentaraglin River EIP Project.

Duhallow Farming for Blue Dot Catchments EIP

The Duhallow Farming for Blue Dot Catchments is a five-year (2019-2023) EIP project with funding of €1.47m. There are 100 farmers participating in the project which focuses on the River's Allow, Dalua, Owenanare and their tributaries. These rivers are mostly in good condition with stretches of 'high-status' rivers that support sensitive species such as the Freshwater Pearl Mussel and Atlantic Salmon. Areas where high-status rivers occur are known as 'blue dot catchments'. The project works alongside the farming community in Duhallow through an innovative results-based approach to maintain or return waterbodies to 'high' or 'blue dot' status.

The Owentaraglin River EIP

The Owentaraglin River EIP is a one-year (2022) EIP project with funding of €198,000. There are 23 participating farmers, all of whom farm land connected to the River Owentaraglin (known locally as the Araglen). This is a high-status river and is an important habitat for several species including the Freshwater Pearl Mussel. Similar to the Blue Dot EIP, a results-based approach is used to reward farmers who provide ecosystem services to the River Owentaraglin.

Department of Agriculture, Food and the Marine

The Department of Agriculture, Food and the Marine is a department of the Government of Ireland. Its mission is to lead the sustainable development of a competitive, consumer focused agri-food sector and to contribute to a vibrant rural economy and society.

Flagship Species in Duhallow

Freshwater Pearl Mussel

The Freshwater Pearl Mussel is a freshwater mollusc that can live for up to 130 years. They require high water quality and for young mussels to survive, they need very clean riverbeds. They are a critically endangered species, and while we may find adult populations in rivers, the real challenge lies in giving the juveniles a chance to survive.

Freshwater Pearl Mussel reproduction is complex and requires host fish and clean gravel beds. Adult females inhale sperm released by males. After fertilisation, larvae (known as 'glochidia') develop in the female and are released into the water after a few weeks. Glochidia must then attach to the gills of a salmon or trout to survive; here they develop for a year before dropping off into the substrate of the riverbed where they mature for about five years until they are able to withstand the heavy flow of water and movement of large stones.

Because they are so dependent on clean water, they are an indicator species of healthy rivers and protecting them

carries benefits for several other species such as the Atlantic Salmon, Lamprey species, Kingfishers and Otters. This species is much-loved in Duhallow and has been a focus of many conservation efforts.

Pictured above: A Barn Owl nesting in a mature tree. (Mike Brown)

Barn Owl

The Barn Owl is surely one of the country's most loved birds. We have a hotspot population of Barn Owls in Duhallow, making the region an important one for the conservation of this red-listed bird species. Once referred to as 'the farmer's friend', the Barn Owl preys mainly on small mammals such as mice, shrews and rats. However, they will also take small birds and even bats and frogs!

While Barn Owls are not necessarily associated with rivers, many of the habitats that benefit rivers are also hugely important for these beautiful birds! They hunt over wetlands, woodland and hedgerow edges and rough and grassy margins. Wetlands such as peat or wet grasslands hold water, reducing pressure on the river during heavy rainfall – they also provide an invertebrate rich habitat, feeding small mammals that in turn feed the Barn Owl! Hedgerows and tree lines provide a buffer from nutrient pollution and help to stabilise riverbanks – again they also provide an ideal habitat for the Barn Owl's prey!

The Barn Owl provides a great example of how different ecosystems and species are incredibly interlinked and dependant on each other.

Pollutants

Pictured above: A minimum of a 10m buffer adhered to by a project farmer. By spreading further back from the river, it reduces the chances of slurry being washed into the river and polluting the river if it rains. The width of this distance should increase where ground is sloped.

Nutrient Pollution

Nitrogen (N) and Phosphorous (P) are natural nutrients and are essential for plant growth and human survival! However, when excess N or P enter a waterbody, they pollute the water in a process known as eutrophication. This essentially robs a river of its oxygen to the detriment of many species that rely on a highly oxygenated environment. The Freshwater Pearl Mussel and Atlantic Salmon are common examples but many other species such as mayflies and stoneflies, that make up a crucial part of the aquatic food chain, are also impacted by nutrient pollution.

Nitrogen usually enters watercourses by leaching through the soil. Therefore, areas with free-draining soils are at a higher risk of nitrogen pollution.

Phosphorous usually enters watercourses via overland flow, therefore areas with heavier soils are more at risk of phosphorous pollution. The EPA have developed pollution impact potential (PIP) maps that show where N and P are most likely to pollute water. These are available at **www.catchments.ie**

Some common pathways by which nutrients enter watercourses from agricultural sources include:

- Overapplication of chemical fertilisers, slurry or farmyard manure or poor timing of application*
- Failure to adhere to buffers*
- Lack of adequate storage
- Farmyards or drains that connect yards to watercourses.

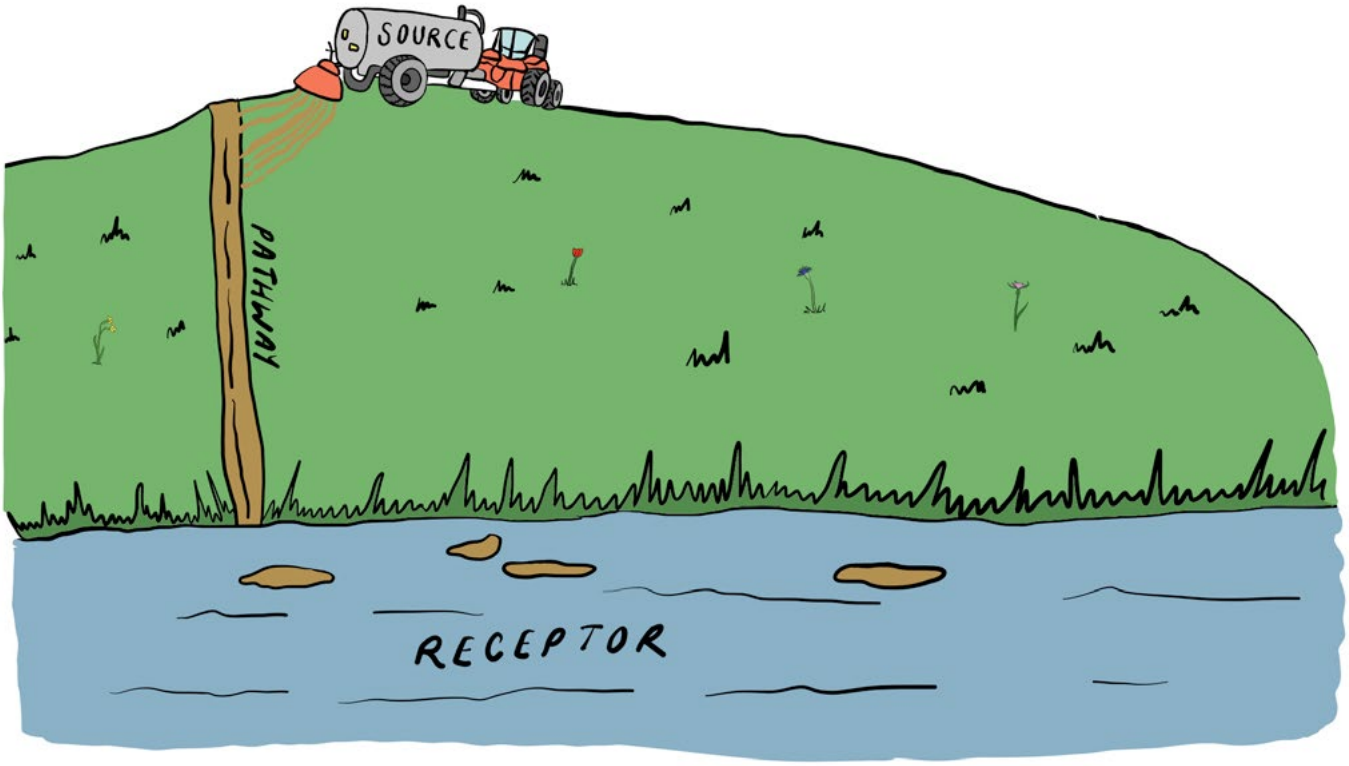
*Details on prohibited spreading periods and buffers can be found on **www.gov.ie**

(SI: Good Agricultural Practices for the Protection of Waters)

Sediment

Riverbank erosion is a natural process and therefore rivers are equipped to handle a certain amount of sediment or silt deposition. However, sediment deposition is often exacerbated by activities such as land drainage, loss of buffers, ploughing near watercourses, cattle access to watercourses and forestry clearfelling.

Excess sediment deposition is a major problem as it can carry pollutants such as phosphates into watercourses and it can also clog the clean gravel bed habitat needed for Freshwater Pearl Mussel, salmon and trout eggs and river insects. Heavy erosion of the riverbank can also damage the nesting habitat for bird species such as the Sand Martin and the much-loved Kingfisher.



The Source Pathway Receptor Model

The Source-Pathway-Receptor Model is used by the project team to identify pollution threats and to determine the most effective solution. The **source** of a pollutant is identified, followed by the **pathway** that connects the source to the **receptor** (i.e., the river). **Reduce** the source, **block** the pathway, **protect** the receptor.

Conservation/Water quality Measures

Legend

1. Benefits Freshwater Biodiversity such as Atlantic Salmon and Freshwater Pearl Mussel
2. Benefits Otters
3. Benefits Amphibians such as Frogs and Newts
4. Benefits Bats
5. Benefits Birds
6. Benefits Pollinators
7. Benefits Small Mammals such as Shrews, Mice and Bank Voles
8. Buffering/Filtering or Reducing Pollutants
9. Stabilises Riverbank
10. Reduces Sediment Deposition (Siltation)
11. Natural Flood Management
12. Carbon Sequestration
13. Greenhouse Gas Emissions Reduction
14. Visually Pleasing Landscapes
15. Financial Savings

9 10 11 12 13 14

Habitats and Buffers

Many habitats found on farmland offer a multitude of benefits such as improved biodiversity, protection of watercourses, visually pleasing landscapes, and carbon sequestration. Examples of the multiple benefits of the habitat and buffer measures from IRD Duhallow's EIP projects are given below.

A buffer is the land adjacent to a watercourse that acts as a filter between terrestrial land use and the water.

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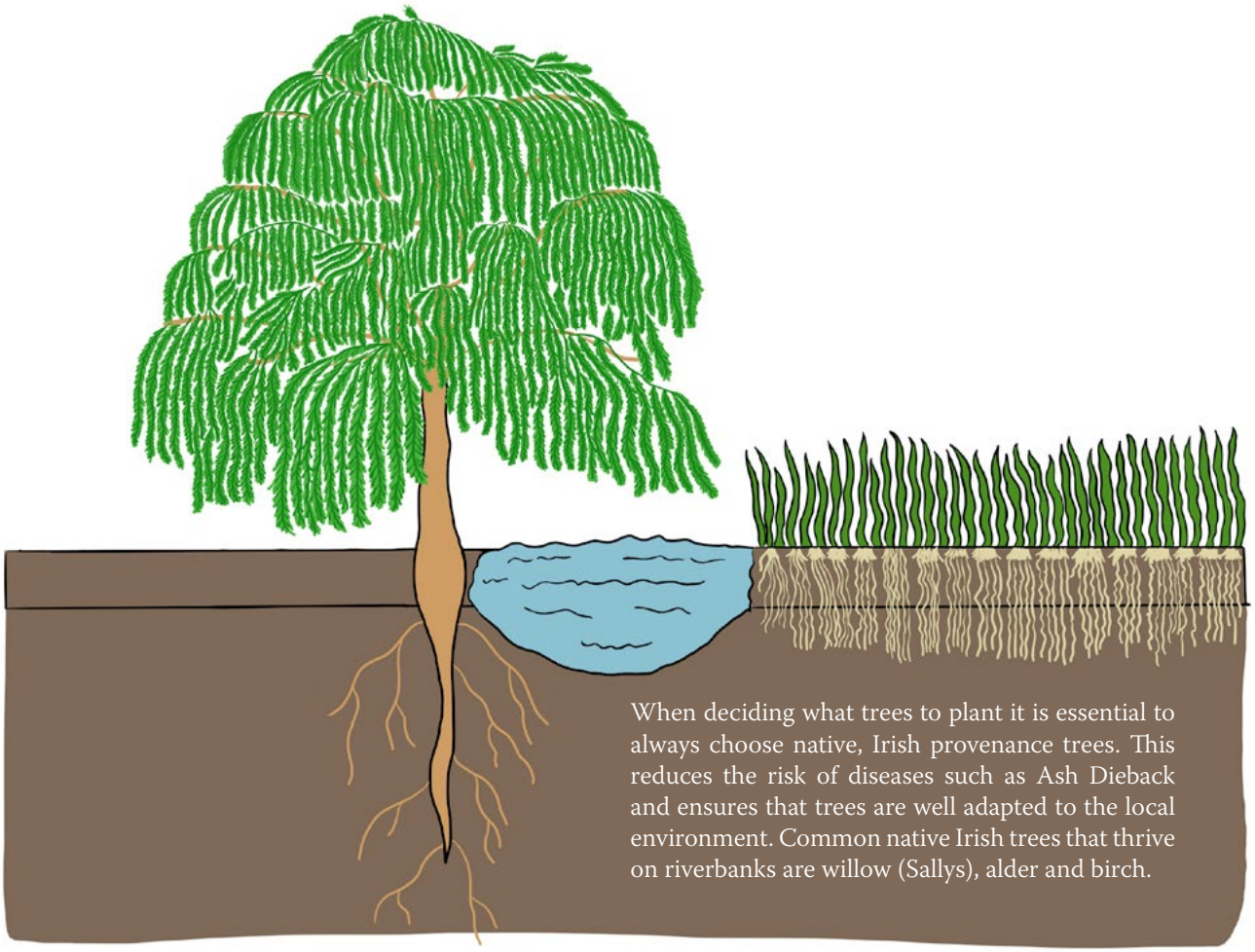
Riparian Tree Planting

1 2 4 5 6 7 8 9 10 11 12 14

Trees have long tap roots that not only sequester carbon, but also help to take excess nutrients such as phosphorous out of the system. These long roots, once established, hold the soil together and protect the bank from erosion, benefitting the farmer and many species such as the Freshwater Pearl Mussel! The leaf matter from riverside trees feeds insects that live in the water – these insects form an important part of the food chain, feeding other insects as well as fish, bats and birds. Trees also provide a terrestrial habitat and food source for several animal species. For example otters will make their 'holts', where they rest and sleep, at the base of riverbank trees. Rivers flow through the landscape and can therefore acts as linear corridors, connecting different habitats; this is of huge importance for biodiversity.

Trees should be pit-planted at least 1.5m back from river banks, particularly if erosion is an issue. This gives their roots a chance to establish. They can be planted in a line at a distance of 2m apart (to allow understory vegetation to establish) or in blocks in areas where nutrients flow into the watercourse (see Nutrient Flow Pathways on page 11). The season for planting trees is November to March.

Pictured above: The roots of a mature Sally/Willow holding the bank together.



When deciding what trees to plant it is essential to always choose native, Irish provenance trees. This reduces the risk of diseases such as Ash Dieback and ensures that trees are well adapted to the local environment. Common native Irish trees that thrive on riverbanks are willow (Sallys), alder and birch.

Pictured above: Sallys coppiced on a riverbank.

Willow trees, commonly known as 'Sallys', are a great way to protect riverbanks from erosion. As Sallys naturally contain an abundance of rooting hormones, they put down roots very quickly and can be planted by simply staking a cutting from another Sally in the ground! Sallys should be staggered at a density of 5 to 6 per m^2.

They can then be coppiced to maintain them at a non-intrusive height (once coppiced they will grow straight up and will not encroach into the field). Sallys respond well to coppicing.

1 2 4 5 6 7 8 9 10 12

Riparian Scrub Retention

Scrub such as brambles and willow often colonise riverbanks. While these may look untidy, they are very important for rivers and wildlife! Brambles are a 'pioneer species', meaning they are one of the first species to colonise an ecosystem, and through them will eventually grow shrubs and trees that carry all the benefits listed above! These species again have a root system that is more capable of stabilising riverbanks and intercepting nutrients than grass. They also provide connectivity between habitats and their flowers, berries and seeds are very important for biodiversity. From the 1st January, 2023, a certain percentage of scrub in a land parcel will be deemed as a claimed area.

Why avoid rock armour?

Water has to go somewhere. Placing boulders in riverbanks only forces the power of the river downstream where it will erode the bank on another farm, or if completely restricted, will erode the riverbed, destroying life. A river needs to be able to erode a certain amount. Using nature-based solutions such as tree-planting allows the river to erode without taking chunks out of the bank.

Watercourse Protection (Fencing the Watercourse)

1 3 4 5 6 7 8 9 10

Fencing the watercourse prevents livestock access, reducing nutrient pollution from dung and urine, and preventing damage to the riverbank and subsequent siltation. Importantly, it also allows riparian vegetation (such as scrub or trees) to develop, helping to stabilise the riverbank, reduce nutrient pollution and improve biodiversity!

Pictured right: A recently fenced stretch of river. Note the vegetation developing behind the fence; this is already slowing the overland flow of phosphorous and providing a habitat for biodiversity, whilst beginning to put down roots that will stabilise the bank over time.

1 2 5 8 9 10 11 12 14

In-stream Woody Habitat

In-stream woody habitat occurs where the branches of trees extend across and into the river. The branches trap silt and litter flowing downstream, and the roots stabilise the riverbank. During heavy rainfall these branches slow the flow, offering a refuge for small fish, Freshwater Pearl Mussels and insects that may otherwise be washed downstream. This is also a natural flood management measure, meaning this habitat plays an important role in reducing the impact of flooding on downstream farms and dwelling areas. Sallys (Willow) are the main trees that are found in in-stream woody habitat, but other tree species such as birch and alder are also common.

Pictured left: A mature Sally/Willow extending into the river. This is hugely beneficial for water quality and biodiversity and is a natural flood management measure.

Pictured above: A vegetated in-drain buffer slows the flow of water, reduces siltation of rivers and helps reduce nutrient pollution.

1 3 4 5 6 7 8 10 11 12 14

Vegetated In-drain Buffer

Land drainage increases the load of water flowing down a river during heavy rainfall, causing unnaturally high levels of riverbank erosion. Allowing drains to remain vegetated slows the flow, reducing the impact of flooding on downstream farmland and towns. Drains often become vegetated with Sallys, brambles and trees that intercept nutrients and stabilise the drain, reducing siltation. Vegetation growing in drains also creates greater habitat connectivity throughout the landscape which is of benefit to biodiversity!

Nutrient Flow Pathways

1 3 4 5 6 7 8 12

Phosphates often travel through the landscape in concentrated flow pathways. These can be found using the EPA's PIP maps (available online at **www.catchments.ie**). They may be identified in the field as depressions in the soil and/or by green flushes of grass or rushes. For nutrient interception, targeting these pathways by simply fencing off part of the pathway can be really effective. Phosphorous enters water via overland flow, therefore allowing vegetation to develop in the pathway will slow the flow of water during heavy rainfall. Similarly, planting with a plot of trees on a nutrient flow pathway may be more efficient at reducing runoff than planting the entire riverbank with trees!

Pictured above: A fenced off nutrient flow pathway slows the overland flow of phosphorous and provides a habitat for many species such as Snipe and frogs.

Grass Buffer Margin

1 3 4 5 6 7 8 12 14

Grass buffer margins can increase biodiversity throughout a farm while offering associated benefits such as protecting adjacent waterbodies from nutrient run-off, providing a habitat and foraging area for pollinators, and providing a safe nesting area for ground nesting birds. The buffer should be managed by topping or mulching to retain a diversity of flowering plants for pollinators. Any management must take place outside of the bird nesting season in early spring of or Autumn.

Pictured above: An exceptionally high quality hedgerow with Hawthorn, Blackthorn and Dog Rose.

1 4 5 6 7 8 12 14

Hedgerows

Hedgerows are one of the most important farmland habitats in Ireland! Dense hedgerows that are a minimum height of 1.8m play a role in nutrient interception (which is of great benefit to water quality), they sequester carbon, and they create and connect habitats for biodiversity. They also create shelterbelts that carry benefits for soil and can act as a natural stock-proof fence if coppiced.* Typical species include hawthorn (whitethorn), blackthorn and dog rose. Many species will hunt along the edges of hedgerows. For example, Barn Owls will hunt at night for small mammals that inhabit hedgerows, and many bat species rely heavily on hedgerows for their insect prey. Hedgerows are also a beautiful feature of the landscape that have helped to shape Ireland's international reputation as a green isle.

*Coppicing involves cutting a hedgerow tree such as Hawthorn/Whitethorn to remove apical dominance. This causes the tree to bush out rather than grow directly up, extending the lifespan and quality of the hedgerow. In the first year, plants are cut to near ground level and in subsequent years, hedgerows should be topped to remove 1.5inches each year until they have reached a height of 1.8m (6ft).

Pictured above: This wet grassland is species-rich. It provides an essential habitat for many species, reduces the impact of flooding downstream and reduces nutrient pollution of rivers.

1 3 4 5 6 7 8 11 12 14

Wet Grasslands

Wet grasslands are high-nature value habitats that typically occur on heavy mineral soils. Because they are poorly drained, they store water, slowing the flow during heavy rainfall and therefore reducing the impact of flooding on riverbank erosion and on downstream dwelling areas. As they will not respond to heavy applications of manure, they are usually not fertilised and as a result they support a diversity of wildflowers such as Yellow Flag Iris, Ragged Robin and Orchids that benefit pollinators (wet grasslands are upgraded to a species-rich grassland when there are over 16 positive indicator species in the plot). They provide a rich foraging habitat for insects, small mammals (e.g., shrews) and several bird species of conservation concern. The loss of wet grasslands has a negative impact on the Pheasant, a popular game bird in Ireland, as well as many threatened wading bird species such as Lapwings and Snipe. It has also had a negative impact on birds of prey such as the Kestrel and Barn Owl as it has removed habitat suitable for their small mammal prey.

Ponds

Ponds may be installed on farms to simply provide a habitat for biodiversity (biodiversity ponds) or to intercept sediment before it can reach a river or stream (silt settlement ponds). Ponds should be designed with gentle slopes where safety is a concern.

Biodiversity Ponds

2 3 4 5 6 14

Farmland ponds were once a common feature on Irish farms but have become rare in recent decades. While biodiversity ponds can intercept nitrates leaching through the soil, their primary function is to provide a habitat for species such as ducks, dragonflies, damselflies, beetles, herons, frogs and Smooth Newts, as well as wetland and aquatic plants such as Bogbean and Water-cress. They are also a beautiful feature on a farm that can be enjoyed by the farmer and family.

Biodiversity ponds are installed by excavating an area in a suitable site with clay-based soil (for free-draining soils, ponds will need to be lined, or at least the bottom packed down by machine, ideally below the water table to retain water in summer). There is no need to line the pond as the clay should provide a relatively impermeable layer. Biodiversity ponds should be a minimum of 5-10m^2 in size and be no deeper than 2m. Creating a variety of depths by stepping the pond allows a greater diversity of aquatic plants to colonise, which in turn support a greater diversity of fauna. The pond should be allowed to naturally vegetate; in fact, nothing should be introduced into the pond (for example, introducing fish into the pond may result in a decline in tadpoles and insect larvae).

Pictured above: This biodiversity pond has been allowed to naturally vegetate since it was installed three years before this picture was taken.

Silt-Settlement Ponds (Multi-chamber)

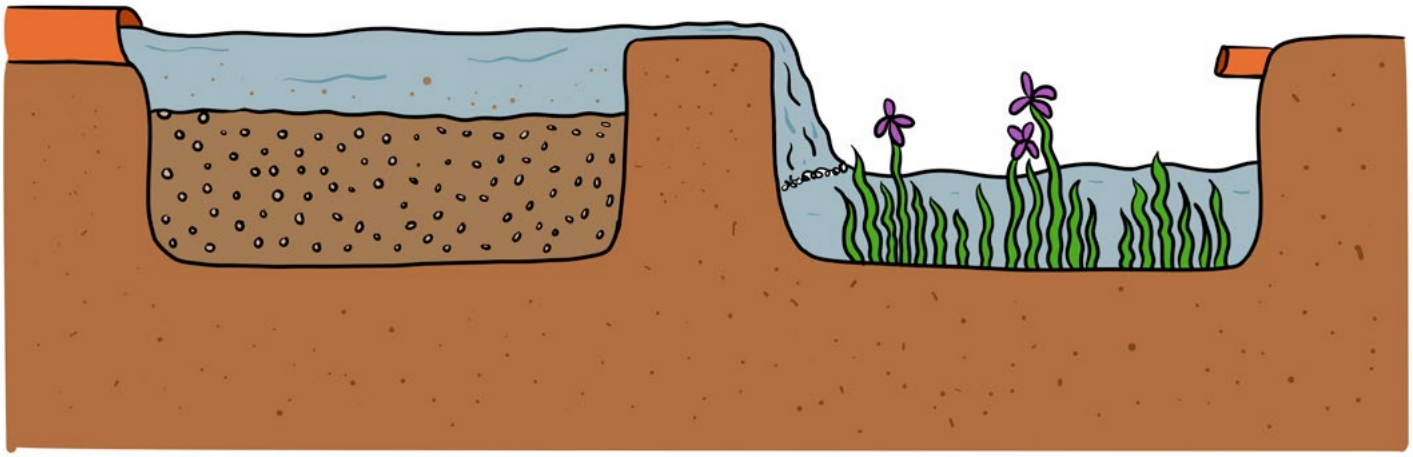
Silt-settlement ponds are installed in a drain or are connected to a water bar on a farm roadway to intercept silt runoff, breaking the pathway before it can enter the river.

In the case of a two-chamber in-drain silt settlement pond, a chamber (5mx3m, 1.5m deep) is installed during dry conditions. A second chamber is installed just downstream in the drain and a mound with an overflow separates the two chambers. During heavy rainfall, silt being transported down the drain settles in the first chamber and overflows in the second where any remaining silt should be deposited before an overflow takes the clean water downstream. The first chamber will fill up with silt every one to three years and must be cleaned out during dry conditions. The removed silt is nutrient-rich and should be evenly spread on the land as a fertiliser at least 20m back from any watercourse.

Note: If a silt-settlement pond is intercepting water from a farm roadway, the overflow pipe from the last chamber must flow into a field or woodland but cannot be directed into a watercourse such as a drain.

1 3 10

Pictured above: A water bar diverting runoff from a farm roadway into a two-chamber sediment pond. Note the flush of green grass where the water runs off the bar; this is from nutrients in the silt. The overflow from this pond is diverted into a woodland.



Pictured above: Much of the silt settles in the first chamber. This is rich in phosphorus and can be carefully spread on the land when removed.

Bird Boxes

5

While in most cases, the best way to help birds is through providing them with suitable habitat to forage or hunt, bird boxes can be of benefit in some cases where loss of suitable nesting sites threatens bird species.

Sand Martin Nest Colonies may help to protect Sand Martins, a species that nests colonially in high riverbanks that can be impacted by erosion or by the installation of rock armour.

Barn Owls would have naturally nested in cavities in trees but have adapted to nest in chimneys and old buildings such as barns (as their name suggests). However, in present times there are fewer trees for them to find suitable nest sites and development or demolition of old buildings can also result in a loss of nest sites. The provision of artificial nest sites (i.e., nest boxes) has proved to be an effective conservation measure, with the number of occupied nest boxes in Duhallow increasing on an annual basis.[1]

Barn Owl boxes should be made of a hardy material such as marine plywood and should be installed at least 3m above the ground in a building or on a tree. If installing the box on a tree the box should be northeast facing to avoid overheating and should have a clear flight-path. Any maintenance, such as removal of branches blocking the flight path or repairs to the box, should be performed in winter (outside of the nesting season).

[1]Lusby, J., O'Clery, M., McCarthy, A. & McDonnell, B. (2021). Duhallow Barn Owl Monitoring Report 2020. BirdWatch Ireland.

Pictured above: A Barn Owl box in a mature tree.

Pictured above: A Sand Martin Colony constructed on the River Dalua.

1 2 3 4 5 6 7 9 10 14

Invasive Species Management

Invasive alien species are non-native species that have a negative impact on an ecosystem when introduced. Invasive species are the second greatest threat to biodiversity globally behind habitat destruction and they are the greatest threat to biodiversity on island ecosystems. As an island, our plants, animals, microorganisms and landscapes evolved together over thousands of years; when highly competitive non-native species are introduced, our native biodiversity cannot adapt quicky enough to compete with them for resources such as light and space.

Invasive alien plant species that are of threat to rivers in Duhallow include Japanese Knotweed and Himalayan Balsam.

Japanese Knotweed

Japanese Knotweed is a highly invasive plant species that can thrive in a variety of habitats including riverbanks, in-stream islands, and river margins. It outcompetes native plants for light and quickly develops into dense stands. It also dominates the belowground environment, developing an extensive network of rhizomes (underground stems) that are so powerful that they can grow through concrete! These rhizomes allow the plant to survive over the winter and new plants can grow from rhizome fragments, hence why it is important not to cut Japanese Knotweed.

Japanese Knotweed is controlled by carefully applying with herbicide in August or September. This will not kill the plant entirely, so it is important that the ground is not disturbed even after the aboveground part of the plant has been killed off. It will take a number of years of repeat applications before this plant is effectively controlled.

This plant can be identified by its large, flat-based, shield-shaped leaves and zig-zag stem with red speckles.

Pictured above: Japanese Knotweed.

Pictured above: Himalayan Balsam. Note how it blocks out the light from other plants.

Himalayan Balsam

Himalayan Balsam outcompetes native biodiversity on riverbanks, developing thick stands. It has a very shallow root system, and when the plant dies off in the winter, there are no roots left to hold the bank together, resulting in erosion during flood events. In Duhallow it flowers from June to October, flowering later in shaded or wooded areas.

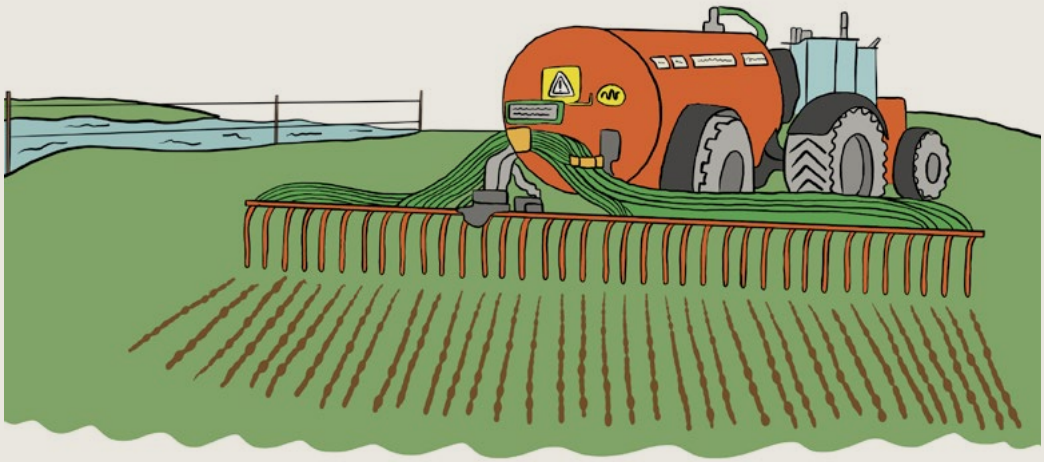
Luckily the plant can be controlled without the need for herbicides. As Himalayan Balsam is an annual plant that relies on seed dispersal for reproduction, it can be controlled by simply pulling the plant from the ground and snapping it in June, before it has flowered and gone to seed. Clearing Himalayan Balsam on your farm in June will allow native vegetation to establish and put down roots, reducing the likelihood of erosion in winter. However, in order to effectively control the plant on a river, the source must be found, and clearance must take place in a downstream direction.

This plant can be identified by its hollow reddish stem with side shoots, shallow root system (often evident aboveground), jagged leaves, trumpet shaped pink and white flowers, and exploding seed capsules (in August/September).

Low Emission Slurry Spreading 1 8 13

Low Emission Slurry Spreading (LESS), using a dribble bar, trailing shoe or trailing hose, is a more efficient method of spreading slurry than using a splash plate. This results in reduced ammonia emissions and less runoff to watercourses.

When spreading slurry, it is essential that you adhere to nitrate regulation buffers or that you ensure your contractor does so. Slurry rain guns are a very inefficient method of spreading slurry and do not comply with regulations; they should never be used.



Soil Conditioning 1 8 13 15

Ground limestone, Physiolith and other soil conditioners increase soil nutrient availability. This can have positive effects for water quality as it reduces the amount of fertiliser required by enabling grass to respond better to reduced fertiliser inputs and by unlocking other nutrients within the soil such as phosphorous and potassium.

Lime should be applied following recommendations from soil samples as over liming can have negative impacts on water quality and nutrient uptake.

Soil Samples 1 8 13 15

Soil samples ensure that pastures only receive as much fertiliser and manure as they need and can optimally utilise nutrients as a result of appropriate liming. This benefits water quality as it ensures that fertilisers are not overapplied or inefficiently applied. This also saves the farmer money!

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Pictured above: A muti-species sward reduces the requirement for chemical nitrogen benefitting the river and the farmer's pocket!

1 4 5 6 7 8 12 13 15

Multi-species Swards

Sowing a multi-species sward involves using a seed mixture that contains multiple plant species, including grasses, legumes and herbs, as opposed to a grass monoculture. Typical species include Perennial Ryegrass, Timothy, Red and White Clover, Chicory, and Ribwort Plantain. Each of these species complement each other and bring their own qualities to the sward. Grass species are important for productivity and strong spring growth. Legumes make nitrogen in the atmosphere available for plant uptake and are a source of protein. Herbs are deep rooting, aerating the soil and sucking up diverse nutrients from deeper in the soil profile. Herbs also 'climate-proof' the sward as they are often more tolerant to drought.

Multi-species swards will not respond to heavy nitrogen inputs and research to date has shown that using little to no inputs on a multi-species sward should result in equal productivity to a ryegrass sward with heavy nitrogen input. This takes chemical fertiliser inputs out of the system, reducing nutrient pollution of rivers. The greater diversity of species also benefits pollinators, other invertebrates and soil structure and enables greater carbon sequestration.

Farm Roadway Upgrades 1 8 10 15

Farm roadways often act as a pollutant pathway, connecting the farmyard (source) to the river (receptor). As of 1st January 2021, new nitrates regulations specify that: '*There shall be no direct runoff of soiled water from farm roadways to water.*' This includes all watercourses, including farm drains (that eventually lead to a natural watercourse).

The farm roadway upgrade methods listed below have the dual benefit of eliminating a pollution pathway, benefitting the river, and improving the farm road, benefitting the farmer and their animals.

Pictured above: A concrete bar diverts water off the farm road to reduce risk of pollution to a watercourse. Note how it extends into the field to avoid streams channelling around it.

Water Bars

Water bars are basically ramps on a farm roadway that direct soiled water off the roadway and into a field, sump or pond. We have found these to be one of the most effective and durable measures in the project. These can be constructed with pencil or re-enforced concrete bars can be installed. The major benefit of a re-enforced concrete water bar is its durability; it is important to remember that heavy machinery will eventually wear away pencil water bars and reduce the positive impact of cambering over time. Concrete water bars are placed in an 18-inch foundation, are 18 inches wide and have a lip at the downhill side to reduce their impact on machinery coming uphill. They must rise a minimum of 4 inches above the ground and must extend into the field or pond/sump to avoid channels forming around the side.

Sumps

Although many of our project farmers report that directing water from a roadway into a field has no impact on the field, sumps can be installed if this is a concern. A sump is created by digging a (min. 1m (W) x1m (D) x 10-20m (L)) hole adjacent to the roadway and filling with 8-inch graded stone, with a depression of one foot to allow water to gather during heavy rainfall before soaking down into the stone.

Cambering

Cambering the roadway involves sloping the road away from a watercourse and into a field. The crossfall must be 1:25.

Piping and Infilling of Trackside Drains

Where a roadway has drains on either side, the solution may be to pipe the drain (provided the water is clean) and infill with graded stone.

Widening of Access Points

A narrow crossing point/culvert on a farm road can be a point source of pollution. Widening this point reduces nutrient and sediment pollution by widening a narrow crossing where runoff would easily have entered a watercourse, particularly during heavy rainfall. This is done by piping at either side of the culvert (a corrugated pipe can be cut in half and fitted at either side), covering with graded stone, banking (0.5m) up the sides of the crossing, and (optionally) covering with gravel or topsoil and grass seed.

Pictured above: A crossing point that was widened with the widened parts covered in topsoil and grass seed.

Sustainable Crossing Point

Crossing points over field drains are protected by bridging the crossing point. This can be done by installing a corrugated pipe and covering with stone. This reduces the amount of sediment and manure entering watercourses. It is important that the bridge (e.g. large pipe) is wide enough to not restrict movement of fish and water bugs.

Pictured left: A Sustainable Crossing Point reducing sedimentation in a farm drain.

Fish should be able move freely up and down drains where they occur. Trout will often spawn in small drains, even channels that go dry in the summer. So it is important that their passage is not disrupted. Consult with Inland Fisheries Ireland for advice.

Alternative Drinking Sources 1 8 10

Replacing livestock drinking points with alternative drinking sources reduces the amount of silt entering rivers, benefitting species such as the Atlantic Salmon, Freshwater Pearl Mussel and freshwater insects like mayflies and stoneflies.

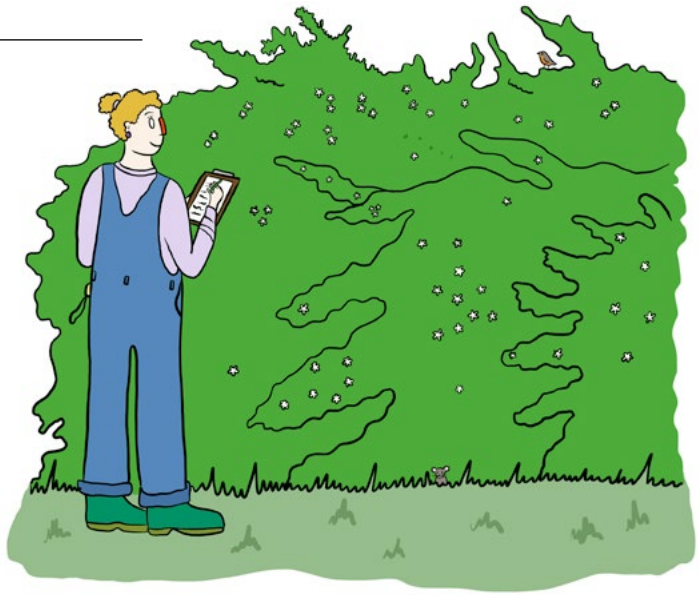
Solar-Powered Pump

Solar-powered pumps are excellent in hard-to-reach areas or in watercourses where gravity flow is not possible. Some solar-powered pumps also have an electric fencer option which is particularly useful for outfarms or areas where there is no electrical supply. It is important that pumps are placed in a watercourse where there is sufficient flow to sustain them, particularly during summer when the demand for drinking water is highest. Placing pumps in shallow and/or silty drains can damage the pump. Solar-powered pumps are large and valuable so should be placed in a location out of sight from public roads to avoid theft. Of course, the panels need to be placed in an unshaded site where they can optimally harness the sun's energy!

Solar-powered pumps should only be used to replace existing drinking points on a watercourse. Where herd numbers are increasing, use mains or other water sources to avoid over-abstraction.

Pasture Pump

Pasture pumps, also known as 'nose pumps' suck water from a watercourse using a mechanical piston pump. Livestock pump their own water on demand! These are again ideal for outfarms or areas where electrical supply is not available. This measure is more suitable to farmers with smaller numbers of livestock; each pump can supply enough water for 20 dairy cows or 30 young cattle. A separate bowl can be added to allow calves to drink. Pasture pumps are unsuitable for sheep.



Farmer Self-assessment

As part of the IRD Duhallow EIP projects, farmers attend training and have access to the scorecards used by the project team to score habitats for results-based payments on their farms. Farmers are encouraged to use these scorecards to evaluate their own farms and see where they could make improvements to protect the environment and receive a higher payment. All scorecards are available on IRD Duhallow's website. An example of a scorecard used by the project team is provided on the following pages. In this case the scorecard is for a wet grassland habitat. All scorecards used by the team are available on IRD Duhallow's website.

DUHALLOW FARMING FOR BLUE DOT CATCHMENT PROJECT
WET GRASSLAND & SPECIES RICH GRASSLAND SCORECARD

Participant:	
Herd Number:	
Survey Date:	
Plot Number:	
Surveyor:	
Habitat Type:	
Total Proposed Payment	€
Plot Score	/100 % (marks)
Total Plot Area	Hectares
Total Measure Payment	€

POSITIVE INDICATORS

Bird's Foot Trefoil		*Marsh Pennywort*		*Mosses*	
Devil's Bit Scabious		*Marsh Thistle*		Selfheal & Bugle	
Eyebrights		*Meadow Thistle*		Sheep Sorrel	
Forget-me -nots		*Meadow Sweet*		Small Bedstraws/Stitchwort's	
Heathers		*Mints*		Small Rushes	
Knapweeds		*Orchids*		Small Umbels	
Lady's Smock		*Ox-eye Daisy*		Tormentil	
Large Umbels		*Ragged Robin*		Vetches	
Lesser Spearwort		*Sedges*		Vetchling	
Violets		*Yellow Composites*		Yellow Flag Iris	
Yellow Rattle		*Yorkshire Fog*		Creeping Bent	
Red Fescue		*Meadow Grasses spp*			

A. COMPOSITION OF POSITIVE INDICATOR SPECIES 15 MARKS

	*Low	Medium	Med-High	High	Very High
No. Plants	0-4	5-8	9-12	13-15	16+
	5 marks	8 marks	10 marks	15 marks	**15 marks**

*Use Semi-Natural Grassland Scorecard

**Species Rich Grassland Payment

B. COVER OF POSITIVE INDICATOR SPECIES 20 MARKS

	Rare	Occasional	Frequent	Abundant	Dominant
Cover %	0-5%	6-10%	11-25%	25-50%	>50%
	0 marks	5 marks	10 marks	15 marks	20 marks

C. COMPOSITION OF NEGATIVE INDICATOR SPECIES 5 MARKS

***Negative species including Nettles, Docks, Ragwort, Perennial Ryegrass, Creeping/Spear Thistle**

	Dominant	Abundant	Frequent	Occasional	Rare
Cover %	>50%	25-50%	11-25%	6-10%	0-5%
	-15 marks	-10 marks	-5 marks	0 marks	5 marks

DUHALLOW FARMING FOR BLUE DOT CATCHMENT PROJECT
WET GRASSLAND & SPECIES RICH GRASSLAND SCORECARD

D. VEGETATION STRUCTURE		10 MARKS
Poor	Moderate	Good
Vast majority of the plot has either tall or short vegetation with lodging or overgrazing evident. Little or no flowering plants.	25-50% of plot has a variety of tall and/or short vegetation throughout with occasional to frequent patches.	>50% of the plot with a diverse sward of tall and short vegetation mosaics
-5 marks	5 marks	10 marks

E. CONTRIBUTION TO WATERCOURSES		15 MARKS
LOW	MODERATE	HIGH
Plot is a dry site with no natural wet features	Natural wet features/natural seepage areas/critical source areas present.	Natural wet features/natural seepage areas/critical source areas discharging to natural watercourse.
0 marks	5 marks	15 marks

F. ARTIFICIAL DRAINAGE FEATURES			15 MARKS
HIGH	MODERATE	LOW	NONE
Newly maintained and/or free flowing drains throughout the plot	Minimal or <10% of the plot with free flowing or recently maintained drains	Well vegetated historic drains present with flow slowed and impeded significantly	No artificial drainage within the plot
-15 marks	-5 marks	5 marks	15 marks

G. THREATS TO SITE INTEGRITY			20 MARKS
HIGH	MEDIUM	LOW	NONE
Evidence of severe Poaching, areas of encroaching scrub, abundance of bracken, presence of invasive species, dumping of material, or the application of organic/inorganic manures or pesticides.	Some evidence of Poaching, areas of encroaching scrub, abundance of bracken, presence of invasive species, dumping of material, or the application of organic/inorganic manures or pesticides	Minimal evidence of Poaching, areas of encroaching scrub, abundance of bracken, presence of invasive species, dumping of material, or the application of organic/inorganic manures or pesticides	No evidence of any damaging activity at the site.
-20 MARKS	-10 MARKS	10 MARKS	20 MARKS

COMMENTS:

Twitter: @duhallowbluedot

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