CRiBZ
Culdaff Riparian Buffer Zones

Culdaff Riparian Buffer Zone Scheme Final Report

March 2023

Inishowen Rivers Trust

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The Inishowen Rivers Trust is an Inishowen-wide environmental charity dedicated to the conservation, protection, and enhancement of the rivers and natural water bodies of Inishowen for the benefit of the environment and the advancement of environmental awareness and skills for the benefit of the community.

www.inishowenriverstrust.com

Project Partners

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Cover photo: CRiBZ riparian buffer zone created on the Culdaff River 2023

The Culdaff Riparian Buffer Zone (CRiBZ) Scheme is an EIP (European Innova on Partnership) project being administered by the Inishowen Rivers Trust. The Project is funded by the EU Recovery Instrument Funding under the Rural Development Programme 2014-2022

EXECUTIVE SUMMARY

The Culdaff Riparian Buffer Zone Scheme was delivered as an agri-environmental payment scheme in Culdaff, Inishowen Co. Donegal between July 2021 and March 2023. The scheme was managed by the Inishowen Rivers Trust who partnered with a number of other organisations including Inishowen Uplands EIP, Inish Forestry, Trees on the Land and the Culdaff River Community Angling Club.

A total of 9 farmers completed measures to create riparian buffers and fence the riverbank. Beehives were also a benefit of the project. A further 32 community members volunteered to help plant 6,000 trees into these buffer zones in 2022 and 2023. Beehives and bee keeping were perceived highlights of the project.

The project was well received in the local community and there is clear and growing awareness of the desire among farmers and members of the public to protect watercourses, to enhance wildlife and to learn new skills.

Baseline data on the biodiversity of the farm sites and the water chemistry were gathered and will be used for comparative purposes for post-project monitoring.

The Culdaff River currently has a Q status of 3 and 4. The river is a good candidate for protection as it does not have some of the more complex issues, such as significant instream barriers and widely distributed invasive species.

The CRiBZ team will continue to maintain contact with the participant farmers and to monitor the planted trees.

This report summarises the findings of the project.

EIP Ref No: LLOC5047
Call5: Farmland Biodiversity
July 2021-March2023
€132,870 total value of fund

PROJECT HIGHLIGHTS

Number of participating farmers	9
Distance fenced	4.209km
No. solar pumps installed	7
No. pasture pumps installed	4
No. Trees	6000
No. Volunteer planting event	8
No. volunteers	32
No. Beehives	10
Coverage of wildflower seeds	125m^2
No. Gates	20
Length of piping	1000m
Length of 3m buffer	1347m
Length of 6m buffer	1122m
No. unique species recoded	135
Total buffer areas created	10,773m^2
Total length of riverbank & drain protected	4.536km

€39,458 Direct payments to farmers

€30,494 Direct benefits to farmers

€107,331 on Project Implementation

COMMUNICATION & ENGAGEMENT

Project video, newsletter, training event & advice

DATA GATHERED

Biodiversity audit
Water chemistry data

Culdaff River
Inishowen, Co. Donegal

CONTENTS

1.0 BACKGROUND

The Culdaff Riparian Buffer Zone (CRiBZ) Scheme is a catchment scale project based on the Culdaff River in North Inishowen, Co. Donegal. The project was awarded under the 5th EIP (European Innovation Partnership) Open Call for Farm & Community Biodiversity Initiative and was funded by the EU Recovery Instrument Funding under the Rural Development Programme 2014-2022. The project was administered by the Inishowen Rivers Trust (IRT), an environmental charity based on the Inishowen Peninsula.

The project aimed to work with local farmers and the community in the Culdaff area to protect and enhance the riparian zones, manage farm inputs into streams and improve habitat quality for biodiversity.

The project had 4 strands:

1. To work with farmers to design and implement effective riparian zones.
2. To provide farmers with a working plan for managing drains and ditch that connect to watercourses and promote nature-based solutions on the farm (Farm Drain Management Plans).
3. To allow biodiversity to flourish by providing habitat, shelter and food sources and to tackle invasive species along the river.
4. To promote social learning opportunities for the landowners and the local community who can engage with volunteer opportunities around planting and invasive species control.

1.1 Project Partners

The CRiBZ scheme partnered with a number of organisations and liaised with a wide range of other stakeholders (Figure 1). The project partners were Inish Forestry, Culdaff River Community Angling Club, Trees on the Land and Inishowen Uplands EIP. Along with the Inishowen Rivers Trust (IRT), these partners formed the Operational Group that steered the project and worked on different aspects of the scheme.

- Inish Forestry – farmer engagement and mapping
- Culdaff River Community Angling Club – landowner connections and local river knowledge
- Trees on the Land – tree supply, advice and consultation
- Inishowen Uplands EIP (Inishowen Farm Innovations) – farming advice and financial administration

The IRT managed the project and the Trust's project officer maintained project records, organised volunteer events and communicated with the farming participants throughout the project.

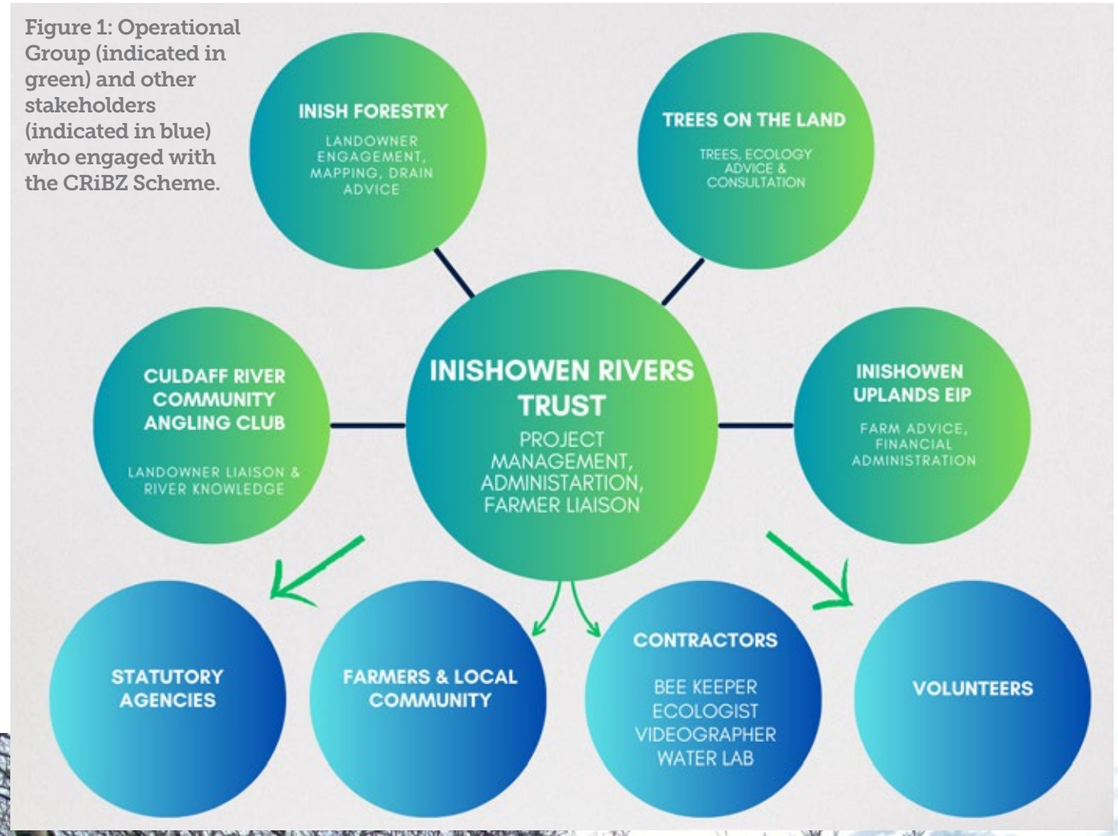

Figure 1: Operational Group (indicated in green) and other stakeholders (indicated in blue) who engaged with the CRiBZ Scheme.

2.0
THE CULDAFF CATCHMENT

The Culdaff River rises in the area of Leitrim at Lough Nastacken and is joined along its journey by many tributaries descending from the hills around Crockroosky, Crockatlishna and Crocknanoneen (Figure 2). There are 5 lakes connected to the system – Lough Nastacken, Drumlee, Black, Effish, and Callybear. The channel and tributaries together total 96km in length and cover a catchment area of approximately 65km^2 (Source: Catchments.ie). There are many small tributaries joining the main channel such as the Baskill, Binglas, Carrowmore. Dristernan, and Drumlee. The catchment is divided into 2 river subbasins, Culdaff_010 (upper catchment) and Culdaff_020 (lower catchment). The river subbasins border two SACs, the North Inishowen Coast SAC to the north and Magheradrumman Bog SAC to the south.

The primary soil type in the catchment is peat with sandy, alluvial soils found along the channel from Gleneely to the estuary at Culdaff village. This makes the land very productive along the river and agriculture is the dominant activity, in particular sheep farming, with pockets of forestry mostly concentrated at Moneydarragh and Falmore. Due to its low altitude, meandering form, the river is prone to flooding at certain points and bank erosion is an issue at many locations.

In 2017 the Culdaff Community Anglers Association engaged the Wild Trout Trust for an advisory walkover of the river (Pedley, 2017). This took place over a period of 3 days with anglers and the Inishowen Rivers Trust accompanying the advisor. The data gathered through this survey provided a detailed overview of the river and made recommendations on how to improve the condition of the riverbanks and fisheries habitat. After this collaboration the IRT became more involved with the Culdaff CAA and embarked on collaborative projects supporting nature-based solutions for the river. This included river clean ups, invasive species control, river training for volunteers and bank erosion control.

A number of organisations monitor the Culdaff River, including the EPA, Donegal County Council and the Loughs Agency who are the fisheries authority for the river. The Culdaff is a salmon river and is one of only two rivers open to salmon fishing in Inishowen. Loughs Agency data indicates that the river supports healthy populations of European eel, brown trout, sea trout, salmon and a range of other species such as stickleback, lamprey, flounder etc.

Figure 2: Culdaff River catchment from source to sea. © Ordnance Survey Ireland. All rights reserved. Licence number Inish Forestry.

Data from the EPA (Table 1) and Donegal County Council (pers. comm) indicate that the water quality status of the Culdaff River is poor to moderate (Figure 3). The key pressures identified in the WFD Cycle 2 Catchment Donagh-Moville Subcatchment Culduff_SC_010 Assessment Report (EPA, 2019) are urban waste water and agriculture (pasture). A key issue for water quality in the area is the waste waters treatment plant at Gleneely which is failing to reach environmental standards and discharges directly into the main Culdaff River channel.

Code Name Type	Name	Type	2007-09	2010-12	2010-15
IE_NW_40C020100	CULDAFF_010	River	Poor	Poor	Poor
IE_NW_40C020150	CULDAFF_020	River	Poor	Unassigned	Poor

Table 1: Sub-catchment assessments for Culdaff River (EPA, 2019).

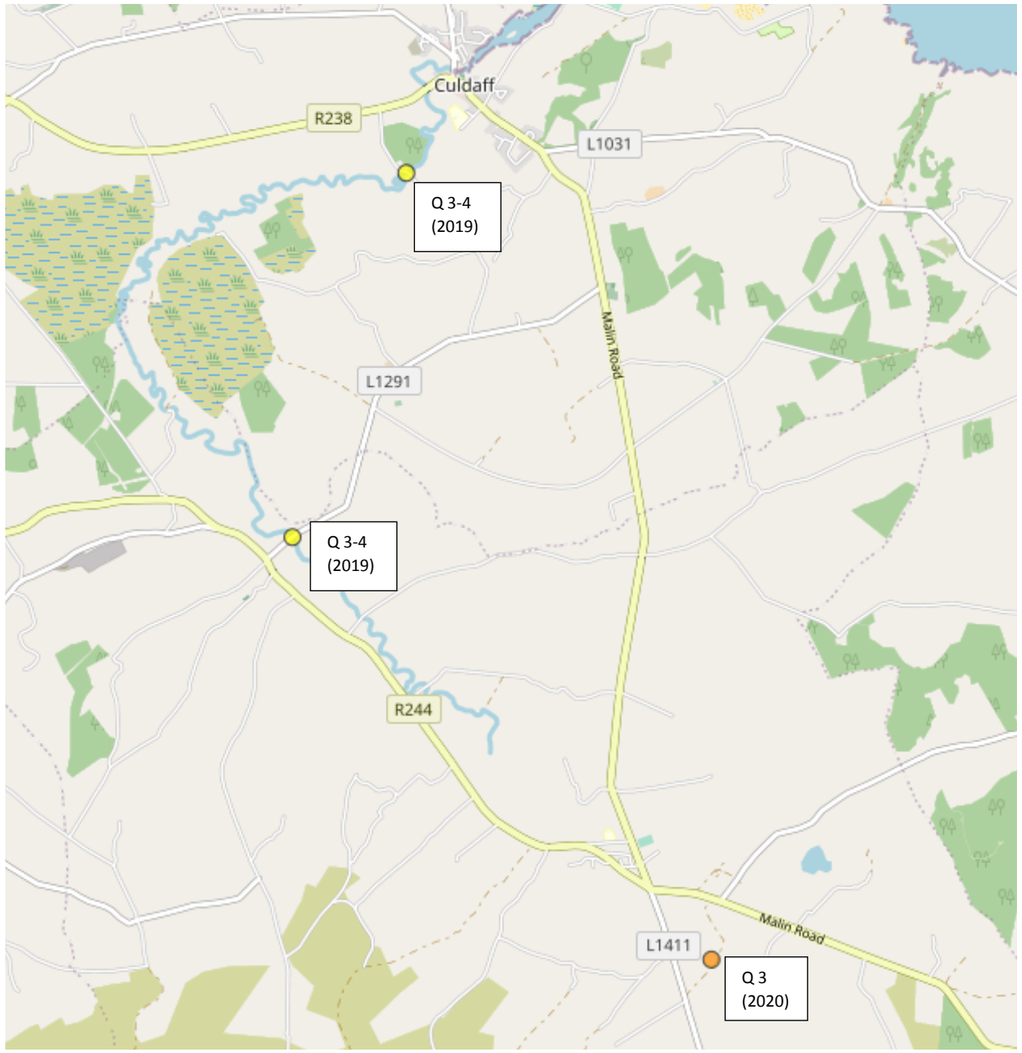

Figure 3: Three monitoring points on the Culdaff River showing Poor status (Q Value 3) and Moderate status (Q Value 3-4). Data source EPA Map Portal.

3.0 CRiBZ MEASURES AND KEY PERFORMANCE INDICATORS

The CRiBZ project aimed to work with farmers to improve riparian biodiversity and water quality through a series of measures that worked for the mutual benefits of all actors involved. Areas higher up in the catchment were targeted for improvement as it was felt this could provide a benefit downstream.

3.1 Registering participants

A standard protocol for engaging participants was developed as follows:

1. Operational group (OG) agreed on measures to be offered to participants.
2. A branded information leaflet and expression of interest form were developed (see section 6). Communication & Public Awareness). Additional general information from the National Biodiversity data Series was printed and provided to farmers. This included information on pollinators, growing wildflowers and improving farmland biodiversity.
3. Information disseminated through local retail outlets and directly through house calls using contacts provided by Culdaff River Community Angling Club. Press release to local papers, social media etc.
4. Once information had been disseminated, participants began to call to discuss.
5. The IRT project officer would provide as much information as possible over the phone followed up by a visit. Information on each of the measures was communicated. Imagery was used to demonstrate such as beehives.
6. On a site visit, the land was walked with the farmer to discuss buffer size, watering supplies and bees. Terms & Conditions of the scheme were offered at this stage.
7. Once the farmer agreed to actions these were recorded formally and the farmer signed the Grant Agreement Form.
8. The farmer then carried out the works as agreed and these were inspected and measured by the IRT project officer and Inish Forestry.
9. Once all receipts were gathered as proof of purchase, the farmer applied for payment. Payments were made by the Trust financial administrator. This was done through the IRT who invoiced DAFM for the amount offered.

3.2 Actions by farmers

The following actions were offered to farmers and details of the payment rates for each were provided.

- Fencing (permanent)
- Gates (any size up to 16')
- Troughs (single and double)
- Solar pumps
- Pasture pumps
- Piping
- Beehives (freedom and honey hive)
- Buffer – 3m
- Buffer - 6m
- Native trees
- Native wildflowers

Additional activities such as drainage work, blockwork, sediment trap and invasive species control were also undertaken at various sites by the participants. See Table 2 for a full list of the landowner actions completed and Figure 4 for a map showing the locations of the sites.

	fencing (m)	gates	trough (single)	troughs (double)	3m buffer	6m buffer	solar pump	pasture pump	piping	freedom hive	honey hive	invasive spp mgt	angling access	drainage works
	295	2		2	32		1		1					
	808	2	3	3	74	169	1		1					
	233	2			88	96		2		1				
	277	2	3		95	247	1	0		1	1			
	232	2		2	102	37	1	2			1			
	141	1	2		119		1		1	1	1			
	249	2		2	121	53	1		1		1			
	403	2	3	0	122	189						1		
	686	2			232	33				1				
	809	2			362	224				1	1		1	
	76	1		3		74	1		1					1
TOTAL	**4209**	**20**	**11**	**12**	**1347**	**1122**	**7**	**4**	**5**	**5**	**5**	**1**	**1**	**1**

Table 2: Complete records of actions fulfilled by farmer participant as part of the CRiBZ Scheme

Figure 4: Participants land marked in red where riparian zones were created. © Ordnance Survey Ireland. All rights reserved. Licence number Inish Forestry.

A total of 9 farmers participated in the scheme (target was 10). A further 5 farmers discussed the scheme with the project officer. Two were not eligible, one declined and engaged on another project and two contacted the Trust after the scheme was closed and there were insufficient funds to support more participants. Time was the limiting factor as there were some delays in the time it took for farmers to complete works. Four of the farmers worked part-time and the work was carried out over an extended period. One farmer had a medical issue which delayed the work, another was waiting for a crop cycle to complete. Two farmers were waiting for contractors to become available.

The solar pumps (Figure 5) were a key attraction for the scheme and the farmers were very happy with the functioning of these systems. The Trust will gather any feedback on the functioning of these systems over time.

3.3 Actions by the CRiBZ team

The CRiBZ team were responsible for collating all information provided by the farmers and analysing results. The team had a responsibility for administration, communication, financial administration, procurement, branding, mapping, monitoring, farm visits, volunteer events and training.

The Trust ran 8 volunteer events over the course of the project and attracted 32 volunteers to tree planting events. Volunteers were shown how to choose the best point to plant the tree looking back onto the landscape and considering the PIP points (Figure 6) where the water is most likely to travel. The volunteers quickly learned to read the landscape to achieve optimum planting.

3.4 Key Performance Indicators

Targets for the project were agreed at the outset. There were some changes to these targets e.g., no invasive species were removed but were instead treated in situ.

Key Performance Indicator	Target	Achieved
No. farmers registered	10	9
No. metres fencing completed	5000	4209
No. of drinking troughs installed	10	23
No. Pumps installed	10	11
No. beehives installed	10	10
No. Trees planted	7000	6000
No. volunteers engaged	12	32
No. wildflowers distributed	50000	125m^2
Tonnage of invasive species controlled	decrease	*
No. Training events delivered	2	1
No. Attendees at training events	12	17
No. Farm drain plans developed	10	0
No. nature-based solutions demos given	2	2
Water chemistry status increase	Improve	**

Table 3: Key performance indicators comparing targets versus results achieved.

* Invasive species not removed but treated in situ
** Water chemistry results will be repeated in the future as part of long-term monitoring programme

Figure 5: Solar pump installed on a plinth on the bank.

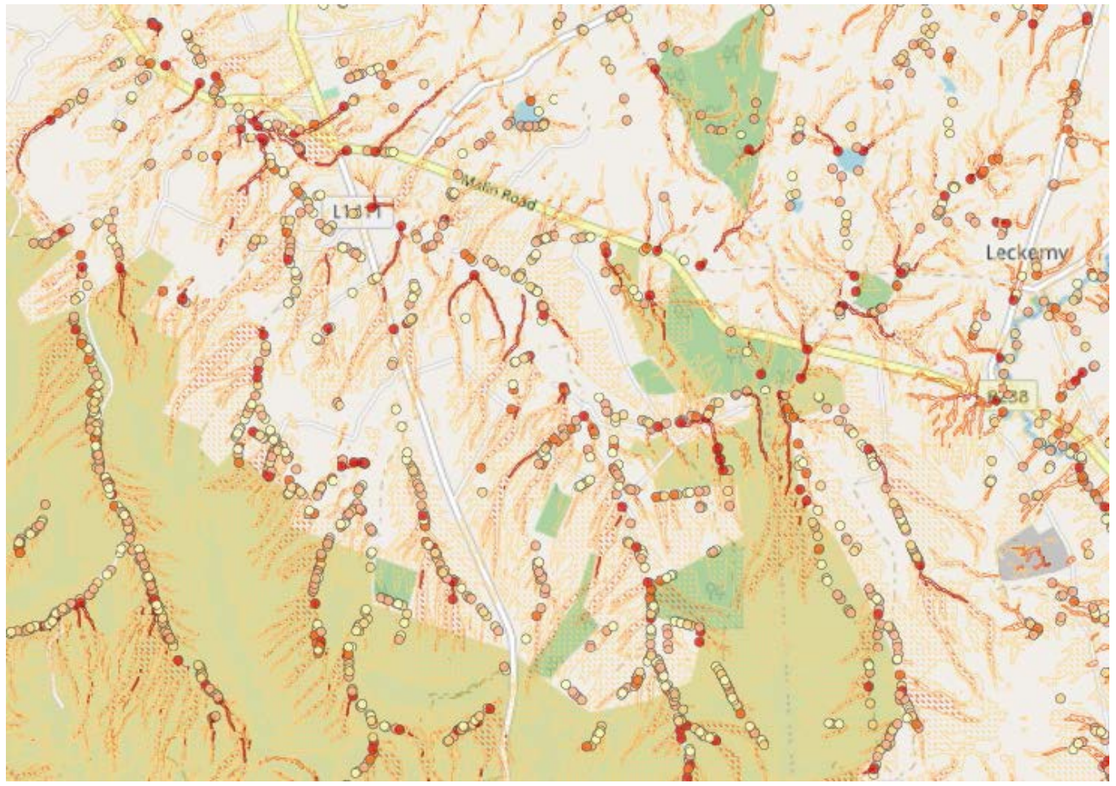

Figure 6: PIP flow pathways and points showing the areas with the highest potential for pollution (Source: EPA Map portal)

4.0 SELECTED CASE STUDIES

a. Buffers and trees

At the gathering of landowners in August 2022, there was a discussion on riparian buffers and tree planting. The benefits of native trees for biodiversity was an important topic. Reference was made to the Pontbren study and the benefit of trees in terms of increased water infiltration into the soil and the resultant adsorption of nutrients and improved flood buffering. The network of tree roots as bank stabilisers reducing land loss and preventing flood erosion (again sediment in the water) was also discussed. As ash is common along the riverbanks, ash dieback was discussed. During tree planting particular attention was made to planting near dying ash to replace these trees in the coming years.

b. Drains

During the project one particular landowner undertook a drainage programme. The farmer had opened the drain down to the river. During a visit by the CRiBZ team, there was an opportunity to discuss drainage and how to prevent sediment from reaching the river. It was recommended that the farmer install a silt trap on the drain before it entered the river. The farmer brought in an excavator to dig the silt trap near the end of the drain to capture any mobile sediment before it entered the river. This was used as a teaching point at the gathering of landowners where they were advised on how to construct and use silt traps and that the last 10 metres of any drain should not be cleared of vegetation so that this can act as a buffer to trap silt. The impact of sediment on aquatic ecosystems was discussed in detail including the potential impact on spawning beds, and the impact of adding nutrients to oligotrophic riparian ecosystems causing algal blooms and fish/invertebrate kills.

c. Biodiversity & Bees

There was a particular drive to promote pollinators through the project and specifically bees by providing beehives. Three different types of hives were installed and in general it was a popular measure amongst the farmers. Freedom hives are a simple measure which requires very little input on behalf of the farmer. These hives are sealed so honey is not harvested from them. The hive is simply left in place in a quiet corner and native black honey bees may be attracted to the hive. Lemongrass scent can be used to attract the bees. Five freedom hives were installed as part of the project.

One hive attracted a colony of black bees after only 2 weeks. Each farmer who took a hive was provide with 2 signs to erect nearby to remind contractors not to spray too close to this area. The signs were templates from the National Biodiversity Centre's All Ireland Pollinator Plan resources.

d. Invasive species management

Japanese Knotweed (JK) – *Reynoutria (Fallopia) japonica* was noted on one of the tributaries in the upper catchment of the Culdaff River at Moneydarragh on the Crocknanoneen river. The area infested covered 18.3m x 4.27m (see Figure 7). A walk upstream did not reveal the source of the infestation although it was late in the season and this survey would need to be repeated in May when JK regrows. The issue was discussed with the landowner who was not aware of the presence of the alien species but agreed to allow a consultant to treat using a novel non-chemical treatment. KPM Soils is a soil consultancy company based in Inishowen that is trialling methods of controlling JK using a bioremediated compost. Research by KPM Soils (Inishowen Rivers Trust, 2021) suggests that soils where JK grows have a poor soil biome with a low amount of fungi present and a poor bacteria to fungi ratio. The treatment is based on improving the bacterial to fungal ratio which discourages the growth of JK. KPM Soils collected and analysed 9 samples at the site and a compost was mulched onto the site in January 2023. A high density of trees was also planted at the site to feed the fungi. JK does not grow in dense woodland patches. This may be due to a combination of low light levels and high fungal composition in a woodland soil.

Further soils samples will be taken later in 2023 to assess the improvement in the soil biodiversity as a result of the mulching and the site will be checked for the regrowth of JK over the next few years.

JK was recorded at 4 other sites (Figure 8) on the Culdaff River during the advisory walkover in 2017 (Pedley, 2017).

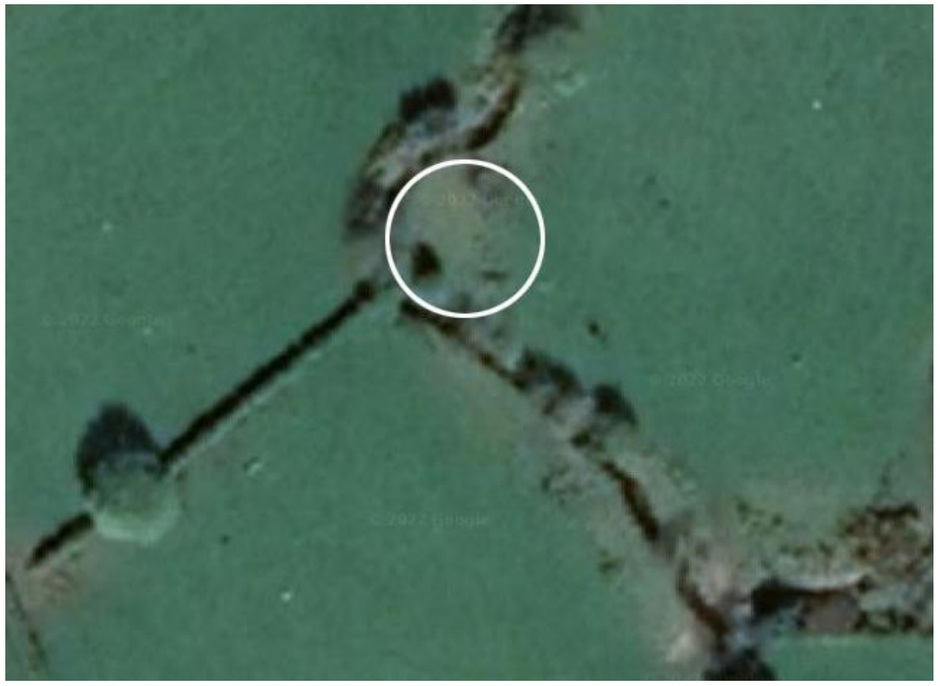

Figure 7: The location of a Japanese knotweed infestation on the Crocknanoneen River in the upper catchment of the Culdaff River in the townland of Moneydarragh. The infestation measures approx. 18.3m x 4.3m. Map modified from Google Maps satellite imagery.

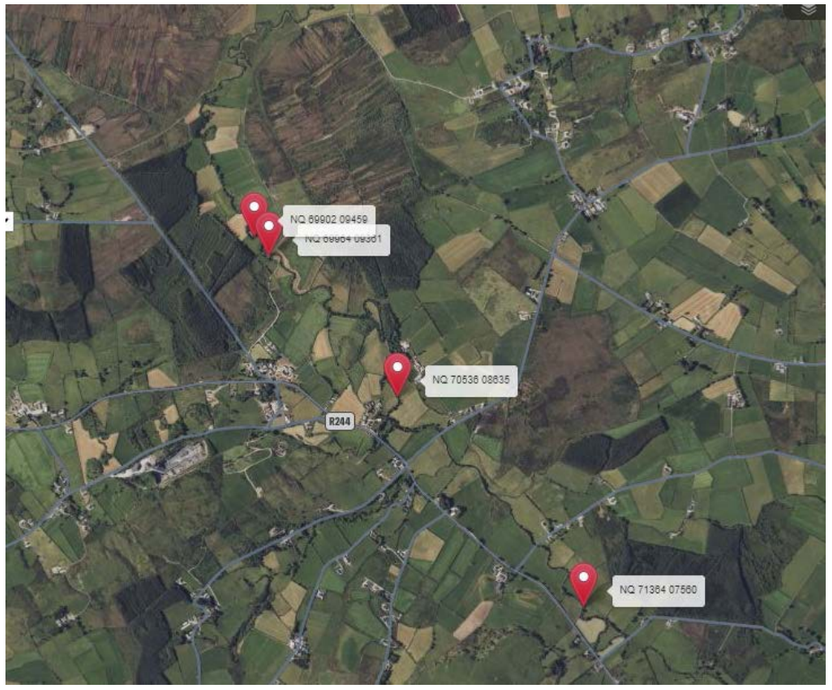

Figure 8: Recorded locations of Japanese knotweed on the Culdaff River downstream of Gleneely village during an advisory walkover (Pedley, 2017). Source map: © OpenStreetMap contributors, www.openstreetmap.org/copyright

5.0 BIODIVERSITY & WATER CHEMISTRY

In order to evaluate the effectiveness of riparian buffers on farmland biodiversity and water quality, the CRiBZ project gathered baseline data during the project. Follow up monitoring will then be compared to the baseline. Gains in biodiversity and improvements in water quality are generally slow to take effect and it is estimated that it will be several years before the positive impacts can be evaluated. As with all nature based projects the status of the sites will be in constant flux and the sites cannot be guarded from external influences such as catastrophic weather events, land clearance or serious pollution incidents. The sites will be monitored by the IRT for future years and data gathered for comparison.

5.1 Biodiversity Audit

An ecologist (Jessica Devlin) was engaged for the project to survey the riparian sites on the participating farms. This was aimed at providing a baseline of data for assessing any biodiversity gains from the creation of the buffer zones. The full species list is provided in Appendix I. The full report by the ecologist is available as a separate accompanying document. The number of species observed per site is shown in Figure 9. A total of 135 species were recorded across all sites and on each site the number of species recorded ranged from 23-54 species or 17% - 40% of species observed.

Total Number of species recorded at each site

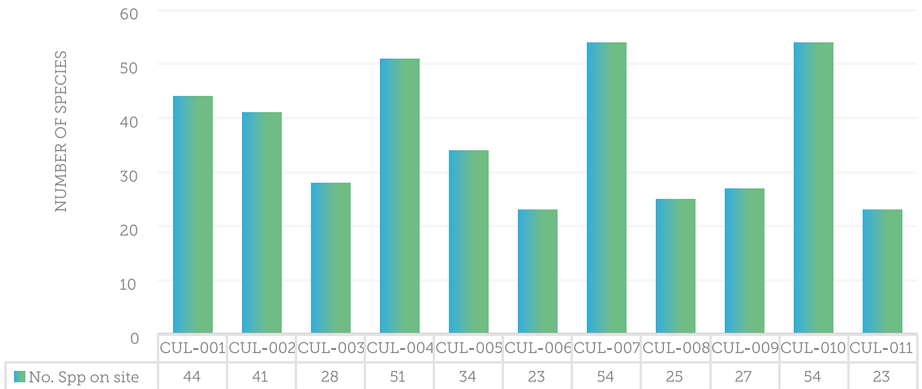

Figure 9: The total number of species recorded at each site in the scheme.

In the short term the planting of these zones increases the biodiversity in cases where the native trees were not already on the site. It is expected that increased vegetative cover will increase insect and bird population as well as improving the soil biodiversity. In addition, understory flowers and shrubs are likely to increase and although certain species may have been present in low numbers, the abundance of some species is likely to increase. This includes invasive species such as salmonberry which thrives in woodland conditions. A risk when fencing off an area is that it will allow invasive species to populate the zone as they will not be challenged by browsing livestock. It is important to remind farmers of the risks with invasive species.

Several invasive species were recorded. These included:

Salmonberry (SB) – *Rubus spectabilis*

The most widespread invasive species across the sites was Salmonberry (Figure 10). This hardwood species is a particular issue across Ulster according to data from the National Biodiversity Data Centre and CEDAR. It thrives in a wide range of habitats, growing well in slightly acidic, moist soils or in disturbed ground. It also thrives in native forest and can form a thick undergrowth if left unchecked. Although SB provides a rich source of nectar for pollinators and berries for birds, it can have long term damaging effects on an ecosystem and needs to be controlled. Farmers were informed about the issue with SB through conversation and through the final newsletter.

Figure 10: Salmonberry in early spring. The bright pink flowers come early in the season as the plant comes into leaf. The stems are thorny and do not break down in the winter after the plant has lost its leaves. Dense stands of bare stems can be seen on many parts of the Culdaff River during the winter.

Himalyan balsam (HB) - *Impatiens glandulifera*

Himalayan balsam (Figure 11) was only observed on one site (CUL-007). This will be tackled in the next field season (May-June 2023). This plant is an escaped ornamental, native of the Himalayas and thrives in damp soils especially along watercourses. It is an annual plant which grows rapidly, out-competing native plants and in the winter, when it dies back, it leaves banks bare and at risk of erosion.

Himalayan balsam can be easily uprooted by hand pulling and this can be an effective control method if carried out consistently by teams of volunteers. This is known as Balsam Bashing. HB spreads rapidly due to its explosive seed pods spreading as much as 700 seeds from a single plant. As it is an annual plant pulling it before it sets seed or flowers can eradicate the plant from an area in a short space of time (within 3 years to ensure the soil seedbank has been depleted).

Figure 11: Pink flowered Himalayan balsam growing with Japanese knotweed. Both plants are highly invasive on Donegal riverbanks. This photo was taken on the nearby Glennagannon River.

Snowberry – *Symphoricarpos albus*
Snowberry was observed on one farm in Culdaff and while this is an attractive plant with tiny pink flowers and white berries, it spreads vigorously by suckering and forms dense thickets. The berries are reputed to be poisonous to humans but they are eaten by bird species. Like many of the other invasives it outcompetes our native vegetation.

Fuchsia - *Fuchsia magellanica*
Fuchsia is commonly planted as a hedging or shrub species in gardens but spreads rapidly in open landscape particularly along riparian corridors and hedgerows. The plant suckers easily (stems touching the ground will root and grow) and this allows the plant to spread widely and without the need to produce seed. Fuchsia is not difficult to control and can be cut back easily. Fuchsia was found in just two locations on the participating farms.

Japanese Knotweed (JK) – *Reynoutria (Fallopia) japonica*
Japanese knotweed was found in one farm location on the Culdaff River at Crocknanoneen. JK is one of Ireland's most invasive non-native species and is regulated under Part 49(2) and 50 of S.I. 477 European Communities (Birds and Natural Habitats) Regulations 2011. Originally introduced into Ireland in the late 1800s (Bailey & Conolly, 2000) as an ornamental plant from Japan, China and Korea, it has spread rapidly taking advantage of the mild atmospheric conditions and suitable soils (Invasive Species Ireland website). It is considered a high impact species and on river corridors its spread is easily facilitated by eroding banks during flood periods.

The source of this infestation was not located and it will not be until the next season that it will be possible to check for it further upstream. When invasive species are detected, it is recommended to begin an eradication programme at the source of the river finding the upper most infestation. This will prevent the downstream spread which will inevitably happen.

Montbretia - *Crocosmia x crocosmiflora*
Montbretia is commonly observed growing along road verges, under hedging and in woodlands areas. It spreads gradually but can be difficult to eradicate due to the many corms produced by the parent plant. Montbretia is very common in the Inishowen peninsula and has spread across Ulster over hundreds of years. The plant forms dense patches which die down in winter. This dead vegetation remains in place and prevents the growth of native plants in spring. The dead vegetation needs to be manually removed.

Invasive animals
Mink droppings were observed by the ecologist during the survey. The Culdaff River has a robust mink population. Members of the Culdaff River Community Angling Club have trapped over 30 mink in the last few years on the Culdaff. These were trapped in the lower reaches of the river but the results of the CRiBZ survey suggests that the species is likely to be present over the entire catchment. Mink are voracious predators and will eat fish, mammals and birds, including bird eggs. They are excellent swimmers and climbers and are difficult to eradicate from an area due to their secretive lifestyles.

5.1.1 Aquatic species

In watercourses, biological monitoring involves a riverfly survey (Figure 12), electrofishing or redd counts (counting the nests of trout and salmon). Additional data on fish species and riverfly scores was obtained from the Loughs Agency through a data sharing agreement. The Loughs Agency results indicate that several fish species are present in the river. These include Atlantic salmon, trout, European eel, lamprey, minnow and flounder. Trout and European eels have been detected in the main subject area upstream of Gleneely village.

Just upstream of the Gleneely WWT plant the Trust observed trout redds in the river. This correlates with the Loughs Agency data showing the distribution of redds along the main channel.

Riverfly monitoring by the Loughs Agency, using the BMWP system (biological monitoring working party), shows scores are poor to fair in the upper catchment. This correlates with the data gathered by the CRiBZ contracted ecologist using SSRS (Small Streams Risk Score).

The EPA score for the Culdaff_010 is poor (Q score of 3) and improving this status will depend on improving not just the biological scores but also the chemical and hydromorphological scores. The EPA Q scores are based on the "one out, all out" principle so a river that fails for just one of these categories will fail overall. Activities by other landowners upstream and downstream of participants sites can impact on any of these scores.

Sedimentation is a major issue in Donegal watercourses and is primarily as a result of runoff from agricultural fields and drains. Sediment impacts a river by depositing over the river bed and clogging spawning gravels or simply covering essential habitat for macroinvertebrates. A more detailed look at sedimentation is discussed below in section 5.2.

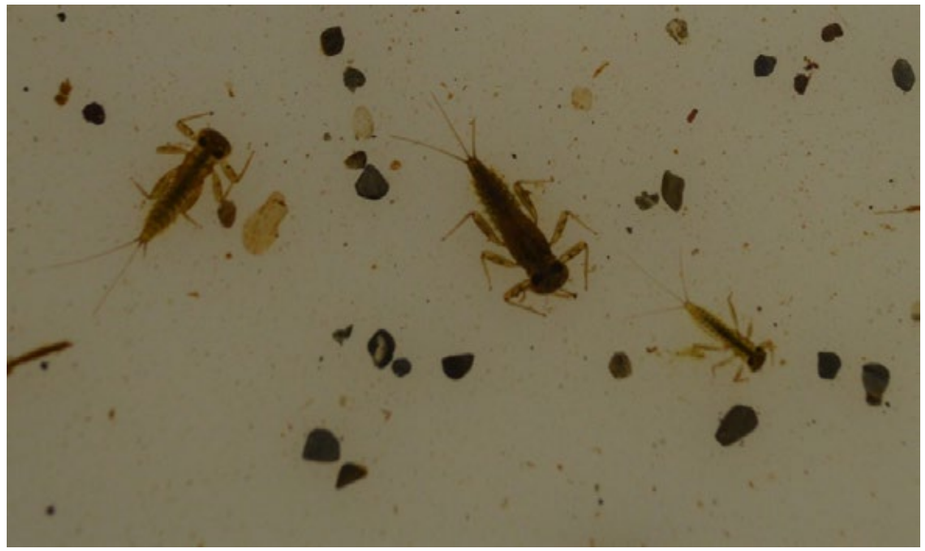

Figure 12: Aquatic macroinvertebrates are important indicators of the status of a river.

5.2 Water Chemistry

In recent years pollutants of emerging concern, such as PFAS, PAHs and persistent pharmaceutical or veterinary substances have received increased scrutiny for their impact on the environment and on human health. A complex picture is emerging of interactions and synergies between chemicals under different environmental conditions. Pesticides have been commonly used in the agricultural sector for many years but it is increasingly difficult to evaluate their impact on the environment with the emergence of new products and 'forever' chemicals.

In the CRiBZ programme, water chemistry analysis was undertaken in an attempt to assess the pollutants that are typically found in the river and assess nutrient enrichment. Basic water chemistry equipment was purchased and used to measure a suite of standard parameters. These instruments were a Hanna multimetre measuring pH, Total Dissolved Solids and conductivity and a Hach Turbidity metre. The IRT already has a dissolved oxygen metre.

Measuring the levels of nitrates, phosphates and ammonia is also standard practice for surface water testing but in order to obtain accurate results it is necessary to have samples analysed in a laboratory. A range of pesticides were also tested for, including the most commonly used chemicals in the agricultural industry, such as MCPA, cypermethrin, clopyralid, mecoprop, etc. The full list of chemicals tested for is shown in Appendix II in an example Certificate of Analysis received for each sample.

The IRT engaged accredited laboratory Fitz Scientific, based in Drogheda, to analyse the samples. A total of 23 samples were collected from the main channel of the Culdaff River and 12 of its tributaries. A sample at the site of each of the participants was collected plus strategic sampling at confluences across the catchment (Figure 13).

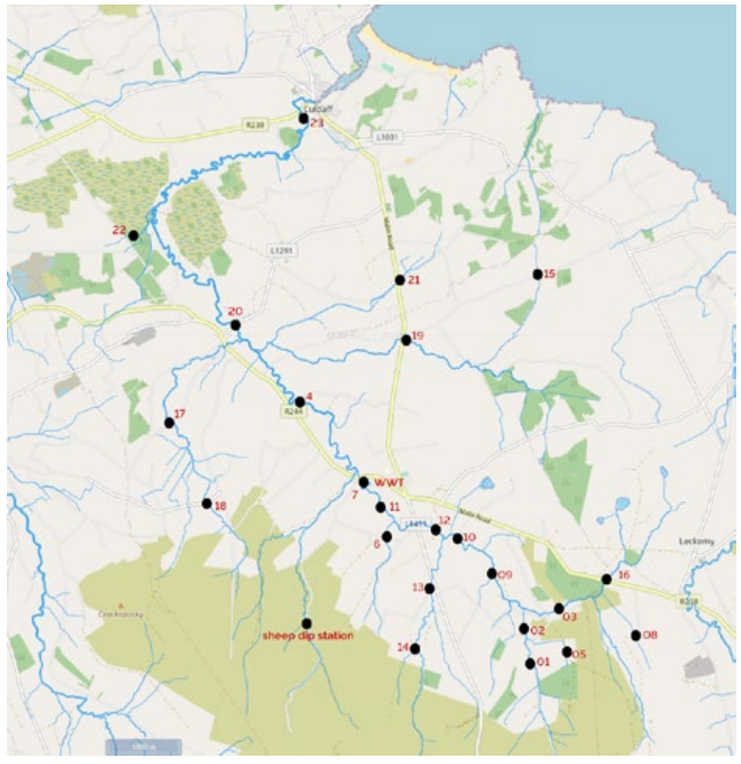

Figure 13: Sample locations on the Culdaff River. The majority of the participants were based above the waste water treatment plant at Gleneely (WWT). Map modified from EPA Map Portal. ©Openstreet contributors

At each sampling point the IRT used a Physical & Chemical Data Form to record the results of the basic water parameter and additional data such as physical characteristics of the sampling point and exact GPS coordinates. This form has been developed in-house by the Trust using Survey 123 (see Figure 14).

The EU Commission (Directive 2008/105/EC) sets Environmental Quality Standards (EQS) for the presence in surface water of certain substances or groups of substances identified as priority pollutants because of the significant risk they pose to or via the aquatic environment. The directive sets thresholds which must not be exceeded if a good chemical status is to be met. In the Irish context, this is transposed into law through S.I. No. 77 of 2019 (Irish Statute Book, 2019).

The EQS for each of the 3 parameters tested in given in Table 4. These values are for river surface water. The table also shows the number of exceedances detected in the samples.

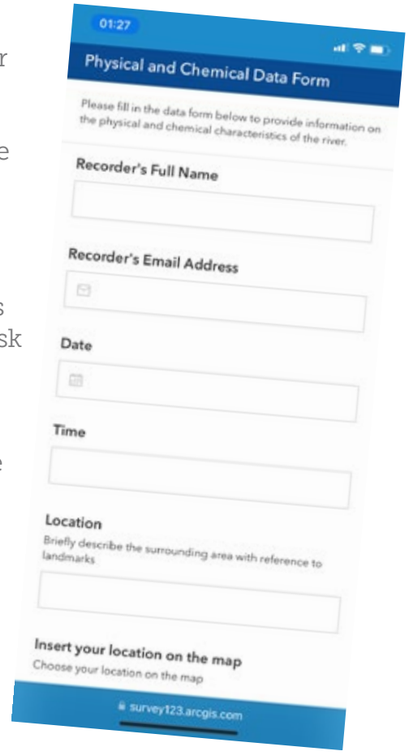

Figure 14: Recording physical and chemical data in the field using a Survey123 form on a mobile phone.

Substance	EQS	Exceedance in CRiBZ samples
Nitrate	2.6 mg/l as N*	1
Phosphate	0.035 mg/l	20
Ammonia	0.065 mg/l as N	3

Table 4: Exceedances for phosphates occurred in 87% of the samples taken (n = 23). *Currently there is no EQS for Nitrates and this mid-range value is used for the purposes of this report. The EPA use a value of 1.8mg/l for status and 3-4mg/l for classification (pers.comm Jenny Deakin (EPA) via Gary O'Connell LAWPRO).

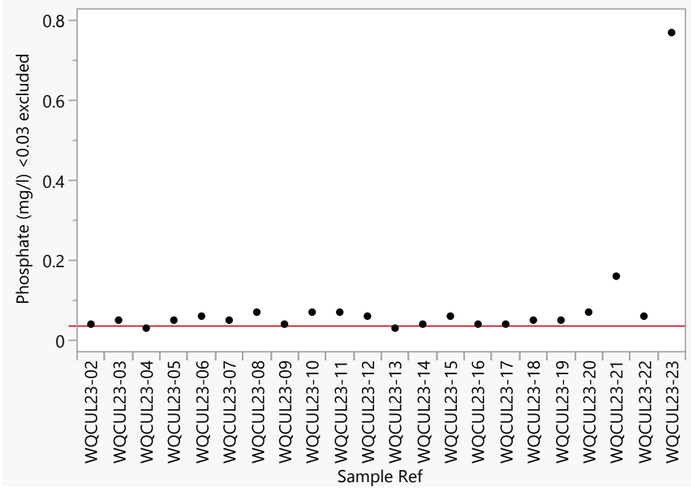

Figure 15: Phosphate levels (mg/l) recorded in each sample with the EQS indicated by the red line. 20 samples indicated a level at or exceeding the EQS threshold.

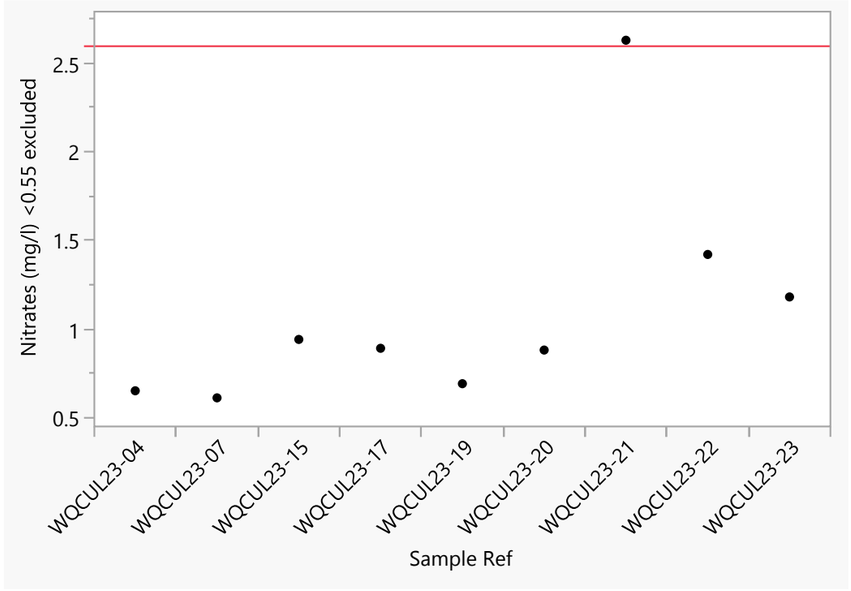

Figure 16: Nitrate levels (mg/l) recorded in each sample were low and only one sample exceeded the threshold EQS, shown as the red line.

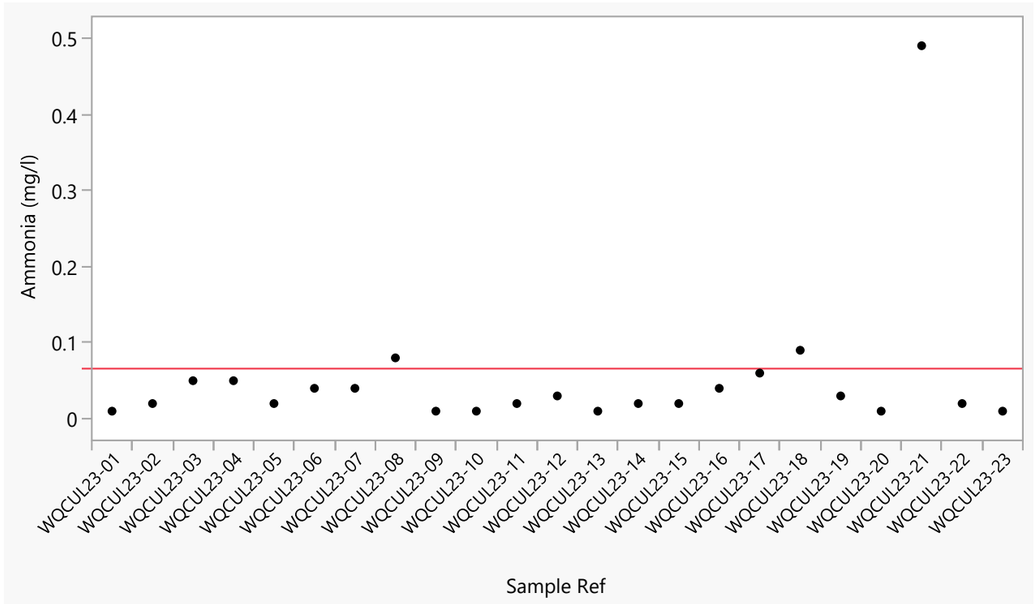

Figure 17: Ammonia levels (mg/l) recorded in each sample with three exceedances (red line is EQS threshold).

Phosphorus is relatively immobile in heavy soils and therefore will runoff more easily. The farmers have been advised that they are more likely to have problems with phosphorus due to the peaty soils in the catchment and care must be taken when spreading fertiliser.

For the basic parameters the pH range was within acceptable range and the Dissolved Oxygen was within range except for one below 80%. For Total Dissolved Solids, the range was well within normal values.

Turbidity is recorded in Nephelometric Turbidity Units (NTUs) and has been used as a proxy for Total Suspended Solids (TSS). Turbidity is defined as a measure of the degree to which water loses its transparency due to the presence of suspended particulates. Sedimentation is seen as an important issue on streams in Inishowen (pers. obs.) and a method to quickly and accurately assess this impact would be valuable for assessing improvements in water quality. Optical turbidity metres (such as the one purchased for this project) provide a relatively high level of accuracy when calibrated correctly. NTU values below 10 are considered low, a value of 50 NTU would be considered moderately turbid, and very high turbidity values can be more than 100 NTU. The turbidity results for the CRiBZ samples are shown in Figure 18. One sample recorded a significantly higher level than the other samples. This sampling point was located just below a coniferous plantation and the pH (6.16) at this point was the lowest across the catchment. The site was on a tributary located above all of the participant sites.

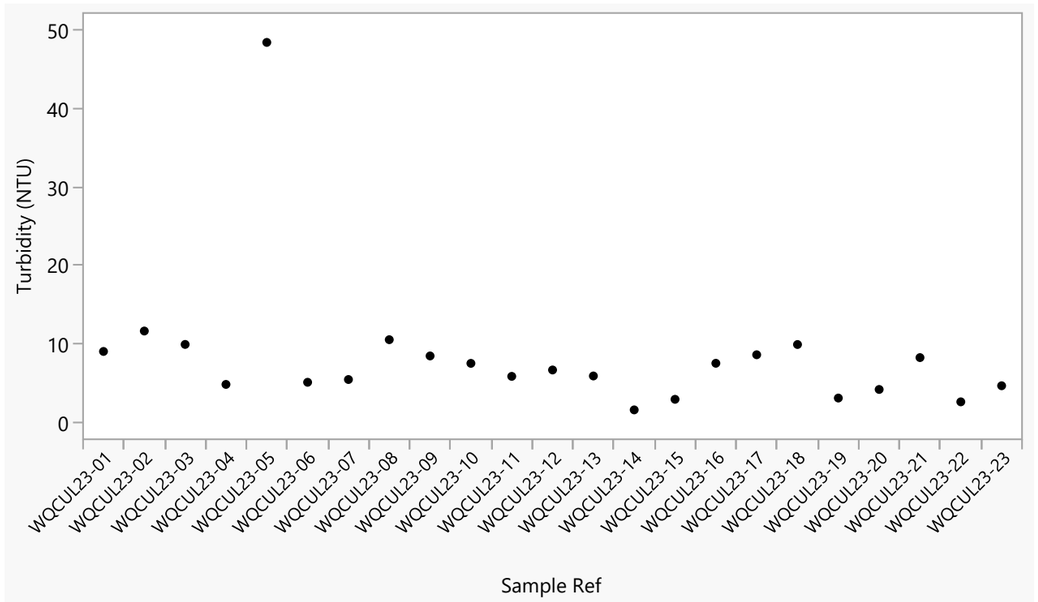

Figure 18: Turbidity levels recorded in each sample. Scores below 10 are considered low. Sample 5 was taken just below a coniferous plantation.

Excessive 'load' in a river can have a range of negative impacts on water quality as well as impacting on erosion and hydrological function in the river. Logging activity releases sediment into forest drains which will make their way to the local watercourse unless adequate mitigation measures are in place during works. In the next 10-20 years in Inishowen many forests will reach maturity and need to be felled. This will have a significant impact on watercourses if proper planning is not in place. The buffers created on the river will help to protect the river by capturing run off.

A further issue with excess sedimentation on a river is the binding of pesticides to sediment particles. This means pesticides can persist in the environment for longer and accumulate. Pesticides can runoff directly into watercourses and spray can drift in windy weather. The results of the pesticide analysis are shown in Table 5. Four different pesticides were detected in the catchment.

The risk of pesticides entering a watercourse is influenced by the multiple factors such as mobility, persistence (half-life), and toxicity, as well as quantity (Harmon O'Driscoll et al., 2022)

Pesticides have an EQS of 0.1µg/l and Table 5 shows the Limit of Detection (LOD) at the water chemistry lab. Samples that breach this threshold are flagged. At one sampling point 3 pesticides were detected. Despite this, all samples are still well below the EQS and are not therefore an immediate cause for concern. However, the synergistic effects of combining chemicals are not well understood although it is known that environmental factors, such as pH and temperature, can affect ammonia toxicity to aquatic animals. The participating farmers have been reminded of the need to be fully aware of the risks of using pesticides and ensuring that the correct PPE is worn at all times. Many farmers are now aware of the risks involved in using weedkillers and data from the EU has illustrated the reduction in pesticide sales in Ireland (EU, 2022).

Glyphosate µg/L	Metamitron µg/L	Pendimethalin µg/L	Fluoroxypyr µg/L
LOD 0.002	LOD 0.0007	LOD 0.002	LOD 0.001
0.003			
0.002			
		0.005	
0.006			
0.003		0.006	0.073
0.004			
	0.0032		
	0.0024		
0.003			
0.004			
0.004			
0.002			

Table 5: Levels of pesticides detected in CRiBZ water samples. At one site three different pesticides were detected. LOD = Limit of Detection.

5.3 Future Monitoring

The Trust will continue to engage with the local farmers and will continue monitoring of the sites using the equipment purchased. The basic water chemistry data can be gathered easily. The participants have also agreed to allow access to the sites for checking in the future. This was written into the contract between the CRiBZ group and the farmer. A good outcome of the project would be a reduction in phosphate levels and future laboratory analysis could focus on this single parameter in addition to the basic sampling.

Engaging farmers in understanding the relevance of water quality and monitoring is considering an important step in achieving better long-term environmental results. The CRiBZ project officer attempted to purchase simple field kits for testing phosphate and nitrate which could be given to the farmers to test their own local area and generate interest. However, procurement proved difficult and was abandoned. These small kits are generally thought to have lower accuracy than laboratory results but should be considered in the wider context of increased understanding and citizen science. A future option for the IRT is to continue phosphate testing at a cost of €12 per sample + VAT + courier costs. Alternatively further sampling could be carried out by the statutory agencies such as Loughs Agency, Donegal County Council or LAWPRO.

6.0 COMMUNICATION & PUBLIC AWARENESS

The CRiBZ project involved a wide range of stakeholders with various responsibilities and remits.

6.1 Engagement with statutory agencies & other organisations

The Operational Group met at intervals (6 meetings in total) to discuss the procedures and results of the project. The team also kept in regular contact by phone and email. All OG meetings were face-to face with the option to join online via Zoom. Trees on the Land, Imogen Rabone joined via Zoom for each meeting but her colleague Mark Donnelly visited Inishowen in August 2022 to review the project and provide agro-ecology advice. Ross Buchanan from Inish Forestry and the Trust project officer Trish Murphy accompanied Mark on a tour of the participating farms. Mark also met with the Inishowen Uplands EIP team at this time.

Other agencies were contacted as part of the project. The Loughs Agency is the fisheries authority and consenting body for the Culdaff River. This agency was the first contacted in relation to the project and the goals discussed. The agency provided data to CRiBZ on electrofishing and redd counts on the river which was released to IRT under a data sharing agreement. Conversations with local inspectors provided information on additional projects that had taken place on the river in previous years.

Other organisations were contacted to discuss issues relating to the Culdaff River. This included Donegal County Council and the CatchmentCare project. The Teagasc ASSAP advisor was contacted in relation to the project but as the Culdaff river is not included in the Priority Areas for Action, there have been no referrals from the LAWPRO Catchment Science Team to the advisor. The Water & Environment section of Donegal County Council were contacted and provided some historical water chemistry data on the river and some advice on the type of parameters most useful to assess.

6.2 Engagement with the public

Following the launch of the scheme the IRT ran a press release in all of the local papers. Over the lifetime of the project, there were a wide range of social media posts and the project featured in three issues of the Trust e-newsletter RiverView. This helped to raise the profile of the Trust and increased volunteer engagement.

6.3 Events

The Trust ran a community/training event on one of the participants land (Figure 19). This was arranged to coincide with the visit of Mark Donnelly, consultant with Trees on the Land, so that the farmers could engage with Mark on trees, biodiversity and agro-ecology. The beekeeper and contractor, Donagh Bees, attended the event and demonstration using the horizontal beehive and answered any questions the farmers had. Tomas Lawrence also provided a demo on macroinvertebrates comparing a Culdaff sample to a sample from the Blue Dot Mill River. This demonstrated the loss in biodiversity in the river when the water quality is poor.

Figure 19: Abdul from Donagh Bees demonstrating how to check the frames in the honey hives provided to farmers as part of the CRiBZ project.

6.4 Volunteer Tree planting

Tree planting events took place in March & April 2022 when the trees first arrived from Trees on the Land. However only one farmer had completed their fencing by then so this area was planted by volunteers and the remainder of the trees heeled in on a nearby farm.

In January 2023 when all sites had been fenced the Trust commenced a further 6 volunteer events to transplant the trees from their temporary home to the buffer zones of the different farmers. A total of 32 unique volunteers helped at the events with between 5 and 15 participants attending each time. The Trust provides all PPE and training for the volunteers and refreshments during the work. Some of the farmers joined in with the planting.

6.5 Branded & Print Material

At the start of the project a brand was developed by designer Big Moo Design. The brand was intended to attract attention to the project and engage potential participants. A range of materials were printed for a CRiBZ housing folder. This contained the following documents which were distributed locally in shops and through face-to-face meetings:

- a one page document About CRiBZ Scheme
- an expression of interest form
- Farmland: Actions to help pollinators (National Biodiversity Data Series No. 14)
- How-to-guide: Hedgerow for Pollinators (National Biodiversity Data Series No. 7)
- How-to-guide: Creation and management of a wildflower meadow (National Biodiversity Data Series No. 13)
- List of Food for pollinators on the farm (from www.pollinators.ie)

Later in the project further print material was developed including:

- 'Water Quality on the Farm' document was produced for the farmers with key messages about water and how to do a kick sample and learn more about managing drains.
- Signs for the participants who took beehives. These signs were branded with the CRiBZ logo.
- Two posters were designed for 2 networking events – one for the National Rural Network EIP meeting in Athlone in November 2022 and another for the 'What's Happening on Inishowen Rivers 'event organised by the Trust in collaboration with LAWPRO and sponsored by the EPA.
- Wildflower information was given to the farmers with their seeds.
- Information on solar pumps was provided for those farmers that were taking the solar pumps
- Farmer received a final newsletter with the overall results of the project and more personalised results for each individual farmer.

6.6 Online material

There were a range of public media posts about the project on the Trust's Facebook and Twitter pages. The IRT website featured a section on the project and a video was created at the end of the project to demonstrate the work that had been carried out. The video can be viewed here.
https://youtu.be/pnKImHhrBDw

7.0 FINANCIAL REPORT

The full amount of funding was disseminated in the delivery of the CRiBZ project (see Table 6).

Participating farmers received €39,458 in direct payments for the actions carried out. In the original budget it was estimated that €20K would be committed to fencing. While some farmers carried out the fencing works themselves and some used a contractor, all payments for fencing were made through the farmers. A number of items were paid for directly by the Trust and supplied to the farmers including the services of contractors. The total amount of indirect benefits amounted to €67,873, giving a total of 81% of the project funds benefitting the farming community. The items purchased directly by the IRT are shown in Table 6 under Project Implementation.

There were some cost savings on some items identified in the original budget and these were accumulated in order to purchase additional solar pumps. The full amount of funding was utilised and a small amount of additional funds (€42.06) were topped up by the IRT in order to close the banks accounts.

Photo credit ID 94730830 @ Dreamstime

CRiBZ Project Budget

July 2021 - Feb 2023
Expenditure

	(€)	Sub Totals (€)	% of overall budget (%)	*NOTES*
Programme Administration				
IRT Project officer staff time	**15,840.00**			*Project Co-ordination, farmer engagement, evaluation*
Communications & Publications	**2,638.47**			*Logo, reg info, 2 leaflets, signs, NBDC print outs, final report*
Training time & venue	**300.00**			*Engaged riverfly expert/venue*
PPE equipment for volunteers	**111.45**			*Gloves, safety glasses*
Operational Group Meetings	**0.00**			*Not required. Using EIP office and online*
Office & Admin overheads	**300.24**			*Office equipment, printing, Banking*
Travel & Subsistence	**1,348.77**			*Travel expenses, Financial reporting, farmer engagement advice*
Inishowen EIP	**5,000.00**			
		25,539	19	
Project Implementation				
Water Chemistry analysis	**13,556.84**			*Water chemistry, water chemistry instruments*
Drinking water pumps and installation	**19,284.30**			*Pasture pumps, solar pumps*
Wildflower seeds	**210.25**			*Irish provenance seeds*
Beehives & management	**4,450.00**			*Timber hives on stands, installation and training*
Ecologist	**6,980.00**			*Ecological surveys, establishment of monitoring protocols*
Farmers Payments	**39,458.00**			*Direct farmer payments for infrastructure*
Trees on the Land	**7,845.00**			*Trees, planting oversight, ecology support*
Inish Forestry	**14,996.68**			*Mapping, planting plans, farmer engagement, drain advice*
KPM Soils	**550.00**			
		107,331	81	
Total costs	**€ 132,870**	**€ 132,870**	100	

Table 6: A summary of the full project fund dissemination

8.0 EVALUATION & LESSONS LEARNED

A risk assessment for the project was carried out in advance (Table 7) which identified the key issues which might impede the project progress. The actual challenges encountered are described below along with a discussion on how these were managed.

1. Time is needed for effective engagement

The predominant challenge was the time frame. Signing up landowners took longer than anticipated. The information leaflet about the project was not developed until December 2021 (resources not transferred to IRT account until November 2021), but as soon as this was printed the project officer and a member of the Culdaff River Community Angling Club started to approach landowners known to the Operational Group. Once the first farmer had agreed to take part (an influential farmer in the area) it was easier to get agreement with other farmers. The OG have found this on other projects when seeking agreement from farmers whether on a voluntary or paid scheme. A good rationale and clear benefits to the farmer must be establish first and provided in print. The farmer must then be given time to consider the scheme and the project officer would make a number of return visits before a final decision was made.

The increased time needed to engage with farmers impacted on time management resources of the project officer. This was anticipated to some extent and Inish Forestry was available to agree contracts and liaise with the farmer. A contingency for staff holidays or illness is important but there should be clear lines of communication with all farmer liaison staff.

Greater impact can be achieved with longer term projects. A number of farmers, including those that participated, have enquired if the project will continue in the future. There is no doubt that extending the project to create further riparian zones on the Culdaff would have considerable benefits for the river and the farming community.

There was insufficient time to engage with school children in the area. The two local schools were contacted but preferred scheduling did not coincide, and the project was closed before this could be achieved. It has been agreed in the Trust that the schools will be contacted in the appropriate season. This would involve a visit to the river (agreed with landowner) to look at riverfly and the benefits of trees. This work is limited to between April and September.

SIGNIFICANT IMPACTS IDENTIFIED	GROUP AT RISK	RISK RATING Impact x Risk = Risk Score			CONTROL MEASURES
Project management – Loss of OP group member	IRT, Inish Forestry, Inishowen Uplands EIP	4	1	4	Contingencies for staff replacement in IRT and IU EIP. For Inish Forestry – new contractor procured
Failure to agree approach within Operational Group	ALL	2	2	4	Work to agreed decision making process. Introduce external mediator if required.
Financial Management	IRT	3	2	6	Accounts scrutinised by IU EIP and IRT accountant. Ensure monthly controls in place.
Overspend on budget	IRT	2	2	4	Accounts scrutinised by IU EIP and IRT accountant. Ensure monthly controls in place. Additional funding may need to be secured. Commitment / engagement by farmers reducing costs
Farmer payment disputes	ALL	2	2	4	All payments agreed in advance and signed off. Experience of IU EIP in handling disputes.
Engagement by Farmers	IRT	3	2	4	Ensure frequent engagement. Clearly explain benefits. Providing considerable financial benefits as well as environmental benefits
Single Farm Payment issues	ALL	4	3	12	Ensure implications are clear to participating, Teagasc advice, IU EIP advice. Clearly define implications at start in MoU and allow participants to withdraw.
No Community Engagement	ALL	2	1	2	Good record of volunteer engagement in the area. Successful projects in areas identified. Provide site visits.
Impacts cannot be evaluated	ALL	2	1	2	Identifying monitoring protocols at start of project. Testing interim results and impacts. Due to nature of project, high probability of successful installation of measures and successful outcomes.

Table 7: Identifying the risks & impacts for CRiBZ.

2. Clarity is needed on how the scheme fits with other agri-schemes

One of the key concerns expressed by farmers when first approached was how the scheme fitted with their other agri-scheme involvement. All of the farmers were concerned about how it might effective their basic payments and also if fencing off the riparian zone would decrease their eligible area. The project officer obtained an email from the DAFM to clarify the matter for the farmer and this helped to increase their confidence in joining the scheme.

Part of the issue around this concern is the lack of focus on the protection of watercourses for many years. This applies to all sectors, not just in agriculture, but it has put water quality issues and protection further down the list of priorities for many farmers who exist on small farm holdings or with small budgets. Every square metre of ground counts and there is no clear financial benefit to keeping watercourses clean other than to avoid penalties. Increased awareness and training is essential (see below).

3. Increasing awareness is critical to success

Although farmers are inherently interested in the environment and the land there is often a low level of understanding of ecosystem functions and the influence on farm productivity. Environment, biodiversity, water and climate literacy is essential to facilitate the behavioural changes that are now needed to conserve and restore our natural systems.

As practical and often time-poor people, it is necessary to provide lots of opportunities for farmers to learn in an easy and convenient manner. It has been long proven that peer-to-peer learning is the most successful tool for engaging farmers with new skills or ideas (e.g.,

Farming with Nature Ambassadors, https://www.farmingfornature.ie/). Small gradual steps that introduce concepts and vocabulary should be established in water and farm biodiversity literacy. This has begun with the National Biodiversity Data Centre with the Farmers' Wildlife Calendar being promoted across Ireland.

There is considerable work to do around drainage, water tables and traditionally held beliefs on how these should be managed. Many farmers are proud of their skill in maintaining 'clean' drains even though this type of drain can often be a point source of pollution for watercourses. The farmers are following traditional methods and guidance that is now outdated as we are starting to understand more and more about the interconnections between watercourses and groundwater. Another issue is an understanding of cross compliance issues in relation to water. Where and how a trough should be placed in order to comply with scheme requirements should be common knowledge with all farmers.

One-to-one interactions, small group interactions and literature were the most effective ways of engaging farmers on this project. The community event held on one of the farms was a very successful and enjoyable evening for everyone involved. Bringing in experts to discuss a topic (trees, bees and biodiversity) was also favourably received.

4. Drainage is a difficult topic to discuss!

The project aimed to provide farm drain management plans for each of the farmers but it was found early on during initial conversations that drainage is a sensitive topic for farmers. The heavy peaty soils in the main project area mean that the farmers and their grandparents have been draining the land for many generations and take a certain pride in a field that is dry with drains that are cleaned out regularly. Over time and when trust had been established between the project team and the farmers, the topic of drainage could be discussed during a walkover or if the topic was raised incidentally. One farmer was in the process of clearing a drain during a visit by the project officer and Inish Forestry. Following the advice of the CRiBZ team, the farmer engaged a contractor to do some further works on the drain i.e. install a sediment trap. This will ultimately help to reduce sediment inputs into the Culdaff river at this point.

Advice was offered to the farmers when the opportunity arose, and could include reference to PIP maps and critical source areas. These are all terms that are new to the majority of farmers but it is important to raise these topics as often as possible. The idea of using vegetation to filter and absorb run off was accepted but redesigning existing farm drains to drain into vegetated areas or to sediment traps would most likely only be considered if it coincided with works on the drains, as in the case of the farmer during this project. Long term relationships with the farmers may mean they will contact the CRiBZ team (Trust) when considering new projects.

5. The size of the buffer matters

The idea of allowing a 6m buffer along a riverbank was met with raised eyebrows by most of the farmers unless they already had an area of ground that was not productive. Asking a farmer to fence off 3m or 6m of good ground would be a difficult decision and needs careful thought. The benefits of providing wide buffers was continually highlighted and there were some good gains with 6m buffers (over 1100m). Sometimes a farmer verbally agreed to install a wider buffer but when inspected the buffer was narrower than intended. Payments were not made out on buffers below 3m but every buffer will provide some benefit no matter how wide. The OG committee believes that the CRiBZ project has without doubt improved the size of the buffer zone over a significant length of river and has succeeded in protecting over 4.5km of riverbank.

6. Deeper understanding of the catchment

The project helped the IRT and consultants to gain a deep understanding of the catchment and the status of biodiversity and water quality in the area. This knowledge will be transferred to others in the community including the farmers and their families. The results of the scheme were distributed to the farmers along with their own results. This encourages the farmers to think more deeply about their relationship with biodiversity and water quality and how their actions affect these cornerstones of productive farming.

During the course of the project the team became aware of many issues that affect many rivers across Ireland. River crossings (fords) are a particular and difficult issue to resolve. Several crossings on the river were detected and while these offer access to remote fields or convenient routes to other areas of the farm, they are also an obvious source of sediment input into the watercourses. Road bridges pose a particular challenge in this regard with runoff at the edge of the bridge likely to contribute to the input of a certain amount of nutrients. Solutions to dealing with these issues need to be carefully approached on a local scale asking how is the crossing used, who has access to the crossing, and is there a balance to be struck between allowing the crossing to be used by livestock and transporting the livestock in trailers?

Alongside the issue of crossings is the barrier issue on rivers which can seriously impede the migration of fish species to upstream areas of a catchment. Fortunately, there are few man-made barriers on the Culdaff River but there are points where manipulation of the riverbank e.g., with walls and stone revetments that impact the hydromorphology of the river. Any work carried out at a point in the river will have impacts for both downstream and upstream sections of the river.

Another issue identified during the project was the issue of old fencing left on riverbanks. Farmers replaced old fencing as part of the project but it was clear from inspection that there are many areas where old wiring, in particular around tree trunks, has been left in place over the years. This may poise a risk to riparian wildlife who may be travelling along the corridors. It also contributes at times to trapping litter and poses a hazard to anyone waking inside the fence line. Encouraging farmers to remove old wiring (as part of a payment scheme) seems prudent. This may be achieved through ACRES but disposal of the old wiring must be facilitated as easily as possible. Some damage may occur as a result of 'cleaning up' the banks so care is advised on where and when this could happen.

7. Pesticide use – breaking a habit or new ways of managing?

The water chemistry results obtained during the project highlights the frequency of pesticides found in Irish rivers (14 occurrences in 23 samples or 61%). There are a range of issues involved here ranging from;

- time constraints in getting a job done,
- long-term spraying in an area means there is less natural pest control in the ecosystem,
- in some cases lack of training or maintaining good practice when using pesticides.

Alternatives such as organic pesticides or nature-based solutions should be encouraged and using pesticides should be a last resort for farmers. The organic farming movement is growing rapidly and hopefully this will lead to wide learning in the general farming community. Reducing pesticide use saves money for a farmer and reduces the health risks associated with exposure to pesticides.

As part of this project, one farmer agreed to tackle Japanese knotweed on his ground, by allowing a contractor paid through CRiBZ scheme to treat the invasive using a non-chemical approach. This approach is based on establishing high fungal content in the soils and altering the conditions under which JK thrives. This technique has meet with some success locally on the Glennagannon River and this new treatment provides a point of conversation with the local farmers.

9.0 RECOMMENDATIONS FOR FUTURE WORK

The IRT will continue to monitor the riparian zones planted as part of the project. Over the period of the project, there have been considerable learnings and sharing with a wide range of stakeholders. Reflecting on the general success of the project there are a number of recommendations for future projects looking at water related issues.

- Continue water chemistry monitoring focussing on the collection of the most useful data to demonstrate improvements in the system.
- Promotion of nature-based solutions for drain management – trial sites and learning more.
- Encouraging the creation of ponds for sediment capture and the removal of nutrients by pond inhabitants.
- Encouraging the use of nature-based solutions for natural water retention to help deal with floods and drought in the future.
- How to manage and control invasive species on a farm scale.

10.0 REFERENCES

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Appendix I (a)

Full list of species recorded by ecologist Jessica Devlin on the CRiBZ participating farms. More details can be found in the full report produced by **Devlin (2022) CRiBZ Ecological Assessment of Riparian Margins** available as a separate document.

Freshwater invertebrates	
Pond Snail	*Phylum Mollusca, Class Gastropoda, Order Pulmonata, Family Lymnaeidae*
Hairworm	*Phylum Nematomorpha, Class Gordioidea*
Diving beetle	*Phylum Arthropoda, Class Insecta, Order Coleoptera, Family Dytiscidae*
Beetle larva	*Phylum Arthropoda, Class Insecta, Order Coleoptera*
Black fly larva	*Phylum Arthropoda, Class Insecta, Order Diptera, family Simuliidae*
Caddis fly larva	*Phylum Arthropoda, Class Insecta, Order Trichoptera*
Caddis Larva	*Phylum Arthropoda, Class Insecta, Order Trichoptera, Family Rhyacophilidae*
Caddis Larva	*Phylum Arthropoda, Class Insecta, Order Trichoptera, Family Hydropsychidae*
Crane Fly larvae	*Phylum Arthropoda, Class Insecta, Order Dipterea, Family Tipulidae*
Flattened mayfly nymph	*Phylum Arthropoda, Class Insecta, Order Ephemeroptera, Family Ecdyonuridae*
Freshwater shrimp	*Phylum Arthropoda, Class crustacean, order Amphipoda, family Gammaidae*
Hairworm	*Phylum Nematomorpha, Class Gordioidea*
Leech	*Phylum Annelidia, Class Hirudinea, Order Rhynchobdellae, Family Pisciocolidae*
Mayfly nymph	*Phylum Arthropoda, Class Insecta, Order Ephemerotera, Family Ephemerellidae*
Mayfly nymph	*Phylum Arthropoda, Class Insecta, Order Ephemerotera, Family Baetidae*
Non biting midge larva (Blood worm)	*Phylum Arthropoda, Class Insecta, Order Diptera, Family Chironomidae*
Snail	*Phylum Mollusca, Class Gastropoda, Order Pulmonata, Family Lymnaeidae*
Spire Snail	*Phylum Mollusca, Class Gastropoda, Order prosobranchia, Family Hydrobiidae*
Stone Fly nymph	*Phylum Arthropoda, Class Insecta, Order Plecoptera*
Water mites	*Phylum Arthropoda, Class Arachnida, Order Hydracarina*

Trees	
Alder	*Alnus glutinosa*
Ash (with die back)	*Fraxinus excelsior*
Blackthorn	*Prunus spinosa*
Elder	*Sambucus nigra*
Green Beech	*Fagus sylvatica*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Holly	*Ilex aquifolium*
Rowan	*Sorbus aucuparia*
Sycamore	*Acer pseudoplatanus*
Conifer	*Picea sitchensis*

Grass	
Annual meadow grass	*Poa annua*
Common bent	*Agrostis capillaries*
Creeping bent	*Agrostis stolonifera*
Creeping soft grass	*Holcus mollis*
Rye-grasses	*Lolium spp.*
Sweet veneral grass	*Anthoxanthum odoratum*
Tufted Hair-grass	*Deschampsia cespitosa*
Yorkshire Fog	*Holcus lanatus*

Invertebrates	
Bumble bee large	*Sp?*
Cranefly	*Tipulidae*
Green veined white butterfly	Pieris napi
Hover fly	*Syrphidae spp.*
Peacock Butterfly caterpillar	*Aglais io*
Ruby Tiger Moth	*Phragmatobia fuliginosa*

Mosses, Lichens & Liverworts	
Bearded Lichen	*Usnea spp.*
Liverwort	*Liverwort sp.*
Red feather moss	*Pleurozium schreberi*

Birds	
Blackbird	*Turdus merula*
Great tit	*Parus major*
Magpies	*Pica pica*
Mallard	*Anas platyrhynchos*
Meadow Pipit (red listed)	*Anthus pratensis*
Woodpigeon	*Columba palumbus*
Starling	*Sturnus vulgaris*
Grey Heron	*Ardea cinerea*
Ravens	*Corvus corax*

Plants, Herbs	
Bird's-foot trefoil	*Lotus corniculatus*
Bitter dock	*Rumex obtusifolius*
Bluebell	*Hyacinthoides non-scripta*
Bracken	*Pteridium aquilinum*
Bramble	*Rubus fruticosis agg.*
Broad dock	*Rumex obtusifolius*
Brooklime	*Veronica beccabunga*
Bush vetch	*Vicia sepium*
Cat's ear	*Hypochaeris radicata*
Cleavers	*Galium aparine*
Cock's-foot	*Dactylis glomerata*
Coltsfoot	*Tussilago farfara*
Common chickweed	*Stellaria media*
Cow parsley	*Anthriscus sylvestris*
Cow parsnip	*Heracelum sphondylium*
Creeping buttercup	*Ranunculus repens*
Creeping ivy	*Hedera helix*
Creeping thistle	*Cirsium arvense*
Crested Dogs Tail	*Cynosurus cristatus*
Crows foot	*Geranium robertianum*
Cuckooflower	*Cardamine pratensis*
Curly Dock	*Rumex crispus*
Daisy	*Bellis perennis*
Dandelion	*Taraxacum vulgaria*
Doc	*Rumex obtusifolius*
Dog violet	*Viola riviniana*
Foxglove	*Digitalis purpurea*
Fuchsia (INVASIVE)	*Fuchsia magellanica*
Germander speedwell	*Veronica chamaedrys*
Gorse	*Ulex europaeus*
Great Willowherb	*Epilobium hirsutum*
Hard fern	*Blechnum spicant*

Hart's-tongue fern	*Asplenium scolopendrium*
Hedge Bindweed	*Calystegia sepium*
Herb robert	*Geranium robertianum*
Himalayan Balsam (INVASIVE)	*Impatiens glandulifera*
Hogweed	*Heracleum sphondylium*
Honeysuckle	*Lonicera periclymenum*
Horsetail (INVASIVE native)	*Equisetum arvense*
Iris	*Iris spp.*
Ivy	*Hedera helix*
Japanese Knotweed (INVASIVE)	*Fallopia japonica*
Lady fern	*Athyrium filix-femina*
Lesser celandine	*Ranunculus ficaria*
Male fern	*Dryopteris filix-mas*
Marsh thistle	*Cirsium palustre*
Meadow buttercup	*Ranunculuc acris*
Meadowsweet	*Filipendula ulmaria*
Montbretia (INVASIVE)	*Crocosmia x crocosmiflora*
Navelwort	*Umbilicus rupestris*
Nettle	*Urtica dioica*
Opposite leaved golden saxifrage	*Chrysosplenium oppositifolium*
Pignut	*Conopodium majus*
Primrose	*Primula vulgaris*
Ragwort	*Jacobaea vulgaris*
Redshank	*Persicaria maculosa*
Ribwort Plantain	*Plantago lanceolata*
Rose hip	*Rosa canina*
Rosebay Willowherb (Fireweed)	*Chamaenerion angustifolium*
Salmonberry (INVASIVE)	*Rubus spectabilis*
Self- heal	*Prunella vulgaris*
Snowberry (INVASIVE)	*Symphoricarpos albus*
Sorrel	*Rumex acetosa*
Spear thistle	*Cirsium vulgare*
Trailing St John's-wort	*Hypericum humifusum*
Tufted vetch	*Vicia cracca*
Tutsan	*Hypericum androsaemum*
Wavy bittercress	*Cardamine flexuosa*
White clover	*Trifolium repens*
Wild angelica	*Angelica sylvestris*
Wood anemone	*Anemone nemorosa*
Wood sorrel	*Oxalis acetosella*
Yellow Goat's beard	*Tragopogon pratensis*

Rushes	
Soft rush	*Juncus effusus*
Sharp flowered rush	*J. acutiflorus*
Rush	*Juncus spp.*
Compact rush	*Juncus conglomeatus*

Additional data from the Loughs Agency indicates that several fish species are present in the river. These include Atlantic salmon, trout, European eel, lamprey, minnow and flounder. Trout and European eels have been detected in the main subject area upstream of Gleneely village.

Just upstream of the Gleneely WWT plant the Trust observed trout redds in the river. This correlates with the Loughs Agency data showing the distribution of redds along the main channel.

Riverfly monitoring by the Loughs Agency, using the BMWP system, shows scores are poor to fair in the upper catchment. This correlates with the data gathered by the ecologist using SSRS.

Photo credit: Cased Caddis. ID121627336 @ Dreamstime

Appendix I (b)

Participating farmers were provided with a wildflower mix to sow on a patch of ground on their farm. If the farmer had available of a beehive from the scheme, it was recommended that the patch be positioned close to the beehive. The following species were provided in the mix sourced from True Harvest. Yellow rattle, Rhinanthus minor, a hemi-parasitic plant of grass roots, was also provided to help reduce grass in a chosen wildflower patch and improve outcomes for the other species planted.

Scientific Name	Common name	% by flowers
Achillea millefolium	Yarrow	6
Centaurea nigra	Black Knapweed	7
Daucus carota	Wild carrot	6
Digitalis purpurea	Digitalis purpurea	6
Dipsacus fullonum	Wild Teasel	6
Echium vulgare	Viper's Bugloss	9
Eupatorium cannabinum	Hemp Agrimony	3
Glebionis segetum	Corn marigold	3
Hypochaeris radicata	Cat's ear	2
Knautia arvensis	Field Scabious	3
Leucanthemum vulgare	Ox-eye daisy	5
Lotus corniculatus	Lesser bird's foot trefoil	2
Lythrum salicaria	Purple loosestrife	3
Papaver dubium	Long-podded Poppy	8
Prunella vulgaris	Self-heal	5
Reseda luteola	Weld	6
Silene dioica	Red Campion	6
Spergula arvensis	Corn spurrey	4
Succisa pratensis	Devil's-bit Scabious	6
Verbascum thapsus	Greater Mullein	2
Viola arvensis	Field pansy	2

Wildflower species found in the True Harvest Bee/Butterfly/Bird Wildflower mix

Appendix II (a)

Data collected at each of the 23 water sampling points on the Culdaff River (February 2023). Results for phosphate, nitrate (as N) and ammonia (as N) were analysed for surface water by Fitz Scientific, Drogheda, Feb 2023. EQS is Environmental Quality Standards.

River Name	Sample Ref	DO%	DO (mg/l)	pH	Conductivity (µs/cm)	TDS (ppm)	Temp (°C)	Turbidity (NTU)	Phosphorus (mg/l)	Nitrate (mg/l)	Ammonia (mg/l)	ORP (mV)	Total hardness mg/l CaCO3
Crocknanoneen river	WQCUL23-01	115.9	14	7.72	119	59	7.8	9.11	<0.03	<0.51	0.01	-39	36
Crocknanoneen river	WQCUL23-02	115.6	13.9	7.67	138	69	8	11.7	0.04	<0.51	0.02	-36	45
Culdaff	WQCUL23-03	116.3	13.9	7.29	145	73	7.5	10	0.05	<0.51	0.05	-15	39
Culdaff	WQCUL23-04	95.9	11.4	7.24	206	103	8.7	4.93	0.03	0.65	0.05	-16	68
Claggan West	WQCUL23-05	106.6	11.8	6.16	151	75	10.9	48.3	0.05	<0.51	0.02	42	30
North Hilltown	WQCUL23-06	128.8	15.5	7.15	223	112	8.1	5.2	0.06	<0.51	0.04	-15	86
Culdaff	WQCUL23-07	100.4	12.2	7.47	189	95	7.6	5.55	0.05	0.61	0.04	-28	64
Moglass Bridge	WQCUL23-08	99.5	12.8	7.82	157	84	4.8	10.6	0.07	<0.51	0.08	-41	28
Culdaff	WQCUL23-09	126.2	15.7	7.42	142	71	6.7	8.54	0.04	<0.51	0.01	-23	39
Culdaff	WQCUL23-10	124.5	15.5	7.37	153	76	6.9	7.6	0.07	<0.51	0.01	-24	45
Culdaff	WQCUL23-11	104.8	12.4	7.84	178	89	8.1	5.95	0.07	<0.51	0.02	-45	59
Culdaff	WQCUL23-12	110.9	13.3	7.52	168	84	8.1	6.76	0.06	<0.51	0.03	-28	53
Binglas tributary	WQCUL23-13	118.8	14.1	7.79	145	73	7.8	6	0.03	<0.51	0.01	-41	43
Drumfadda trib, Culdaff	WQCUL23-14	118.4	14.7	7.33	83	41	6.5	1.7	0.04	<0.51	0.02	-14	19
Kindroghed	WQCUL23-15	75.7	8.78	6.57	172	86	8.9	3.04	0.06	0.94	0.02	21	50
Owengam river(Falmore)	WQCUL23-16	115.3	13.5	6.99	140	70	9.3	7.61	0.04	<0.51	0.04	-2	31
Baskill 40	WQCUL23-17	93.3	10.9	7.52	318	159	9.1	8.69	0.04	0.89	0.06	-32	143
Baskill river	WQCUL23-18	118.1	13.7	7.38	206	103	9	9.99	0.05	<0.51	0.09	-25	76
Drumlee trib	WQCUL23-19	115.3	13	7.57	197	97	9.6	3.2	0.05	0.69	0.03	-31	62
Culdaff	WQCUL23-20	94.1	11.2	7.45	225	113	7	4.29	0.07	0.88	0.01	-24	71
Knockergrana	WQCUL23-21	120.3	13.9	7.43	329	164	9.4	8.33	0.16	2.63	0.49	-29	13
Clonca West	WQCUL23-22	110.5	13.1	7.1	444	220	7.8	2.72	0.06	1.42	0.02		200
Culdaff	WQCUL23-23	115.7	14.1	7.59	154	72	7.8	4.76	0.77	1.18	0.01	-23	105

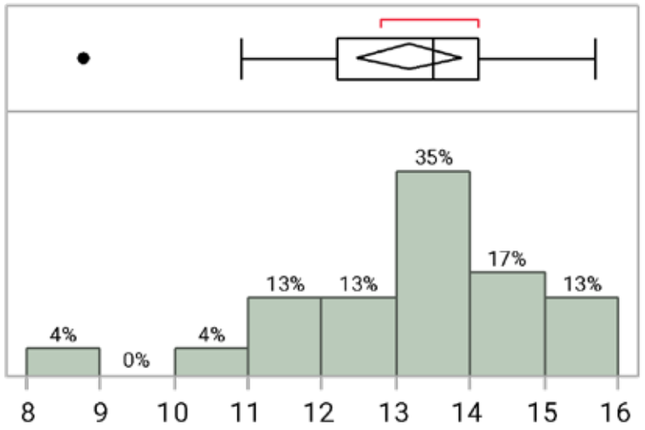


Figure A2-1: Distribution of Dissolved Oxygen (mg/l) readings (n = 23). Mean = 13.19 (SD 1.63mg/l)

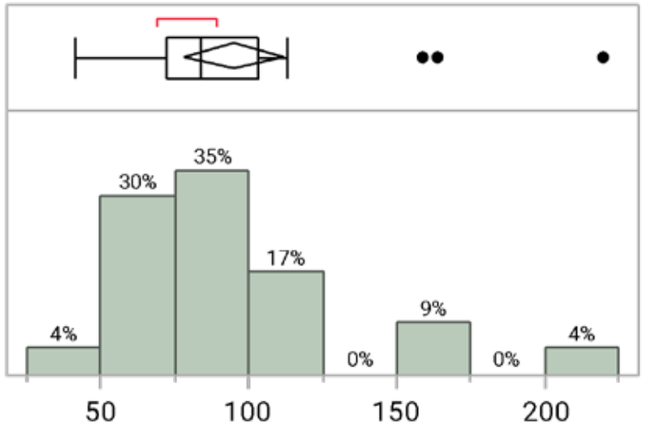
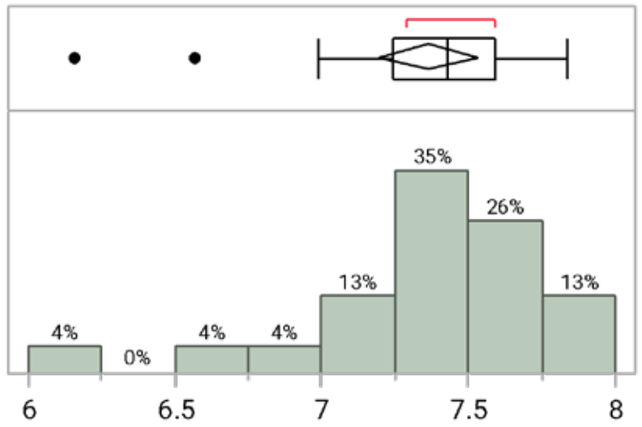


Figure A2-4: Distribution of Total Dissolved Solids (ppm) readings (n = 23). Mean = 95.13ppm (SD 39.27)

Figure A2-2: Distribution of pH readings (n = 23). Mean = 7.36 (SD 0.39)



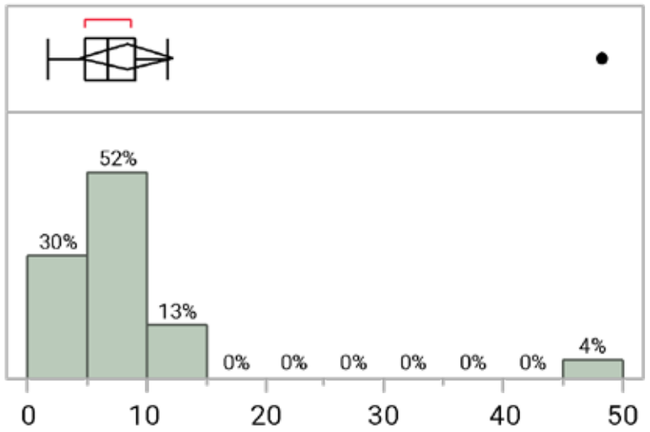


Figure A2-5: Turbidity readings (n = 23). Mean = 8.46 NTU (SD 9.10 NTU)

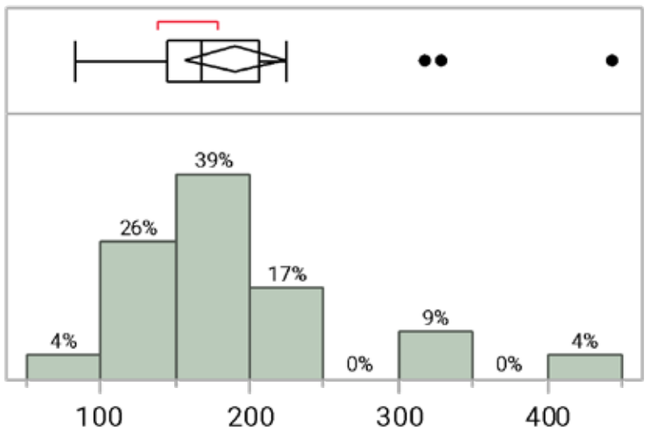


Figure A2-3: Conductivity (µg/l) readings (n = 23). Mean = 190.52 µg/l (SD 79.01mg/l)

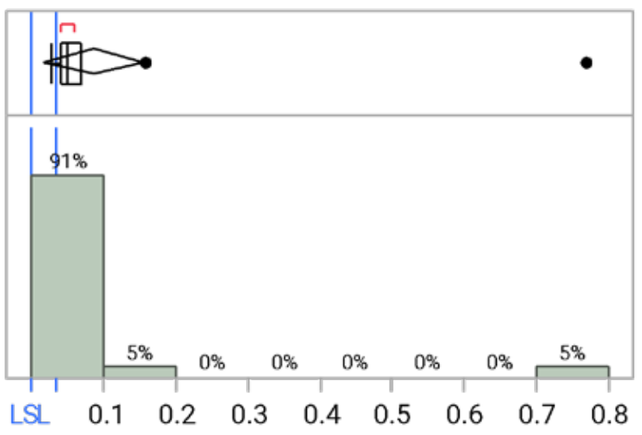


Figure A2-6: Distribution of Phosphate readings (n = 23). Mean = 0.089mg/l (SD 0.15mg/l)

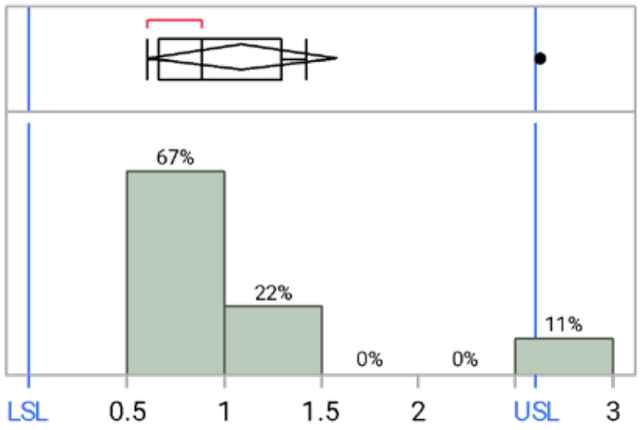


Figure A2-7: Distribution of Nitrate (as N) (mg/l) readings (n = 23). Mean = 1.09 mg/l (SD 0.63mg/l)

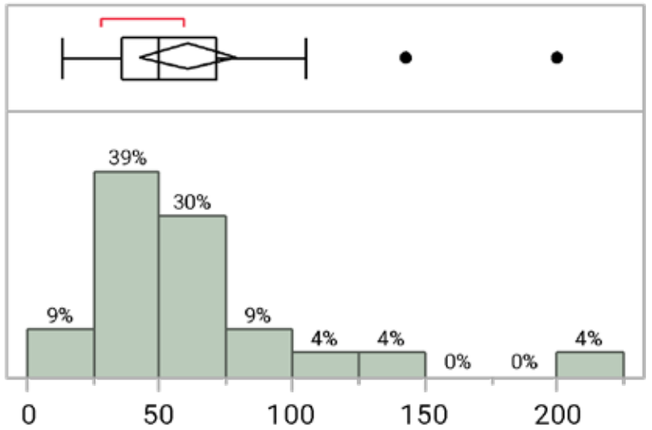
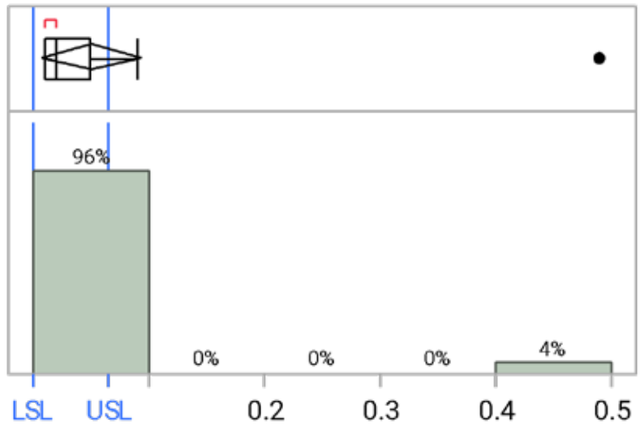


Figure A2-10: Distribution of Total Hardness (mg/l as CaCO3) readings (n = 23). Mean = 61.8mg/l (SD 41.9mg/l)

Figure A2-8: Distribution of Ammonia (as N) readings (n = 23). Mean = 0.05mg/l (SD 0.09mg/l)



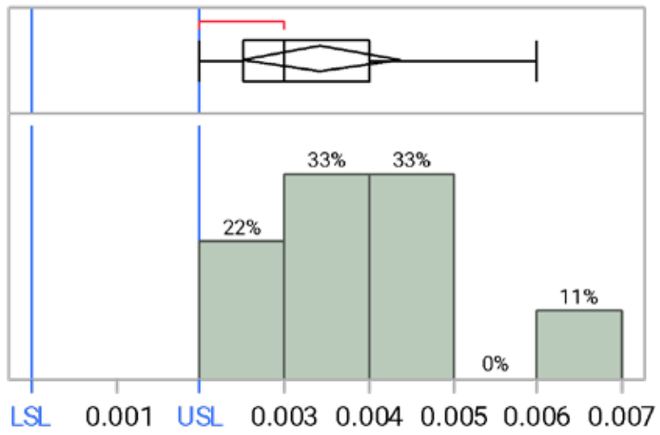


Figure A2-11: Distribution of Glyphosate (µg/l) readings (n = 23). Mean = 0.00344 µg/l (SD 0.00123 µg/l)

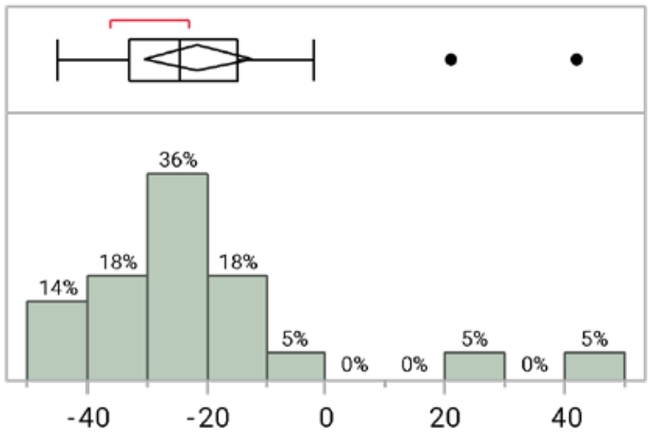


Figure A2-9: Distribution of ORP (mV) readings (n = 23). Mean = -21.27 (SD 20.22 mV)

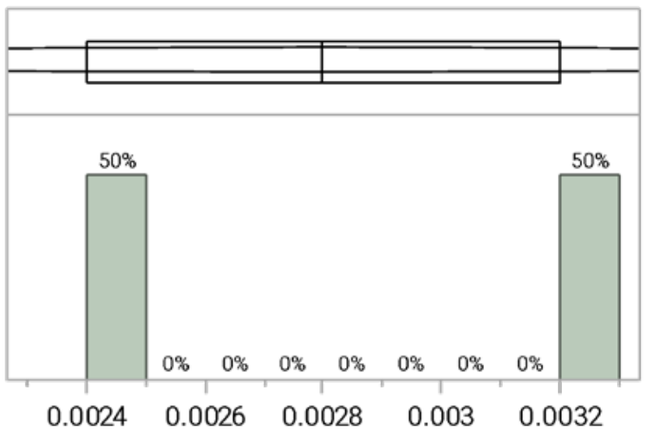


Figure A2-12: Distribution of Metamitron µg/L readings (n = 23). Mean = 0.0028µg/l (SD 0.00056µg/l)

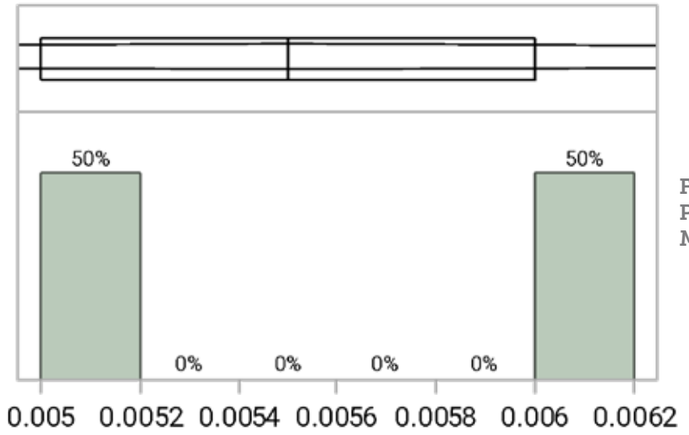


Figure A2-13: Distribution of Pendimethalin (µg/l) readings (n = 23). Mean = 0. µg/l (SD 0.0 µg/l)

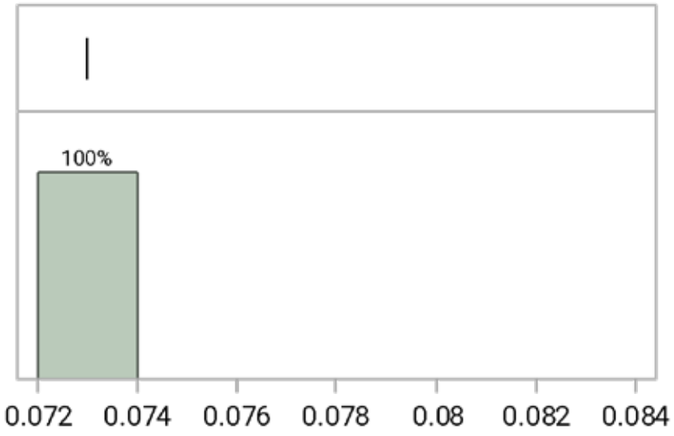


Figure A2-14: Distribution of Fluoroxypyr µg/L readings (n = 23). Mean = 0.073µg/l

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Customer supplied information appear in italics.

Customer	*Trish Murphy* *Inishowen Rivers Trust*	Lab Report Ref. No.	7059/001/12
		Date of Receipt	
		Sampled On	
		Date Testing Commenced	
		Received or Collected	
		Condition on Receipt	
Customer PO		Date of Report	
Customer Ref		*Sample Type*	
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
2,3,6-Trichlorobenzoic Acid (SW)	543	LC-MS-MS	<0.005	ug/L	INAB
2,4,5-T (SW)	543	LC-MS-MS	<0.0013	ug/L	INAB
2,4-D (SW)	543	LC-MS-MS	<0.0008	ug/L	INAB
2,4-DB (SW)	543	LC-MS-MS	<0.003	ug/L	INAB
2,6-Dichlorobenzamide (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Aldrin (SW)	575	GCMS	<0.002	ug/L	INAB
alpha BHC (SW)	575	GCMS	<0.0003	ug/L	INAB
Ammonia (Surface Water)	114	Colorimetry	0.01	mg/L as N	INAB
Asulam (SW)	540	LC-MS-MS	<0.0018	ug/L	INAB
Atrazine (SW)	540	LC-MS-MS	<0.0005	ug/L	INAB
Benazolin (SW)	543	LC-MS-MS	<0.005	ug/L	INAB
Bentazone (SW)	543	LC-MS-MS	<0.002	ug/L	INAB
beta BHC (SW)	575	GCMS	<0.0011	ug/L	INAB
Boscalid (SW)	540	LC-MS-MS	<0.0008	ug/L	INAB
Bromacil (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Bromoxynil (SW)	543	LC-MS-MS	<0.002	ug/L	INAB
Carbaryl (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Carbetamide (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Chlorfenvinphos (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Chlorothalonil (SW)	575	GCMS	<0.001	ug/L	INAB

Signed: A Harmon **Date: 13/03/2023**

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017

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	Moyville	Received or Collected	Delivered by Customer
	Donegal F93 X2T7	Condition on Receipt	Acceptable
Customer PO		Date of Report	13/03/2023
Customer Ref	*WQCUL23-20*	*Sample Type*	*Surface Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Chlorpropham (SW)	575	GCMS	<0.001	ug/L	INAB
Chlortoluron (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Clopyralid (SW)	543	LC-MS-MS	<0.002	ug/L	INAB
Cypermethrin (SW)	575	GCMS	<0.001	ug/L	INAB
Cyproconazole (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
delta BHC (SW)	575	GCMS	<0.002	ug/L	INAB
Diazinon (SW)	540	LC-MS-MS	<0.006	ug/L	INAB
Dicamba (SW)	543	LC-MS-MS	<0.003	ug/L	INAB
Dichlobenil (SW)	575	GCMS	<0.001	ug/L	INAB
Dichlorprop (SW)	543	LC-MS-MS	<0.005	ug/L	INAB
Dieldrin (SW)	575	GCMS	<0.010	ug/L	INAB
Diflufenican (SW)	540	LC-MS-MS	<0.003	ug/L	INAB
Dimethoate (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Diuron (SW)	540	LC-MS-MS	<0.0007	ug/L	INAB
Endosulfan I (alpha) (SW)	575	GCMS	<0.009	ug/L	INAB
Endosulfan II (beta) (SW)	575	GCMS	<0.004	ug/L	INAB
Endosulfan Sulphate (SW)	575	GCMS	<0.002	ug/L	INAB
Endrin (SW)	575	GCMS	<0.004	ug/L	INAB
Endrin Aldehyde (SW)	575	GCMS	<0.004	ug/L	INAB
Epoxiconazole (SW)	540	LC-MS-MS	<0.001	ug/L	INAB

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Customer Ref	*WQCUL23-20*	*Sample Type*	*Surface Water*
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Ref 3			

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Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Fenoprop (SW)	543	LC-MS-MS	<0.0011	ug/L	INAB
Fenpropidin (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Fenpropimorph (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Fluoroxypyr (SW)	543	LC-MS-MS	<0.001	ug/L	INAB
Flutriafol (SW)	540	LC-MS-MS	<0.002	ug/L	INAB
gamma BHC - Lindane (SW)	575	GCMS	<0.005	ug/L	INAB
Glyphosate (Surface)	579	LCMS/MS With Derivitisation	<0.002	ug/L	INAB
**Hardness Total (Surface Water)	111	Colorimetry	71	mg/L CaCO3	INAB
Heptachlor (SW)	575	GCMS	<0.002	ug/L	INAB
Heptachlor epoxide (SW)	575	GCMS	<0.002	ug/L	INAB
Hexachlorobenzene (SW)	575	GCMS	<0.010	ug/L	INAB
Isoproturon (SW)	540	LC-MS-MS	<0.0005	ug/L	INAB
Kresoxim methyl (SW)	540	LC-MS-MS	<0.002	ug/L	INAB
Linuron (SW)	540	LC-MS-MS	<0.0005	ug/L	INAB
Malathion (SW)	540	LC-MS-MS	<0.002	ug/L	INAB
MCPA (SW)	543	LC-MS-MS	<0.0009	ug/L	INAB
MCPB (SW)	543	LC-MS-MS	<0.002	ug/L	INAB
Mecoprop (SW)	543	LC-MS-MS	<0.0012	ug/L	INAB
Metalaxyl (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Metamitron (SW)	540	LC-MS-MS	<0.0007	ug/L	INAB

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Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Metazachlor (SW)	540	LC-MS-MS	<0.014	ug/L	INAB
Metoxuron (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Mevinphos (SW)	540	LC-MS-MS	<0.002	ug/L	INAB
Monuron (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
**Nitrate (Surface Water)	103	Colorimetry	0.88	mg/L as N	INAB
o,p DDT (SW)	575	GCMS	<0.001	ug/L	INAB
Oxadixyl (SW)	540	LC-MS-MS	<0.001	ug/L	
Parathion Methyl (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Pendimethalin (SW)	540	LC-MS-MS	<0.002	ug/L	INAB
Pentachlorophenol (SW)	543	LC-MS-MS	<0.002	ug/L	INAB
Phosphorus (Total) Surface Water	166	Colorimetry	0.07	mg/L as P	INAB
Picloram (SW)	543	LC-MS-MS	<0.002	ug/L	INAB
Propazine (SW)	540	LC-MS-MS	<0.0009	ug/L	INAB
Propiconazole (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Propyzamide (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Quinmerac (SW)	540	LC-MS-MS	<0.015	ug/L	INAB
Simazine (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Sulfotep (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Tebuconazole (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
trans-Permethrin (SW)	575	GCMS	<0.001	ug/L	INAB

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Triadimefon (SW)	540	LC-MS-MS	<0.001	ug/L	INAB
Triallate (SW)	540	LC-MS-MS	<0.003	ug/L	INAB
Triclopyr (SW)	543	LC-MS-MS	<0.0013	ug/L	INAB

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Appendix III - Communications & Publications

INISHOWEN INDEPENDENT | **Tuesday, 14 September 2021**

New €133k project to rejuvenate Culdaff River

SCHEME TO ENHANCE FARMLAND BIODIVERSITY AND PROTECT WATER QUALITY

A NEW project to improve water quality and enhance farmland biodiversity along the Culdaff River has been officially announced by the Inishowen Rivers Trust.

The Trust has been awarded €132,870 via the Department of Agriculture's 'European Innovation Partnership' to carry out the initiative to rejuvenate the waterway and its surrounding lands.

The project, known as the Culdaff Riparian Buffer Zones (CRiBZ) scheme, will focus on the Culdaff catchment and aims to enhance riparian (riverbank) habitat, improve biodiversity and improve water quality.

Project Officer Trish Murphy can't wait to get started.

"We're really looking forward to getting on the ground to chat to local farmers about what can be achieved in their section of the river. The Culdaff is a fantastic river and there is great scope to enhance riverbank habitat and improve biodiversity."

"We have pulled together a great team with a wide range of experience to help bring about benefits for farmers, the environment and the wider community."

Trustee and chairperson of the Culdaff River Community Angling Club, Mervyn Norris, is hopeful the new project will help to reverse a recent decline.

"I've fished the Culdaff River all my life and I have seen the river decline over the years. This project will be an opportunity to restore the river and as a farmer I like nothing more than to see a healthy stream and abundant wildlife on my farm."

The Culdaff River is one of the largest rivers in Inishowen with a catchment covering 65 square kilometres. It is open for fishing from April 1 to October 20 every year and has good fishing opportunities for salmon and trout, being one of only two rivers in Inishowen currently open for fishing.

■ The CRiBZ project partners on the banks of the Culdaff River. Pictured, left to right, Mark Davenport (Inishowen Rivers Trust and Culdaff River Community Angling Club), Ross Buchanan (Inish Forestry), Trish Murphy, (Project Officer IRT), Mervyn Norris (IRT and Culdaff River Community Angling Club) and Claire Thompson (IRT).

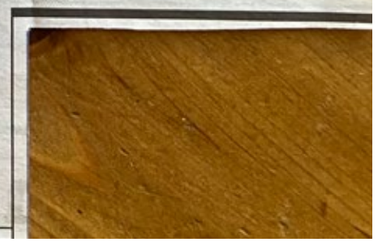
However, in recent years the quality of the river has declined and erosion and sedimentation are significant issues.

The CRiBZ scheme has a number of partners including the existing Inishowen Uplands EIP, managed by Henry O'Donnell, while other partners include: Inish Forestry, Trees on the Land and the Culdaff River Community Angling Club.

In collaboration with local farmers and landowners the scheme will offer a number of farmers the opportunity to engage with the project and carry out actions such as fencing, tree planting, wildflower planting, setting up of beehives and the provision of water troughs and pumps.

The Inishowen Rivers Trust Project Officer and collaborating ecologist will work with local farmers to develop the project and to discuss suitable areas along the river and provide advice on nature-based solutions for water and drain management.

To find out more about the project – funded by the EU Recovery Instrument Funding under the Rural Development Programme – you can contact the Trust on culdaffeip@inishowenriverstrust.com or call Trish on 087 6478183.



New river project to enhance biodiversity and protect water

Inishowen Rivers Trust launch a new EIP to benefit farms along the Culdaff River

The Inishowen Rivers Trust have recently been awarded €132,870 through DAFM's European Innovation Partnership (EIP 5th call) to support a project that aims to enhance farmland biodiversity along riverbanks on the Culdaff River and improve water quality.

The project, known as the Culdaff Riparian Buffer Zones (CRiBZ) scheme, will focus on the Culdaff catchment and aims to enhance riparian (riverbank) habitat, improve biodiversity and improve water quality.

The Culdaff River is one of the largest rivers in Inishowen with a catchment covering 65km2.

It is open for fishing from 1st April to 20th October and has good fishing opportunities for salmon and trout, being one of only two rivers in Inishowen currently open for fishing.

However, in recent years the quality of the river has declined and erosion and sedimentation are significant issues.

The CRiBZ scheme has a number of partners including the existing Inishowen Uplands EIP managed by Henry O'Donnell and other partners include Inish Forestry, Trees on the Land and the Culdaff River Community Angling Club. In collaboration with local farmers and landowners the scheme will offer a number of farmers the opportunity to engage with the project and carry out actions such as fencing, tree planting, wildflower planting, setting up of beehives and the provision of water troughs and pumps.

The Inishowen Rivers Trust Project Officer and collaborating ecologist will work with local farmers to develop the project and to discuss suitable areas along the river and provide advice on nature based solutions for water and drain management.

Project Officer Trish Murphy said: "We're really looking forward to getting on the ground to chat to local farmers about what can be achieved in their section of the river.

"The Culdaff is fantastic river and there is great scope to enhance riverbank habitat and improve biodiversity.

"We have pulled together a great team with a wide range of experience to help bring about benefits for farmers, the environment and the wider community."

The CRiBZ project partners on the banks of the Culdaff River. Pictured (left to right) Mark Davenport (IRT and Culdaff River Community Angling Club), Ross Buchanan (Inish Forestry), Trish Murphy, Project Officer (IRT), Mervyn Norris (IRT and Culdaff River Community Angling Club), Claire Thompson (IRT). Missing from photo Henry O'Donnell (Inishowen Uplands EIP), Imogen Rabone and Mark Donnelly (Trees on the Land)

Trustee and chairperson of the Culdaff River Community Angling Club added: "I've fished the Culdaff River all my life and I have seen the river decline over the years.

"This project will be an opportunity to restore the river and as a farmer I like nothing more than to see a healthy stream and abundant wildlife on my farm."

To find out more about the project you can contact the Trust on culdaffeip@inishowenriverstrust.com or call Trish on 087 647 8183.

More details about the Inishowen Rivers Trust can be found on www.inishowenriverstrust.com.

INISHOWEN

MONIES AWARDED TO INISHOWEN RIVERS TRUST WILL ALSO IMPROVE WATER QUALITY

€132,870 funding to help enhance biodiversity of Culdaff river

By Staff Reporter
editorial@derryjournal.com
Twitter: @derryjournal

The Inishowen Rivers Trust have recently been awarded €132,870 through DAFM's European Innovation Partnership to support a project that aims to enhance farmland biodiversity along riverbanks on the Culdaff River and improve water quality.

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The Culdaff River is one of the largest rivers in Inishowen with a catchment covering 65km 2. It is open for fishing from April 1 to October 20 and has good fishing opportunities for salmon and trout, being one of only two rivers in Inishowen currently open for fishing. However, in recent years the quality of the river has declined and erosion and sedimentation are significant issues.

Members of Inishowen Rivers Trust.

The CRiBZ scheme has a number of partners including the existing Inishowen Uplands EIP managed by Henry O'Donnell and other partners include Inish Forestry, Trees on the Land and the Culdaff River Community Angling Club. In collaboration with local farmers and landowners, the scheme will offer a number of farmers the opportunity to carry out actions such as fencing, tree planting, wildflower planting, setting u of beehives and the provision of water troughs and pumps.

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"The Culdaff is a fantastic river and there is great scope to enhance riverbank habitat and improve biodiversity. We have pulled together a great team with a wide range of experience to help bring about benefits for farmers, the environment and the wider community."

Trustee and chairperson of the Culdaff River Community Angling Club added: "I've fished the Culdaff River all my life and I have seen the river decline over the years. This project will be an opportunity to restore the river and as a farmer I like nothing more than to see a healthy stream and abundant wildlife on my farm."

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ISSUE 4 — APR 2022

RiverView

The latest news from the Inishowen Rivers Trust

In This Issue

Inishowen Rivers Trust

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w. www.inishower

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Riparian Buffers on the Culdaff River

The Culdaff Riparian Buffer Zone Scheme (CRiBZ) which is managed by the Trust is well on its way. The scheme pays farmers to fence and plant trees and hedging on the riparian zones of the Culdaff River. The project aims to promote farmland biodiversity and improve the water quality of the river but there are many other benefits too. Improving water quality ensures we have good clean drinking water, allows biodiversity to

New DAFM funding to create buffer zones on the Culdaff River

Earlier this year the Trust were delighted to be awarded €132,870 from the Dept. of Agriculture, Food and the Marine for a new EIP project called Culdaff Riparian Buffer Zone (CRiBZ) Scheme. This scheme will pay farmers to fence and plant trees and hedging on the riparian zones of the Culdaff River. The project aims to promote farmland biodiversity and improve the water quality of the river but there are many other benefits too. Improving water quality ensures we have good clean drinking water, allowing biodiversity to flourish in the habitats created, bank erosion is reduced, and recreation and angling on the river is supported. We are still accepting expressions of interest, so call us now.

CRiBZ Culdaff Riparian Buffer Zones

A New Year's Resolution

We've had a great idea! For your New Year's resolution why not register as a volunteer of the Trust! It's a great way to get exercise, meet new people and learn about the environment. You would also be helping to tackle the climate and biodiversity crisis. All our projects are aimed at helping restore our rivers to good health and that creates the right environment for wildlife to thrive and rivers to function normally. And we thrive there too because being out in nature is good for us.

There are lots of ways to register. Scan the QR Code, browse to the link, register via the website or simply email us. See you soon!

https://arcg.is/15HvD1l

DEC 2022

RiverView

he latest news from the Inishowen Rivers Trust

Seasons Greetings!

Wintertime brings lots of celebrations for many but it is also the tree planting season! Over the next 2 months there will be tree planting volunteer events & we'd love to see you out and about with us in your wellies and woollies! In this issue we discuss more on the importance of trees and our efforts to learn about what to plant and where.

It's been a busy year for us here at the Trust and as this is only our second issue of *RiverView* for 2022, we have made it a bumper issue and hope you enjoy reading about some of the activities we have been involved with.

We have welcomed John Duffy to the team, and having a 2nd staff member brings new perspectives and opportunities - exciting times! Our volunteers continue to be hugely important to us helping achieve our vision of improved waterbodies for Inishowen and connecting communities through our local rivers. Thank you to all who have supported us this year so far, it really is appreciated.

Wishing you all Peace, Joy and Happiness at this time and hope to see you all very soon!

IRT newsletter RiverView which featured CRiBZ project in 3 issues

CRiBZ Culdaff Riparian Buffer Zones

Expression of Interest

The Inishowen Rivers Trust invites you to submit an Expression of Interest for the scheme titled 'Culdaff Riparian Buffer Zone'. The CRiBZ Scheme offers farmers a chance to restore the banks of the Culdaff River to a healthy status, promoting wildlife and helping to achieve good water quality status. This scheme offers:

1. Payments for fencing the river and riverbank set aside (minimum 3m b
2. Drinkers provided to replace livestock access to river
3. Recommendations on farm drain management
4. Optional Beehive installation and wildflower seeds, with management
5. Establishment of long-term riverbank stabilisation and erosion control
6. Improved water quality
7. Improved farm biodiversity including native trees and wildflowers
8. Improved compliance to DAFM environmental standards

If you are interested in participating in the project, please **complete the E below** and return by post to Inishowen Rivers Trust, CRiBZ Project, Ballyb or scan and email to **culdaffEIP@inishowenriverstrust.com**.

Upon receipt of your application, a member of the CRiBZ team will be in c

Name: .....

Address: .....

Farm Location: .....

Tel.: ..

Email

I c
In

CRiBZ Culdaff Riparian Buffer Zones

About the CRiBZ Scheme

In 2021 the Inishowen Rivers Trust secured funding of €132,870 from the Department of Agriculture, Food and the Marine to deliver a scheme that works with local farmers and community to protect and enhance our riparian zones, manage farm inputs into our streams and improve habitat quality for biodiversity. The Culdaff Riparian Buffer Zone (CRiBZ) Scheme is a catchment scale project based on the Culdaff River in North Inishowen, Co. Donegal.

Project partners

Inishowen Rivers Trust. The other key partners are:

Club

mmunity groups, contractors and beekeepers

mplement buffer zones. Landowners on the river are invited participating in the project. A range of measures are offered for landowners:

riverbank set aside

ck access to river

anagement and use of nature based solutions

ildflower seeds, with management & expertise

nk stabilisation and erosion control

ng native trees, wildflowers

vironmental standards

d advice on control

CRiBZ team: Trish Murphy (Project Officer)

CulduffEIP@inishowenriverstrust.com

CRiBZ Culdaff Riparian Buffer Zones

Water Quality on the Farm

Good water quality is essential for everyday life on a farm – for drinking water, for watering livestock, for irrigating crops and for healthy streams and lakes.

The health of our rivers is rapidly declining and farmers can play a pivotal role in protecting water and restoring it to good health.

Factors That Affect Water Quality

Sedimentation

Particles of soil or sand can build up in a river over time or get washed into the river after a heavy rainfall. Activities such as spreading near rivers, farm road run off, forestry felling and peat extraction release sediment into the river. Sediment can clog up gravels in a river killing aquatic animals and carries nutrients like fertiliser and pesticides. These chemicals cause water quality to deteriorate and can get into our drinking water. In Inishowen the majority of our drinking water is from surface sources.

Hydromorphological Modification

Physical changes made to a river channel or bank disrupts normal river processes. The transport of gravel and nutrients downstream is disrupted, the energy of the river changes leading to more erosion and flooding; and habitats for fish and other aquatic animals and plants are damaged.

Avoid
- straightening
- widening
- culverting
- installing weirs
- changing channel direction
- modifying banks

Wastewater

Sewage and domestic wastewater brings bacteria and viruses into the river as well as chemicals such as household bleach (ammonia) and microplastics. This excess of nutrients in the water is known as 'eutrophication' and causes bacteria and fungi ('sewage fungus') to bloom in the water, smothering the channel bed. Temperature levels also increase and oxygen decreases, killing aquatic life.

How do we monitor our rivers?

Riverfly Monitoring is one way to assess the health of a river. By observing the insects in the stream, you can get an idea of how your river is doing.

You can use the Citizen Science Stream Index (CSSI) to assess the flies in your river. Learn to recognise the 'good guys' and the 'bad guys'.

TRUE HARVEST SEEDS

Rhinanthus minor

Yellow Rattle is an attractive native plant that can reduce the dominance of grass species and therefore increase the population of wildflowers.

One challenge with some wildflower meadows is that grasses tend to take over after a number of years.

Yellow Rattle is a native plant that feeds off the roots of these grasses reducing the amount of grass and providing a better environment for wildflowers.

Yellow Rattle:

- Can often be used to complement existing wildflower and to extend the longevity of previously sown sites.
- Can be sown as part of a mixture or on its own into established meadows or grassland.
- Once established can reduce the competitive vigour of certain grasses by up to 50% providing a more balanced habitat.
- Must be sown in the autumn because it needs to be chilled through the winter to trigger germination.

Management with Yellow Rattle

Yellow Rattle is an annual species with short-lived seed and therefore it must set seed each year.

Cutting or grazing between April and mid-July must be avoided because these actions will prevent it re-seeding itself.

It is important that the management of your site takes the above into account.

If you wish to kill off the rattle then cut between flowering and seeding for one or two years.

To start your seeds off

If you are sowing them into an already grassy area. Get the seeds into the soil amongst the grass roots. Use a spade/trowel to open up a shallow slit, <1cm, in the soil and put some seeds in. Close the slit over with the heel of your boot. Do this in patches over the area you wish to cover. The rattle will fill in the gaps in years to come.

If you are starting a completely new area of wildflowers you can mix the yellow rattle and wildflower seeds together and sow in autumn. This should give grasses a chance to establish over winter. Grasses are essential to the survival of yellow rattle.

Yellow rattle is a very pretty flower in its own right and beneficial to many kinds of insects.

True Harvest Seeds, 36 Ardglass Road, Downpatrick, BT30 7NS
www.trueharvestseeds.org

TRUE HARVEST SEEDS

instructions for the pure Bird/Butterfly/Bee mix

ations on your purchase of the native-Irish-origin wild flower seed mix.

sowing, growing and caring for native flowers you are directly helping many different kinds of your area and it follows the birds and other animals who rely upon insects as a food source.

ou to get the most from your seeds. Mixes are intended to be direct sown. For the grower this hallenge. You will have to beat the weeds, particularly grass, you'll be watching out for slugs be keeping mice and birds off the seeds. But not to worry, with care and attention you can do

preparation

ing of a myth that wild flowers prefer impoverished conditions, they need nutrients, light and like any other plant. What wild flowers really dislike is competition for the above; given a y do better without competition; and most of the competition struggle more than wild flowers ished places.

s, then give them nutrients, light, water and space.
them really fine soil to nestle into, then they're not struggling . You'll have to work that soil, dig it over, pull out the seeds, ve for a few weeks then kill the weed seeds that came up) if it's , clumps broken up, stones removed, finish it with a fine soil e preparation.
y moist (not soggy either though), preferably with a fine spray face that's moist, dig in and have a good look, if it's dry below p moisture can evaporate quickly, if your seed bed dries out it's

can mix the seeds with some sand to help you measure it out. It divide up your seed mix, minimising bare patches.
rface; bury them too deep and they won't have the energy to

he seeds perched on the surface birds and mice will have a field es from), plus they're in danger of drying out in the sun, which

begin to take up moisture - more on bedding in the seed in a

e with sand first on another area to see you get an even spread) h a swinging/spreading motion of your arm and wrist let them sed to bring in professional seed sowers to sow their fields, so ng.
ee where you've sown helping you fill in any bare patches.

lass Road, Kilclief, Downpatrick, Co Down, BT30 7NS
rueharvestseeds.org Email: info@trueharvestseeds.org
istered charity: NIC100201

Video of project available at
https://youtu.be/pnKImHhrBDw


CRiBZ
Culdaff Riparian
Buffer Zones