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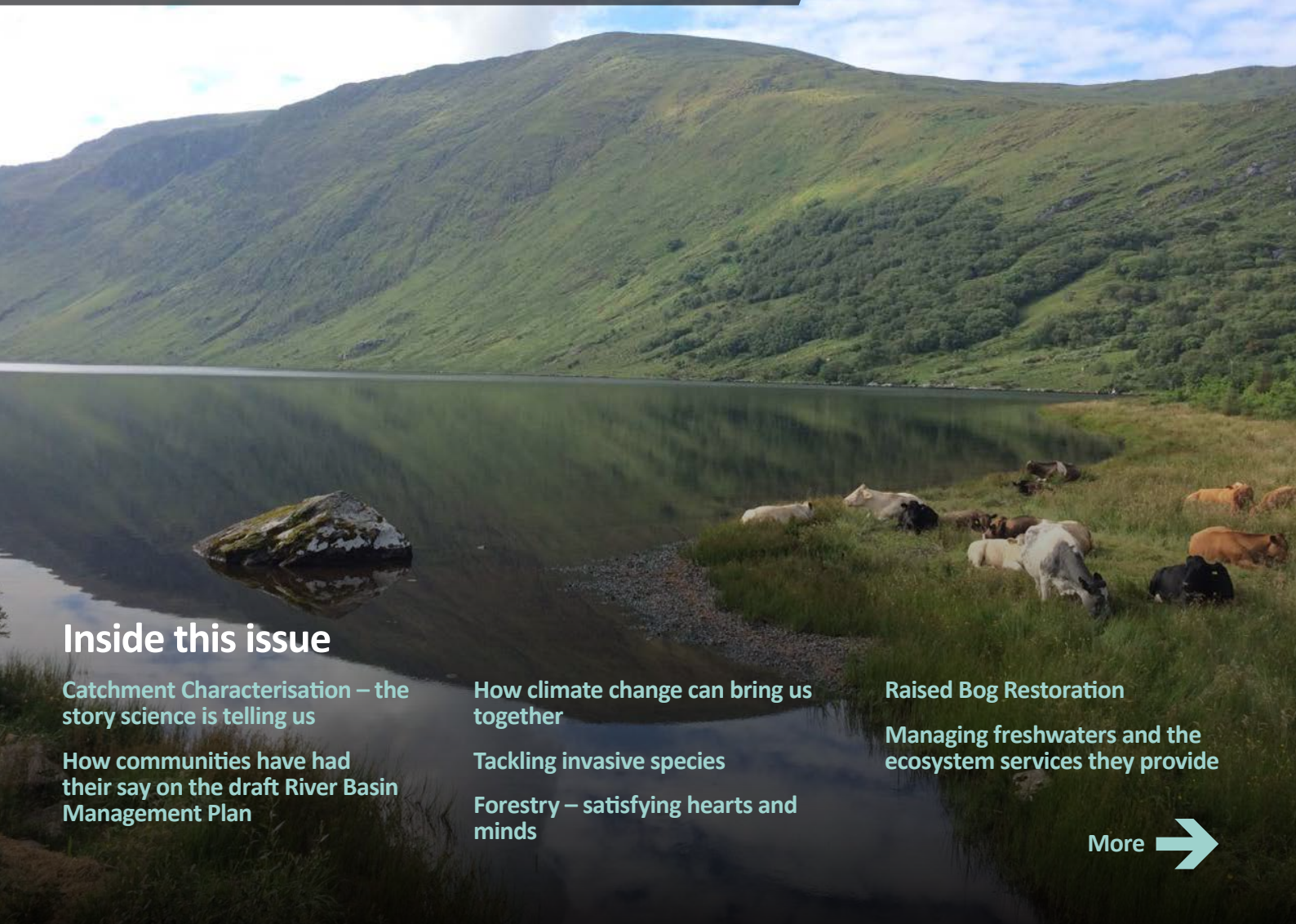
Catchments Newsletter

Integrated Catchment Management: sharing science and stories

Talking to local communities about their water, and the story the science is telling us

Waters & communities
Healthy Waters supporting Vibrant Communities



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Editorial Issue 6 Catchments Newsletter

"If you don't have an emotional connection to why you are trying to accomplish your goals, the odds are you won't reach them or will quit trying." **Brett Hoebel**

What, you might ask, is the relevance of this quote to catchments and catchment management? Because it is intended to raise (rather than answer) the issue of the role of emotional connection to our natural environment and the relevance of emotional responses to deciding on and undertaking the actions needed for a sustainable future.

During the last three years as we undertook catchment characterisation work and prepared material for the Department of Housing, Planning and Local Government as a contribution to the draft River Basin Management Plan, those of us working in the Catchments Unit tried to formulate a cohesive and integrated view of present and future approaches as a 'mental model' on which to base our work and vision; inevitably this is a partial view based on the experiences and thoughts of a limited number of people. It is summarised in this editorial as a means of encouraging further thought and discussion, rather than to provide solutions.

As a starting point, we must accept and admit that we have water quality problems, as highlighted in the article by Shane O'Boyle on page 5, as well as disimproving biodiversity and greenhouse gas emissions that are not reducing as quickly as required. The questions then are: what are we doing and what else must we do about it?

The EPA Catchments Unit has summarised the various management strategies under the headings below. None of these on their own will be sufficient; it is considered that they should be undertaken, if not quite in parallel, then as part of a coherent, integrated process.

1. Licensing of (large) discharges to water and, in the future, large water abstractions.
2. Compliance checking/inspections for both large and small discharges as required by the relevant regulations.
3. Investigative assessment to enable diffuse and small point pollution sources to be located and possible mitigation actions to be considered.
4. Local (field-scale and street-scale) mitigation measures, mainly targeted, to be undertaken.
5. Integration into the planning process.
6. Use of incentives, e.g., agri-environment schemes.
7. Innovation and new technology.
8. Engagement and partnership.

Large point sources, such as discharges from urban wastewater treatment plants (UWWTPs) and industry, are a readily identified source; their location is known and the engineering measures required can be devised. A licensing and enforcement regime is in place to help ensure that the required conditions are followed and, where necessary, improvements are occurring. Industrial discharges are licensed and are checked for compliance by the EPA. Therefore, it can be argued that there are systems in place for dealing with large point sources, although the challenge remains of providing Irish Water and local authorities with sufficient resources to improve wastewater treatment facilities.

But, what of diffuse (non-point) sources (e.g. farming, forestry, peatlands and urban areas) and small point sources (farmyards, septic tank systems, and misconnections in urban areas), which impact on more water bodies than large point sources (see article on page 30)? Their potential to impact on water does not just depend on the 'load' of nutrients (phosphorus and nitrogen) or faecal pathogens that they generate, but also more critically on the availability of a route or pathway to water. For instance, while ponded septic tank effluent in a garden may be a hazard to children playing in the area, it will not impact on water in circumstances where it is not entering water. Also, fields with a soils phosphorus index of 4 will not generally be a hazard for water where the underlying soils and subsoils are thick and free-draining. In addition, while the general area (at a scale of approximately 1:25,000) where significant pressures are present is known, the specific area (field scale or street scale) is usually not known, and as a consequence the specific mitigation measure needed cannot even be determined, never mind undertaken. This is our main challenge for the future.

How do we meet this challenge? In simple terms, by:

- Looking in more detail at the receptor (e.g. stream, lake, beach or well) being impacted or, in other words, undertake an Investigative Assessment to find out what exactly the problem is, where it is arising and what might be done about it. (See more details on Investigative Assessments here: https://www.catchments.ie/download/catchments-newsletter-sharing-science-stories-june-2016/)
- Producing guidance on practical mitigation actions, based on the different biophysical settings (e.g. poorly draining Vs freely draining areas) and pollutants (e.g. phosphorus Vs nitrogen Vs sediment), that could be undertaken. (This guidance is being prepared currently.)
- Providing a means (e.g. legislation, incentivisation, knowledge exchange) of enabling all the required targeted actions to be undertaken – this is one of the biggest gaps and future challenges.
- Integrating Water Framework Directive requirements into the spatial planning process – a critical component in view of the importance of planning decisions in the location and management of new developments. (An Advice Note for planners is currently being prepared by the EPA.)
- Using incentives (e.g. the Green Low Carbon Agri-Environment Scheme (GLAS) and grants for upgrading septic tank systems) to encourage actions in areas that benefit water and biodiversity. However, the GLAS scheme is now closed to new applications until later this decade. In addition, there is a need for incentive schemes to become more targeted to the areas that will give the greatest environmental benefit. Disincentives are becoming a feature – for instance, some dairy industries are imposing a penalty on farmers that are not certified under the Bord Bia Sustainable Dairy Assurance Scheme. Having said this, there is a need for amendment and improvement of the Scheme to take more account of water quality.
- Adopting innovative approaches, such as the National Dairy Sustainability Forum, which is a joint industry/farmer/government forum, and the Smart Farming initiative, which is led by the Irish Farmers Association. In addition, new technologies, such as use of GPS, will lead to greater efficiencies in fertilizer and pesticide applications.
- Ensuring compliance with the existing regulations.

So, undoubtedly progress is being made with the management of diffuse and small point sources. But, it is not enough, and we can and must do more.

Editorial Issue 6 Catchments Newsletter - continued

Up until now our main emphasis in environmental protection and achieving 'healthy water' has been on 'one size fits all' national regulation and on the 'command and control' approach, using inspections and compliance checking, e.g. licensing discharges, and farmyard and septic tank system inspections. But they have not worked and will not work on their own, although there is no doubt that they are an essential 'tool' to have in the 'toolkit'.

Farming takes place over a far higher proportion of the landscape than any other human activity. Virtually all farmers appreciate the environment in which they live and which they are custodians of. However, at the moment for most farmers, the interaction with environmental protection is through inspections, either by the Department of Agriculture, Food and Marine or local authorities. As a consequence, for many farmers the 'environment' is off-putting. Farmers are fearful of inspections even when they feel that the situation on their farms is satisfactory. But, 'fear' as an emotional reaction is not an effective means of bringing about the understanding, actions and behavioural change that are needed. So, can we change the emotional response from being somewhat negative to being positive and constructive?

In our view in the Catchments Unit, without the involvement, cooperation and co-ownership of water management by local communities and particularly farmers, and the opportunity to engage with and learn from farmers, Ireland's water quality objectives will not be achieved in the foreseeable future. So, what do those of us who are scientists and engineers involved with catchment management need to do?

- Acknowledge this point.
- Put ourselves 'in the shoes' of farmers and local communities.
- Listen and have empathy with farmers, appreciate their need to 'make a living', genuinely engage, develop a common language, keep the message simple, be objective (scientists with narrowly focussed agendas either personal or based on their discipline are a turn-off), be transparent, appeal to both the emotions and the senses, and avoid criticisms of past activities while learning from them.
- Putting emphasis on 'can' not 'can't'; in other words, put emphasis on what can be done. Also, 'ask' not 'tell', and 'talk with', not 'talk to'.
- Change the traditional top down, linear model of research from advisory body to farmer using a more balanced bottom up–top down knowledge exchange approach (see EPA publication http://bit.ly/agimpact for development of this point)
- Pay farmers for 'ecosystem services' derived from our plants, animals and landscape, particularly in areas of high nature value farming (see EPA publication at: http://bit.ly/eparesearch209). The reality is that we will need to pay the private landowner who conserves for the public interest (a concept advocated by Aldo Leopold, the influential American conservationist (see https://www.aldoleopold.org/about/aldo-leopold/)).
- Use farm advisors, who already have training and experience on production but would be specifically trained on environmental protection, as a link between regulators and farmers where water quality problems are present; farm advisors are trusted by farmers in a way that regulators will never be.

These are not a panacea, they may not work in all circumstances and expecting alignment between farmers and local communities, on the one hand, and environmental regulators, on the other, on all issues is not realistic; however, they are a means of enabling those with the issues, e.g. farmers, to either lead the challenge or, if not always leading, at least helping and actively working collaboratively to find and undertake solutions.

Which brings us back to the quotation at the start of this editorial; while a rational response to environmental protection is needed, the addition of a positive emotional reaction and relationship creates a dynamic that will increase the likelihood of beneficial behaviours, even in circumstances where there is no financial benefit and there may even be disbenefits.

Abraham Lincoln (slightly amended) put it well:

"In order to win a person to your cause, you must first reach their heart, the great high road to their reason. This is the only road to victory."

Easier said than done.

But we have made a good start:

We have the evidence base for the scientific components on the impacts of human activities on water and the environment, and the mitigation measures required, although it needs to be kept in mind that knowledge does not necessarily lead to behavioural change.

The economic benefits of a satisfactory environment (e.g. for tourism, marketing of agricultural products) are helping to provide the rational basis for environmental protection.

Collaboration is now seen as an important driver, with a corresponding reliance on compliance as the ultimate rather than the first measure.

While the impacts of climate breakdown due to human activities may still seem remote and in the future for most people, it may be starting to raise awareness of the role of our environment on human wellbeing.

There is an increasing realisation that progress is more likely when nature and its protection is not compartmentalised unduly by legislation, disciplines or organisations, and that co-benefits are not only achievable but also more effective.

Waters and Communities Office staff (see more details here: https://www.catchments.ie/download/catchments-newsletter-sharing-science-stories-spring-2017/) are linking effectively with local communities, not only on water issues, but also with biodiversity and local heritage.

Engagement and partnership among people in local communities, environmental NGOs, farming bodies, agri-industry, public sector bodies and (even!) among the different scientific disciplines are starting to be seen as essential components of environmental management.

Several of the articles in this and previous Catchment Newsletters have emotional connection as an underlying basis.

Thus, no real solutions are provided here to advancing the role of people's emotions and senses as factors in helping to achieve a genuinely sustainable future. But perhaps it will encourage consideration that more than scientific evidence and rational reasoning may be needed, and that further thought should be given to encouraging emotional connections.

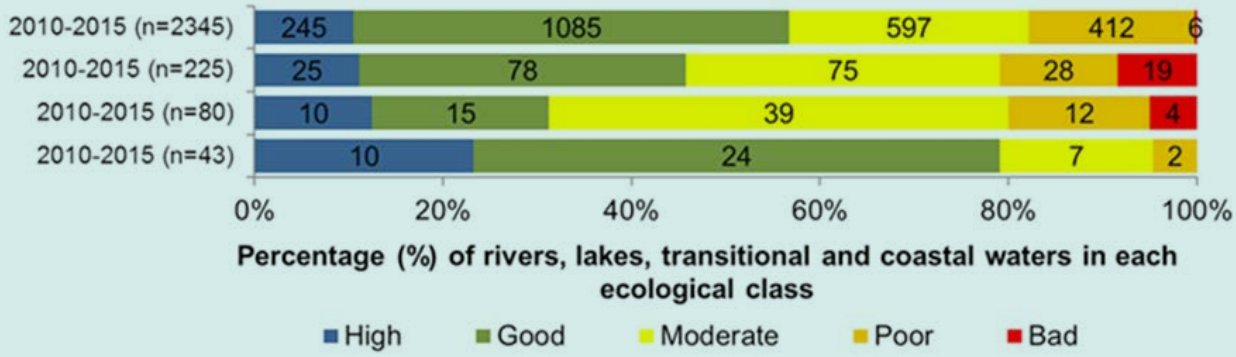
"A once in a lifetime experience; a truly wonderful intergenerational project; an event that sent everyone home smiling".

Quotations from the article on St Brigid's Holy Well, Kilteevan (page 14)

Donal Daly
Catchments Unit, EPA

New EPA Report: Water Quality in Ireland 2010-2015

The latest Water Quality in Ireland report 2010-2015 has been published by the Environmental Protection Agency. The report contains the most up-to-date and comprehensive assessment of the ecological health of Ireland's surface waters and the status of Ireland's groundwater resource.



The results, which are also reported in Ireland's draft River Basin Management Plan (2018-2021), shows that a considerable amount of work is still required to meet the environmental objectives of the Water Framework Directive.

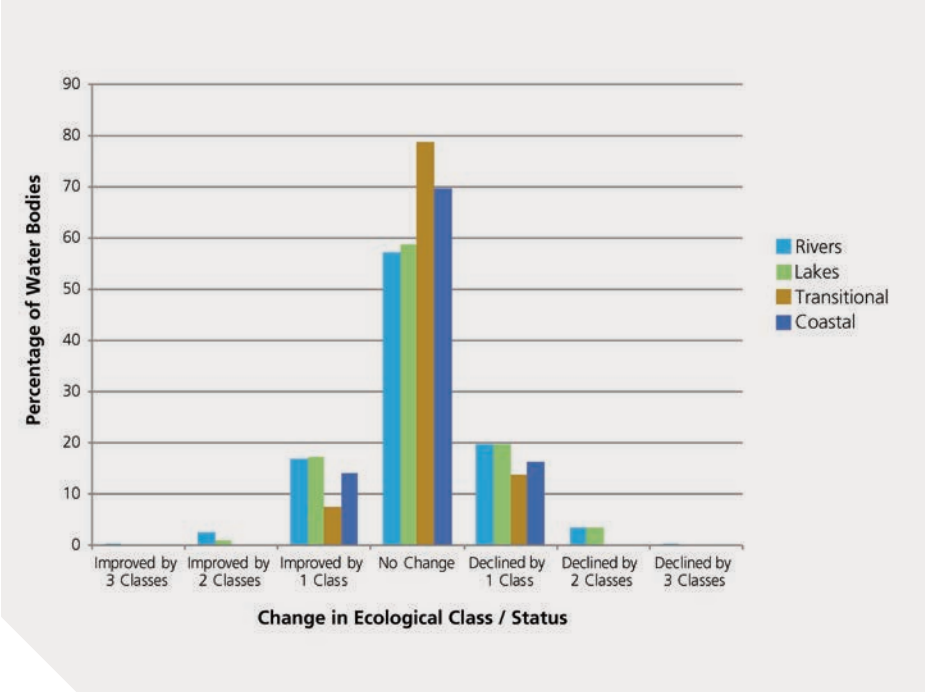
Four out of every 10 river water bodies are failing to meet their objectives having been classed at moderate or worse ecological status.

The picture for transitional waters is even more challenging, with seven out of every 10 water bodies failing.

The overall quality of our surface waters has remained unchanged since the previous assessment which covered the period 2007-2009. This indicates that the improvements planned for under the first cycle of the Water Framework Directive have not been achieved. On closer inspection, however, it is evident that there have been improvements in some water bodies, but these have been offset by deterioration in others. The EPA is currently assessing the reasons for these changes to help inform decisions on what actions are needed to improve water quality between 2018 and 2021.

The report highlights some positive outcomes with a reduction seen in the number of seriously polluted river water bodies, with only six river water bodies assigned bad status compared to 19 in 2007-2009 and 39 in 2004-2006. This improvement reflects the success of the Red-Dot programme which focused attention and resources on the most seriously polluted waters.

The report also confirms the excellent quality of Ireland's coastal waters with eight out of every 10 water bodies achieving good or high ecological status. On a more negative note, the continuing deterioration in our highest quality river water bodies has continued. The number of highest quality river sites has declined ten-fold since the late 1980s with only 21 highest quality sites identified in the most recent assessment. This represents a serious deterioration in the quality of Ireland's river water bodies. The protection and restoration of these waters and other high status water bodies is a priority in the national River Basin Management Plan.



Shane O'Boyle, EPA Ecology Unit

You can download this report from the EPA website - http://www.epa.ie/pubs/reports/water/waterqua/

Follow @EPAEcology on Twitter

The EPA Ecology team monitor and assess Ireland's rivers, lakes, estuaries and coastal waters. You can follow @EPAEcology on Twitter to get an idea of how varied and detailed their work is – and to see some truly stunning nature photography from all around Ireland.

LOUGH BRIN, IVERAGH PENINSULA, KERRY

URAGH STONE CIRCLE (CIRCA 2500 BC) ON THE BEARA PENINSULA, COUNTY KERRY, WITH LOUGH INCHIQUIN IN THE BACKGROUND

MEET THE OYSTER THIEF, SO CALLED AS THE PLANTS ARE SAID TO INFLATE WITH GAS AND FLOAT AWAY WITH THE SMALL OYSTERS THEY ATTACH TO!

THE WHITE WATER LILY (NYMPHAEA ALBA)

New Data - 2016 Q Values for Macroinvertebrates

The EPA Ecology team look at thousands of sites around the country to monitor the health of our waters. This data is key in helping us understand and manage our water bodies and their catchments.

One of the ways they do this is by looking at macroinvertebrates, which are animals without a backbone that can be seen with the naked eye. They are used as indicators of water quality. A 'Q-value' is the name for the score assigned to a location based on the health of its macroinvertebrates.

Q Value results for all hydrometric areas surveyed for river macroinvertebrates in 2016 are now available at http://www.epa.ie/QValue/webusers/

Q Value*	WFD Status	Pollution Status	Condition **
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2,	Bad	Seriously polluted	Unsatisfactory

* These Values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site. The intermediate values (Q1-2, 2-3, 3-4 etc.) denote transitional conditions. The scheme mainly reflects the effects of organic pollution (i.e. de-oxygenation and eutrophication) but where a toxic effect is apparent or suspected the suffix '0' is added to the biotic index (e.g. Q1/0, 2/0 or 3/0). An asterisk after the Q value (e.g. Q3*) indicates something worthy of special attention, typically heavy siltation of the substratum.

** "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses.

New Data Dashboards on Catchments.ie

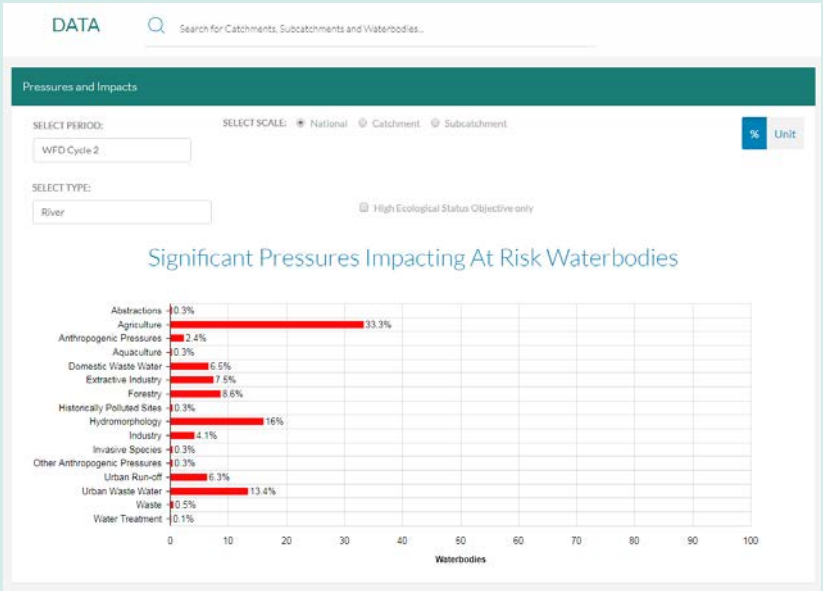
We have recently added new Data Dashboards on www.catchments.ie

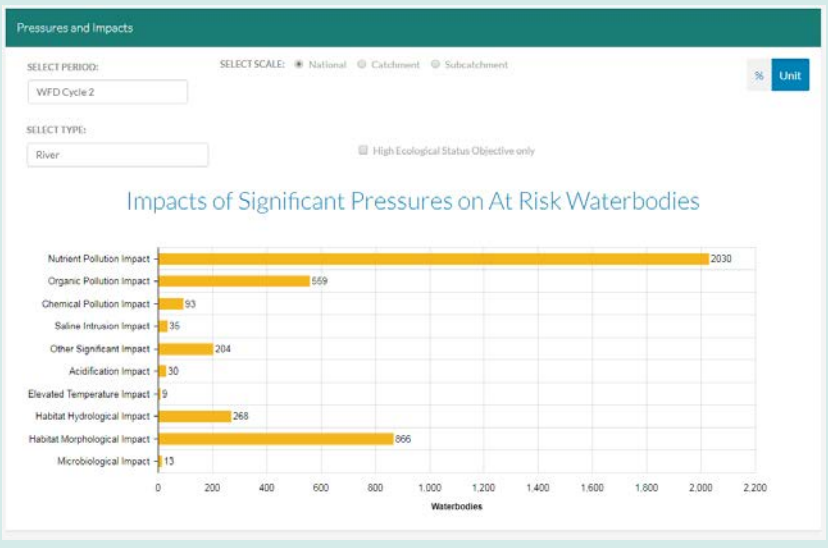
You can find information on Water Quality Status, Water Framework Directive Risk, and Significant Pressures and Impacts at National, Catchment and Subcatchment scale. At present this information is available for Rivers and Lakes - additional data will be published as the characterisation process is completed over the next few months.

https://www.catchments.ie/data/#/dashboard/waterquality

https://www.catchments.ie/data/#/dashboard/risk

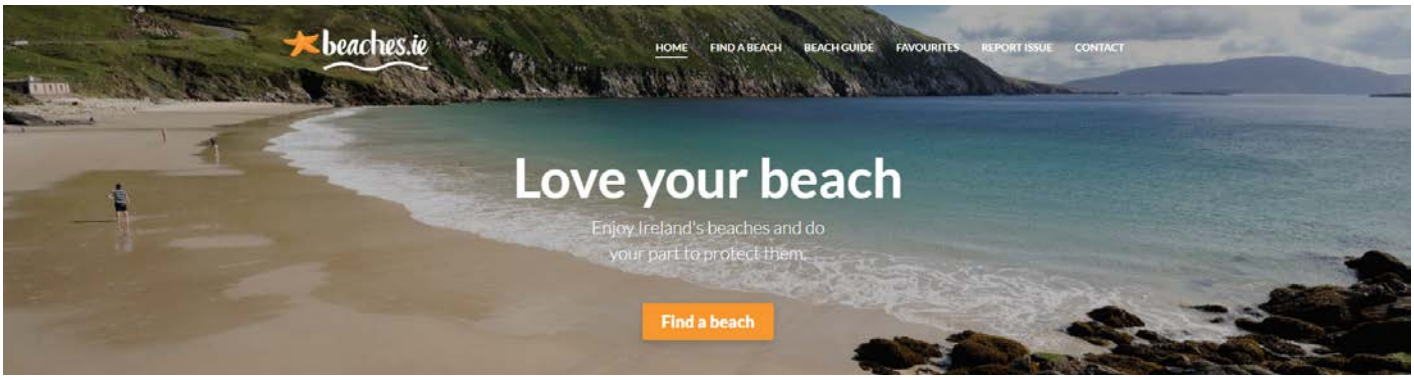
https://www.catchments.ie/data/#/dashboard/pressure





BLUE SKIES & LIGHT WINDS OVER THE BEARA PENINSULA

Beaches.ie launched - #LoveYourBeach



Going for a swim at your local beach or lake?

The new www.beaches.ie website has all the information you need...

beaches.ie is mobile friendly, so you can quickly and easily access a range of bathing information while on the way to your local beach or lake, or while you are already there.

As most people go to their nearest beach the 'Home' page on beaches.ie displays beaches near you and their water quality if you have your location services turned on your device.

beaches.ie allows you to easily find out:

- What the recent water quality has been like at your regular beach or inland bathing water
- If any swim restrictions are in place at our main beaches
- What the weather is likely to be
- What time the tide is due in
- Amenities available at your chosen beach, including access to beach wheelchairs

beaches.ie is continually updated during the summer as results of monitoring become available from local authorities.

You can also follow **@EPABeaches** on Twitter for the latest news and updates.

The beaches.ie website currently provides information on 142 identified beaches (monitored and managed under the Bathing Water Quality Regulations) and 52 other monitored beaches.

The information on beaches.ie is based on local authority monitoring of water quality, Met Eireann weather forecasts and Marine Institute tidal information.

If you have any queries about beaches.ie you can contact the EPA Beaches team via email - hello@beaches.ie

When visiting your local beach:

- Use the new beaches.ie website.
- Take note of warning signs: Always observe any swim restrictions or safety hazards signs; they're there for your safety.
- Know the warning flags: Never swim where a sign says not to or when the red flag is flying. The red flag is flown when there is a water safety risk e.g. the presence of dangerous under-currents, where pollution is likely, or where there is an increased risk of illness if you go into the water.
- Water quality can deteriorate quite quickly after very heavy rainfall, especially at beaches near urban areas. It is best to avoid water activities at the beach for at least 48 hours after heavy rainfall to protect your health.
- Respect your surroundings: Take a 'leave no trace' approach to prevent and minimise harm during your next summer trip. While at the beach or outdoors, make sure to dispose of litter properly in the waste and recycling bins provided or alternatively bring your waste home and dispose of it later.
- Use the 'See it Say it' App to report any environmental concerns: By taking a quick photo, and adding a few details, this app makes it easier to make a complaint about issues such as dumping of litter or other environmental problems.
- Never go swimming alone: Always swim with others within your depth, parallel to shore. Swim in designated areas when a lifeguard is on duty.
- Supervise Kids: Adults supervising kids at the beach or near water need to be vigilant.
- Don't drink and swim.
- Avoid harm from sun exposure: Apply sunscreen with a high SPF to reduce the intensity of the sun rays. Apply sunscreen ~15-20 minutes before sun exposure. Limit exposure especially between the hours of 10am and 2pm as UV rays are strongest at these times, especially during the summer.

Annmarie Tuohy, Environmental Protection Agency

Beaches.ie was developed and is maintained by the Environmental Protection Agency and is a collaboration with the Local Authorities and the Department of Housing, Planning and Local Government.

Maigue Rivers Trust launched in Limerick

The Maigue Rivers Trust was launched in Croom on Friday, May 26th, with a mission 'to protect, enhance and cherish the rivers and lakes of the Maigue catchment for the benefit and enjoyment of all'.

Patrick O'Donovan, Minister for Tourism and Sport, launched the Maigue Rivers Trust said, "I want to congratulate everyone involved in the launch of this Trust. This is a community initiative which seeks to see the benefit of rivers and waterways on our environment and the contribution they make to our local areas. The rivers in County Limerick flow through some of the most beautiful landscapes in Ireland, and we have to make sure that we try to protect them and look after them so as to maintain habitats, protect drinking water and enhance our communities. I want to wish the Trust well in their work for the future and to thank all of the various different sectoral representatives for their work on this project."

ATTENDING THE MAIGUE RIVERS TRUST LAUNCH WERE MINISTER FOR STATE FOR TOURISM AND SPORT, PATRICK O'DONOVAN, TD, CARMEL FOX, CHAIRPERSON, MAIGUE RIVERS TRUST AND CLLR EDDIE RYAN, A DIRECTOR OF THE MAIGUE RIVERS TRUST. PHOTO: LIAM BURKE/PRESS 22

The Maigue Rivers Trust came about after a pollution incident on the River Loobagh (one of the major tributaries of the Maigue) which occurred in August 2014. Following this, the community came together to look at ways in which it could engender a spirit of stewardship towards the river, resulting in the eventual formation of The Maigue Rivers Trust.

Several initiatives followed including works to improve the habitat for fish, an education and awareness programme, and a pilot project to control giant hogweed in the catchment. The interest in these initiatives and in the river generally and the desire to further enhance this valuable resource led to the need for a more formal structure which would be better placed to help the community achieve its priorities for the river.

This led to a group of stakeholders undertaking a study trip to the Ballinderry Rivers Trust in Northern Ireland to look at how a Rivers Trust operated and to see if this was a model that would work for the Maigue. The group was very impressed by the success of the Ballinderry Trust and returned to Limerick convinced that this was what was needed to help the Maigue achieve its full potential.

Rivers Trusts are community initiatives started by local people to care for their local rivers. River trusts are charities which aim to deliver river improvements on a catchment management scale for the public benefit.

Councillor Eddie Ryan is one of the Directors of the Trust. He said the Trust will help protect the Maigue and its catchment area stretching from Martinstown near Kilmallock to where the river enters the Shannon Estuary near Ferrybridge.

"Following the fish kill in the Loobagh River a number of years ago, the need to put measures in place to protect the river was brought to the fore. From then the project has grown to include the River Maigue and its large catchment area. In order to protect the Riverway and help promote and enhance it, all stakeholders need to buy-in to the project and the idea of a Rivers Trust. We all own the rivers and we all have a responsibility to protect it and the develop it, we need the farming associations and community, fishing groups, other users of the river, schools, local associations to get involved. It is a brilliant idea which will have significant benefits for all in the long run"

Get involved with The Maigue Rivers Trust

You can contact Maigue Rivers Trust if you wish to get involved - info@maigueriverstrust.ie or 061 407547

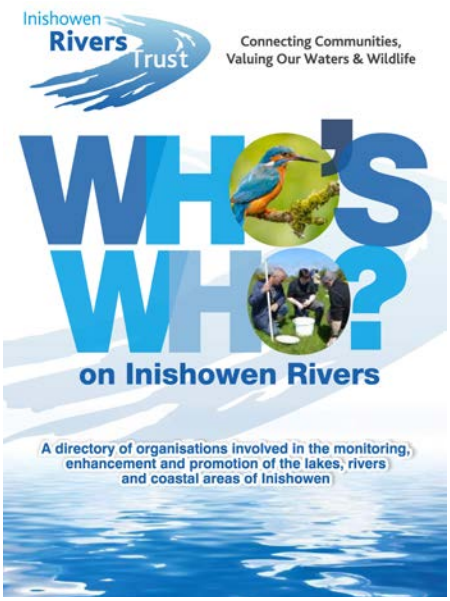
A version of this article originally appeared on www.ilovelimerick.ie

You can read more about the background to this story on catchments.ie - https://www.catchments.ie/catchment-case-study-river-loobagh/

River Care Knowledge Share - Inishowen Rivers Trust

On Wednesday February 22nd, the Inishowen Rivers Trust invited communities and agencies to gather and share their hopes and vision for the future of Inishowen's precious rivers, loughs and coastal waters.

INISHOWEN RIVERS TRUST'S 'RIVER CARE KNOWLEDGE SHARE' EVENT



"It was clear from the outset that this was going to be an uplifting event" said Trish Murphy, one of the Trust's directors and organisers of the event. "There was a buzz amongst organisations as they set up their stalls with banners, leaflets and interesting objects to demonstrate to the audience the work they carry out on Inishowen waters."

The event began with water songs performed by local musicians setting a relaxed tone for the evening and reminding us of our shared passion to care for our local rivers. This was followed by excellent presentations from Bernie O'Flaherty and Jimmy McVeigh from the Waters & Communities Office, and Mark Horton, the All Ireland Director of The Rivers Trust.

Each of the speakers reiterated the importance of community engagement with water and showed how Trusts can connect communities across a large catchment area, have multiple benefits in terms of water quality, biodiversity, health and well-being, and generate an economic benefit for those communities. After the presentations agency representatives and several community groups were invited to give a short introduction to their organisation and everyone had the chance to provide comments, feedback or questions to a harvest board. This provided ample opportunity to mingle and meet others, and it was certainly a busy evening. The final part of the night focused on looking at the themes raised on the harvest board and a Question and Answer session from the floor provided a further chance to raise more issues.

The Inishowen Rivers Trust was formed in late 2015 after a number of public meetings to gauge interest and explain the concept of a rivers trust. There are currently seven trusts in the Republic of Ireland and a number of further groups exploring the idea. All trusts operate as charities and provide training, education and opportunities for communities to reconnect with nature and enhance our environment. Director Larry Coyle added, "It was a great night and a brilliant opportunity to meet the people working on the ground. Everyone was there - landowners, fishermen, farmers, walkers, artists, environmentalists, bird watchers and all those who want to learn more about our local waters." There are a wide range of statutory agencies involved in the monitoring, promotion and enhancement of our natural waters and this Who's Who event aimed to help communities understand what these roles are and what agencies operate in Inishowen. 27 statutory agencies, Non-Governmental Organisations and affiliations attended the event and provided a synopsis of their role. This information has been put together as a 20-page directory. Larry continued, "We hope this directory booklet will be a useful resource for communities in the future who wish to get involved in water projects. They can find out who to contact for support or advice."

The Inishowen Rivers Trust would like to thank the Waters & Communities Office for funding this event and supporting the work of the trust. The Trust would also like to thank everyone who contributed to the event, to the speakers, singers, greeters, agencies, printers, hotel staff and all the community groups that turned out with an open mind and a willingness to learn and share our thoughts and ideas.

Get involved with Inishowen Rivers Trust

You can learn more about the work of the Inishowen Rivers Trust and how to get involved by visiting their website at www.inishowenriverstrust.com

Inishowen Rivers Trusts - Who's Who on Inishowen Rivers?

Huge credit to Inishowen Rivers trusts for preparing this useful little book – a handy directory of organisations involved in the monitoring, enhancement and promotion of the lakes, rivers and coastal areas of Inishowen.

This document could be a very useful template for other communities to follow – you can download a copy from www.catchments.ie/download/whos-inishowen-rivers

Inishowen Rivers Trust

Big Turnout for Galway's Waterways Workshop

A larger crowd than expected turned out on the evening of 19th May in the Galway Rowing Club to plan the future of Galway's Waterways. The meeting was attended by members of clubs that use the rivers and canals, the residents and businesses that are located along them, as well as churches and schools. TD's Noel Grealish and Eamon O'Cuiv were in attendance as were City Councillors Frank Fahy, Padraic Conneely, and Colette Connolly. Guest speakers included Catherine Seale from the Galway/ Roscommon Waters and Communities office and Mark Horton from The Rivers Trust.

The public workshop was part of the Galway Waterways Initiative being promoted by the Galway Waterways Association. The Association is a non-governmental organisation created by local residents concerned with the poor state of Galway's rivers and canals. The Initiative aims to raise awareness of Galway's waterways, organise volunteer efforts to clean them up and maintain them, and to enhance them for residents, visitors, and the natural environment.

As Phil James, chairman of the Galway Waterways Association says, "Sometimes the stars are in alignment. A number of things are happening at the international, national, and local levels to make it the right time for a focus on our waterways.

The European Water Framework Directive has put the quality of our water resources at the top of the national and international agenda. The designation of Galway as the European Capital of Culture 2020 gives us a goal post to aim for major clean-ups and enhancements, and the River Trusts movement across the U.K. and Ireland sets the precedent for communities to organise around their catchment areas and to take action to improve them."

A small number of focused workshops organised by interest group will take place in the early autumn to refine the vision set out in the May workshop. Presentations about the Galway Waterways Initiative will be made to the Galway City Council and the Lough Corrib Navigation Trust. A proposal is being prepared for the Galway Waterways Initiative to become an official programme of the Capital of Culture project, and a number of smaller clean-up actions and enhancement projects are in the planning stages.

Get involved with the Galway Waterways Initiative...

Email phil@proactivate.ie to become part of the Galway Waterways Initiative and to receive the newsletter of the Galway Waterways Association.

Celebration of Portumna's relationship with the Shannon and Lough Derg

DR CHRISTY CUNNIFFE, GALWAY COUNTY HERITAGE FORUM, WAS THE KEYNOTE SPEAKER AT THE RECENT 'PORTUMNA WATERWAYS' CONFERENCE HOSTED BY THE IRISH WORKHOUSE CENTRE IN PORTUMNA.

A CAPACITY CROWD AT THE CENTRE FOR THE RECENT 'PORTUMNA WATERWAYS' CONFERENCE HOSTED BY THE IRISH WORKHOUSE CENTRE IN PORTUMNA.

PICTURED AT THE LAUNCH OF THE RECENT 'PORTUMNA WATERWAYS' CONFERENCE IN THE IRISH WORKHOUSE CENTRE, PORTUMNA WERE PAUL DILLON (IWC DIRECTOR), ANNE RABBITTE T.D., STEVE DOLAN (IWC MANAGER), CLLR IVAN CANNING, AND CLLR JIMMY MCCLEARN.

On June 10th 2017 a conference on Portumna's relationship with its waterways was held at the Irish Workhouse Centre in Portumna town. A capacity crowd, swelled by the involvement of University College Dublin Women's Graduate Association, enjoyed an array of Speakers on topics ranging from the medieval ferry from Terryglass to Portumna, to the Viking presence of Irish rivers.

In addition to the conference, the centre hosted a family day' with an 'Exploration Dome' and outdoor activities (including a mini obstacle) which were hugely popular. The free day was made possible by the support of Waterways Ireland and Podumna Glamping Village and it is hoped it can become a regular feature on the waterways calendar.

JuneFest 2017: River Liffey Nature Walk

The River Liffey offers an inspiring way to bring learning to life. On Saturday 17th June 2017, The Waters and Communities Office collaborated with the JuneFest Committee to celebrate the wonders of the River Liffey in Newbridge, Co. Kildare.

A nature walk along the Linear Park during JuneFest enabled children and adults alike to discover inventions, uncover stories and spot amazing wildlife on their doorstep! The nature walk was a fun-filled activity and helped us to learn about and appreciate the wide variety of precious wildlife that the River Liffey is home to.

The Waters and Communities Office engaged the expertise of a local nature enthusiast, Michael Jacob to lead the walk. Michael led 50 people along the river on a glorious summers day and treated them to a lively and fun-filled talk which brought the River to life.

PARTICIPANTS ENJOYING THE NATURE WALK IN THE GLORIOUS SUNSHINE

Kick Sampling

The day's activities also included the opportunity for participants to take part in kick-sampling of the River which helped to assess the quality of the water and to discover the types of invertebrates which inhabit the Liffey.

The Waters and Communities Office would like to thank all who attended the JuneFest River Walk and would also like to express gratitude to the JuneFest Committee for their help and support in coordinating the event. We look forward to next year's event already!

Aoife McGrath, Community Water Officer, Waters and Communities Office

PARTICIPANTS PARTAKING IN KICK SAMPLING

Trout Fishing Event hosted for Wicklow Youths

An introductory trout fishing event for Wicklow Youths was hosted by Inland Fisheries Ireland's Dublin Angling Initiative recently at Annamoe Fisheries, Co. Wicklow. The Sean McMorrow Memorial Trout Fishing Day, which was aimed at introducing young people in the area to the pursuit of trout fishing and angling, was attended by 28 participants from Rathdrum National School, Roundwood National School and Rathdrum & Roundwood Scouting Groups.

Inland Fisheries Ireland's Dublin Angling Initiative aims to promote, develop and improve angling in the Greater Dublin Area through educational fishing courses for young people. This event is one of several being hosted by Inland Fisheries Ireland over the summer months. The Sean McMorrow Memorial Trout Fishing Day was held in memory of Sean McMorrow, a former General Manager of Inland Fisheries Ireland, and this event was kindly supported by his family.

The Annamoe event commenced with a workshop on water quality and invertebrate identification, by Sinead Hurson, Community Water Officer for Dublin and Wicklow with the Local Authority Waters and Communities Office. This fascinating workshop gave participants an insight into how water quality affects fish and communities in general.

Fishing lessons from experienced anglers in the Dublin Angling Initiative and the Vartry Angling Club followed with tutoring given in fishing techniques and safe fish handling. Participants practised fly fishing over an action-packed morning with most of them landing several fish.

The young anglers also enjoyed lunch at the venue, followed by a final hour of fishing and a chance to show off their new-found fishing skills. At the end of the event, the Sean McMorrow Memorial Trophy was presented to Darcy Santos from Rathdrum National School, for his focused effort in landing a fine rainbow trout of over 4lb.

Suzanne Campion, Head of Business Development at Inland Fisheries Ireland said: "The Sean McMorrow Memorial Trout Fishing Day was a great success and a fitting tribute to our former colleague and friend who recognised the importance of engaging the next generation around the pursuit of angling. The novice anglers showed great skill and ability and we hope that they consider taking up fishing into the future."

Oisin Cahill, Co-Ordinator of Inland Fisheries Ireland's Dublin Angling Initiative said: "The Dublin Angling Initiative aims to empower young people to enjoy angling and to appreciate the importance of conservation and protection. The combination of theoretical and practical lessons proves to be popular and we are delighted to be hosting a number of educational initiatives and courses over the next few weeks."

Anyone interested in learning more about the Dublin Angling Initiative should contact Oisin Cahill, Dublin Angling Initiative Coordinator at Inland Fisheries Ireland, just email: oisin.cahill@fisheriesireland.ie

Enquiries are welcome from any groups or individuals interested in the programme and availability will be on a first come, first served basis.

FRONT, LEFT TO RIGHT, OISIN CAHILL CO-ORDINATOR FOR DUBLIN ANGLING INITIATIVE (IFI), SHANE BRADY, AGE 13 FROM 17TH WICKLOW ROUNDWOOD SCOUTS HOOKED FOR LIFE AFTER CATCHING THIS FINE RAINBOW TROUT, SINEAD HURSON, COMMUNITY WATER OFFICER, AND AT THE BACK WESLIE ATKINSON (SCOUT LEADER).

St Brigid's Holy Well, Ballina Boy, Kilteevan - Kilteevan Junior Tidy Towns Make History

In June 2017, Kilteevan Junior Tidy Towns/Kilteevan N.S. brought a beautiful hand painted stone to Ballinaboy to mark St Bridget's Well. The stone was painted by Trish Fox, Junior Tidy Towns Liaison Officer and Cormac Dolan, Kate Cunningham, Orianna Cribbon, Kayla Rowkins and Malcom Cumberland carried it to the well.

CORMAC DOLAN, KATE CUNNINGHAM, ORIANNA CRIBBON, KAYLA ROWKINS AND MALCOLM CUMBERLAND BRING THE STONE TO MARK ST BRIDGET'S WELL AT BALLINABOY KILTEEVAN.

During the event maps marking St Bridget's Well dating back to 1899 and 1914 were viewed. While St Bridget's Well has been named on maps, this precious aspect of Kilteevan's local heritage was neglected in recent times and was unknown to many in the community.

Before the event Kilteevan Tidy Towns cleaned the well and tidied the surrounding area. The well was blessed by Fr. Sean Beirne. Those there described the event as "A once in a lifetime experience", "a truly wonderful intergenerational project", and "an event that sent everyone home smiling".

Nollaig Feeney, Heritage Officer Roscommon County Council, gave advice and guidance to Kilteevan Tidy Towns in relation to working on the well. The Area Engineer John Mockler had also visited the well and offered advice. The event was attended by Ms Catherine Seale, Community Water Officer Roscommon Co Council. A talk given by Catherine earlier in the year had inspired Tidy Towns to seek out local wells. Also in attendance was Loes Nijkamp, a student from the Netherlands, who was conducting research on Tidy Towns in Roscommon.

The young people at the event were impressed by the depth of the well, the clarity of the water and the capacity of the well to refill itself. The group engaged in chat about the importance of all water sources while one student referred to the effects of climate change.

Two members of Kilteevan Tidy Towns, Mattie and Gertie Murphy, spoke about their memories of using the well. Mattie recalled his family's daily use of the well. He remembered groups stopping at the well on the way to the bog to fill up containers of water.

Gertie gave a demonstration on making butter with utensils she had kept for forty years. The weight, quality and shine on Gertie's seamless, stainless steel bucket stole the show. The bucket bought in Harlows Roscommon and cost £20 which was the equivalent of a month's wages at the time. On hot summer days, she said "it was important to be up before the sun and to peddle into Roscommon shops with your Ballinaboy butter else all you would have is a trail of grease on the road". After the fascinating description, the group visited the site of the former dairy in Ballinaboy where Gertie told the group that if someone visited the dairy while churning was in progress, it was customary to give the churn a few twists or else risk bringing bad luck upon yourself.

Kilteevan Tidy Towns are hoping to carry out further research on Kilteevan's wells and waterways in the near future.

Eileen Fahey

LEFT SIDE OF WELL - EILEEN FAHEY, CORMAC DOLAN, GERTIE MURPHY, MALCOLM CUMBERLAND, MARGUERITE CROGHAN RIGHT SIDE OF WELL - LOES NIJKAMP, NETHERLANDS, CATHERINE SEALE COMMUNITY WATER OFFICER, KATE CUNNINGHAM, ORIANNA CRIBBON, MATTIE MURPHY, ETHNA DOLAN AND KAYLA ROWKINS

Reanimation of functional wetlands and application of the 'Integrated Constructed Wetland' (ICW) concept

River basins typically comprise a diversity of catchments that intercept precipitation. Each catchment is circumscribed by topographical boundaries involving a series or parallel set of *functional ecosystems*. These receive water that subsequently percolate to ground, flow to receiving waters, absorb, evaporate or transpire to the atmosphere. Together the geomorphology, pedology, topography, and associated biology of each ecosystem, especially that of vegetation, which play key roles in catchment hydrology, and subsequently effect associated receiving waters. More than any other European country, Ireland has suffered great diminutions of its two once dominant habitat types of primary importance to its catchment ecosystems: forests and wetlands. This tragic largely unnoticed integral loss persists, in spite of such habitats' substantial social, economic and environmental importance being repeatedly alluded to by oversight bodies such as the UNEP/FAO and Ramsar.

In the first of three articles on the roles that forests and wetlands play in the hydrology of catchments (2016. EPA Catchments Newsletter Issue 4.), the authors presented an overview of their sustainable capacities to sequester carbon and to intercept, transform, recycle and retain water-vectored contaminants - both pollutants and nutrients. This second article focuses on reanimating functional-wetlands with special reference to the applying the Integrated Constructed Wetland (ICW) concept.

Lost habitats generally and forests and wetlands in particular, can be *functionally reinstated* by reanimating their basic structure, vegetation and supporting constituents - key facts needing to be acknowledged.

Reanimated wetland ecosystems, most particularly those that are shallow and have a marsh-fen structure, are best appreciated when appropriately landscaped and designed for intercepting known 'contaminated' water sources. As known by experience and experiment, these may include severely burdened sources such as animal slurry and acid-mine drainage and less challenging sources such as sewage (also combined with storm-water), industrial waste waters, and lightly contaminated land drainage, road and urban sources.

Manifold benefits of forestry have been made evident and accepted over the past 100 years in Ireland and other largely deforested European countries. On the other hand, and irrespective of replicated experiment and operational demonstrations over the past six decades, wetlands of various designs continue to struggle to gain wider sorely needed acceptance. This is mainly because 'functional' wetlands have mostly been designed solely to achieve *maximum* performance for the treatment of influent waters typically by minimizing the land area used. As might be expected, other *implicit* benefits such as comparative ease in operational management, aesthetics and biodiversity are generally acknowledged. But just like forests, wetlands can deliver many more benefits beyond their primary function. Moreover by adopting an *explicit* ecosystem/catchment based approach to water management - as done over the past 21 years with the 'Integrated Constructed Wetland' (ICW) concept implemented in the Dunhill/Annestown catchment of south County Waterford and elsewhere, a comprehensive range of additional benefits and ecosystem services beyond efficacious water management alone has been achieved. Furthermore this *optimal* approach, not attempting to maximize, yields a more robust infrastructure for coping with the unexpected - such as increased flows generated by severe weather events, as recently experienced in the northwest of the Country.

Endorsed by more than 80 science journal papers and presentations at relevant professional symposia including those by VESI Environmental, the results of this *integrated* wetland approach comprehensively demonstrate the *intrinsic* social, economic and environmental benefits of such an ecosystem based enterprise. Paradoxically, and for many perhaps counter-intuitively, whereas wetland reanimation may be considered the antithesis of drainage, it can be complementary to it by intercepting both point and diffuse drainage waters *before* they discharge to receiving waters such as streams, rivers, lakes and inshore waters. Such interception attenuates flow - a key factor in preventing flooding, and helps remove 'emerging pollutants' that might otherwise evade conventional water treatment. There is clear evidence that by reanimating wetlands designed for water treatment and flow purposes, many urgent social, economic and environmental needs can be met, particularly the chemical, physical and biological integrities of the Country's surface and ground waters – Ireland's river basins.

Marsh-fen type wetlands, typically shallow (less than 200mm deep) and densely vegetated by emergent/helophyte species, *simultaneously* support both aerobic and anaerobic aquatic environments. Consequently they nurture one of the widest ranges of biogeochemical processes for any habitat type. The transformative capacity of such dual simultaneously-existing microbial assemblages is truly vast, given their 4 billion year evolutionary background. They competitively and symbiotically 'digest' through-flowing substrates and are limited by few ambient conditions. The helophyte vegetation that dominate these habitats have specifically evolved to marsh-fen environments and feature many significant adaptive characteristics not found in terrestrial vegetation. Together microbial assemblages and vegetation have the *combined* capability of treating through-flowing water, sequestering nutrients and carbon, and volumetrically attenuating surface flow. When configured and sized to meet a specific landscape, they can be relied upon to provide long periods of service. This is well demonstrated by Integrated Constructed Wetlands (ICWs) constructed more than two decades ago which continue to function as designed and are, with minimal management, expected to have a functional life-span of more than 100 years. Such prolonged functional life-span has further economic and environmental significance due to the sustained capacity to sequester carbon at rates greater than that found in possibly any other ecosystem type due to their high primary productivity and phenol inhibited decay (typically 15 tonnes of organic matter (dry weight) per hectare per year).

As natural and reanimated wetlands tend to have well defined catchment boundaries, they lend themselves to detailed hydrological and ecological study (Society of Wetland Scientists - http://www.sws.org/europe-chapter). The ICW concept continues to provide further insights into the many benefits of wetland-intercepted water management and wider opportunities for their application and delivery.

Natural marsh-fen type wetlands may form wherever water slows on its passage to the sea. They, like most other natural habitats, are the product of geological happenstance.

ARTICLES

Understanding the factors that contribute to their formation points to how they can be reanimated wherever conditions allow. The main factors fundamental to ICW systems are:

- Underlying soils and ground conditions limiting through-flow exfiltration and permitting construction.
- Influent toxicity limiting/influencing vegetation growth at the point of inflow.
- Hydraulic loading determining the area of wetland required and its configuration to treat the influent, including that from precipitation.
- Topography and the challenges of constructing level ground.
- Attenuation capacity of receiving waters, whereby the expected discharge concentration of specific effluent parameters from the wetland are achieved. Zero *surface* discharge is possible with the required wetland area and appropriate vegetation cover.
- Surrounding landscape and ecology - to meet the aesthetic potential of the surrounding area and habitats.
- (Additional information on the above six factors are to be found at: http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad%2C24931%2Cen.pdf)

Detailed studies show that for optimal function, ICW systems need to be divided into a 'cascading *sequence*' of separate wetland cells through which influent water may flow. This minimises priority flows and sequentially decreases eutrophic conditions for each subsequent cell, thus capturing, retaining and degrading influent contaminants with increasing effectiveness. The accumulated nutrients and associated organic matter of the most eutrophic wetland cells may be dewatered, composted and their contents used in various ways. The configuration of each wetland cell is optimal when curvilinear, and has a similar length to width ratio. The anatomical structure and transpiration capacity of the dense vegetation in each cell progressively reduces water through-flow, thereby achieving *both* concentration *and* mass reductions of influent contaminants, as well as contributing to flood attenuation (Figure 1). A schematic diagram of ICW layout showing how the flow-attenuating freeboard between wetland cells is achievable, along with their indicative hydraulics, are shown in Figure 2.

ICW systems have been effectively deployed to treat a wide, often challenging, range of effluent types (Figure 3). Their benefits are found in each location but excel when collectively considered within a catchment. Applied over 21 years in combination with the ecological reanimation of the Dunhill/Annestown stream in Co, Waterford, some 20 ICW systems have contributed both to the natural return of salmon and sea trout, and to the lessening of flooding - by about 1m at the lower reaches of the catchment. This work has also provided many other benefits for the local community, including multi-use riparian woodland

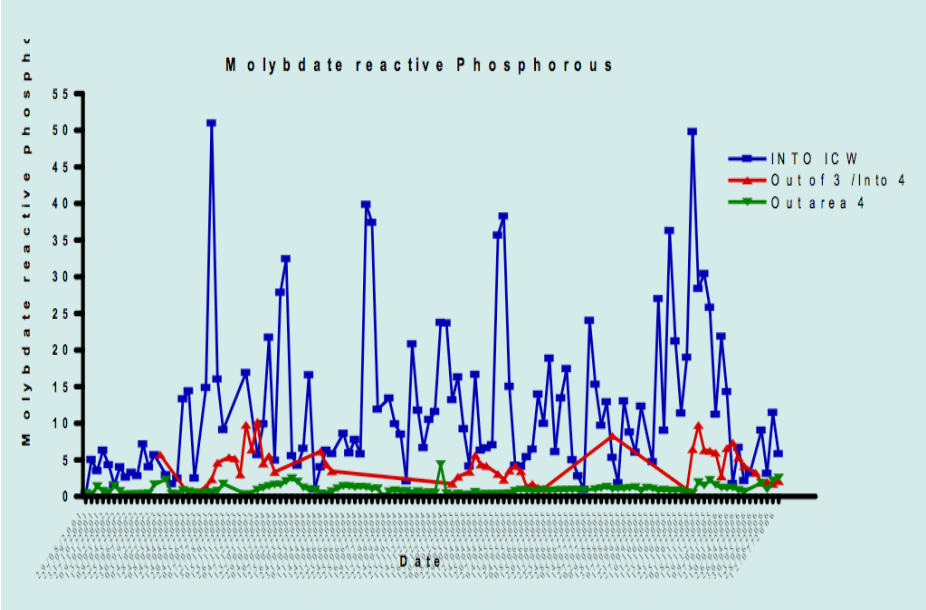


FIGURE 1. SIX YEARS OF MOLYBDATE REACTIVE PHOSPHORUS (MRP) PERFORMANCE DATA FROM AN INTEGRATED CONSTRUCTED WETLAND (ICW) TREATING DAIRY FARMYARD SOILED WATER: INTERCEPTED INFLUENT (BLUE), MIDWAY (RED) AND AT OUTFLOW (GREEN).

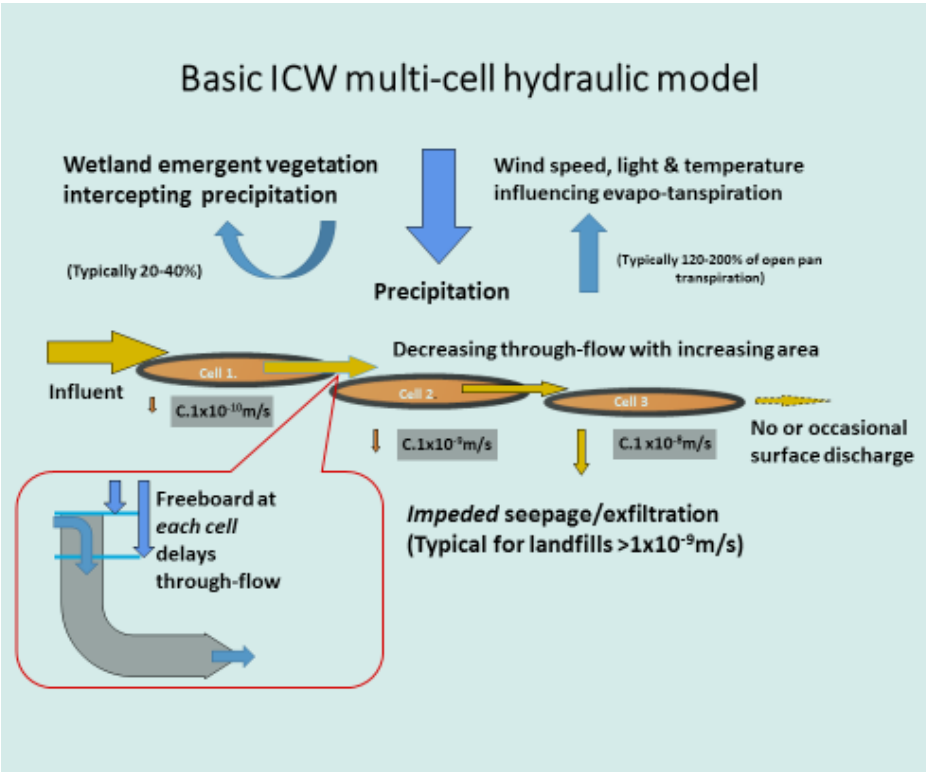


FIGURE 2. THE BASIC INTEGRATED CONSTRUCTED WETLAND (ICW) HYDRAULIC MODEL.

corridors, infrastructure for the creation of a high-use amenity/exercise track, and infrastructure allowing wider appreciation of the aquatic environment.

Wetland economics is becoming ever more to the fore as water management including wastewater issues, become more demanding. These along with flood attenuation-needs, which were recently debated for Cork City, gain in importance. Water management is clearly a land use issue, the economics of which are, as shown in the many case studies undertaken by the authors and others, indicative of high economic return on both the investment needed in land, and in

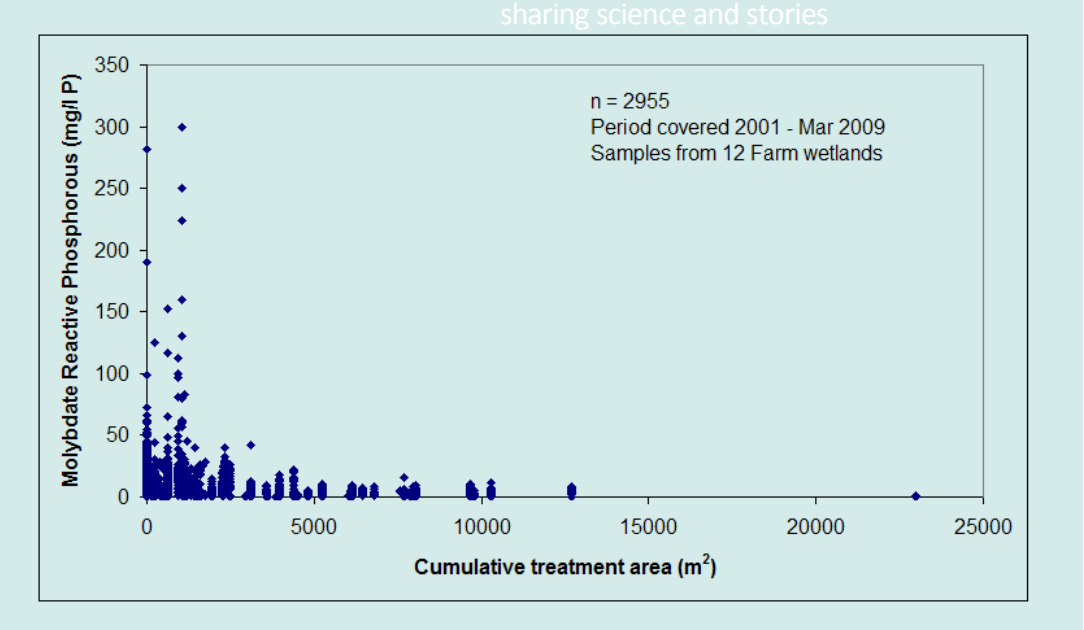


FIGURE 3. EIGHT YEARS OF AGGREGATED DATA FOR MOLYBDATE REACTIVE PHOSPHORUS (MRP) FROM 12 INTEGRATED CONSTRUCTED WETLAND (ICW) SYSTEMS TREATING FARMYARD WASTEWATER IN THE ANNE VALLEY CATCHMENT, CO. WATERFORD, DEMONSTRATING DECREASING MRP CONCENTRATION WITH INCREASING AREA.

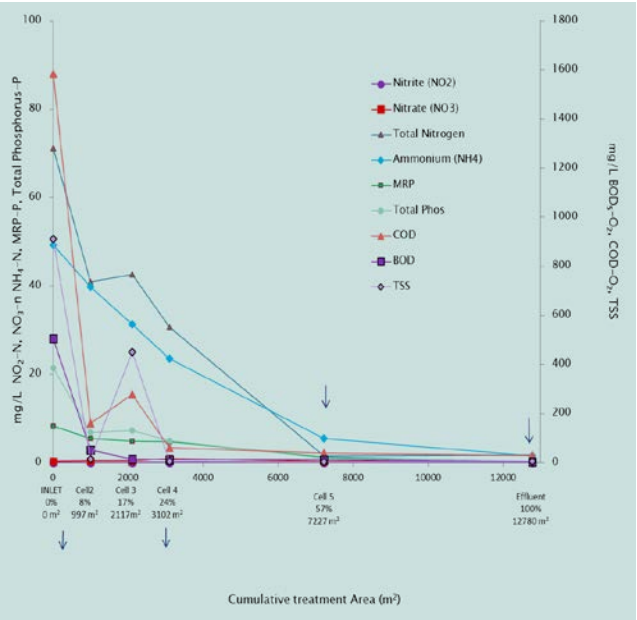


FIGURE 4. PERFORMANCE OF DUNHILL VILLAGE'S INTEGRATED CONSTRUCTED WETLAND (ICW) TREATING VILLAGE WASTEWATER - CONCENTRATIONS FOR 9 PARAMETERS EACH SHOWING ITS OWN REDUCTION RATING WITH INCREASING AREA OF WETLAND. MASS REDUCTION (FLOW X CONCENTRATION) IS C. 100% FOR ABOUT 5 MONTHS EACH YEAR WHEN HIGHER EVAPORATION AND VEGETATION TRANSPIRATION, AND LOWER RAINFALL OCCURS – AN ADDED BENEFIT WHEN THE ASSIMILATIVE CAPACITY OF THE RECEIVING STREAM IS LIKELY TO BE LOWER.

FIGURE 5. LOCATIONS OF SOME OF THE MORE THAN 100 INTEGRATED CONSTRUCTED WETLANDS (ICWS) TREATING A RANGE OF EFFLUENT SOURCES IN IRELAND.

their construction, making in many instances the reanimation of wetlands one of optimal land use and profitability. The more society becomes aware of what water vectors, the more relevant wetland functions become. Water from land drainage, built environments, and products of enterprise such as farming, industry, mining and forestry, requires more effective management than it is presently implemented. Experience shows that this can be achieved by acknowledging the role that *functional wetland reanimation* demonstrated by the Integrated Constructed Wetland (ICW) concept can have, and that this concept can play a marked positive role in the economy and environment of the Country for the long-term wellbeing of its people (Figures 4 and 5).

Aila Carty, Caolan Harrington, Rory Harrington, VESI Environmental Ltd. Little Island, Cork & Dunhill, Co. Waterford

Engaging communities on local waters and the draft River Basin Management Plan for Ireland.

What do your local rivers, lakes, groundwater, estuaries and coastal waters mean to you?

This question was asked of local communities by Community Water Officers during public consultation on the draft River Basin Management Plan for Ireland 2018 – 2021.

Over 120 public meetings were held across all 31 Local Authority areas between 20th April and August 5th 2017. Municipal Districts were chosen as catchment areas for these meetings as they are recognised Local Authority administrative areas and provide a good geographic spread.

The purpose of these public meetings was primarily to raise awareness about the Water Framework Directive and encourage submissions from the public and interest groups on the draft River Basin Management Plan, to enhance public participation in policy making. The meetings also opened discussions on local water interests and issues.

The main purpose of public participation is to improve decision-making, by:

- ensuring that decisions are soundly based on shared knowledge, experiences and scientific evidence,
- that decisions are influenced by the views and experience of those affected by them,
- that innovative and creative options are considered and new arrangements are workable and acceptable to the public.

(Public Participation in relation to the WFD, Guidance Document no. 8, EC)

The draft River Basin Management Plan provided an opportunity for members of the public, local communities, groups and organisations to make submissions on water quality management issues relating to their local rivers, lakes, groundwater, estuaries and coastal waters.

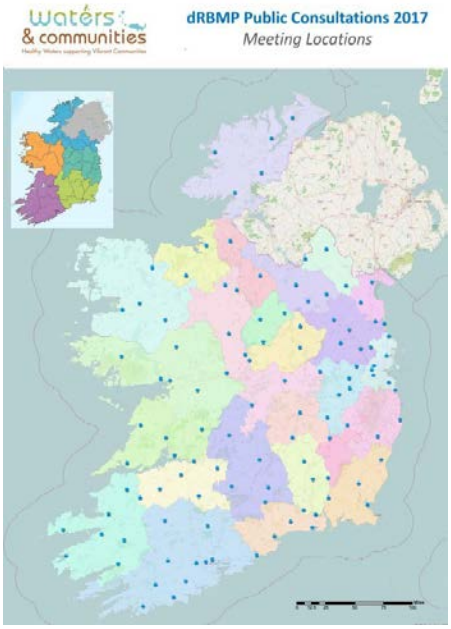
These public meetings also provided an opportunity to introduce the new online publicly available Water Framework Directive resource catchments.ie by displaying local maps with EPA data on water quality, complimented by stories of successful water projects from around the country.

With the Local Authority Waters and Communities Office public consultation process on the draft River Basin Management Plan concluded, the process of analysing and organising the information gathered has begun. A large volume of submissions were received covering a wide range of issues. This information will be presented to the Department of Housing, Planning, Community and Local Government to inform the final River Basin Management Plan

Follow up meetings are planned for late September/October to provide feedback at county level on the issues raised, and to highlight results from the catchment characterisation workshops led by the EPA in collaboration with Local Authorities, public bodies and invited stakeholders with specific catchment based knowledge.

The success of the River Basin Management Plan can only be achieved through an integrated Catchment Management approach where all stakeholders including local communities work together to achieves its goals. The River Basin Management Plan for Ireland 2018 - 2021 and its Programme of Measures will provide a basis for this collaboration over the next four years.

Details of these meetings and the draft River Basin Management Plan public consultation report will be made available on www.watersandcommunities.ie



Alan Walsh, **Local Authority Waters and Community Office**

The Suir from Source to Sea – a public engagement pilot

Background

Flooding has been high on both the public and political agendas since the major flooding episodes in 2015. Most people agree that the protection of life and property from flood damage is a priority for any civilised society. How this is achieved and where flood measures or defences are placed depends on a lot of factors. Some of these factors play an important role in the management of flood water in the first place (e.g., landscape management) or relate to the value of a watercourse in terms of recreation, local economic or biodiversity etc. The management of flood risk is not simple and usually requires a holistic approach involving many actors in the field together with the public to ensure that the best outcomes for each flood risk area are achieved.

In July 2016, the Office of Public Works (OPW) scheduled six Catchment Flood Risk Assessment and Management public consultation days aimed at developing options to manage flood risk at ten locations within the River Suir catchment. The Waters and Communities office sits on the steering committee for the South-East Catchment Flood Risk Assessment and Management programme and it was proposed that a complimentary set of public consultations concentrating on the Water Framework Directive could provide a wider context to flood risk planning, encouraging people to think about and engage in their local water body and introduce the public to the Water Framework Directive objectives.

On request from the public who attended these meetings, an additional ten Waters and Communities Office led meetings were added to the original six. This resulted in meetings spread throughout the entire catchment from source to sea, covering counties Tipperary, Kilkenny, Waterford and Wexford. The meetings targeted some of the major tributaries and the main freshwater portion of the catchment together with the estuarine (transitional water) and coastal areas. The experience of the consultations provided the basis for the development of a template which would inform the Public Consultations of the draft River Basin Management Plan for 2018-2021 which took place between April and August 2017.

How were the meetings run?

The Office of Public Works Public Consultation meetings were open to the public from 13.00 to 19.00. Elected members also had the opportunity to attend from 12.00 to 13.00. Flood maps and potential flood management options were placed on public view with experts on hand to discuss and take any queries.

The Local Authority Waters and Communities

Office Water Framework Directive sessions took place immediately after the Office of Public Works public consultations. These meetings took the form of an interactive format (town hall); the primary aim was to actively engage members of the public in their local water body.

A local focus was maintained where possible by placing the overall catchment in the local context. The meetings were advertised with the caption "What does your River Suir mean to you?". This question was tailored to the relevant waterbody where applicable (e.g., tributary or coast).

The concept of a catchment and how it applies to the River Suir Catchment was explained with examples of important features relevant to the meeting location. For example, the importance of the River Suir as a Special Area of Conservation (EU Habitats Directive) was highlighted and "features of qualifying interest" local to the area identified – for example, crayfish, otters or kingfishers.

The importance of the area for wider catchment community benefits was also emphasised (e.g., if the area is an important spawning area for salmon or trout, its importance in the context of the local economy or elsewhere within the catchment). The concept "the whole is greater than the sum of the parts" was explained in terms of tributaries and the wider catchment and how this applies irrespective of the perspective taken (e.g., economic, biodiversity, water quality, heritage etc.) – i.e., the tributaries and main channel are interlinked. People were encouraged to familiarise themselves with the Office of Public Works Catchment Flood Risk Assessment and Management plans and the flood management options being proposed for their local area and shown how to make submissions.

Included in this discussion was consideration of the wider community perspectives and the potential to find areas where added value could be made to any planned flood risk management option. At the basic level, people were encouraged to familiarise themselves of the plans and make informed submissions to the Office of Public Work's Catchment Flood Risk Assessment and Management consultations. The activities of local groups carrying out work associated with water were acknowledged and examples given. This was followed with a subsequent discussion on the wider potential for such groups and new groups to come together and form wider partnerships throughout the catchment. The catchment partnership concept was introduced together with where the Waters and Communities office can provide support for communities wanting to get involved in the management of their local waters.

The Water Framework Directive was introduced, its background and objectives explained with an update on developments on where Ireland is today. The attendees were informed that the River Basin Management Plan consultation for the 2nd cycle would commence shortly. The Waters and Communities office was introduced and its role explained. Funding options open to the public were highlighted together with an explanation on how communities can get involved in the management of their waterways. Examples of projects led by community groups around the country were given and examples of the types of projects that communities can get involved in and what can be achieved shown. A proposal from the floor was that the Waters and Communities Office should organise an annual family Fun Day event, and rotate this between communities within the Suir catchment to promote the positive aspects of the catchment.

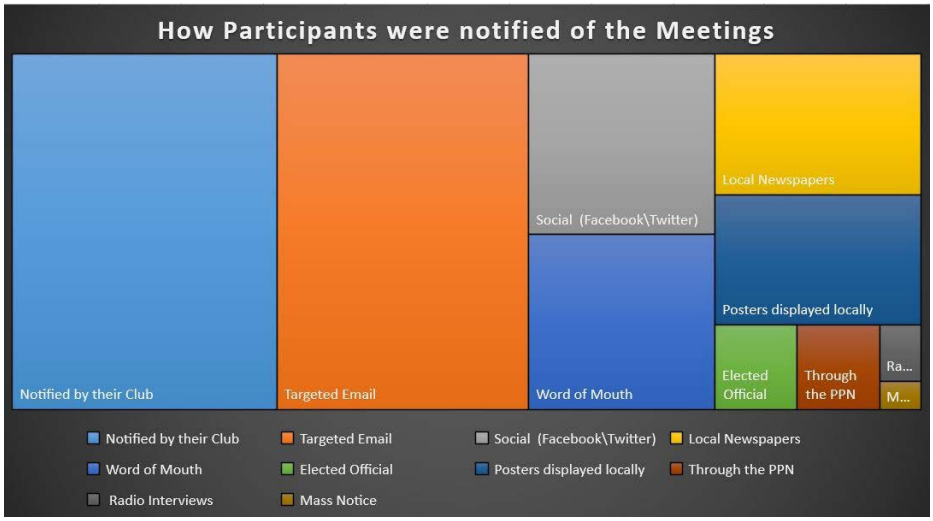
What happened at the meetings?

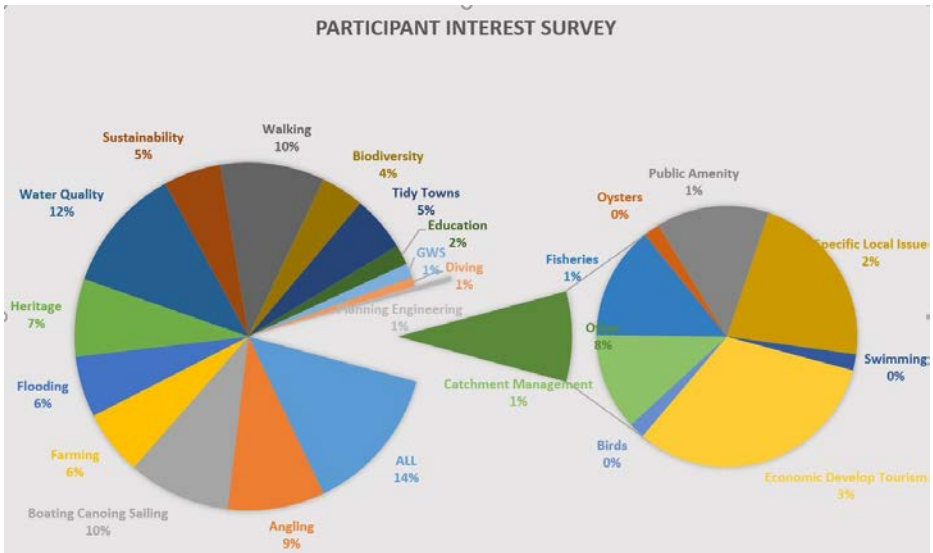
The presentations that were given were designed not to be generic. Each presentation was different and contained photos of the local waterbodies relevant to that area and other points of information that local communities could identify with. The idea here was not to deliver the usual generic presentations often associated with public consultations. In fact, we were warned by Local Authority colleagues that the public could be suffering from Consultation Fatigue!

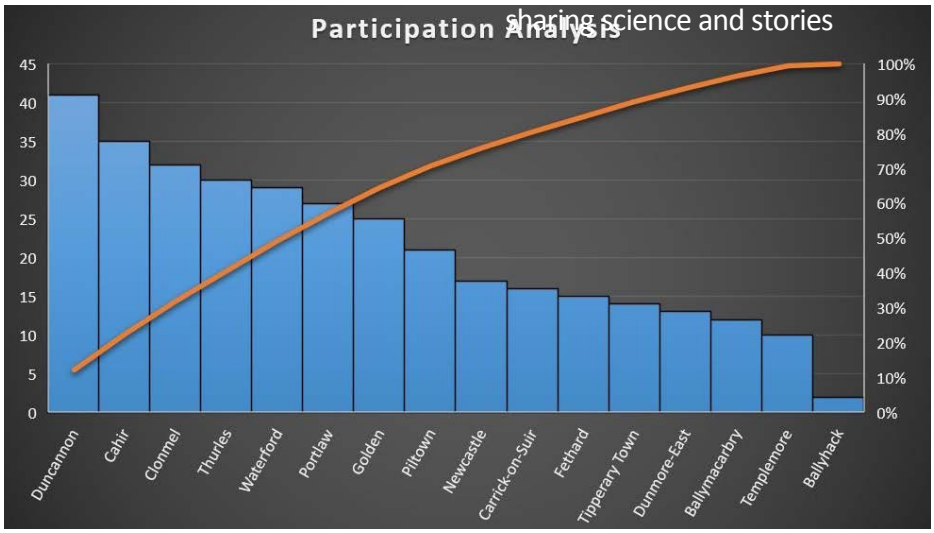
Information for the meetings was gathered from many sources. Waters and Communities office staff used their contacts in other agencies to gather information on flooding, fishing, wildlife and local amenities from Local Authorities, Inland Fisheries Ireland (IFI), National Parks and Wildlife Services (NPWS) and the Office of Public Works together with data from the Water Framework Directive website Catchments.ie. A few days before each meeting they travelled to respective location and took photographs to use in the presentation. These were received very positively in the meetings as the images connected with the attendees and got the conversation flowing with locals. Preparatory meetings were held with Local Authority staff to discuss and plan for any contentious issues and identify potential opportunities where communities can engage.

Who attended the meetings?

Considerable effort was made to get people to come out and attend the meetings. Posters were placed in each meeting location, local radio interviews were given, articles published in the local newspapers, social media was used extensively following stakeholder analysis for each







area to identify active groups etc., direct targeting of known local champions, various networks including those associated with the four local authorities (e.g. Public Participation Network, Local Community Development Committees, Heritage Fora, Elected members) covering the Suir catchment and Church announcements. People were interviewed on their arrival to the meetings to get a profile of who attended and their interest. It is clear from those that answered the survey on arrival that participants had a multitude of interests. 14% identified with all the options available on the attendee survey sheet.

What issues concerned most people?

Attendees were encouraged to identify the benefits of their local water bodies and share any issues which need to be addressed. Benefits ranged from water as an amenity, its importance to local commerce, farming and heritage, and many people shared stories about their local water course including their memories.

Issues raised varied. Some were common to most water bodies whist others were very specific to a particular waterbody (e.g., a pipe contributing pollution). The most commonly identified issue was "lack of joined up thinking amongst agencies" and "too many agencies involved in water management".

The public are confused and unsure where to turn to about water management issues. For example, who does one talk to about problems associated with vegetation control if river bank trees are causing excessive shading or blockages? Conflicting views were common also where an issue to some was perceived as a benefit to others.

Other areas of concern included flooding and river management. Often, water quality itself did not feature strongly at all meetings. People did however associate with different water benefits, which in themselves are a proxy for water quality, or are influenced by water quality - for example, tourism, fishing etc.

Community Participation

A total of 339 attendees were recorded although this number does not include those too shy to record themselves on the attendance sheets!

The largest attendance was at Duncannon, a small village in Co. Wexford. The beach recently lost its "Blue Flag" status and locals were quite exercised about it. They identified the local sewage treatment plant as one of the main sources of pollution. They directly attributed the loss of the Blue Flag to it and accused it as having a direct impact on tourist numbers, which affected the local economy. The smallest attendance was in Ballyhack, which is located a few miles from Duncannon. The meeting was held a week after the Duncannon meeting. It was added on at a late stage, to facilitate a request by an attendee from a previous meeting, but was poorly advertised compared to the other meetings. Proving the adage "fail to plan - plan to fail".

Public bodies

Officials from the Local Authority were present at all meetings (other agencies had personnel present at some of the events) and this allowed them the chance to mingle with the local community, explain their roles and discuss some issues which had been raised. One Local Authority official noted that the meetings were a great chance to catch several issues of concern, which otherwise would have been not recorded because of the burdens of their day job.

Outcomes

Culminating from these meetings a database has been set up with attendees contact details and regular feedback on catchment activities is provided. This network has proved invaluable recently as it facilitated a speedy response to the outbreak of the crayfish plague on the Suir. Information collected at the meetings is being collated and being acted upon -for example a submission was made to the Tipperary Heritage Plan based on feedback from the meetings.

The Waters and Communities Office have been working with several groups with a view to progressing river initiatives – a Freshwater Pearl Mussel project in Portlaw, biodiversity work in St Johns River Waterford, invasive species management throughout the catchment and community Family Fun Day events in Ardfinnan, Cahir, Carrick on Suir (Clancy Festival) and Sproai Waterford. The theme for this year's Spraoi Festival street parade is "The River Suir – From Source to Sea". After the conclusion for the meetings the Local Authority Waters and Communities Office were invited by elected members to present at Municipal District meetings on the local issues raised.

We would like to thank all of those who helped with the meetings, especially the Office of Public Works, the Local Authority staff, everyone who promoted the meetings including the elected members and of course the communities who attended. The learnings from these meetings went on to inform the draft River Basin Management Plan public consultations.

Fran Igoe, Michael Pollard, Alan Walsh and Sheevaun Thompson, Local Authority Waters and Communities Office

Water Catchments

WHERE WE LIVE, WORK & PLAY


Properly sited and managed woodlands and forests can protect our water environment.
Livestock access to watercourses must be managed correctly.
Clean water sources require less chemical treatment.
Approximately 30% of private wells are contaminated by E.coli – EPA 2010.
There is an angling club associated with every town and village in Ireland. Angling tourism benefits local communities.
The River Basin Management Plan – get involved!
Share Your story.
Protecting our waters for future generations to enjoy.
Clean coasts are important for water based tourism and recreation

"Climate change can bring us together, if we have the wisdom to prevent it from driving us apart"

Quote from Former British Foreign Secretary, Margaret Beckett (2007)[1]

Many wonder why, in the face of one of the most important global issues of our time, people are still struggling to respond effectively to climate change, and to curb their own greenhouse emissions. After all, the scientific evidence is becoming more and more obvious and immediate.

We could explain it away with the T.S. Elliot quote that 'humankind cannot bear too much reality', but that would be giving in to our human foibles too easily.

Over the past decade or so, much research has centered on why climate action is such a challenge to us. One of the explanations is that the issue is intangible - you can't touch it, hear it, or feel it. No-one can predict exactly how it will affect you, me, or our families and local communities. Although some of its effects are playing out right now, it is often described as being something that will happen in the future.

Faced with this, the human mind is ill-equipped to respond effectively. It has evolved to prioritise the present over the future, and to worry about the known over the unknown. Uncertainty puts us off, we can be unrealistically optimistic, and if something is too hard to take we are quick to slip into denial.

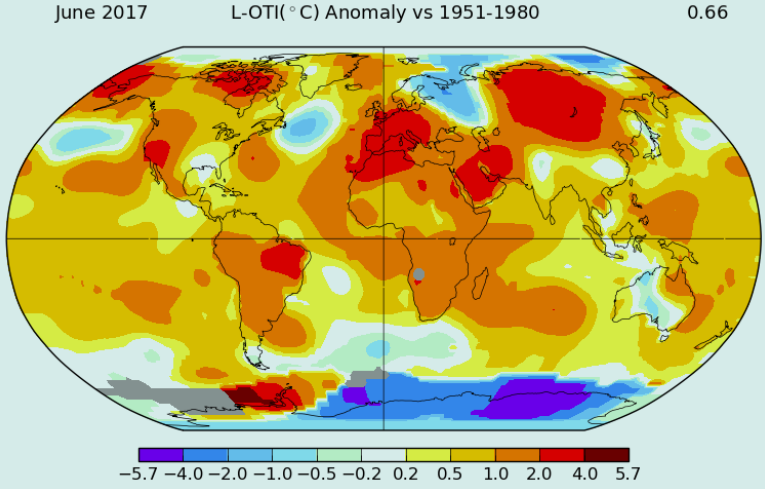
Moreover, climate change is a challenge to how we live our lives, and, in particular, to the notion of economic growth, and spiraling resource and energy consumption. Many fear that cutting greenhouse emissions will involve pain, sacrifice and unacceptable lifestyle changes. What used to be 'wants' are now 'needs' that people are reluctant to give up. We appear to be 'locked-in' to routines and patterns of behaviour that are resistant to change.

Social creatures, social norms

Human being are social creatures. And whether we admit it or not, we are influenced by social norms and social practice. We do what we do because we do it, and because everyone else is doing it too. We don't like stepping away from the herd and we worry about being judged by others for doing something different. Like children in the playground, we fear being shunned, isolated or ignored.

'Climate change has emerged as a phenomenon which poses challenges on an unprecedented scale. But it is not a problem waiting for a solution. It is an environmental, cultural and political phenomenon which is reshaping the way we think about ourselves, our societies and humanity's place on Earth.'

Professor Mike Hulme, founder of the UK Tyndall Centre for Climate Change Research



JUNE 2017 TEMPERATURE DATA, SHOWING THE TEMPERATURE INCREASE COMPARED TO THE AVERAGE FOR 1951-1980 SOURCE: NASA

Policies on climate change have tended to reflect the rational choice model, which focuses on the provision of information, as demonstrated by the 'Power of One' and 'Change' campaigns, and the offer of financial incentives, such as grants for home retrofitting and the purchase of electric vehicles. While these may work for the early adopters and environmentalists amongst us, progress is slow.

It is now more widely accepted that we need to look beyond the individual, and to the influence of social practice, peer groups, social and cultural norms, and to institutional and systemic barriers. New, flexible and more creative policy approaches are beginning to emerge, which not only attempt to address the problem of greenhouse emissions, but also play a wider role in helping to change how governments and policy makers interact with citizens, and how they make decisions.

Working collectively on community energy

Working with people collectively has more impact, and out of this thinking has emerged an interest in community energy.

Community energy is a broad term which allows for different interpretations, but it includes local ownership and participation in the generation of renewable energy, and in energy efficiency initiatives. Community energy projects are facilitating the spread of sustainable energy awareness and knowledge, and the promotion of energy saving behaviour. It is also hoped that involvement will help develop people's understanding and acceptance of renewable energy in general, and that a degree of community ownership and financial gain will foster approval for local renewable installations.

If it works, community energy can be a win-win situation for both policy makers and the community. Proponents stress that local benefits can include lower energy costs, job creation and investment, the fostering of a sense of engagement and civic duty, the strengthening of social networks, and the development of social capital, cohesion and resilience.

The promotion of energy efficiency measures and small scale renewable energy production is an obvious next step for national energy policy, if statements, like the following, from the 2015 White Paper on Energy are to be taken seriously:

'The transition will see the energy system change from one that is almost exclusively Government and utility led, to one where citizens and communities will increasingly be participants in renewable energy generation, distribution and energy efficiency'

To support this ambition, welcome steps have recently been taken by the Sustainable Authority of Ireland (SEAI) to expand their Better Energy Communities grant programme and to develop and support a network of Sustainable Energy Communities.

Challenges for Community Energy

However, there are significant challenges to the roll-out of community energy projects across the

INSTALLATION OF SOLAR PV FOR ELECTRICITY GENERATION

country. How a group emerges, who sets it up, the task it sets itself, the support it gets along the way, and the local context, can all determine the outcome.

A community energy practitioner needs staying power and the ability to respond to whatever hurdle comes their way. The topic can seem to be overly technical and complicated – we much prefer energy to be invisible, rather than presented to us in the form of kilowatts and joules. Sometimes, the group will face local apathy, disinterest or opposition. As with other volunteer activities, fatigue and burn-out can be a problem.

Outside agency support is key to the successful development of the sector, and it needs to be consistent and for the long-term. Substantial practical, technical and financial supports are required to help bridge experience and knowledge gaps.

However, over and above these requirements, community energy is unlikely to develop in any significant way, or to help address our national renewable energy and energy efficiency targets, if the current key barriers are not addressed. According to community energy advocates, these include:

- priority access to the electricity grid for community owned renewable energy projects,
- changes in the planning laws to allow for their appropriate siting, and
- a local feed-in tariff so that communities can benefit financially from the energy they produce.

Moreover, it is felt that policy makers shouldn't expect miracles from volunteers. If community energy is to have any meaningful impact, funding needs to be made available for the employment of people with community co-ordination and development skills, and with the relevant practical and technical expertise.

So, while community energy, as a grassroots-up response, cannot be seen as the silver bullet or cheap solution, it can, if given the appropriate supports, contribute to the energy efficiency challenge.

However, it will not flourish if there is not also an appropriate and visible response from the top down. For people to become interested in local energy initiatives, they need to see that the government, the local authorities and businesses are also playing their part. We also need to know that our leaders, politicians and policy makers are making the required behavioural changes within their own lives.

For this to happen there needs to be a national narrative on the energy transition and a clear and practical vision, which demonstrates to people what they are being asked to do, and what others are already doing. We need to know that the train has left the station, and that, if we don't hop on, we'll be left behind.

After all, no-one likes being left behind...

Clare Watson, Energy Policy Modelling Group, Environmental Research Institute and MaREI, UCC.

Clare is a PhD researcher on the EPA-funded interdisciplinary and transdisciplinary research project 'Climate Change, Behaviour and Community Response' (2015-2017). The research is focusing on the behavioural, social and institutional drivers of, and barriers to, climate action, and especially on the role played by community energy groups and intermediary organisations.

Find out more about Sustainable Energy Authority of Ireland Schemes:

Better Energy Communities: http://www.seai.ie/Grants/Better_Energy_Communities/

Sustainable Energy Communities: http://www.seai.ie/SEC/

Tackling invasive species - biosecurity needs to be second nature to us all

In Ireland we are experiencing the same phenomena as seen globally, that is an increase in the number of non-native species arriving here. While most of these won't be able to survive particularly well, some will thrive to the point of being invasive. Our wildlife and nature are under enough pressure as it is without introducing more problems. My hope for the coming years is that we will be better protected from invaders. The crux to achieving this is everyone playing a role in biosecurity.

Biosecurity is about taking measures to prevent the introduction and spread of invasive species. As an island, Ireland and Northern Ireland have a better opportunity than most to protect from new invaders being introduced. Intentional introductions tend to be through trade of plants, pets or live species for the pet and aquaria trade. Regulations banning trade and import of some invasive species are already in place and can be built upon. The biggest challenge is in preventing the introduction and spread of species that are introduced unintentionally. These tend to be as hitchhikers.

"Hitchhikers" are things like plant fragments, animals, seeds etc. hitchhiking on plants, in soil, on the hulls of boats, in bilge water, as contaminants of animal feed or fodder or even on our cars, boots or cargo. Taking measures such as sourcing native plants or products such as fodder generated in Ireland would help but we also need to act to prevent further spread of invasive species already in Ireland. For this a campaign of Check - Clean - Dry your equipment, footwear and clothing after being in aquatic areas is recommended whether invasive species are known to be in the waterbody or not. For land areas where invasive species are known to be present, then Check and Clean vehicles, boots etc. before leaving the area is important. Disinfection is a critical element in cleaning especially when tackling pathogens. In Ireland animals known to be kept as pets have been found in the wild such as Chipmunks and Slider turtles. While these species have restrictions on being traded and how they are kept under European law, being Pet Wise and considering the impacts if your pet escapes or is released to the wild before you buy it should be considered.

In the case that new invasive species do arrive, we need to have early detection surveillance and rapid response in place to remove them before it would be longer possible or feasible to do so.

I'm mindful that when fancying about the potential Ireland as an island has to protect it from new invaders, that measures taken in places like Australia including thorough border entry inspection as seen in the TV programme Border Control, does come with a high cost. Genovesi (2012) reports that the Australian biosecurity framework had a total budget of $1.6 billion from 2009 with $524.2 million of new funding for the 2012–2013 period. This budget was based on a collective effort from the agriculture, forestry, fisheries, and environment sectors, recognising the threat not only to biodiversity and the free services nature provides people, but also the economic threat to agriculture and forestry. This ambitious biosecurity approach has successfully kept Australia free of several highly invasive species.

When away at European level invasive species events where folk are discussing what they are developing or planning to do on invasive species, I can stand proud and say that Ireland has done so much of it already and can contribute in a real and practical way to find shared solutions to many of the issues. Ireland should give itself a pat on the back for achieving so much with such little resources given to it, but also recognise how much more needs to be done and that this needs to be properly resourced.

If we are to avoid leaving both a degraded environment and an immense financial bill for impact and control, we need to be fully implement existing policy and regulation, and for each of us to take responsibility and ownership to support vigorous implementation of the required biosecurity actions. While we don't know what the future may bring, we should at least better invest in biosecurity measures now as prevention is better than cure, and less costly!

Hopefully by this time next year, as a reflection of a determined focus to protect our biodiversity and ecosystems, there will be biosecurity policies and wilful adoption of in Departments, agencies, clubs etc. throughout Ireland supporting every citizen and species to be better protected from invaders.

THE COYPU

Case Study - Coypu

Species name: Coypu (Myocastor coypus)

Invasive status: Risk of high impact in Ireland. One of 37 EU Regulated invasive species.

Distribution status: Since first verified sighting in 2010, Coypu have reported from 7 locations. Just one animal was seen in 6 of the sites but a population of 10 animals was removed from Cork City in 2016. Continued presence in Cork City confirmed in May 2017.

Why of concern: Highly invasive impacting on wildlife, riverbank stability and is a pest of agriculture crops. High reproduction rates. Coypu may carry a number of diseases of importance to humans and domestic animals.

Pathway of introduction: Use in pet farms and as a pet species most likely.

Response to date: Rapid response triggered with animals removed from 3 different sites. Public species alert issued May 2017 to encourage reporting of sightings. Additional sightings confirmed for Cork City area.

Future outlook: eradication of isolated populations is possible. If Coypu became widely established in Ireland, it may not be possible/ feasible to eradicate them.

THE WHITE-CLAWED CRAYFISH

How can future introductions be prevented: There are now Europe wide restrictions on trade, transports and in keeping Coypu. Those who currently have Coypu need to ensure they cannot escape confinement and cannot reproduce. If no longer wanted, they should be euthanized or rehomed in a licenced facility.

Case Study - Crayfish plague

Species name: Crayfish plague (Aphanomyces astaci)

Invasive status: Risk of high impact in Ireland.

Distribution status: Outbreak confirmed in 2 locations, the River Suir and the River Deel.

Why of concern: where present, the plague will kill all the protected White-clawed crayfish with impact on the waterbody ecology. Ireland has the world's most important population of this species.

Pathway of introduction: Current source unknown. Plague can be introduced on wet infected equipment/clothing and by introduction of a plague carrying non-native crayfish. Non-native crayfish have not been recorded in Irish waters.

Response to date: Rapid Response triggered with dead crayfish specimens removed from suspected sites and tested. Extensive surveillance in infected sites to determine extent of crayfish kill and to try and determine if any non-native crayfish in the rivers. Public notices and awareness issued. Request issued for voluntary biosecurity practices to be implemented to prevent further spread and introduction into uninfected areas.

Future outlook: Not good! Risk of spread within infected catchments is almost inevitable and risk of introduction to currently uninfected areas is highly likely.

CLEAN, CHECK AND DRY' WAS PART OF THE RESPONSE TO THE RECENT CRAYFISH PLAGUE OUTBREAK ON THE RIVER SUIR

How can future introductions be prevented?: Biosecurity guidance to Check, Clean, Disinfect and thoroughly Dry all equipment and protective clothing is required when between waterbodies. Ideally, if equipment and clothing is used in an infected area then it should not be used in an uninfected area. Risk from trade of non-native crayfish needs to be addressed.

Collete O Flynn, National Biodiversity Data Centre

For further information on Coypu and Crayfish plague see: www.biodiversityireland.ie/projects/invasive-species/species-alerts/

https://www.catchments.ie/outbreak-crayfish-plague-stretch-river-suir-downstream-clonmel-carrick-suir/

For information on how to Check, Clean and Dry see http://www.nonnativespecies.org/checkcleandry/

ESManage – understanding how to manage freshwaters and the ecosystem services they provide

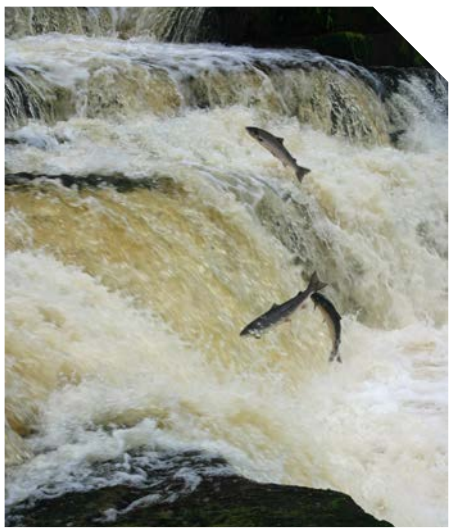
GLENDALOUGH UPPER LAKE. PHOTO: NOEL QUINN

Of all the ecosystems on the planet, freshwaters are under the greatest pressure and are likely the most endangered. Human activities affect freshwater resources extensively, in terms of both quantity, quality and biodiversity loss, despite the fact that our existence and quality of life depends so much on clean and sustainable freshwater resources.

In Ireland, for example, the 2016 EPA State of the Environment Report estimates that up to 50% of our freshwaters are impacted by pollution and other pressures, mainly from agriculture and municipal sources.

A key global challenge in the 21st century is to maintain the supply of clean water, food and other benefits derived from freshwaters without destroying the life-support natural capital and ecosystem processes that enable these supplies. These challenges, enshrined in the UN's Sustainable Development Goals require that we not only identify what we derive from rivers, lakes, ground waters and associated wetlands but also to consider their value, monetary or otherwise, and how those values can be incorporated into policy and management decisions.

The goods and benefits we derive from our freshwaters are referred to as ecosystem services because they are enabled by the aquatic biological organisms and the various functions that they perform. For ease of understanding and to help capture the full range of ecosystem services they have generally been categorised as provisioning, regulating and maintenance, and cultural.



FISH SWIMMING UPSTREAM. PHOTO: INLAND FISHERIES IRELAND

Provisioning services refer to goods that are consumed or used. The principal provisioning service in Ireland is the supply of water for drinking and non-drinking purposes, such as use in agriculture and industry. Pollution threatens the quality of this supply which has implications for the cost of treating water to the standard required for safe consumption but also quality in terms of taste and appearance. Freshwaters produce fish which are obviously a source of food in many countries, but apart from the aquaculture industry, wild fisheries in Ireland have a greater significance in terms of recreational angling than as a food resource.

Regulating and maintenance services are not as immediately obvious as the two other categories and therefore are often overlooked and consequently more difficult to value. They include those benefits that both directly (e.g. waste assimilation, pathogen control) and indirectly (e.g. regulation of decomposition, climate and flows) sustain environmental quality.

Cultural services on the other hand are readily appreciated by all of us. They include tangible recreational uses such as swimming, kayaking, angling, wildlife watching and walking along a river, and contribute to less tangible benefits, such as aesthetic or spiritual benefits, as well as educational value. These benefits can contribute significantly to good health and quality of our lives.

Currently the ESManage team is consulting the general public in three study catchments, the Dodder, Suit and Moy to gain insight into how people value a number of services such as water quality, water health, bankside vegetation, wildlife and angling.

You can read more about ecosystem services in a short Introduction for Stakeholders produced by ESManage, a project funded by the EPA which is harnessing the knowledge and tools required to embed the ecosystem services approach into policy and decision-making for sustainable management of water resources, as required by the Water Framework Directive. http://www.epa.ie/pubs/reports/research/water/research208.html

ESManage has also produced a report documenting the freshwater ecosystem services delivered by freshwater resources in Ireland and their relative importance to Irish society. It is available at http://www.epa.ie/pubs/reports/research/water/research207.html

Mary Kelly-Quinn, UCD ESmanage Project

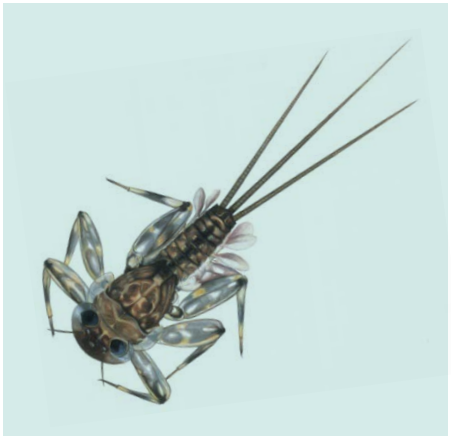
Further Information:

Follow @ESManage on Twitter or check out their website: http://www.ucd.ie/esmanage/

EPA 2016 State of the Environment report: http://www.epa.ie/irelandsenvironment/stateoftheenvironmentreport/

United Nations Sustainable Development Goals: http://www.un.org/sustainabledevelopment/sustainable-development-goals

DAMSELFLIES LIKE THIS ONE (CALOPTERYX HAEMORRHOIDALIS), DRAGONFLIES AND OTHER WILDLIFE ENHANCE THE ENJOYMENT OF RIVERSIDE WALKS. PHOTO: JAN ROBERT BAARS



ECDYONURUS, A MAYFLY NYMPH THAT CONTRIBUTES TO THE ECOSYSTEM PROCESSES WHICH MAINTAIN WATER QUALITY. IT IS ELIMINATED BY WATER POLLUTION. DRAWING BY AOIFE QUINN.

A KINGFISHER. PHOTO: MARK CARMODY

STAKEHOLDERS AT ONE OF THE ESMANAGE WORKSHOPS

Explaining the Catchment Characterisation Outcomes – Finding the Appropriate Words

Over the last few months, Catchment Unit staff have given numerous presentations as part of the catchment characterisation process. While it can be acknowledged that, from a scientific perspective, significant progress has been made, it has become clear that the words/language used need to be appropriate for two audiences:

i) scientists/engineers that are involved with the technical aspects of catchment management and Water Framework Directive implementation; and

ii) people often without a technical background but whose role in successful catchment management is critical, such as farmers and local communities.

Failure to communicate effectively can lead to inadequate understanding of the characterisation results and poor take-up of the actions required to achieve progress and, where needed, behavioural change. While effective communication has many aspects to it, for sure the words/language used are an important component.

Characterisation outcomes – the formal results

The ultimate objective of the Water Framework Directive is to arrive at and undertake measures to enable Water Framework Directive objectives to be met, which are either achievement of good or high status by 2027 at the latest, unless natural conditions do not permit this. The approach, in summary, has been to categorise all 4,829 water bodies (groundwater, river, lake, transitional (estuarine) and coastal waters) into three categories based on the information available at the end of 2015:

1. 1,466 (30%) water bodies that are At Risk of not meeting their Water Framework Directive objectives. These water bodies require not only implementation of the existing measures described in the various regulations, e.g. the Good Agricultural Practices Regulations, but also in many instances more targeted supplementary measures.
2. 2,130 (44%) water bodies that are Not at Risk and therefore are meeting their Water Framework Directive objectives. These require maintenance of existing measures to protect the satisfactory status of the water bodies.
3. 1,233 (26%) water bodies that are categorised as Review either because
   - additional information is needed to determine their status before resources and more targeted measures are initiated or
   - the measures have been undertaken, e.g. a wastewater treatment plant upgrade, but the outcome hasn't yet been measured/monitored.

The risk of not meeting Water Framework Directive objectives is determined by assessment of monitoring data – water body status, trends in hydrochemistry and distances to thresholds, such as environmental quality standards. We use monitoring data to identify those water bodies that are not likely to be at their target water quality status by 2021, which is the duration of the 2nd WFD planning cycle.

For water bodies that are At Risk of not meeting their Water Framework Directive objectives, an evidence-based process was undertaken to identify the significant pressures; once a pressure is designated as 'significant', measures and accompanying resources are needed to mitigate the impact(s) from this pressure.

Risk is not determined by the presence of pressures – there is sometimes a tendency to assume this, which leads to misunderstandings, wrong conclusions and, potentially at least, inappropriate and ineffective measures to mitigate the impacts. The characterisation process has shown that for many diffuse (non-point) sources and some point sources, the pathway for pollutants between the pressure (source) and the receptor (such as a stream or well) may not be present or may be readily broken (see the role of the pathway in the diagram on p. 31).

The breakdown of the number of water bodies that are impacted by the various significant pressures is shown in the graph on p. 31. Investigative assessments now have to be undertaken in the catchment areas of most of these water bodies to enable the necessary measures and their precise location to be decided on.

These are the activities that we now have to look at in more detail, work out what needs to be done to alleviate the problems they are causing, and then undertake the necessary actions.

Characterisation outcomes – an everyday description

Satisfactory and healthy waters are needed for the wellbeing of Irish people, particularly as the basis for health, quality food, tourism, employment and an appealing and appreciated natural environment, as well as meeting our environmental responsibilities as members of the European Union.

Based on the physical setting and to make analysis of the situation easier and sensible, Ireland's water resources are subdivided into five water types – rivers, lakes, estuaries, coastal and groundwater (well and spring water). This has resulted in the mapping out of 4,829 water bodies throughout the country (3,192 river, 818 lakes, 195 estuaries, 111 coastal and 513 groundwater bodies).

The first step in achieving satisfactory water resources has been to evaluate all the available data for each of the 4,829 water bodies on water quality and quantity (e.g. levels of phosphate can affect rivers and lakes (for instance, shown by the presence of slime), nitrates that are dangerous for babies, pathogens or germs that make certain bathing waters unsuitable, and abstractions for drinking water and industry that can reduce river flows in summer), and the stresses and pressures that we put on our environment (e.g. septic tank effluent, urban wastewater, runoff of phosphorus (the main cause of eutrophication or blooms and slimes in our rivers and lakes in Ireland), sediment and nitrogen from farmland and farmyards).

Based on the analysis of the available information at the end of 2015 and the input of many public bodies, such as the EPA, local authorities, Inland Fisheries Ireland and Irish Water, all water bodies have been subdivided into three categories:

1. 1,466 (30%) unsatisfactory water bodies that require improvement using both the existing regulations and specifically targeted actions.
2. 2,130 (44%) satisfactory water bodies that need to be protected from human activities so that the current satisfactory situation is sustained.
3. 1,233 (26%) water bodies that we are not sure about, because either
   - we don't have enough information at the moment to know or
   - where actions to improve the situation are in place, e.g. an improved wastewater treatment plant, but we haven't yet had the opportunity to check that the water quality is satisfactory. It is probable that a proportion of these will be satisfactory.

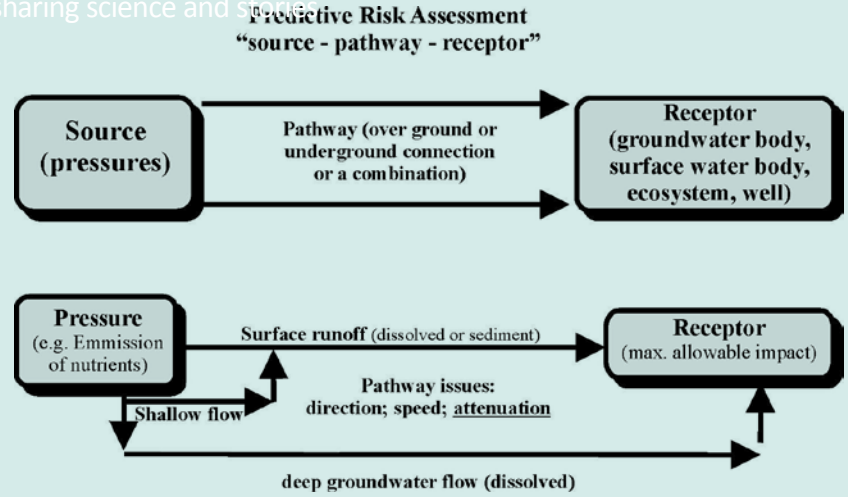
A crucial step in improving the situation is to work out which human activities are causing the problems in sub-standard water resources. The EPA in collaboration with several other public bodies, particularly the Environment Section staff in local authorities, have examined the situation closely and have concluded on the human activities that have caused the unsatisfactory water resources in 30% of our water bodies (see the diagram on p. 31). These are the activities that we now have to look at in more detail, work out

30

what needs to be done to alleviate the problems they are causing, and then undertake the necessary actions to improve the situation.

The situation is summarised as follows:

- Farming (runoff of pollutants from the land and from farmyards) has a detrimental effect on more water bodies than any other activity. However, the diagram also shows that farming takes place over a far higher proportion of the landscape than any other landuse.
- Sewage disposal and the resulting effluent arising from people in cities, towns and in rural houses is the second highest pressure category on our water quality.
- The animals and plants in our rivers, lakes, estuaries and coastal waters need good physical habitat conditions and the term 'hydromorphology' covers this requirement. For instance, sediment arising from land reclamation and drainage channel maintenance or the building of dams or other structures on rivers have a serious impact on fish and other aquatic plants and animals. (Sediment (clay, silt, peat) is now considered the 2nd greatest pollutant of Irish waters after phosphate.)
- Forestry activities, particularly during planting and harvesting, can generate sediment and phosphate. However, forestry also has the potential and will be used in the future to prevent impacts, for instance, planting of native woodlands alongside streams can protect them from runoff of phosphate from adjoining fields.
- The 'other' category consists of activities that on their own impact on only a small number of water bodies, such as historically polluted sites and invasive species, e.g. zebra mussels.
- The extractive industry that has the greatest impact on water quality is 'peat drainage and extraction', which result in high ammonia concentrations in nearby rivers and, in some instances, sediment.



PRESSURE – PATHWAY-RECEPTOR MODEL FOR IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE

Where do we go from here?

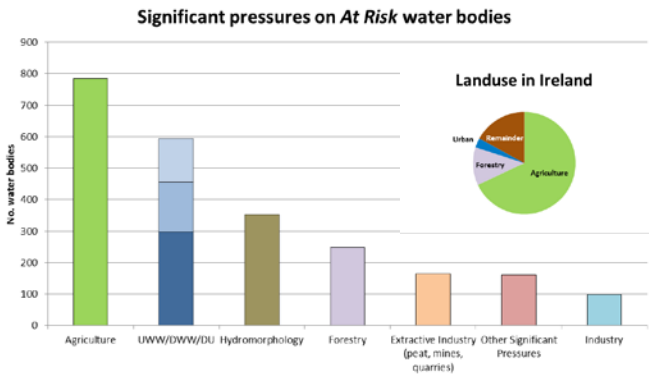
Although it is the foundation of water management, analysing the situation to arrive at conclusions on what the water problems are, where they are arising and what is causing them is the easy part; reaching conclusions on what to do and then doing it is the real challenge. This is the challenge for the future that we must meet.

But, what about the role of 'finding the appropriate words'? This is, in my view, critical to meeting the challenge effectively. Words in written material provide information, encode values, enable mental images, shape our views and trigger responses. Therefore, can I suggest that those that are scientists/engineers give priority to finding the appropriate words, and those that are not scientists/engineers help scientists/engineers to find the appropriate words.

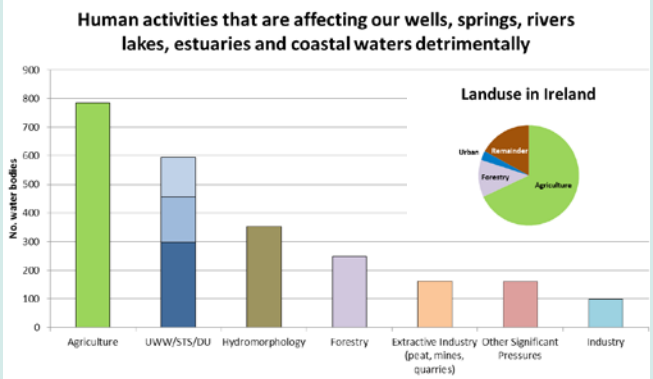
"If Moses had promised the Israelites a land flowing with mammary secretions and insect vomit, would they have followed him into Canaan? Though this means milk and honey, I doubt it would have inspired them."

Quote from article by George Monbiot, Guardian newspaper columnist, 9th August, 2017, https://www.theguardian.com/commentisfree/2017/aug/09/forget-the-environment-new-words-lifes-wonders-language?CMP=Share_AndroidApp_Tweet.

Donal Daly, EPA Catchments Unit



SIGNIFICANT PRESSURES IMPACTING ON AT RISK WATER BODIES. NOTE: HALF OF ALL AT RISK WATER BODIES ARE IMPACTED BY MORE THAN ONE SIGNIFICANT PRESSURE. (UWW = URBAN WASTEWATER; DWW = DOMESTIC WASTEWATER TREATMENT SYSTEMS; DU = DIFFUSE URBAN I.E. MISCONNECTIONS, LEAKY SEWERS AND RUNOFF FROM PAVED AND UNPAVED AREAS)



CAUSES OF UNSATISFACTORY WATER QUALITY (NOTE: HALF OF ALL UNSATISFACTORY WATER BODIES ARE IMPACTED BY MORE THAN ONE HUMAN ACTIVITY.) (UWW = URBAN WASTEWATER; STS = SEPTIC TANK SYSTEMS; DU = DIFFUSE URBAN I.E. MISCONNECTIONS, LEAKY SEWERS AND RUNOFF FROM PAVED AND UNPAVED AREAS)

31

Forestry - satisfying hearts and minds

Farm woodlands are making a growing contribution to Padraig Corcoran's quest for environmental, social and economic farm sustainability.

PADRAIG IN MOUNT PLUNKETT NATURE RESERVE

"This was my playground when I was a child" muses Roscommon farmer Padraig Corcoran as we approach his twelve acres of two-hundred-year-old broadleaf woodland which is the beating heart of Mount Plunkett Nature Reserve.

Adjoining the canal which links Lecarrow village, just north of Athlone, with nearby Lough Ree, the woodland and associated wetlands are the jewels in the crown of Padraig's farm which he has been managing for the past twenty years, and where with an infectious enthusiasm he has established the nature reserve with the protection of nature and wildlife at the heart of everything he does.

Satisfying hearts - farming conservation

Outside the woodland Padraig's farm would be considered small and extensive – he farms eighty-one acres – sixteen rented – with sheep and store cattle – a typical Roscommon farm. But his impeccable environmental and conservation credentials are reflected in his long-term involvement in agri-environment schemes, from REPs right up to GLAS - planting hedges and trees, putting up nesting boxes, developing species-rich wetland and creating plots of wild bird cover.

On a breezy sunny morning, the woodland is in full leaf – mature Ash, Oak, Beech, Sycamore and remarkably Elm look down on Hazel, Holly and Spindle. In brighter gaps a new generation of younger trees are growing. A handful of ewes and lambs meander through, lightly grazing on the nutritious herb layer in the shelter of the trees. There is a cacophony of birdsong.

Woodland restoration

It wasn't always this idyllic. "Before I bought it in 2005 the woodland, right down to the canal, was completely abandoned for more than twenty-five years" says Padraig. "It was a mess and when I got the chance I jumped at the opportunity to buy it and begin to restore it." For Padraig this means restoring and managing both woodland and wetlands in the traditional style of farming – High Nature Value farming in today's terminology. Because the area is in the Lough Ree Special Area of Conservation this involves consultation with the National Parks and Wildlife Service and other agencies to sensitively manage the multiple services provided by the woodland.

To support the sustainable development of the woodland Padraig recently got approval for funding under the Native Woodland Conservation scheme. Administered by the Department of Agriculture and the Marine's Forest Service, the scheme prioritises sites of high ecological significance where native woodland restoration will 'deliver' benefits regarding the protection of watercourses and aquatic habitats.

Spreading the message

Padraig is passionate and proud of what he has achieved but he is anxious to spread the message to policymakers that more joined up thinking is required between farming and the environment to ensure that production is sustainable - economically, socially and environmentally.

Perhaps the real strength of Mount Plunkett is in the education it offers as a demonstration of

FARM WOODLANDS - SATISFYING HEARTS AND MINDS

WOODLAND AND WETLAND RESTORATION ENHANCING FARM BIODIVERSITY

PADRAIG IN HIS PLANTATION WHICH INCLUDES JAPANESE LARCH, SITKA SPRUCE AND BROADLEAVES.

what can be done. Since 2006 Padraig has hosted numerous visits and courses involving agencies ranging from Teagasc to Birdwatch Ireland and the National Parks and Wildlife Service to the annual Roscommon Lamb Festival to name but a few. Padraig particularly welcomes local schoolchildren who he describes as "open and enthusiastic sponges for knowledge, information and ideas."

Satisfying minds - production forestry

But for Padraig farming is also about being a pragmatist. His is not a big farm and by 2012 he began to appreciate the reality of modern farming - longer hours and reducing returns even with an off-farm job. With the future of his young family to consider, he saw that in order to continue to sustainably manage the land an alternative secure source of income would be necessary.

As Padraig saw it the environmental focus on farming was only going to get stronger with a particular emphasis on the protection of water quality and reducing the carbon footprint. He set about seeking an alternative farm enterprise with an environmental profile to complement his own farming system.

Forestry ticked all the right boxes as an enterprise offering these environmental benefits and more, coupled with guaranteed annual premiums and retention of the Basic Payment.

Having sourced land – marginal for farming but highly productive for forestry – Padraig planted his first farm forest – 8.8 hectares of Sitka spruce, Japanese larch and broadleaves in 2012.

Every year since then he has been planting an additional 6-8 hectares and is planning a further 4 hectares in the back end of the year. He has engaged a local Roscommon forestry company to do most of his planting but in 2015 he planted 3 hectares himself and, not surprisingly, is following its progress with particular interest. "To get the best from forestry owners need to be in touch with what's going on" says Padraig. "Planting a few trees or doing a bit of grass cleaning is great experience and is good for them and the trees."

In the same spirit of openness evident in Mount Plunkett earlier this year Padraig hosted a Teagasc walk where forest owners learnt about the management of young plantations.

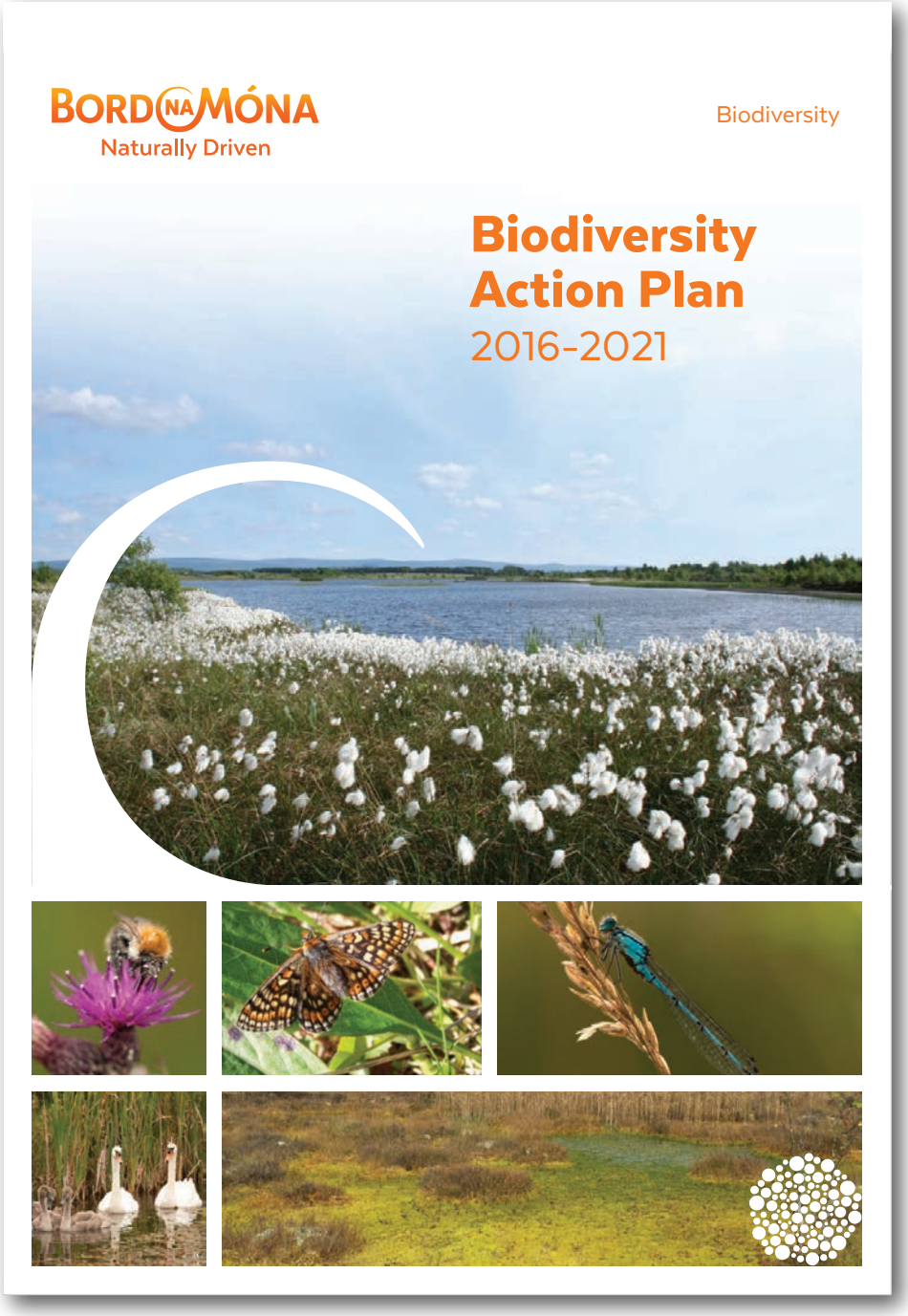
Padraig is delighted with the growth so far in his young plantations and their unashamedly strong focus on the production of commercial softwood. "Today's plantations match strong environmental measures with really fast tree growth" he comments "The trees are carbon neutral and a renewable resource - I see them as complementing the woodland conservation work in Mount Plunkett and helping to sustain the way, we as a family, want to see the farm develop."

Noel Kennedy, Teagasc Forestry Development Department

This article originally appeared in Today's Farm
https://www.teagasc.ie/publications/todays-farm/

The Bord na Mona Raised Bog Restoration Project

If you travel through the Irish midlands, you will eventually come across Bord na Móna peat production bogs. These areas are now a significant part of the Irish midlands landscape. Bord na Móna developed these bogs for fuel, security of energy supply and growing media. Bog development also provided jobs, economic security and supported local communities. But not all these bogs were completely developed for industrial peat production. Travel north of Ballinasloe through some of the lesser known by-roads along the River Suck and you may pass some other Bord na Móna bogs that were partially drained but never fully developed.



Bord na Móna carried out a baseline ecological assessment of all its properties in 2009-2012, as part of its Biodiversity Action Plan. Several midlands raised bogs that were initially partially drained in the 1980s in anticipation of peat production were identified as having substantial ecological and conservation value, as well as significant bog restoration potential as they still retained natural bog vegetation. Bord na Móna decided to conserve and restore these bogs. These sites now form the core of the Bord na Móna Raised Bog Restoration programme (2009-present).

Raised bogs are threatened habitats as only a small proportion of 'active' (peat-forming) bog still exists in Ireland. They contain a wide range of different species, many of which are threatened or under pressure in the wider landscape and are dependent on these peatland habitats. Raised bogs like to be wet, very wet. So, the key to raised bog restoration, is the restoration of this wetness and the bog's hydrology, encouraging the natural regeneration of bog species like Sphagnum. These mosses are a key species of raised bogs and require water-logged nutrient-poor conditions to thrive. Peat-forming or 'active' bog habitat is rich in Sphagnum species.

The main objective of the Bord na Móna Raised Bog Restoration programme is to restore raised bog habitats by blocking drains and restoring bog hydrology. Re-wetting the bog can aid the development of Sphagnum-rich plant communities and restore peatland habitat function. The methodology used for bog restoration was developed by the National Parks and Wildlife Service (NPWS) under the Dutch-Irish Restoration programme in the 1990s and has also been used extensively by the NPWS and by Coillte. Drains are blocked using peat dams constructed by a specially modified excavator.

As the programme is in early stages, no definitive conclusions about the impacts of the restoration can be made yet. However, in general, water levels have responded quickly and are being maintained close to the bog surface. Specific habitat condition monitoring at Abbeyleix Bog and Cuckoo Hill Bog has shown there has already been a notable increase in Sphagnum cover in some sites already and there have been increases in 'active' raised bog habitat. Monitoring of greenhouse gases has also taken place at Moyarwood Bog over 5 year period (NEROS project, funded by EPA and Bord na Móna) to assess the potential offset of carbon emissions with final results expected in 2018. Over 1200 ha of raised bog has now been restored by Bord na Móna at 12 different sites so far, and restoration work will continue with a further 1,000 ha of bog targeted through Cos, Roscommon, Westmeath, Longford and Tipperary.

In addition to restoring and conserving biodiversity, this bog restoration programme can also provide significant ecosystem services including maintaining storage of carbon within these bogs and the enhancement of active peat-forming Sphagnum-rich vegetation within these sites, creating carbon sinks in time. Re-wetting can also help attenuate flooding within catchments and improve water quality. Bog restoration within these sites, in addition to other raised bog restoration projects completed by Coillte and currently being undertaken by NPWS will also help Ireland meet its biodiversity objectives including commitments to conserve raised bog habitats via the EU Habitats Directive. The majority of the sites restored so far are being considered for designation as part of the NATURA 2000 Special Area of Conservation network or as part of the national conservation network as Natural Heritage Areas - see the National Peatlands Strategy www.npws.ie.

Bog restoration can also help provide sites for amenity and education to local communities, such as the community-led Abbeyleix Bog Project. In 2010, Moore Gun Club approached Bord na Móna about the development of a conservation project at Ballydangan in Co. Roscommon focused on Red Grouse. This site still held low numbers of this peatland bird, which is particularly rare now on lowland bogs. Since then, 234 ha of the bog have been leased by Bord na Móna to this local group for the development of a community project, which now employs several local people through a community employment scheme (Department of Social Protection). While Grouse numbers remain low so far, conservation management has already boosted numbers of breeding Curlew, whose breeding population has significantly declined in recent years. Ballydangan and surrounding bogs remain an important stronghold for this iconic bird species. Bord na Móna has now completed bog restoration work on Ballydangan Bog with 3744 peat dams constructed to block drains, helping to re-wet the bog.

Bord na Móna is transitioning, away from the traditional peat-based business towards other more sustainable businesses, such as renewable energy. In 2008, the company announced that no new bog areas (i.e. no previously un-drained bog areas) would be developed for industrial peat production. In 2015, Bord na Mona set out its 2030 strategy to transition from traditional peat-based activities and to cease peat production for electricity generation. Future company strategy will balance commercial development of the new cutaway landscape with its biodiversity and amenity/social value. The Bord na Móna Raised Bog Restoration Project forms part of this strategy. This work continues to be funded under the Bord na Móna Biodiversity Action Plan.

Mark McCorry, Ecologist, Bord na Móna

For more information, visit http://www.bordnamona.ie/company/bord-na-mona-story/biodiversity/

Biodiversity Key Metrics

1,000 HECTARES OF BLANKET BOG
leased to the National Parks and Wildlife Service.

2 SPHAGNUM MOSS TRIALS
established on Kilberry Bog, Kildare.

2 BIODIVERSITY ACTION PLANS
developed and published for 2010-2015 and 2016-2021.

940 SPECIES RECORDED
at the Lough Boora Discovery Park Bioblitz 2012.

6 YEARS OF REHABILITATION TRIALS
on cutaway bogs carried out to inform best practise.

190 HECTARES OF BOG
leased to Abbeyleix Bog Group for local biodiversity, education and amenity use.

365 WHOOPER SWANS
recorded at Kilmacshane bog, Galway, the largest single flock in the country (All-Ireland Swan Census 2015).

3 PAIRS OF BREEDING CURLEW
recorded on the restored Ballydangan Bog, Roscommon.

Blanket Bogs, Hydrology & Ecosystem Services to Water.

Although blanket bogs are often recognised as iconic elements of the Irish landscape by many, their capacity to provide a range of ecosystem services to water is less widely acknowledged. These include hosting high status water bodies, regulating stream flow and acting as source areas for high quality drinking water. An EPA-funded study "Quantification of blanket bog ecosystem services to water" (QUBBES), being carried out jointly by researchers from Queen's University Belfast and University College Dublin, seeks to raise awareness of the wider contributions provided by healthy blanket bog ecosystems to society and the environment, while also examining the wider cost of their degradation. In this way, researchers aim to provide a more defensible justification for the sustainable use of Irish peatlands, not only from the perspective of habitat conservation, but also from an economic point of view.

Assessing the impact of peatland condition on drinking water forms the cornerstone of "Quantification of blanket bog ecosystem services to water". Provision of potable water needs to satisfy a range of aesthetic and health-based criteria before it is suitable for consumption. Low pollution pressures in peat-covered catchments, compared to more intensively farmed areas, make areas containing blanket bogs attractive sources of drinking water across both the UK and Ireland. Nonetheless water still needs treatment-and this comes at a price.

The cost of water treatment depends on raw (untreated) quality. At facilities treating water flowing off peatlands, removal of colour is an important issue, with Natural Organic Matter (NOM), dominated by humic substances, often being the main constituent of concern. Natural Organic Matter is costly to remove and in Ireland employs technologies such as coagulation/filtration, oxidation and membrane filtration. These methods require large amounts of chemicals and/or energy, while waste by-products such as treatment sludge also require disposal; this all makes for a costly process, which becomes more expensive with higher levels of colour.

To further complicate matters widely-used processes such as coagulation/filtration are not 100% efficient in removing NOM but can leave residual levels after treatment that react with oxidants such as chlorine to create disinfection by-products (DBPs). These disinfection by-products include trihalomethanes that can impact human health. The economic costs of disinfection by-products removal to satisfy water quality standards can be high and add yet more expense to treatment costs.

Although meeting drinking water standards can be achieved through end of pipe processes, studies completed in the UK have shown that improving/maintaining raw water quality often makes economic sense, while also proving friendlier to the environment. Doing this effectively requires information about where, when and how much Natural Organic Matter enters water courses. Catchment scale investigations, including mapping water quality to identify colour sources under contrasting hydrological regimes helps relate colour sources to physical settings. The approach, already applied for other parameters in the EPA-funded Pathways project, provides a means of identifying the impact of various land uses at particular locations in the catchment on water quality. This in turn allows critical source areas, which contribute disproportionately, to be identified. Looking at this another way, the approach permits activities on blanket bogs, which may potentially impact water courses, such as forestry and grazing to be accommodated in less sensitive areas, while optimising the ecosystem services provided by blanket bogs to water. However, the approach requires management tools underpinned by scientifically defensible concepts and data if it is to be used objectively.

Adapting concepts and methods developed for areas of more intensive land use to blanket bog catchments in Ireland can prove challenging. A pilot study initiated when "Quantification of blanket bog ecosystem services to water" research began in Summer 2016 aimed to test concepts in a baseline study of a peat-covered catchment in south Co. Antrim that supply drinking water to the towns of Ballymena and Larne. The study area is underlain by basalt bedrock, overlain by variable thicknesses of glacial till and/or blanket bog peat. In areas lacking blanket bog, a covering of peat soil up to 50cm thick overlies till. Land use mapping across the area is dominated by forestry and open moorland, largely used for grazing.

Spatial mapping of water quality in three of the principal streams feeding a treatment plant

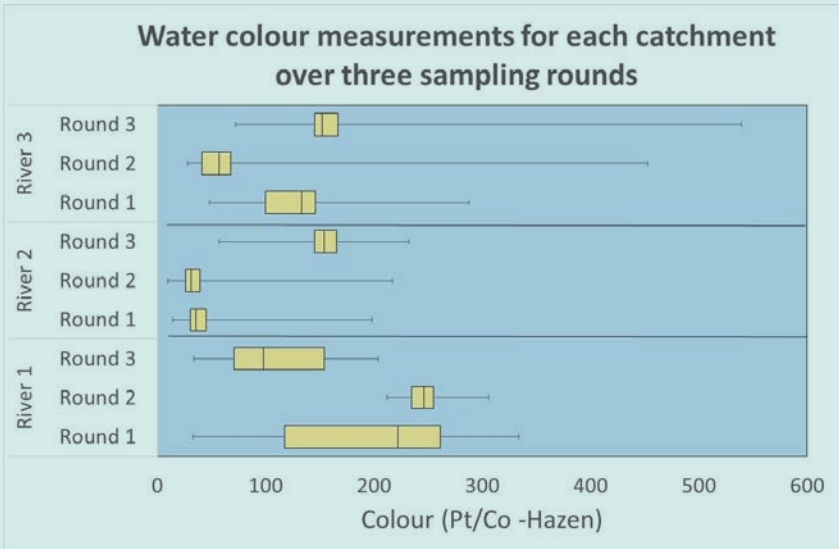


FIGURE 1: VARIATION IN COLOUR CONTENT IN WATER IN THREE STREAMS IN PEAT COVERED CATCHMENTS, CO. ANTRIM.

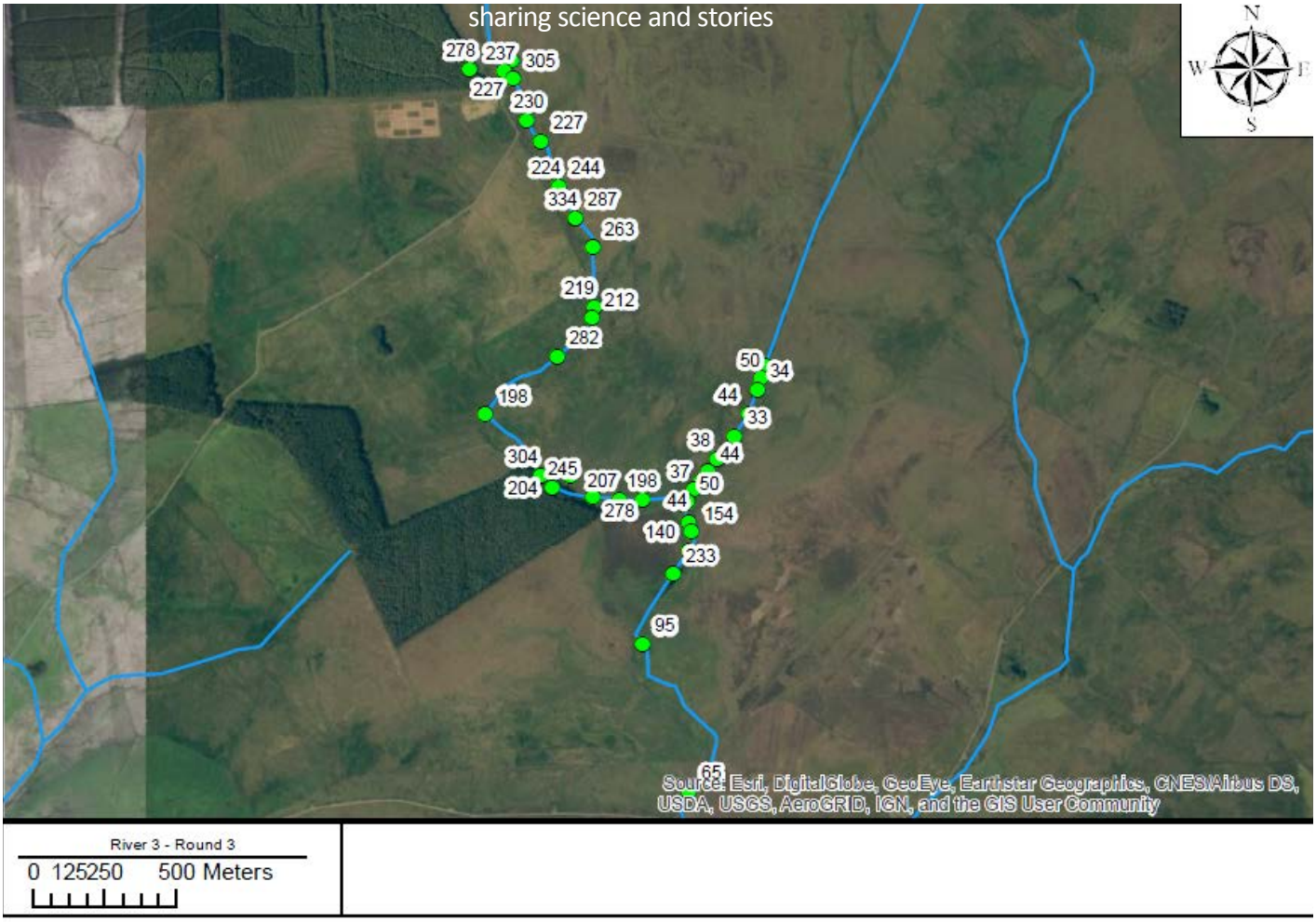


FIGURE 2: SPATIAL VARIATION IN COLOUR CONCENTRATION (IN HAZEN UNITS) ACROSS A PEAT COVERED TEST CATCHMENT, CO. ANTRIM.

provided a means of assessing both hydrological pathways delivering water to streams and the impact of contrasting land uses. Field water quality parameters that can be measured accurately and frequently, notably Specific Electrical Conductance (SEC), coupled with laboratory measurements of colour and pH provided inexpensive indicators of gross water quality. Surveys of the three streams carried out at three different times aimed to assess the consistency in readings.

The box and whisker plot in Figure 1 summarises the results of colour analyses for the three streams surveyed. The plot shows significant differences in water colour between sampling events, with variations within streams for each sampling event proving greater than between individual streams; the results of Specific Electrical Conductance measurements reveal a similar differences. Overall, data suggested that higher concentrations of colour occurred following periods of heavy rainfall, while this also resulted in lower Specific Electrical Conductance. However, spatial analysis of colour content reveals inconsistent trends with land use, with contrasts in water quality from streams flowing through afforested and grazed areas both varying by up to an order of magnitude. Figure 2 provides a representative indication of the variation spatial variation in colour levels in one of the catchments. Subsequent measurements showed these levels to rise by a factor of 4-5.

Study findings call some of the prevailing concepts underpinning blanket bogs hydrological models into question. Given the low pollution pressures observed in the area, coupled with typically low Specific Electrical Conductance levels in groundwater sampled from bog peat, elevated conductivity levels observed in stream water samples point to significant contributions of more mineralised groundwater. This in turn suggests that some bog water flows through peat to depth before discharging to streams. A review of peatland hydrological literature suggests that this issue has been largely overlooked.

In a related vein, water samples collected from streams flowing through afforested areas sometimes failed to show elevated Natural Organic Matter levels. This contrasts with findings from longer term studies but may be explained by the timing of the survey (summer 2016), during which time afforested areas can display elevated soil moisture deficits, attributable in part to the high levels of interception.

The results of this pilot study highlight the highly variable nature of stream water quality in peat-covered catchments in both space and time, and the requirement for more detailed studies spanning the hydrological year. This needs to be accompanied by integrated hydrological monitoring to better constrain competing conceptual models. This work will be completed by "Quantification of blanket bog ecosystem services to water" researchers over the next two years at a number of sites across Ireland. Findings along the way will be reported to the Catchments Newsletter.

Raymond Flynn, Sorcha Cahill and Katie Woodhouse, School of the Natural and Built Environment, Queen's University Belfast

If you would like to know more about Quantification of blanket bog ecosystem services to water or peatland hydrological research in Ireland, please contact Dr Raymond Flynn at r.flynn@qub.ac.uk.

Groundwater source protection terminology used in Ireland

This article aims to explain and clarify technical terms used for groundwater source protection.

There are several terms used in Ireland for the areas around springs and wells, which can lead to a certain degree of confusion. The most widely used terms include catchments, zones of contribution, source protection areas, source protection zones, capture zones and safeguard zones, which are described as follows:

Zone of Contribution (ZOC) is the land area that contributes water to the well or spring (Misstear et al 2006). It is a simple, intuitive, basic hydrogeological definition that is considered to be the best term for general use.

Catchment is the land area that contributes water to the well or spring. Like surface water bodies, springs have natural catchment areas, whereas catchment areas to boreholes depend on a number of hydrogeological and meteorological factors plus the abstraction rate.

Capture Zone is a common term present in the scientific literature and is equivalent to the Zone of Contribution.

Safeguard Zone is a specific Water Framework Directive term that encompasses the same area as the Zone of Contribution.

Source Protection Areas: The Geological Survey of Ireland developed this terminology and the methodology for delineating the areas (DELG, EPA, GSI, 1999). Two Source Protection Areas (SPAs) are delineated which, when combined, are equivalent in area, shape and orientation to the Zone of Contribution:

- Inner Protection Area (SI), designed to give protection from microbial pollution.
- Outer Protection Area (SO), encompassing the remainder of the zone of contribution (ZOC).

Different methods can be used to map the entire Zone of Contribution to a spring, borehole or dug well, resulting in different degrees of confidence associated with the boundaries of the de-lineated area. To be able to specify the Inner Protection Zone within the entire Zone of Contribution, knowledge or estimates of groundwater travel time within the aquifer are required (e.g. from site-specific hydrogeological parameters or tracer tests).

The Zone of Contribution and the Source Protection Area account for the 'horizontal' movement of groundwater. Source Protection Zones are obtained by integrating the Source Protection Areas with the groundwater vulnerability categories, as shown schematically in Figure 1. An example of the Source Protection Zones defined for the Toberdaly source is provided in Figure 2.

The Source Protection Zone includes the complete pathway, both vertical and horizontal, for re-charge and any entrained contaminants to the abstraction point.

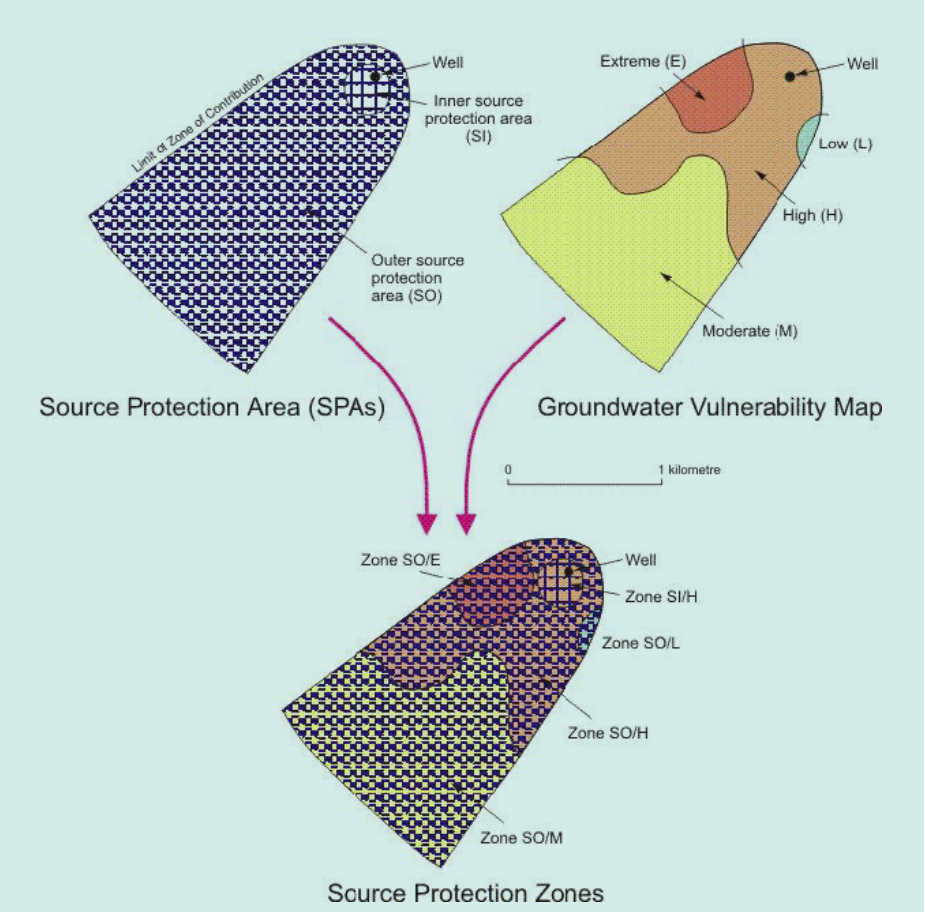


FIGURE 1: SOURCE PROTECTION ZONES (DOELG/EPA/GSI, 1999)

Whereas the objective of delineating ZOCs is to define approximate areas that contribute water to an abstraction point, the objective of SPZs is to geo-scientifically characterise the pathway and receptor elements of risk to groundwater within the ZOC of a given source (Kelly, 2010). EPA prepared an advice note on "Source Protection and Catchment Management to protect Groundwater Supplies" that outlines the key measures and policies in place in Ireland (EPA, 2011).

While these three terms essentially encompass the same total area, there are differences and they should be used appropriately. It is recommended that for general usage the simplest, most basic hydrogeological term "ZOC" is used. "SPA" and "SPZ" are appropriate when considering protection of groundwater sources and when a sufficiently detailed study has been undertaken in order to delineate the areas and zones. The term "Safeguard zones" is only used with reference to implementation of the WFD (Daly, 2009).

Other Related Terms

Drinking Water Protected Areas are a specific Water Framework Directive term and they encompass the same areas as Groundwater Bodies.

Groundwater Body is a specific Water Framework Directive term used to subdivide aquifers into effective management units, largely based on hydrogeological rules in relation to the boundaries, e.g. a 'no flow' boundary (GW WG, 2005).

Drinking Water Safety Plans is a risk assessment

FIGURE 2 : TOBERDALY SOURCE PROTECTION ZONE
(A) ZONE OF CONTRIBUTION / CAPTURE ZONE / CATCHMENT; (B) SOURCE PROTECTION ZONE (SPZ) INCLUDING INNER PROTECTION AREA (SI) AND OUTER PROTECTION AREA (SO) / SAFEGUARD ZONE; AND (C) SOURCE PROTECTION ZONE COMBINED WITH GROUNDWATER VULNERABILITY, IN THIS EXAMPLE SI AND SO COMPRISE LOW, MODERATE, HIGH, EXTREME AND EXTREME X GROUNDWATER VULNERABILITY.

and risk management approach to ensure the 'safety' and 'security' of a water supply. In this context 'security' refers to the catchment to the supply and 'safety' refers to the quality of the treated water meeting drinking water standards. Further details are provided in an EPA Guidance Note on 'Developing Drinking Water Safety Plans (EPA, 2011).

Setback Distances, Exclusion Areas/Zones are specific terms used to regulate the spreading of organic fertilisers and other farmyard activities around drinking water sources. The regulations (S.I. No 31, 2014) provide a range of setback distances from a water source depending on the daily abstraction or the number of people served. The regulations provide for alternate distances and/or zones to be proposed by a local authority or Irish Water subject to EPA approval for abstractions supplying 10m^3 or more, of water per day, or serving 50 or more persons. Further details are given in the EPA advice note No. 11 (EPA, 2011).

Distinguishing Zone of Influence and Zone of Contribution

"Unless the water table is horizontal prior to pumping the Zone of Contribution is not the same as the zone of influence of the pumping well (the zone contained by the radius of influence of the well)" (Misstear et al., 2006).

The zone of influence (ZOI) is defined by the "radius of influence" of a pumping well, i.e. the area where drawdown occurs due to pumping. Therefore, the Zone of Influence boundary is where the drawdown is zero. The water table is unlikely to be flat in Ireland, therefore the Zone of Contribution and Zone of Influence areas and boundaries will never be the same for pumping wells. In most circumstances, the Zone of Contribution will be larger than the Zone of Influence. The difference between the zone of contribution (ZOC) and zone of influence (ZOI) is illustrated in Figure 3. As shown in Figure 3, the Zone of Contribution boundary will extend further up-gradient than the Zone of Influence but not as far down-gradient.

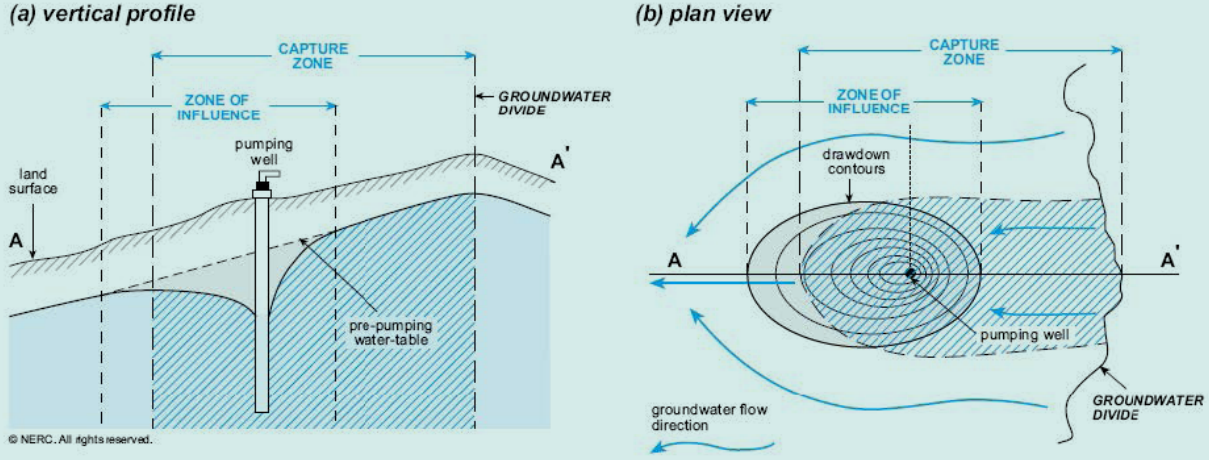
Summary

- Groundwater 'Drinking Water Protected Areas' comprise the entire land surface of the Republic of Ireland as all groundwater bodies are capable of yielding more than 10 m^3/day as an average.

  We recommend only using this term for WFD implementation purposes.
- The simplest and most intuitive term conceptually for the catchment area of a well/spring is "zone of contribution (ZOC)".
- ZOC area = SPA area (SI+SO) = SPZ area = safeguard zone area = capture zone. While these terms encompass the same total area, they have different purposes. It is recommended using ZOC for general usage as the most basic hydrogeological term; SPA and SPZ as appropriate when considering protection of groundwater sources; and only referring to "safeguard zones" when considering implementation of the WFD.

Taly Hunter-Williams, Geological Survey of Ireland, Coran Kelly, Tobin Consulting Engineers , and Donal Daly, Environmental Protection Agency.

This article originally appeared in the Geological Survey of Ireland's Irish Groundwater Newsletter, which you can find at http://www.gsi.ie/Programmes/Groundwater/Groundwater+Newsletter.htm



RESOURCES

DELG/EPA/GSI, 1999. Groundwater Protection Schemes. Department of the Environment and Local Government, Environmental Protection Agency and Geological Survey of Ireland. Misstear, B. D., Banks, D., and L. Clark. 2006. Water Wells and Boreholes. Wiley & Sons Ltd. ISBN-13: 978-0-470-87989-7.

EPA Guidance Note No. 7. 2011. Advice on Source Protection and Catchment Management to protect Groundwater Supplies.

EPA Guidance Note No. 8. 2011. Developing Drinking Water Safety plans.

EPA Guidance Note No. 11. 2011. Advice on Prior Investigations and Technical Assessments for Good Agricultural Practice Regulations.

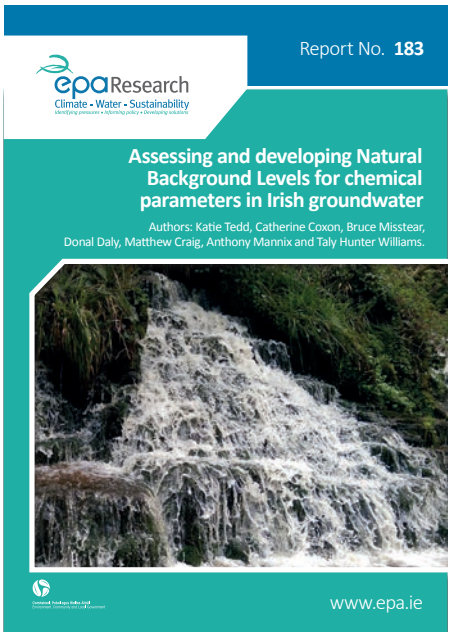
European Union (Good Agricultural Practice for Protection of Waters) Regulations. S.I. No. 31 of 2014.

Groundwater Working Group. 2005. Water Framework Directive (WFD) River Basin District Management Systems: Approach to Delineation of Groundwater Bodies. Guidance Document No. 2. Available on the http://www.wfdireland.ie/documents-wfd.html

Kelly, C. 2010. Delineating Source Protection Zones and Zones of Contribution for Monitoring Points. IAH (Irish Group) Annual Conference Proceedings. http://www.iah-ireland.org/ conference-proceedings/2010.pdf

Recent EPA Research Reports

EPA Research Report 183: Assessing and developing Natural Background Levels for chemical parameters in Irish groundwater.



The natural background levels established by this research are the range in concentration of chemical parameters in Irish groundwater arising from natural processes. Natural background levels are important for understanding pollution and for setting regulatory limits. The EU Water Framework Directive (2000/60/EC) and Groundwater Daughter Directive (2006/118/EC) require Member States to consider natural background levels when establishing threshold values that are used to assess the chemical status of groundwater bodies.

Natural background levels were established for forty parameters, comprising field parameters, major ion, minor ions, nutrients and trace elements. Following international best practice this study used pre-selected datasets of the EPA groundwater quality monitoring data. The most likely hydrogeological and hydrochemical controls for each parameter were considered and the natural background levels were defined accordingly.

Read the full report online:

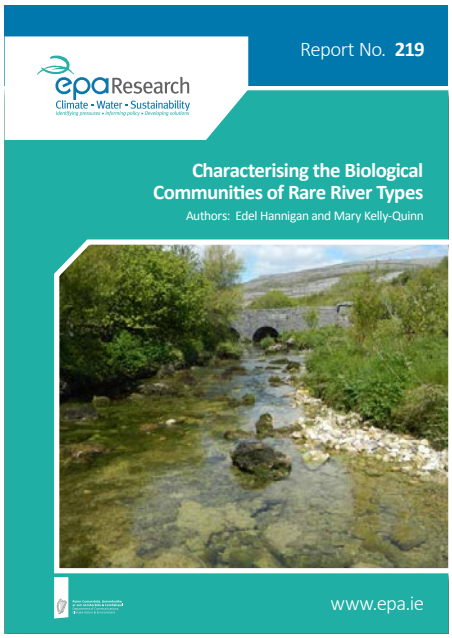
http://bit.ly/eparesearch183

EPA Research Report 217: Beneficial Use of Old Landfills as a Parkland Amenity

The EPA has published a research report on the Beneficial Use of Old Landfills as a Parkland Amenity. The conversion of suitable closed landfills to parkland amenities presents an opportunity to make beneficial use of land that would have previously been considered sterile from social, environmental and economic perspectives.

http://bit.ly/eparesearch217

EPA Research Report Number 219: Characterising the Biological Communities of Rare River Types.



Under the Water Framework Directive, all EU Member States are obliged to develop a river typology upon which type-specific reference conditions can be defined to enable the accurate evaluation of ecological status. Ecological status is determined on the basis of deviation from these type-specific reference conditions. Rare or unusual river types were not adequately represented in the development of the 12-type national river typology for Irish rivers. Rare river types in this context are defined as systems that present the biota with a combination of naturally challenging or distinct environmental conditions.

The RareType research project aimed to characterise the macroinvertebrate, macrophyte and phytobenthos communities of four potential rare river types:

(i) groundwater-dominated rivers,

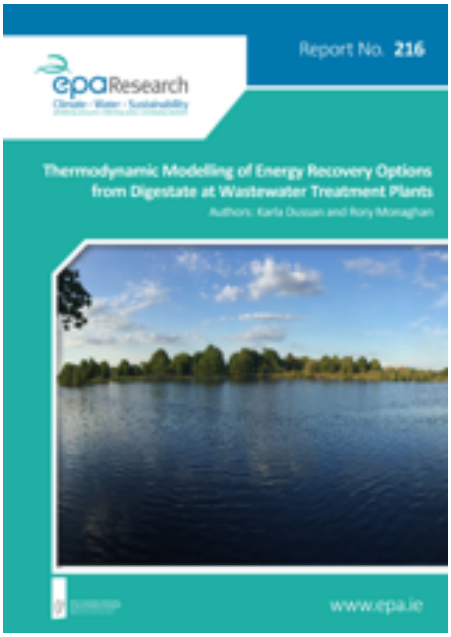
(ii) highly calcareous rivers with calcium precipitate,

(iii) naturally acidic rivers, and

(iv) rivers strongly influenced by lakes.

http://bit.ly/eparesearch219

EPA Research Report 216: Thermodynamic Modelling of Energy Recovery Options from Digestate at Wastewater Treatment Plants



This project explored the application of state-of-the-art combustion and gasification technologies for sewage sludge generated in wastewater treatment plants to reduce waste and recover energy.

http://bit.ly/eparesearch216

Further reading:

New Zealand Geographic article on 'Troubled Waters'

This article has some amazing images, and looks at whether New Zealand can have 'swimmable rivers or more hooves on pastures – is there a way of improving water quality without paralysing the primary sector? Or has agriculture reached an environmental tipping point?'

https://www.nzgeo.com/stories/troubled-waters/

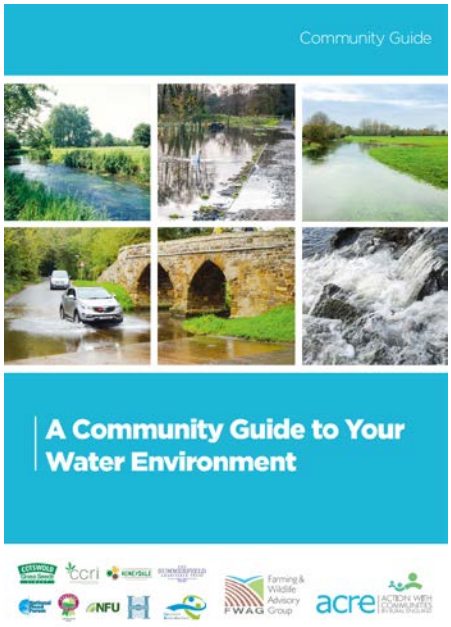
LIFE Environment and Climate Action Updates and Funding Opportunities from the National Rural Network

National Rural Network

This is the first EU LIFE newsletter from the National Rural Network. The LIFE programme is the EU's funding instrument for the environment and climate action. The newsletter features showcases the work of KerryLIFE, ArranLife, Burren LIFE, the Living Bog Project and the Community Wetland's Forum. It also highlights the 2017 call for funding proposals under EU LIFE.

http://bit.ly/nrnlife

UK - Community Water Guide



This UK Guide explains to local communities how to look after their water environment. There are 4 case studies which are well worth a read.

Water is something we tend to take for granted. This guide aims to help you understand the importance of the water in your local environment. It offers advice on how you can take action to become more prepared for extreme weather events of flood and drought while protecting the purity and biodiversity of your waterways.

http://acre.org.uk/cms/resources/comm-guides/community-water-guide.pdf

Oregon, USA – Environmental restoration economy pumps out new jobs and business opportunities

This article looks at the 'Restoration Economy' in Oregon – jobs like removing invasive species and river bank restoration to prevent erosion and restore habitats.

A 2015 study shows that "ecological restoration is a $9.5 billion industry, employing about 126,000 people directly" in the United States. Additionally, "the restoration economy indirectly generates $15 billion and 95,000 jobs, bringing restoration's total economic output value to nearly $25 billion."

https://revitalizationnews.com/article/oregons-environmental-restoration-economy-enjoys-solid-job-growth/

Kilcullen Diary Viewpoint: Our river and climate change

This is a great article looking at the how important the River Liffey is to Kilcullen, and how some thought action now can help the community reduce the impacts of climate change in the future.

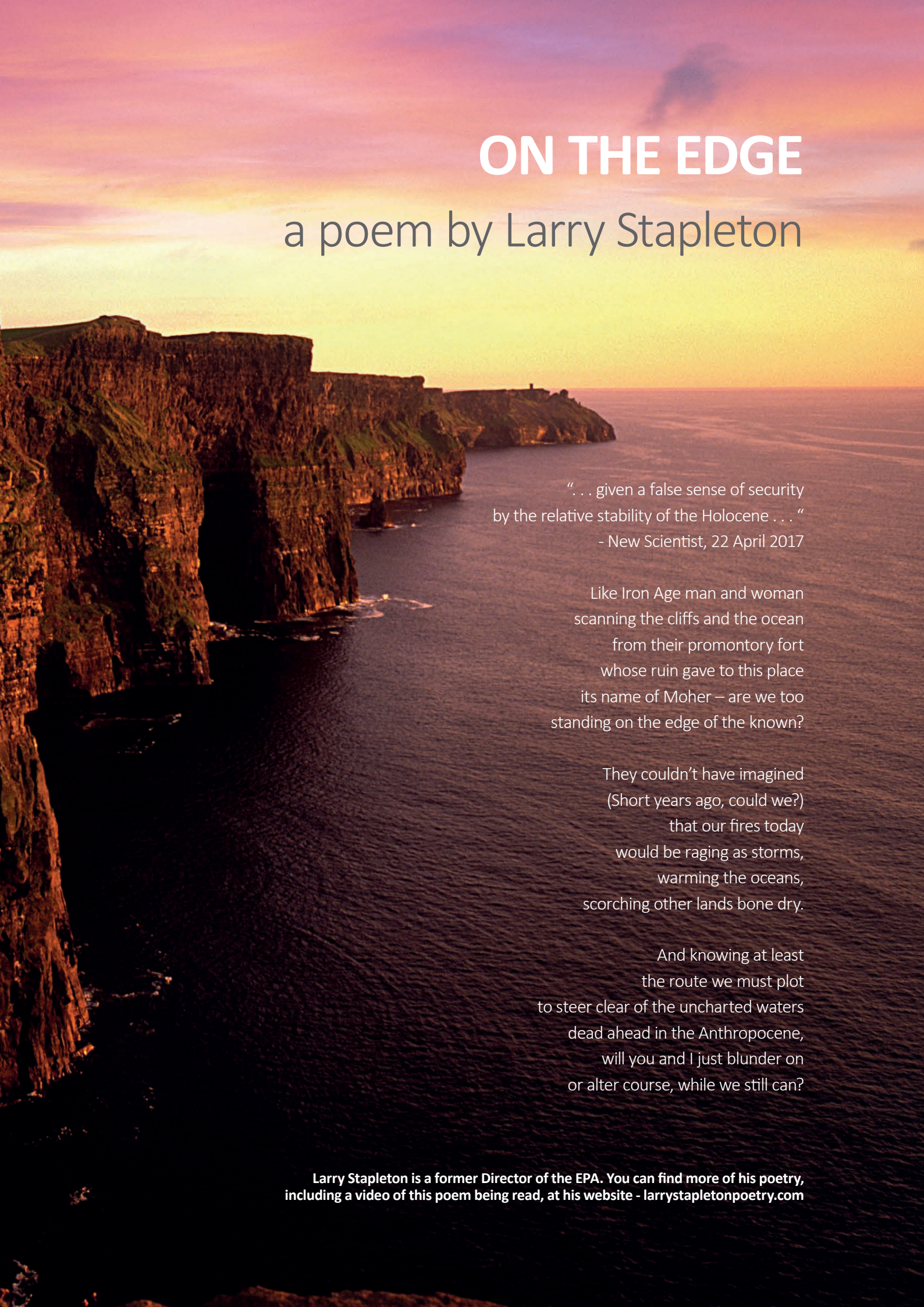
"...if like everybody who walks across the bridge, you stop occasionally and look down to see what's happening in or on the water, remember a fact. It's not their potential river problem, it is our river, and we all need to play a part in making sure it's OK for those who will be living on in the community through the next half-century."

https://kilcullenbridge.blogspot.ie/2017/08/viewpoint-our-river-and-climate-change.html

Better Homes & Gardens - 6 Steps to Make a Rain Garden

Rain gardens filter runoff and protect groundwater, especially after big rains. They also add unexpected beauty to low spots that tend to collect water and draw wildlife. This article shows how to make a rain garden in your own landscape.

http://www.bhg.com/gardening/landscaping-projects/landscape-basics/make-a-rain-garden/



ON THE EDGE

a poem by Larry Stapleton

". . . given a false sense of security
by the relative stability of the Holocene . . . "
- New Scientist, 22 April 2017

Like Iron Age man and woman
scanning the cliffs and the ocean
from their promontory fort
whose ruin gave to this place
its name of Moher – are we too
standing on the edge of the known?

They couldn't have imagined
(Short years ago, could we?)
that our fires today
would be raging as storms,
warming the oceans,
scorching other lands bone dry.

And knowing at least
the route we must plot
to steer clear of the uncharted waters
dead ahead in the Anthropocene,
will you and I just blunder on
or alter course, while we still can?

Larry Stapleton is a former Director of the EPA. You can find more of his poetry, including a video of this poem being read, at his website - larrystapletonpoetry.com

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EPA Catchments
McCumiskey House, Clonskeagh, Dublin 14

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hello@catchments.ie

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