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Catchments Newsletter

Integrated Catchment Management: sharing science and stories

MEET THE WATERS & COMMUNITIES TEAM

promoting community involvement in catchment management

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Editorial

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

On the one hand, we in Ireland live in a beautiful country with a relatively good environment in terms of water quality and quantity, and biodiversity, and we produce high quality food that can benefits us personally as consumers or in terms of the economic benefits that arise. On the other hand, Environmental Protection Agency figures show that Ireland is unlikely to meet its 2020 EU greenhouse gas (GHG) emission reduction targets, pressures from agriculture (nutrients, sediment, GHGs) and a rising population (nutrients and Biochemical Oxygen Demand (BOD)) are increasing, water quality is not improving as required by the Water Framework Directive (WFD), and biodiversity and ecosystem health is disimproving. However, there is progress and one of the aims of the Catchments Newsletter is to illustrate the progress and encourage further progress by telling 'good stories'; in this issue we concentrate on people, communities and science.

Why people and communities? The answer may be obvious, but let's state some reasons:

- People (not just scientists or policy makers) are the main custodians of the environment – water, biodiversity, air quality – as well as being the main consumers of our natural capital and the main threat to it.
- The concepts of 'environmental management' and 'sustainability' can only be truly viable when they take firm root in public opinion and consequently have an effect on politics and policy-making.

Taking 'firm root' and, as Abraham Lincoln might say, achieving victory by reaching the hearts of people, are both interesting and worthwhile challenges; in fact, without exaggeration, they are essential for the future of humankind. But this is easier said than done; however, four recently published EPA reports (see page 31) outline how public and community engagement and participation can be achieved. Over the years, the popular EcoEye TV series has drawn the attention of the public to environmental issues and solutions; on page 5, Paddy Morris outlines and provides the link to a recent programme on 'Community Water'.

The draft River Basin Management Plan has been published; this is a critical document for the future of Ireland's water resources and Ken Jordan (page 17) outlines some details of the plan and encourages submissions to the consultation process. Cian Ó Lionáin's article on page 19 outlines how a new National Water Forum is being established to help create better public engagement on water.

Undoubtedly, the decision of the then Department of Environment, Community and Local Government to set up the Local Authorities Waters and Communities Office (LAWCO) is one that will have far-reaching beneficial consequences. Alan Walsh points out (page 18), that the role of LAWCO is to engage with local communities and promote public participation in the management of local rivers, streams, lakes, coastal waters and groundwater. Indeed, while that may their official role, in practice biodiversity is also being covered by their work. Details on each of the 18 staff in LAWCO are given on pages 20-25.

Good news stories abound in this Newsletter which makes writing this editorial a bit overwhelming! Starting with the successes of our young scientists – Abbie Moloney, Scoil Mhuire Strokestown and Jack Murphy and Michael Sheehan, Colaiste Treasa Kanturk, who won awards for their projects on septic tank systems and the hen harrier (page 4), respectively – congratulations to them and their teachers. There have been some great local events in recent months: celebrating Wetlands Day in Roscommon, attended by Minister Dennis Naughten, and in Dublin (page 7); and the Cavan-Monaghan Science Week, with events attended by ~8,000 people (page 10).

We also have some examples of work being done around the country, starting on page 26 with an article about the MulkearLIFE programme, which ran 2009 to 2014 and worked on practical catchment management, including science, engineering, education and community involvement, enhancing the habitat for Sea Lamprey, Atlantic Salmon and European Otter in the Lower Shannon Special Area of Conservation (SAC). We then have "Waiting 35 years for this day" – a title that comes across to me as a mixture of relief and optimism for the article by David Lee (page 28) on the first of what should be many meetings of the River Funshion Catchment Community. Similarly optimistic feelings are evoked by Grainne Barron in her article "Uisce Aille – Burren integrated catchment management education project" (page 14) and in "Turning the tide in Mayo ...." (page 29), which provides details on the newly-formed Moy Catchment Association. Successful community engagement has been taking place in Britain for a number of years, so it is good to hear from Guy Pluckwell on page 15 telling the "Love Your River Telford" story; perhaps the concept of having a (aptly named) "Clean Stream Team" might be followed here. Also, the Yorkshire Upper Aire project is worth checking out (page 46). On a more pessimistic note, could hedgehogs be one on our 'canaries in the coal mine' species? If so, Yvonne McCann shows that it is in trouble, but also recommends ways of protecting them (page 8).

Invasive alien plant species pose a threat not only to ecosystems, homes, infrastructure and human health, but also to water quality in that they leave river banks prone to erosion in winter. Exemplars are needed to illustrate that this pest can be tamed; Amanda Pedlow and Offaly County Council provide this on page 12. In addition, Ann Goggin and Limerick County Council have developed an excellent 'report invasive plants' tracking app for iPhones and Android smartphones (page 9); and John Ballinger (page 11) reports on progress that the RaptorLIFE project is having in treating invasive species and installing extensive bankside fencing as a means of improving fish habitats.

Stories from abroad help to inform us and therefore it is as pleasure to get an article from Ben Scott, who not only describes an approach to pollution source assessment in Sydney's drinking water catchment, but also makes linkages to Ireland (page 41). And David Galalazzi on page 39 reminds us of the beauty and history of Florence when he describes "The Flood of Florence" that occurred 50 years ago. Helping overseas development projects is a role undertaken by Engineers without Borders Ireland; Conor Quinlan (page 6) describes how EPA and local authority hydrometric equipment is being donated to overseas projects.

Climate change is now with us and an important research project on the impacts of this on Irish groundwater resources has commenced – see article by Èlia Cantoni, Laurence Gill and Bruce Misstear on page 44.

An innovative approach to predicting the impact of microbial pathogens on bathing waters at Enniscrone beach is described by Wayne Egan on page 36.

To finish off, perhaps the most beguiling article is the one by Bernie O'Flaherty and Alan Walsh (page 13) who start with a lovely quotation that is worthwhile repeating – 'we must begin thinking like a river if we are to leave a legacy of beauty and life for future generations' – then Bernie and Alan tell the 'story' of a tributary of the Ulster Blackwater.

"It's people who save rivers, not plans, reports and newsletters..."
Quote adapted from 'Saving Eden: A Manifesto'
www.savetheeden.org

Donal Daly, EPA Catchments Unit

Young Scientists

"Prey availability for hen harriers in managed farmland" wins 3 awards

A huge congratulations to Jack Murphy, Michael Sheehan and their teacher Derry Donavan, Colaiste Treasa Kanturk, on this fantastic achievement. The students picked up a total of 3 awards: Best in Group - Biological and Ecological, Runner up over all in the whole event and the EPA award for Best Environmental project. These awards bring public attention to the Hen harrier and its endangered status. Well done to all involved and what an inspiration for other young people!

They were really good at presenting their work in person, and it was a pleasure for Paddy Morris from the EPA Catchments Unit to get to speak to them. More importantly, they also got to talk to Minister for Agriculture, Food and the Marine Micheal Creed about their work – it's great to see such talented young people get an opportunity like that to highlight the great work being done by local communities around Ireland to understand the value of the nature in their back yard, and how we can all work together to protect it. IRD Duhallow and RaptorLIFE are proud to have been involved in the mentoring of this project. This again highlights the importance of the work of RaptorLIFE creating awareness amongst the young people of the area and as such it will have a knock on effect of others becoming more aware of our environment too.

http://www.duhallowlife.com/

"An investigation into the quality of effluent discharging domestic waste water treatment systems (septic tanks) and an apparatus to improve this" - EPA Catchments Favourite, and 3rd place in the Senior Individual Biological and Ecological category

My BT Young Scientist project was about the quality of water exiting standard non mechanical sceptic tank systems. There are half a million septic tanks in Ireland, meaning the equivalent of 84 Olympic sized swimming pools of water are discharged into the ground every day.

This water is of very poor quality and contains high levels of ammonia and phosphorus. These both have many harmful impacts on the environment such as fish kills and soil acidification and the contamination of ground water drinking sources. I do a lot of open water swimming as a hobby and have always been concerned about the quality of water I swim in. There was a local fish kill in my area; this horrific sight really sparked my interest into water quality and water pollutants.

During transition year I started to investigate reasons how water becomes contaminated. I started my research on EPA.ie where I found much of the information and reports I needed to support and refine my project. I began to realise that a major cause of contamination was septic tanks and 48% of tanks inspected failed inspection during 2015-2017.

I started researching how they work and thinking of ideas of to how they could be improved. I devised a retro fit apparatus to improve the water discharge quality. During my experimental period with a basic prototype I saw that there was a 23% reduction in ammonia content in just two weeks.

There were also other significant benefits following the installation of my apparatus. The test tank was a standard non-mechanical two chamber septic tank system serving a detached house with four occupations. This meant that the water inflow to the tank was average.

I applied for patent for my apparatus and it is currently patent pending. The apparatus will be standalone, easily to install and cost effective. I am continuing to refine, research and improve this project.

I thoroughly enjoyed competing in BT Young Scientist this year and was fortunate enough to be selected for one of the 550 places out of 2,500 entries to go forward to the RDS exhibition. I was thrilled to win 3rd place in the Senior Individual Biological and Ecological category.

I would advise any student to avail of the opportunity to participate in this amazing learning event. I would like to thank Miss Geoghegan and Miss Donnelly in Scoil Mhuire Strokestown and my parents Pat and Lesley who supported me throughout the exhibition. I am looking for a manufacturing company which would be willing to produce my device as I have been advised that it has enormous commercial potential. I can be contacted via my school.

Abbie Moloney, Scoil Mhuire Strokestown

"It is great to see an interest in improving the management of our Septic Tanks, and I wish to commend Abbie for looking at this problem and thinking about how to manage the discharges from the approximately 500,000 septic tanks across Ireland."

Margaret Keegan, EPA Septic Tank Expert

For more on this topic, see http://www.epa.ie/water/wastewater/

Eco Eye – Community Water

Anja Murray and the Eco Eye team journey through Ireland in this episode looking at what communities around Ireland are doing to look after their local rivers and lakes. This episode looks at some of the causes of pollution putting pressure on these sensitive ecosystems, and possible solutions.

YOU CAN FIND THIS EPISODE ONLINE AT HTTPS://WWW.CATCHMENTS.IE/ECO-EYE-COMMUNITY-WATER/

The Liffey Head Bog, and current status of our waters

The episode starts in the Liffey Head Bog and Lough Dan in the Wicklow Mountains. This area is where The Liffey, Dargle, Dodder and Glencree rivers all rise here. Its a Special Area of Conservation and hugely important as it is a source for Dublin's drinking water.

Anja Murray and Sinead O'Brien from the Sustainable Water Action Network discuss the current status of our waterbodies.

About half of our rivers and lakes are at good status – if you want to learn more, www.catchments.ie includes a dashboard that summarises the status of our rivers, lakes, transitonal and coastal water bodies.

One size fits all solutions won't work – we need the involvement and knowledge of locals

You can see Jenny Deakin from the EPA Catchments Unit talking about how given the unique nature of our local catchments, one size fits all approaches won't work everywhere – and how it is key that local communities get involved in managing their local rivers and lakes.

Agriculture and Forestry

Sources of pollution for our rivers and lakes include agriculture and forestry.

Forestry can also be part of the solution, especially if the right trees are planted in the right place. The Forest Service will pay for planting trees like this under the Native Woodland Scheme. Anja talks to Declan Little, who describes how these trees can be used as a buffer strip beside rivers – both protecting the water, and enhancing the beauty of the area.

Constructed Wetlands – enhancing water quality and biodiversity

You can also see the innovative Tolka Valley Integrated Constructed Wetlands on this episode, a project which was led by Mary Ann Harris, Parks Superintendent in Dublin City Council. The wetlands provide benefits for water quality in the River Tolka, and habitats for species like birds.

Anglers taking ownership of the Tolka

It also has helped the Tolka recover so it can support fish after a previous pollution incident – with local angling clubs being closely involved with their river, and helping look after it.

This is done with the support of people like Oisin Cahill, who helps run the Dublin Angling Initiative for Inland Fisheries Ireland .

Oisin makes the point that once people get active on the river, and think of it as theirs, they are much more active in helping look after it.

Getting locals involved – Rivers Trusts, The River Loobagh and StreamScapes

The River Loobagh in Limerick is also covered – Anne Goggin from Limerick City and County Council tells Anja the story of a small river that was badly damaged by a slurry spill in August 2014.

While this caused the angling community heartbreak at the time, the Anglers, County Council and Inland Fisheries Ireland all got involved in a project to help restore the river, and are now considering setting up their own River's Trust – a story we previously covered on Catchments.ie with our Catchment Case Study on The River Loobagh, and we also covered how to set up a River's Trust for anyone who may be interested.

Last up is StreamScapes and Mark Boyden – who wants to create a sense of wonder and make people aware of the linkages between our daily actions, and our quality of life and local environment. StreamScapes aims to "Engage, Enlighten and Empower" local communities to understand and help manage their own local environments by doing activities like checking the health of a local stream.

As Mark says, it is about developing a culture that cultivates "a sense of voluntary stewardship" – we are all in this together.

Paddy Morris, Catchments Unit, EPA

Engineers Without Borders Ireland - EPA and local authorities donate old hydrometric equipment for use in developing countries

The Environmental Protection Agency along with local authorities around Ireland have recently upgraded their surface water hydrometric stations and groundwater level monitoring sites to telemetric data loggers.

As a result they have donated hydrometric equipment that they no longer require to Engineers Without Borders Ireland for use on overseas development projects. Engineers Without Borders Ireland will now use this equipment on projects to help disadvantaged communities in developing countries along with some of their partner organisations in Africa and Asia, which will have a long lasting benefit in the effort to provide clean and safe water. It is fantastic that instead of being disposed of, this equipment will now be reused and recycled in regions where it is vitally required.

Thanks is due to the hydrometric officers of the EPA who collected, sorted and checked this equipment prior to its donation, and to Máire Ní Chionna (Galway County Council) who coordinated the local authority element of the donation. The first batch of equipment should arrive at its destination in the coming weeks. Watch out for updates in future issues showing how this equipment is reused in these development projects.

Conor Quinlan, EPA Hydrometrics Unit

http://www.ewb-ireland.org/

DR. CONOR QUINLAN OF THE EPA HYDROMETRIC AND GROUNDWATER SECTION, LIAM MCCARTON AND DECLAN ALCOCK, DIRECTORS OF EWB-IRELAND.

StreamScapes wins Community and Council Award for 'Most Significant Contribution to Water Quality'

The 2017 Local Authority Members' Association Award for 'Most Significant Contribution to Water Quality' has been won by Coomhola Salmon Trust of Bantry for their 'StreamScapes Waters & Wilds Community Engagement' Programme.

Coomhola Salmon Trust Directors Mark Boyden and Paul Kearney attended the Award Ceremony in the Crowne Plaza Hotel, Dublin, on Saturday February 4th. "We're really surprised and delighted to receive this Award", said Mr. Boyden, "and it's furthermore a tribute to every school, student, teacher and Community that we have ever worked with throughout Ireland north and south, over the past twenty–five years. It's their award too."

The Local Authority Members' Association/LAMA 'Community & Council Awards', sponsored by IPB Insurance, are presented annually to State Agencies, Local Authorities and Community initiatives which have achieved distinction, and the award to StreamScapes was to acknowledge their innovative 'Catchment'-based approach to promoting citizens' awareness and stewardship of local aquatic and biodiversity resources. StreamScapes projects have been produced in Catchments all around the country, from Cork and Kerry up through Limerick, Clare, Galway and including cross-border initiatives in the River Erne in Fermanagh and the Ulster Blackwater involving Monaghan, Tyrone, and Armagh.

www.streamscapes.ie

LAMA CHAIRPERSON COUNCILLOR MAGS MURRAY (FINGAL COUNTY COUNCIL) AND COUNCILLOR WINSTON J. BENNET (CAVAN COUNTY COUNCIL) PRESENT 'STREAMSCAPES' DIRECTORS PAUL KEARNEY AND MARK BOYDEN WITH THE 2017 AWARD FOR 'MOST SIGNIFICANT CONTRIBUTION TO WATER QUALITY'

Celebrating Wetlands Day – February 2nd, 2017

GOLDEN PLOVER IN FULL FLIGHT ON WORLD WETLANDS DAY OVER THE TURLOUGH, LOUGHNANEANE PARK

SOME OF THE ATTENDEES WITH THE TURLOUGH IN THE BACKGROUND

Loughnaneane Park, Roscommon

On World Wetlands Day, the Heritage Office of Roscommon County Council in conjunction with Roscommon Tidy Towns, The National Parks and Wildlife Service and The Waters and Communities Office held a nature walk to see the wildlife at the turlough in Loughnaneane Park. This is a lovely park located right on the edge of Roscommon Town.

World Wetlands Day is celebrated every year on the 2nd of February to raise global awareness about the value of wetlands for humanity and the planet.

This particular date is chosen because it marks the date of the adoption of the Convention on Wetlands on February 2nd 1971, in the Iranian city of Ramsar on the shores of the Caspian Sea.

There was a great turn-out for the nature walk and the fifty or so walkers who braved the February weather were rewarded with a sunny morning and displays from Shovelers, Lapwings and Golden Plovers.

Dublin Bay Biosphere

The Dublin Bay Biosphere celebrated World Wetlands Day and their internationally important wetlands of Dublin Bay Biosphere with an exhibition hosted by Dublin City Council in the Atrium of the Civic Offices. As well as photos of the Wetlands, they showed the results of the 2016 Coastwatch Annual Survey.

For more details, see www.dublinbaybiosphere.ie/ and www.coastwatch.ie

MINISTER DENNIS NAUGHTEN, CATHERINE SEALE (COMMUNITY WATER OFFICER) AND SOME PARK RANGERS...

LAUNCH OF WORLD WETLAND'S DAY EXHIBITION, DUBLIN CITY COUNCIL OFFICES.

A Prickly Affair – helping wild Irish hedgehogs find sanctuary

Hedgehogs are undoubtedly one of the most unique of all Irish mammals. Weighing less than 1kg this insectivore has been part of the Irish fauna since supposedly being introduced by the Normans as a food source around the 13th Century. Since then they have fascinated folk the country over. They have earned their place on the Wildlife Act 1976 (amended 2000) to be included as a protected species.

REMEMBER, NETS CAN BE DEADLY TO HEDGEHOGS

Protected or not these prickly insectivores face all manner of problems on this fair island. Once numbering almost 40 million in the UK, they are now at risk from extinction there and a recent UK census has put the number there at just 1 million.

How are Irish hedgehogs faring?

We simply don't know as a census has not been conducted for some time. If antidotal evidence is anything to go by, then they are in trouble. Simply ask any rescue centre and you will hear of stories from people who "used to see them every year but they seem to have disappeared" or the avid gardener who since using slug pellets "hasn't seen a hedgehog".

Another common tale is of the family in rural Ireland who used to watch big families of hedgehogs come and go yet "since the construction of the motorway" they have all but disappeared. A lovely couple from North Dublin who had been feeding 'Sonic' for years were devastated to find him dead in their uncovered pond, and a 9 year old Manchester United supporter lost sleep over finding his beloved 'Spike' trapped in the football nets in the back garden one morning.

Unfortunately the simple fact is that in many places we are losing our hedgehogs, a delightful, fascinating species that has roamed this planet, unchanged, for 15 million years. They are harmless creatures that wander the neighbourhood in search of food and then curl up under the old garden shed, make a nest, have their babies and hibernate. They are charismatic yet uncomplicated beings.

By changing a few simple things we can stop our hedgehogs going the way of their counterparts in the UK. We can save them. It is not too late.

What can we do to help protect and preserve these thrilling animals?

- Avoid using slug pellets, pesticides and weed killers. The active ingredient is metaldyehyde which is a toxin that when ingested causes convulsions and death. Let hedgehogs do the work or use natural alternatives like copper wire, ground egg shell, coffee grounds, beer traps etc.
- Cover drains and stop wandering hedgehogs getting into trouble.
- Leave an area of the garden wild. Leave out autumn leaves, hedge trimmings, logs etc to help not only hedgehogs, but also invertebrates particularly our bees which are also in danger.
- If you have a pond, place mesh over it. Hedgehogs can swim but they need a means of getting out or they will drown.
- If you do burn garden waste, please ensure there are no sleeping hogs inside and move the pile before you burn it.
- "A hedgehog out during the day is not OK". Hedgehogs are nocturnal animals and generally only venture out during the day if disorientated, injured or sick.

COVERING YOUR DRAINS CAN STOP WANDERING HEDGEHOGS GETTING INTO TROUBLE, AND IF YOU HAVE A POND MAKE SURE ANY HEDGEHOGS THAT FALL IN CAN GET OUT BY ADDING A RAMP FOR THEM

- If you do find a hedgehog in trouble please contact your local wildlife rescue centre.

You can find a list here http://www.irishwildlifematters.ie

Yvonne McCann, Hedgehog Rescue Dublin

About: Hedgehog Rescue Dublin was established in 2013 with a mission to rescue, rehabilitate and where possible release wild Irish hedgehogs. It is based in Rush, Co. Dublin. We rely solely on donations from members of the public and receive no funding whatsoever. You can find us on Facebook at www.facebook.com/hedgehogrescuedublin

Fight Alien Plants Invading Ireland - 'Report Invasive Plants' tracking app for iPhone and Android launched

Invasive plants pose the second greatest risk to wildlife after habitat destruction, and also pose a threat to water quality by leaving banks vulnerable to erosion. The 'Report Invasive Plants' app allows you to report sightings of invasive plants in your area. Once reported the information will help track the extent of these invasive plants.

This app has been developed by Limerick City and County Council and has been designed to be easy to use.

It includes photos of the 4 most common invasive plants: Giant hogweed, Himalayan balsam, Japanese knotweed and Winter heliotrope.

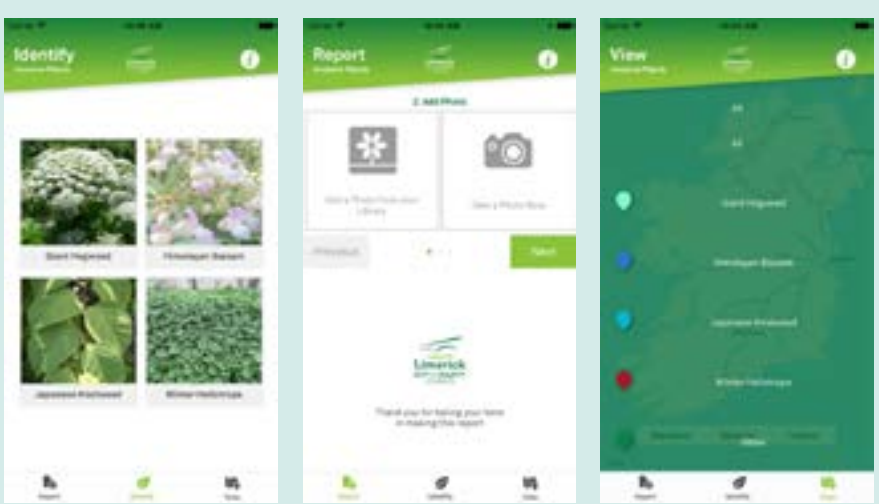
You can easily identify and report Invasive plants you see, and view reports on a map.

You can find the app by searching for 'Report Invasive Plants' on the Apple App Store or Google Play Store, or use the links below:

iPhone App: http://bit.ly/iphoneinvasiveplants

Android App: http://bit.ly/androidinvasiveplants

Anne Goggin, Limerick City and County Council



Eight thousand people get involved with Cavan-Monaghan Science Week

LECTURE ON WATER QUALITY IN JOHNSTOWN CENTRAL LIBRARY

CSI WATER- HOSTED BY CAVAN AND MONAGHAN COUNTY COUNCIL ENVIRONMENTAL STAFF

RIVERS ON THE MOVE – THANKS TO BALLINDERRY RIVERS TRUST

THE SCIENCE OF GOLF WITH DR IAN KENNY

Cavan and Monaghan County Councils joined forces during Science Week from 13th-20th of November 2016 hosting a range of events during the inaugural Cavan Monaghan Science Festival 2016. Our mission was to stimulate and sustain the interest of all in Science, Technology, Engineering, Arts and Math (STEAM) by producing a most exciting and educational festival.

There were water and environment related events for all which ranged from water testing to the science behind weather forecasting as well as boat building to a family science quiz. Teagasc in Ballyhaise also opened their doors to over 200 children to attend workshops on the practical application of science in farming. Dr Dan Courtney and Rónán Mac an tSaoir delivered a lecture on water quality, the world imbalance in quantities of water, and how climate is influencing this balance. Rónán spoke of the body of research being undertaken by Teagasc and other agricultural bodies to deliver a nutrient management plan to work in tandem with soil type and our climate.

Technical staff from Cavan & Monaghan County Councils gave a very informative talk on their education and careers in relation to STEAM for secondary school students and third level students in both Cavan & Monaghan Institutes.

CSI: Water

Environmental staff from Cavan & Monaghan County Councils worked with students rolling out a Crime Scene Investigation (CSI): Water workshop which showcased many of the scientific techniques used on site as well as in the laboratory as part of their day to day enforcement work.

This workshop also highlighted many of the environmental pressures evident in both counties. A poster competition was also included to raise awareness in terms of protecting and improving water quality for all primary and post-primary schools with winners from both counties having their fabulous entries on display in Cavan & Monaghan along major national routes on billboards for all to see.

Family Fun Day and Rivers on the Move

The family fun day on the Saturday of the festival was hosted over 4 locations in Cavan town & Carrickmacross and proved a roaring success with little and "big" kids getting involved in the numerous events on show. One of the major water related highlights included the interactive Rivers on the Move exhibition hosted by the Ballinderry Rivers Trust during the family fun day with participants learning about river flow paths & how they are impacted on by humans, forestry, bridges, floods, etc.

Some of the other environmental related events facilitated for adults, children, family and all members of the public during the festival included energy workshops, farm safety and geology talks by GSI.

The Cavan Monaghan Science Festival would sincerely like to thank the Science Foundation of Ireland for their support. A huge thanks to all of the County Council staff, facilitators and speakers who helped make the inaugural Science Festival such an overwhelming success. Thanks also to those who came out in such numbers to the open events and to the schools who participated in the schools programmes.

Keep updated with other science and technology news and events taking place at
www.cavanmonaghansciencefestival.ie
You can also find the festival on Facebook, or Twitter - @CMSciFest

Allison Traynor, Cavan County Council

Free fencing for farmers along the Owentaraglin and Blackwater Rivers

In December last year there was a major fish kill on the Owentaraglin River, a tributary of the Munster Blackwater River in North Cork. Inland Fisheries Ireland officers discovered more than 1,200 fish mortalities over a ten kilometre stretch of the river near the village of Kiskeam, with the cause of the fatalities attributed to a slurry spill.

The Owentaraglin River is an important spawning ground for fish with stocks of salmon, brown trout, eel and stickleback affected. Of particular concern were the significant numbers of hen salmon carrying eggs that were killed in the incident, effectively interrupting the life cycle of the salmon. This tragic event illustrates the consequences of poor slurry management, and it may take years for this section of the river to fully recover.

Unfortunately, this incident has largely overshadowed the good work that IRD Duhallow (a rural development company) has been doing in the catchment through their RaptorLIFE project. RaptorLIFE is a 4.5 year programme (2015-19), whose overarching objective is to bring local communities together to better manage upland and freshwater habitats within the Duhallow area. RaptorLIFE is an ambitious project in terms of scale (large project area joining two Natura 2000 sites) and political sensitivities. For this reason, the project has concentrated on building effective partnerships with the local community and relevant statutory authorities.

RaptorLIFE have been working in partnership with local farmers to improve the health of the Owentaraglin and upper Blackwater rivers through extensive bankside fencing. By excluding livestock from rivers, fencing reduces pollutants such as bacteria, nutrients, and silt entering the water. IRD Duhallow offers farmers with land adjoining these rivers free bankside fencing and alternative livestock drinking sources. Since June 2016, RaptorLIFE have erected 9.2km of new fencing and 38 cattle drinkers, with more lined up at no cost to landowners. By the end of the project, they hope to fence 28km of riverbank. As an added incentive, landowners in the GLAS agri-environmental scheme receive payment for the fencing work done by IRD Duhallow.

In addition to the fencing, RaptorLIFE are helping to protect riverbanks through the planting of native trees on eroding bends, and treating invasive species like Japanese knotweed and Himalayan balsam that are creating erosion and biodiversity problems on the banks. All of these actions are helping to keep silt and nutrients out of the river, creating better habitat for our freshwater fish.

RaptorLIFE would like to acknowledge and thank all of the landowners, supporters and volunteers for their assistance with the project to date.

If you would like further information or to participate as a volunteer, you can contact them on Tel: 029-606 33; Email john.ballinger@irdduhallow.com; Website http://duhallowlife.com/raptor-life; or Facebook www.facebook.com/IRDDuhallowLifeProject/

John Ballinger, IRD Duhallow RaptorLIFE Project Scientist

The IRD Duhallow RaptorLIFE Project is supported through the LIFE financial instrument of the European Community

Tackling Invasive Species in Offaly

Knotweed is Priority for Offaly

The focus for work on invasives in Offaly is predominantly on Japanese knotweed with two sites of Himalyan balsam. We are very fortunate that we do not have the task of tackling Gunnera or Giant hogweed.

There are a small number of recorded patches of Gunnera, still in the original setting where they were planted. We are examining Himalayan balsam along the Camcor river in 2017 which is of increasing concern.

Recording, Monitoring and Awareness

The vast majority of the Japanese knotweed sites in Offaly are roadside with just a couple of sites along riparian zones beside waterbodies. This makes treatment easier as access, permissions, monitoring and health and safety are more straightforward than riparian work.

We work closely with NPWS rangers, the botanical recorder for the Botanical Society for Britain and Ireland (BSBI) in Offaly and the Offaly Naturalists' Field Club to monitor the range of invasive species. We have been promoting awareness of invasive species since 2008 when we held Biodiversity Training for Offaly County Council staff. The first key message was 'Do Not Disturb' as it was clear that hedge and verge cutting was a factor in the spreading of knotweed. Staff throughout the Council have reported sites with litter wardens, clerk of works, area engineers and roads teams all being to the fore. This has resulted in close to 40 sites being logged for treatment.

Treatment – Persistence is the key!

We commenced county wide treatment and 2017 will be the fourth year. Persistence is definitely the key! Having sprayed in 2014 there was practically no re-growth in 2015 except for one or two shoots emerging at the edge of treated patch where the rhizomes (continuously growing horizontal underground stems which put out shoots and roots at intervals) may not have been reached the previous year. However in 2016 we had some shoots of weak, knarled growth at a number of the sites. They have all been treated again and we wait to see what happens in 2017.

Stem injecting is the most effective treatment but it is very time and labour intensive. We have done this at a couple of sample sites and also at one site adjacent to a river as Synero is not recommended close to water.

We have been spraying with a number of different brands for the past three years. All have been effective to varying degrees. We find that Synero has the advantage that it can be effective when sprayed during the summer as well as after flowering in late September.

Awareness

We issue Facebook posts, newspaper articles and do radio interviews to raise awareness and for the past number of years we have included information about Japanese knotweed in the hedge cutting notices to landowners.

The Offaly Tidy Towns network is also a key group that we work with.

As Heritage Officer I will call to private landowners if knotweed is on their land and check the land register to contact them otherwise. This is not so practical perhaps in other counties where there is a much higher density of sites but our aim has been to tackle the matter before it became a major problem. Once information has been given to landowners the success rate of dealing with it is very high. There has been a definite change in awareness in the past five years with the vast majority of people I have called to now being aware of the issue of Japanese knotweed but perhaps not recognising it as being on their land. This has been greatly assisted by national media running a number of features.

In 2016 the Council put up notices at East Offaly sites to draw attention to the locations. These are on 1.5m high metal post with permanent signs that certainly are being noticed by passersby, but also by drivers of hedge cutting machines. This is also important as while we may achieve no re-growth above ground, we do not know what condition the rhizomes are in – they may be stunned but not dead. Ongoing monitoring is essential and awareness of the location of treated sites so that they are not disturbed accidentally thus spreading the rhizomes.

Amanda Pedlow, Offaly Heritage Officer

If rivers could talk!

'We must begin thinking like a river if we are to leave a legacy of beauty and life for future generations' David Brower

Water is often undervalued by civil society, yet our very existence is dependent on a continuous supply of fresh water. Human activities linked to population growth, food production, industrialisation and land use changes have damaged our natural waters.

If rivers could talk, what story would they tell and how would they view humans and our actions?

This is the story told from a rivers' perspective. If we are to understand what is happening in rivers we must try and appreciate the journey from source to sea.

It is much more than a journey, it is an adventure fraught with perils and dangers, whilst also full of the wonder and beauty of nature.

This is the story of a tributary river of the mighty Ulster Blackwater.

My story so far...

I am a tributary of the Ulster Blackwater that drains a catchment area of 60 square kilometres. I once enjoyed a healthy status to rival any river in Ireland, but not anymore, largely as a result of damage caused by human activities.

My source is an upland area covered by blanket bogs and forests. It is a magical place, from where I flow through a valley of marginal land to a lowland area of fertile pastures and rural settlements. A network of ditches, drains, streams, wetlands and lakes in the surrounding landscape connect to my main river channel; this area I call my Catchment.

One of my lakes supplies drinking water to a nearby town and the numerous homes, businesses and farms in between. Many people enjoy walking along my river banks and lakesides. Activities like swimming, canoeing and kayaking all happen in my waters and anglers, birdwatchers, and huntsmen all benefit from the wildlife I support. My groundwater supplies many wells and is even bottled and sold, who would have thought! I am given the unenviable task of dealing with effluent discharge from wastewater treatment plants. You would think I would be highly valued for all these services I provide - but sadly this is not the case.

In the 1970's, when biologists first began to check the health of Ireland's rivers I was in a very healthy state with good water quality along my entire length, however, within a few years my water quality rapidly deteriorated due to the discharge of human sewage from an expanding village. Later a sewage treatment plant was built reducing the pollution load discharged.

In the mid 80's large stretches of my river bed were removed to deepen my channel as part of a major arterial drainage scheme. This destroyed natural wildlife habitat and fish spawning grounds and resulted in severe siltation downstream in my lower reaches. A major slurry spill from a farm followed in the late 80's - coating my river bed with organic material, depleting oxygen levels and causing a fish kill for up to 3kms downstream of the source.

My middle reaches did not escape damage, a discharge of silt and sand from a quarry discoloured my waters downstream followed by a poisoning incident in the 90's when the reckless disposal of a toxic pesticide killed off all life, everything, along a 5 kilometre stretch and it took several years for sensitive aquatic life to return and water quality to recover.

In the 90s, a new industry came to my catchment which produced lots of organic waste. Thousands of tonnes were dumped at various locations in my wetlands and marginal lands resulting in the leaching of contaminants into my waters. Clusters of houses sprang up with septic tanks incorrectly installed on poorly draining soils resulting in further contamination. My lakes did not escape either, pollution of the feeder stream caused over enrichment with nutrients and some severe algal blooms. This affected the drinking water supply to the local town and also affected a popular bathing area.

My upper reaches remained in pristine condition until the mid-90's, however an excavation machine removed gravel from my river bed and disturbed the iron pan, a ring feeder was located on my river bank and illegal dumping of liquid waste took place all contributing to a loss of sensitive aquatic species.

There are many more pollution events that I have suffered over the past 40 years, some from poor farming practices, others from contaminated runoff from hard surfaces, faulty septic tanks, chemicals and oils, road drainage and siltation caused by construction and forestry works. These have all impacted negatively on the health of my waters and the wildlife they support.

The good news is that today I am in recovery; my upper and middle reaches are healthy again and my excessive phosphorus levels are lowering. Farmers have availed of farm grants to improve slurry management and REPS, GLAS and other schemes have promoted better nutrient management and fencing along watercourses. The village sewage treatment plant now operates under a licence and septic tank standards have improved. The status of my lake water body will, however, take longer to recover fully as nutrients have accumulated in my lake sediments.

My lower reaches remain unhealthy but today there is a new focus on catchment management, and public bodies, community groups and anglers are interested in restoring my waters to healthy status. A River Trust has formed and following a survey they recommend reconstruction works on weirs, river bank stabilisation works, rehabilitation of spawning and nursery areas, and improvements to natural vegetation along my river corridor. This work is costly and awaits a funding source.

One day, I could be a fully healthy river providing a cleaner source for water supply, safer bathing and recreational areas and healthy populations of otter, dippers, kingfishers, mayfly and trout. With care from my catchment community, one day even the Salmon might return.

Bernie O'Flaherty and Alan Walsh, Local Authority Waters and Communities Office

Uisce Aille – Burren Integrated Catchment Management Education Project

Public and particularly local participation in protecting our rivers, lakes and water resources from pollution has never been more important. Such local engagement can be realised fully when a community becomes familiar with the often unique environmental characteristics of the local catchment. And as the old adage goes, we can't manage what we haven't measured.

Managing our catchments effectively requires us to understand and integrate a huge range of information. And what better way to encourage awareness, pride, and participation than through educating and training future local stakeholders?

One project aiming to fill that gap in knowledge is the Uisce Aille project in the Burren Co. Clare. Supported by Burren GeoparkLIFE program and coordinated by research student Grainne Barron from the National University of Ireland (NUI) Galway, transition year students from Mary Immaculate School in Lisdoonvarna are participating in a water resource awareness program. The students have named the program Uisce Aille and are exploring and mapping the natural and built environment underlying the Aille Catchment in the Burren.

In simple terms, a catchment is the area of land contributing to a river, lake or other waterbody. Water is vital not just for our health, but for the health of our ecosystems, the community and local economies. Because water is so integral to our wellbeing it is essential to know how it moves through the landscape, from the highest point and all along its route to the sea, be that through the ground or on land. Nestled into lush green hills, with the river carving its way through the resilient shale, Lisdoonvarna makes an ideal setting for learning about the natural drainage of an area. The Aille River is fed by a number of tributaries including its headwaters on the slopes of Slieve Elva upstream of Lisdoonvarna. The system is characterised by predominantly surface water features on the shales until it reaches the karstic limestone cave system at Doolin, before entering the sea.

The students have undertaken a catchment walk as well as visiting stretches of their local river to gain hands on field experience in river surveying including kick sampling, flow characteristics, identification of habitats and invasive species etc. They have also been introduced to the wealth of freely available environmental information online. Combining local knowledge, outdoor field and surveying skills with use of QGIS, which is Open Source (i.e. free to use) Geographical Information System software, the students are creating a map of the Aille catchment.

Lisdoonvarna also has a rich cultural heritage due to its fame as a spa holiday destination in the 18th and 19th century, as a result of healing properties of the mineral rich waters discharging from the shale bedrock at the Twin Wells.

Lisdoonvarna is still as picturesque as ever due to the waters that sustain it. The map created by the students will be populated with lots of different datasets such as soils, geology, land use, aquifers, water resources but will also show important cultural and heritage sites.

The finished map and accompanying poster will be displayed and replicated within the Burren by the Burren GeoParkLIFE project.

Uisce Aille – A transferable toolkit

The Uisce Aille program is a pilot scheme in developing a transferrable toolkit that other schools can use to channel student's energy into positive action, empowering them to improve and protect their local water resources.

It aims to enable and empower educators to explore an alternative approach to local stakeholder engagement in a three step process:

Train the Trainers;

- Engage and Educate the students;
- Empower the students so that they can share their message with their local community.

The project fits with the aims and ethos of the Water Framework Directive: it is participatory, it is educational, it is emancipatory, it is based in and of the community, and the outcomes will be replicable and transferable.

Classes with the transition years began in mid-September 2016 and will ran until the end of February 2017. The students have entered their project - Uisce Aille - into the Unesco Young Environmentalist Awards (YEA) and also presented the project to local community groups on March 23rd 2017 at the Pavilion in Lisdoonvarna.

Grainne Barron, Research Student, National University of Ireland, Galway

Love Your River Telford: partnerships and progress in an urban area

My name is Guy Pluckwell. I'm a Senior Environment Officer for the Environment Agency and work on the 'Love Your River Telford' project in the West Midlands, UK.

When we first surveyed the watercourses in Telford back in February 2013 we found they were being impacted by urban pollution, such as sewer misconnections and trading estate and highways runoff. As well as these water quality problems the town also suffers from flooding and a deteriorating habitat for biodiversity.

In an attempt to tackle these issues we approached various partners and local groups and began to combine our efforts by working together. There was a lot of enthusiasm for a project to improve Telford's watercourses which was great to see!

It became clear that Telford had a quite large and very active network of volunteer groups that focused on environmental issues. After many discussions, some very innovative ideas and lots of unique suggestions about how to approach the challenges we faced, 'Love Your River Telford' was born.

Since the birth of the project two and a half years ago we have completed some great work to help improve the environment. The urban catchment management model that we've created together has resulted in three national awards in that short time.

WHAT LOVE YOUR RIVER TELFORD WERE UP AGAINST IN THEIR LOCAL WATERCOURSES

What do we do?

We have completed a number of training sessions with the volunteer groups led by either project partners with appropriate expertise or brought in expertise, incuding:

- Signs of pollution in watercourses
- Walkover surveys and recording
- Chemical testing of watercourses
- Invertebrate monitoring of watercourses
- Aquatic plant identification in watercourses

We also asked the volunteers if there was anything they would like to learn more about and subsequently also ran two further courses on:

- Mammal identification
- Bat monitoring

We have also provided chemical and invertebrate monitoring equipment and the groups are now capable of monitoring their own stretches of watercourse, identifying water quality issues, and knowing what action to take where they do identify issues.

SOME OF THE LOVE YOUR RIVER TELFORD VOLUNTEERS BEING TRAINED

Clean Stream Team

We've also developed a new approach for dealing with urban pollution – we've formed the 'Clean Stream Team'. This is made up of representatives from the Environment Agency, Severn Trent Water with support from Telford & Wrekin Council and Shropshire Wildlife Trust.

By using shared knowledge, experience and equipment the 'Clean Stream Team' work together in the town to resolve pollution issues identified by the community as well as proactively seeking out and resolving problems themselves.

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Blue Business Awards and community advice

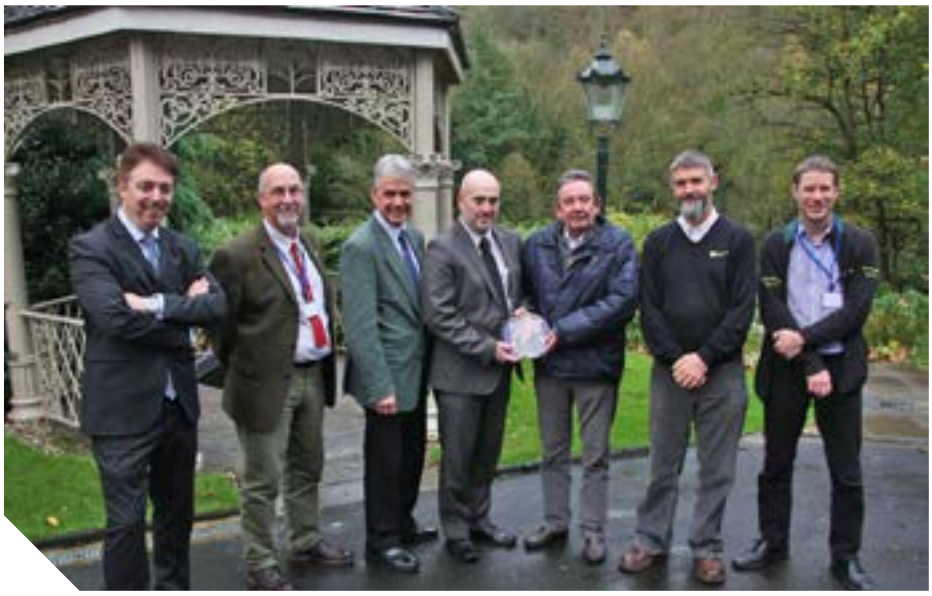
We have worked closely with Telford's business community and have created the Blue Business Awards, recognising and celebrating those businesses that excel in pollution prevention management and water efficiency.

We work with the local community in Telford providing them with advice and guidance on how they can help improve their watercourses in the town.

River Rangers programme in local schools

Last but not least, we have identified schools for our River Rangers programme. The aim of which is to raise awareness about the environment and water quality amongst schoolchildren. We go into the schools for one session a week over six weeks and the children complete a water audit of their school, dip their local watercourses to see what lives in it, learn about pollution and how it can affect what lives in the watercourse and finally the kids build a mini Sustainable Drainage System (SUDS) in their school at the end of the programme. The River Ranger School Education Programme is available for anyone to use via Shropshire Wildlife Trust's website who have developed it.

As a partnership we have also made a number of physical improvements to watercourses and their catchments in the town to complement our extensive community engagement programme.



WINNERS OF LOVE YOUR RIVER TELFORD'S BLUE BUSINESS AWARDS

SCHOOL CHILDREN IN A TELFORD SCHOOL BUILD THEIR OWN SUSTAINABLE DRAINAGE SYSTEM

HIGHWAY SUDS SCHEME

GREEN BARRIER TO PROTECT A WATERCOURSE

WET WOODLANDS CREATED AS PART OF DECULVERTING A LOCAL STREAM

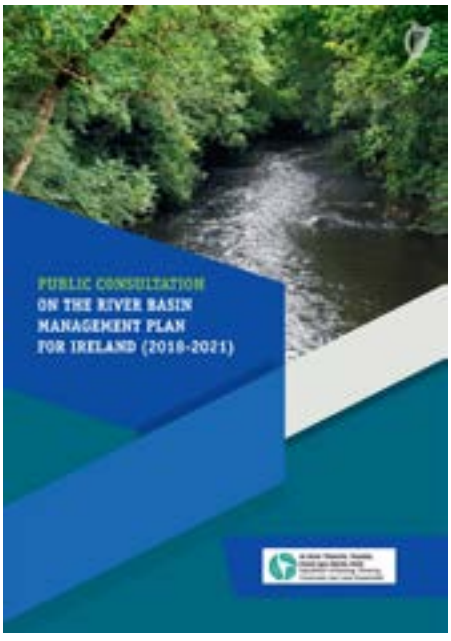
Together we have; installed Sustainable Urban Drainage Systems (SUDS), brought watercourses back to the surface through de-culverting, enhanced and created wetland habitats by installing woody debris and removed impermeable surfaces replacing them with rain gardens. Twelve different organisations have helped steer the project and collaboratively we have not only improved the water quality in the town's watercourses but also realised a whole range of multiple benefits for the town's people and environment, including significant cost savings as a result of everyone working efficiently together.

Guy Pluckwell, UK Environment Agency

Public Consultation on the draft River Basin Management Plan

The overarching aim of the Water Framework Directive is to achieve at least good status for all water bodies. It aims to do so by ensuring effective water management based on river basins and catchments. Whilst this requires Government to devise and implement plans and programmes, it also requires all agencies and actors to work together, and the further development of a wider public engagement in water policy and water management.

A central element of the Directive is the requirement for member states to produce River Basin Management Plans. These plans must, amongst other things, assess the environmental pressures causing water bodies to be at risk of not meeting the objectives of the Directive, for example, pressures causing water bodies to be at less than good status. Based on this assessment a programme of measures must be developed to address the significant pressures on such water bodies.



The Directive sets out 6 yearly planning cycles. Ireland's first cycle plan covered the period 2009-2015, and a draft second cycle River Basin Management Plan has recently been published for public consultation. As required, this draft plan provides an assessment of the pressures on the water environment in Ireland, and the proposed programme of measures to be implemented in the period to 2021. The plan identifies prioritised objectives, including meeting our EU obligations, preventing deterioration of water bodies, and achieving protected area and high status water body objectives. Based on these significant pressures and the prioritised objectives, proposed measures are set out for each of the identified significant pressures including agriculture, waste water, hydromorphology, forestry and peat extraction. Proposed implementation structures, and planned actions for communication and public engagement are also set out.

Measures

The types of measures outlined in the draft plan fall into two broad categories. Firstly, those high level measures to be implemented by national authorities, for example, ensuring effective waste water treatment is in place and ensuring appropriate application of EU regulations in sectors such as agriculture and forestry. It is envisaged such plans and programmes will result in significant progress during the second cycle in terms of managing pressures on the water environment.

Secondly, there are supporting measures, which are required where these high level measures have been implemented, but are not sufficient to ensure good water quality in specific areas. The draft plan envisages that local authorities will lead in terms of decision making and managing implementation of these supporting measures, supported by the expertise and evidence base of the EPA. However, the plan also recognises the need for stakeholders including local authorities, public authorities, non-governmental organisations and communities to cooperate and work together to achieve common goals. The Local Authority Waters and Communities Office will have a vital role in making such co-operation a reality on the ground – as will the continued work of the EPA in developing networks and engagement on water quality issues.

Public Consultation and Engagement

There has already been significant consultation with stakeholders including environmental organisations in terms of developing this draft plan and the proposed programme of measures. Further engagement with stakeholders will be central to developing the final plan. We hope that the consultation process will also provide an opportunity for wider engagement with water management issues, and that individuals, community groups and schools can engage with the plan and inform us as to how the plan can be improved, and how we can better facilitate their engagement in the implementation of this plan and the objective of improving the water environment.

The full draft plan and details on how to engage in the consultation process are available online. Whilst the consultation is open for 6 months, until the end of August 2017, we would encourage early submissions to allow us to consider how the final plan can best reflect the input of interested parties.

http://www.housing.gov.ie/water/water-quality/river-basin-management-plans/public-consultation-draft-river-basin-management

Ken Jordan, Department of Housing, Planning, Community and Local Government

The Local Authority Waters and Communities Office (LAWCO) - promoting public participation in river basin planning.

The Waters and Communities Office was set up to engage local communities and promote public participation in the management of our natural waters. Over the past six months Community Water Officers have been actively engaging with community groups right across the country to provide information, technical advice and funding support in relation to local water quality initiatives.

Local Community Water Officers have found that public engagement on water quality requires an open approach where the opinions of the local communities are valued. In this way, local knowledge can be combined with specialist expertise to create a better understanding of what is happening to our waterbodies, right across the country.

Piloting the new approach - what does your river mean to you?

Such an approach was recently adopted in the River Suir catchment where a total of 16 public meetings were held in locations across the four counties of Tipperary, Waterford, Kilkenny and Wexford. What initially started out as a series of 6 meetings to compliment the Office of Public Works CFRAMS consultations, soon resulted in more meetings across the Suir catchment in response to interest and demand from other communities.

These meetings extended from source to sea across the entire catchment, mobilising a turnout of over 400 people from a diverse range of experience.

The meetings maintained a local focus by asking the question "What does the River Suir and its tributaries mean to you?", people connected with this idea and there was a clear understanding of the purpose and context of the exercise. A more detailed article on this will follow in the next edition of this newsletter.

Similar turnouts have been recorded at public meetings in other parts of the country, for example the River Moy, Inishowen peninsula, River Funshion and Dundalk Bay catchment. This shows that people want active engagement and an opportunity to raise issues associated with their local waters.

Creating better public engagement on Water – a National Water Forum

The recently published draft River Basin Management Plan (RBMP) has a specific focus on improving public engagement on water. It recognises that raising public awareness of water as an environmental, social and economic resource is essential if we are to improve how we manage this valuable resource. Meaningful public and stakeholder engagement on the draft RBMP, on its implementation and on other water issues is vital to achieving our environmental objectives.

The draft Plan, therefore, commits to the establishment of a National Water Forum to facilitate stakeholder engagement on all water issues. It is planned to establish this Forum before Summer 2017 and that it will consider, amongst other things:

- Water as a resource;
- Issues of water quality;
- Rural water issues;
- Issues affecting customers of Irish Water; and
- Implementation of the Water Framework Directive.

The forum will determine its own work programme and will provide independent commentary and policy advice on such issues to the Minister for Housing, Planning, Community and Local Government. The Department is committed to providing staffing and other resources to this new Forum to enable it to operate independently.

In the short term, the Forum will be established on an administrative basis, drawing on the membership of both the existing Public Water Forum and the National Rural Water Services Committee. It will also bring in new members to ensure that all key interested sectors are represented. The Local Authority Waters and Communities Office has been asked to provide secretarial support to the new Forum and it is hoped to convene a first meeting of the new body by May 2017.

FRAN IGOE, REGIONAL COORDINATOR LISTENS CAREFULLY TO OPINIONS CONCERNING THE RIVER SUIR FROM MEMBERS OF THE LOCAL COMMUNITY IN CAHIR, CO. TIPPERARY.

Public Consultation on the draft River Basin Management Plan

The draft River Basin Management Plan is now open for public consultation for a period of six months up to August 31st. This provides an opportunity for local communities, Non-governmental organisations (NGOs) , public bodies and other stakeholders to make submissions on water quality issues.

The Waters and Communities Office will undertake a series of public meetings across the entire country over the coming months to provide clear information and consultation on the significance of the River Basin Management Plan and how local communities can play a big part in future decision making.

Once available, details of these meetings will be advertised locally and on www.watersandcommunities.ie

Alan Walsh, Local Authority Waters and Communities Office

Dr Tom Collins

Dr Tom Collins, current chairperson of the Public Water Forum, has agreed to chair this new Forum which will, in the longer term, eventually replace the two existing bodies referred to above. All going well, a report on the first meeting of the National Water Forum will be featured in the next newsletter.

In the longer term, it is intended to enact legislation to establish the National Water Forum on a legal basis. Proceeding now on an administrative basis means we can figure out the very best long-term model for the Forum and learn collectively as we go along.

Also taking place in May, in Farmleigh House in the Phoenix Park, will be a draft RBMP stakeholder public consultation workshop. This will be a follow-on to previous workshops that were held as part of the development process for the draft RBMP and we hope that it will assist organisations to input to the public consultation process. The Department is also developing a public engagement strategy to facilitate individual and community-level interaction with the draft RBMP.

Cian Ó Lionáin, Water Quality Section, Department of Housing, Planning, Community & Local Government

Meet the Waters and Communities Office

Border Region

Bernie O'Flaherty

Regional Coordinator - Border Region

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Earliest Childhood Memory of Water:

I was reared on a farm bounded by a stream, the Liffey, and the Grand Canal, and in the pre-daytime TV years play time was very much outdoors. I remember fishing for pinkeens and frog spawn with jam jars, damming the stream and canal bank walks. I still remember 4th class in Nass where Sister Bosco taught us Patrick Kavanagh's beautiful poem Canal Bank Walk.

Why I wanted to work with Waters and Communities:

I found the new approach to water management to be a very exciting and a common sense approach. I enjoy a challenge and working with people and saw this job as a great opportunity to put my 30 years' experience to good use.

Bernie has an MSc and has studied at UCD, Sligo IT and UU. After a short period with private industry, Bernie worked with Monaghan County Council's Water & Environment Sections. Bernie headed up the Water Team and over the years saw a substantial increase in environmental regulations without the necessary awareness raising or engagement initiatives. After 2003, Monaghan introduced a new approach, combining regulation with an awareness and engagement programme. Work in water management in Monaghan with its intensive agriculture, drumlins and heavy soils, was never easy or dull but thanks to the dedicated water team & colleagues was always rewarding.

Jimmy Mc Veigh

Community Water Officer - Donegal

Mob: 085 8085603
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Earliest Childhood Memory of Water:

I always seemed to be on, beside or in the water growing up, be it at the coast in Donegal or Lough Erne. I have fond memories of spending many hours learning to skim stones under blue skies.

Why I wanted to be a Community Water Officer:

Water connects all our communities, big and small, upstream and downstream, and everyone has a part to play in the enhancement, protection and enjoyment of our waters.

The role of a Community Water Officer allows me to facilitate these connections, promote community environmental projects, education and promote the protection of our waters at a grassroots level.

Jimmy has worked as a marine wildlife guide and has experience of delivering community-led environmental management projects. Jimmy also has a wealth of experience and skills in environmental education, having worked on the Green-Schools; Clean Coasts and Blue Flag Programmes previously. Jimmy holds an Honours Degree in Zoology and has completed PG Diploma in Integrated Coastal Management. Jimmy's interests include boats, islands, mountains, climbing, wildlife, sea fishing and cycling.

Gretta Mc Carron

Community Water Officer - Louth, Monaghan and Cavan

Mobile: 085 808 5756
Email: gmccarron@lawco.ie

Earliest Childhood Memory of Water:

Disturbing the dust that had collected on the surface of water in a barrel.

Why I wanted to be a Community Water Officer:

After working in education, teaching teachers, children and young people to explore the wonders of nature and our natural heritage; having an opportunity to work with adults to promote the protection of our water and natural heritage for future generations seemed the perfect next step.

Since graduating in Earth Sciences, Gretta has worked primarily in environmental education. She taught children to record water quality in their local streams in the Vital signs project and developed Discover Primary Science programmes for the Ballybay Wetlands Centre. Training teachers to survey nature with school children was an important part of her work at the OPAL project at Queen's University, Belfast. Gretta enjoys gardening and hill walking.

Karen Kennedy

Community Water Officer - Sligo, Leitrim, West Cavan and Longford

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Earliest Childhood Memory of Water:

Paddling in a small stream near my home in Sligo on a hot summer's day appreciating the cool water against my feet, the dappled shade of the trees, exploring the wonders of the rock pools followed by a picnic on the bank with family members...a perfect day.

Why I wanted to be a Community Water Officer:

I believe our environment is very much dependent on nurturing sustainable communities. I am excited and fortunate to have the opportunity to work alongside local communities to protect and improve our water environment which is essential for our social, environmental and economic well-being.

Karen has experience of working in industry, rural development and higher education. She is very interested in sustainable community development and lifelong learning and has been an active volunteer for many years. Karen holds a BSc in Environmental Science & Technology, a Post Graduate Diploma in Education for Sustainability, and a MSc in Rural Development.

Mid Region

Ray Spain

Regional Coordinator -Mid Region

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Earliest Childhood Memory of Water:

When the sun seemed to shine all summer long, all us kids in the street coming home from school and racing up to the river to swim. This always seemed to be accompanied by our mothers bringing a picnic as well.

Why I wanted to work with Waters and Communities:

I have seen far more accomplished by people & communities volunteering and being proactive in the environmental arena, as opposed to being reactive to the imposition of legislation or regulation.

Ray has an M.Sc. in Environmental Science and over 30 years' experience in the environment and water area, having started with Offaly County Council in 1981. Before commencing with the Waters & Communities Office Ray spent 10 years as manager with the South Eastern River Basin District. Over the past number of years, Ray has led, on behalf of the local authority sector, on the development & establishment of the Waters & Communities Office.

Mick Kane

Community Water Officer - Mayo / Mid and North Roscommon.

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Earliest Childhood Memory of Water:

My father was a keen fisherman. I remember travelling the rivers and lakes of Carrickmacross in Monaghan watching him fish for trout. He taught me to fish on the River Fein and the water has always been a huge part of my life ever since. I spent my youth cycling with friends for miles every day with rods, bags and lunch to the next lake or river.

Why I wanted to be a Community Water Officer:

I am passionate about nature and our environment. The role of Community Water Officer allows me to help promote our waters and to encourage communities and individuals to get involved in our rivers, lakes and sea on how to enjoy and protect them for future generations.

Mick has worked in the community sector for many years with a focus on recreation and tourism. He has also worked in the outdoor education sector for several years and is a keen surfer, hill walker and paddler. He is actively involved with community led projects locally and has a passion for wildlife and for protecting Ireland's natural environment. Mick lives on beautiful Achill Island with his wife and four children, all of which share his love of the outdoors and nature.

Aoife McGrath

Community Water Officer - Meath and Kildare

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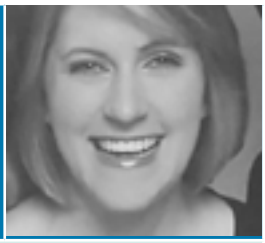

Earliest Childhood Memory of Water:

Making sand castles with my family on Duncannon Beach and getting dunked in the water by my Dad on a rare sunny summers day in Ireland!

Why I wanted to be a Community Water Officer:

I have a passion for the environment and the health and vitality of our communities. I wanted to become a Community Water Officer because I love working alongside members of the community, supporting them and offering them guidance and opportunities to initiate change and make improvements to our environment and our wellbeing. I couldn't wish for a better job!

Aoife has extensive community development experience and has worked previously on the LEADER programme in County Meath. Aoife also has experience in Planning and Development and has previously project managed Irish Water's First Fix Scheme. Aoife enjoys playing team sports – especially ladies soccer. Aoife is also an avid outdoor pursuits enthusiast and loves partaking in adrenaline-filled activities – skydiving in particular!

Catherine Seale

Community Water Officer - Galway and South Roscommon

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Earliest Childhood Memory of Water:

Wearing a pink dress with elephants on it, and washing my feet in a basin outside my granny's house before going into visit my new baby sister Agnes, in the Regional Hospital, Galway. Granny was old school and didn't have running water in the house.

Why I wanted to be a Community Water Officer:

A friend of mine, showed me the advert for the Community Water Officer and I instantly knew that it was my dream job. The role is a combination of all my favourite things: being outside, getting to meet new people and most importantly learning how we all as a community can take better care of our natural waters.

From Woodlawn in East Galway, Catherine was from an early age fascinated with nature. Indeed, a National School teacher once remarked that her most likely future profession was as a beach comber. Catherine has worked in the area of community engagement since 2009. Firstly, as an education guide at Ballycroy National Park, Co. Mayo and more recently as a PhD researcher with The Open University and Teagasc in Athenry, Co. Galway.

Basil Mannion

Community Water Officer - Offaly, Westmeath & Laois

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Earliest Childhood Memory of Water:

Saving hay with my dad and brother and sisters along the Shannon Callows overlooking the waters and rushes of Lough Ree.

Why I wanted to be a Community Water Officer:

I have a passion for working with people, communities and the outdoors and being a community water office allows me to combine all three.

Basil has previously worked for Offaly and Westmeath Local Authorities and Bord na Móna Environmental Ltd. Basil has experience in all aspects of Environment (Water & Waste Management in particular), Planning (Domestic Wastewater Treatment) & Municipal Waste Water Services. Basil has a BSc in Environmental Science & Post Graduate Diplomas in Environmental Engineering & Energy Management. Basil is very active in his local GAA community and enjoys cycling, running and many other outdoors activities.

Sinéad Hurson

Community Water Officer - Dublin & Wicklow

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Earliest Childhood Memory of Water:

Paddling and trying to fish in the Dromore River near my Grandmother's house during hot summer days with my younger cousin. We were totally confident that we'd catch a fish with our handmade fishing rods which consisted of sticks, some thin rope and a worm. We never did catch anything surprisingly enough but it didn't stop us trying!

Why I wanted to be a Community Water Officer:

I felt this was a fantastic opportunity to work with people in the community who valued the environment around them, to facilitate the great work that is being done and to encourage everyone to get involved to protect and improve their water environment for this generation and future generations through active involvement in all steps of the process.

Sinead has been working within the Environment Sector in the areas of Water Quality, Pollution and Waste Management for over 9 years. She has worked in Monaghan County Council, the Northern Ireland Environment Agency (NIEA) and most recently with the Scottish Environment Protection Agency (SEPA). She holds a BSc in Analytical Science and a Post Graduate Diploma in Environmental Protection.

Southern Region

Fran Igoe

Regional Cooridnator – Southern Region

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Earliest Childhood Memory of Water:

Earliest child hood memory of water would be bobbing for apples at Halloween. However, the most influential memory was at the age of 9, looking over the small bridge on the old main road out of Wexford town with my mother, watching trout flash and glisten in the sun as they chased food in Mrs Malone's pool on Carrig River beside Crosbies Garage. It wasn't long after that I caught my first trout on my brothers Green Shield stamp fishing rod with my sister Aine in the same pool.

Why I wanted to work with Waters and Communities:

To me Integrated Catchment Management always made sense. In my experience people and especially the public are so often not involved in many worthwhile river restoration projects or in important decisions around water leading to poorer outcomes. So when the opportunity arose to work with Communities and Waters, it was a no brainer. Integrating catchment based work with the people who live there surely has to be the way to go, to ensure sustainable communities and the waters they depend on, including the associated habitats, wildlife, amenities, fisheries etc. into the future.

Fran graduated with a PhD from UCD. He worked with Inland Fisheries Ireland for fifteen years. Fran has led on the development of three EU LIFE projects (MulkearLIFE, DuhallowLIFE and RaptorLIFE), managing the latter two projects with rural development company IRD Duhallow.

He set up the River Allow Catchment Management Group in partnership with the TRAP project (EU INTERREG IV) and Mary Immaculate College (UL) and supervised the EPA Research project Delivering integrated water resource management through the bottom up approach: A critical analysis which aimed to help develop a bottom-up approach to Integrated Catchment Management in Ireland, in line with Water Framework Directive objectives. Fran has a particular interest in river ecology and landscape management. He wrote Inland Fisheries Ireland's guideline "Planning for watercourses in urban environments". Fran also works in a voluntary capacity to promote the sustainable use and conservation of our water. He also believes that although all rivers were created equal, some were created more equal than others...

Bláithín Ní Ainín

Community Water Officer - Kerry

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Earliest Childhood Memory of Water:

Learning to swim on Béal Bán beach in West Kerry, floating along with my mother holding both my hands as I kicked and how happy and proud I was to be swimming. I also distinctly remember my first time in a river, swimming in the River Lee at Inchigeelagh with my mother while my dad was working, the strangeness of the ground under my feet and how beautiful but different it was to being in the sea.

Why I wanted to be a Community Water Officer:

Whilst working in Australia talking to people about their waterways and what vision they had for the future, I couldn't stop thinking about Ireland and how passionately I wanted to be working with my own community, to be part of this movement to improve Irish waterways, for my own children to enjoy. Water is essential in our daily lives and in Ireland it has enormous significance in our folklore and history. I would love to see the references to our ancient waterways to continue to have meaning, that we will always see the salmon and the otter where we did in tales of old.

Bláithín has been involved with catchment management in Australia, working with regional communities to develop regional catchment and waterway strategies. She has also conducted research on the effects of nutrient enrichment on Irish lakes and overgrazing on streams. She has a PhD in Freshwater Ecology and a Masters in Environmental Science. Bláithín loves being outdoors, hiking, running, swimming and surfing (badly).

Ruairí Ó Conchúir

Community Water Officer - covering Clare, Limerick & North Tipperary

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Earliest Childhood Memory of Water:

Summer holidays and fishing in my father's boat off Minard Head in West Kerry and distributing glistening mackerel to cousins and neighbours. Playing in the sea and on the beautiful hidden gem of Minard beach with its enormous rounded storm boulders. Jumping the stepping stones across the tiny coastal stream which flows down from Baile na Saor, dividing the beach and the ruins of Minard Castle. Walking beyond the castle to St. John's Well to collect blackberries and to look out across the shimmering waters of Dingle Bay to the majestic Reeks.

Why I wanted to be a Community Water Officer:

My work experience from Southern Africa, West Clare, the Burren and the Mulkear has clearly indicated to me that real and active community engagement, with meaningful involvement in the planning and implementation of localised projects, is the way forward. The Local Authority Waters and Communities Office offers considerable potential to develop a new approach to community based catchment management where such community involvement will be real, engaged, valued and respected.

Ruairí has worked for more than 25 years in agriculture, conservation and community based natural resource management. He holds an MSc and a range of postgraduate qualifications. Having spent a decade in Africa, working mostly in land reform and conservation farming, he returned to Ireland in 2001. Since then he has worked largely in conservation, including 5 years with BurrenLIFE – Farming for Conservation in the Burren and 5.5 years managing MulkearLIFE, an EU funded LIFE project focused on integrated catchment management on the Lower Shannon SAC. He lives in the Burren, has a keen interest in environmental education and is a Leave No Trace advanced trainer.

Kieran Murphy

Community Water Officer - Cork and South Tipperary

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Email: kmurphy@lawco.ie

Earliest Childhood Memory of Water:

My earliest memory of water is my father telling me about the Owentaraglin River, a tributary of the Blackwater in north Cork, and how the same river ran through the villages of Kiskeam and Cullen (where I lived), connecting the two. When he wasn't selling fishing tackle from his pub, he was out on the river, known locally as the Araglin, catching trout and bringing the bigger catches home for dinner.

Why I wanted to be a Community Water Officer:

I wanted to be a Community Water Officer to help communities find the ways and means of reconnecting with our natural waters and improving and protecting them for future generations.

Kieran was previously project scientist on the IRD Duhallow LIFE Project in north Cork. This provided Kieran with years of experience in Special Area of Conservation and river catchment management, ecological surveys (including Freshwater Pearl Mussel), habitat restoration and public engagement. Kieran holds a BSc in Wildlife Biology.

Ann Phelan

Community Water Officer - Kilkenny, Waterford and Wexford.

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Earliest Childhood Memory of Water:

Working in a hot urban environment, wishing to be beside the river to dive in and watch the sun create diamonds on the crest of the rivers gentle waves, experiencing the freedom that swimming in a river gives you.

Why I wanted to be a Community Water Officer:

Coming from a local authority background I realised the precious resource that water is, and the relationship we have with water in our daily lives, and living on the River Barrow I understand how important it is for recreation, amenity, economic benefit and also wellbeing. I have also been involved with all of the communities along the River, through festivals, regattas, rowing clubs, Tidy Towns, in some ways I feel the job was created with me in mind.

Ann was previously a public representative at both local and national level. Her role involved rural economic development and community. She has a wealth of experience in water services, planning, community development, communications, heritage and conservation. Ann chaired the National Rural Water Services Committee and worked in conjunction with the National Federation of Group Water Schemes. Ann is based in Kilkenny County Council and covers the counties of Carlow, Kilkenny, Waterford and Wexford.

Waters & Community Headquarters, Clonmel

Matt Shortt

Project Leader

Matt Shortt is a Director of Services with Tipperary County Council and has worked in all the regulatory, enterprise and service delivery areas of Local Government including: Roads, Water Services, Environment, Housing, Planning and Community and Enterprise.

Carol McCarthy

Earliest Childhood Memory of Water:

My dad teaching me how to swim at the beach in Rush

Carol is Acting Senior Engineer with Kilkenny County Council and has worked in several service delivery areas, including the Environment Section since 2001. Her responsibilities there include implementation of the River Basin Management Plan in Co. Kilkenny through the Local Authority's programme of measures.

NEWS AND ARTICLES

Alan Walsh
Communications
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Earliest Childhood Memory of Water:

Growing up in Dungarvan, much of my childhood was spent swimming in the sea or adventuring along the coastline, building rafts or jumping 'the cuts' as they were known. Our town had an outdoor swimming pool that was routinely filled with seawater as the tide came in. From a young age I spent many a summer's day swimming and jumping into that pool. Little did I realise at the time, that sewage and industrial effluent from the town flowed freely into the bay, not that far from our prized outdoor swimming pool. The entire harbour is in a much healthier state today.

Why I wanted to work with Waters and Communities:

Having enjoyed the experience of working with local communities connected with the RIver Suir I was keen to continue working in this area. LAWCO presented an opportunity for this promoting the collaboration of Local Authorities and local communities. Public participation in decision and policy making has always been of particular interest to me.

Alan has worked for Tipperary County Council in the Planning, Water Services and Roads sections. He was also a coordinator on an INTERREG Co-funded project which focused on the development of the River Suir for the benefit of local communities. Prior to this, he worked with the National Roads Authority and in the private sector in road construction. Alan enjoys kayaking and sea fishing. He is a firm believer in lifelong learning and is currently undertaking a Masters in Government and Public Policy at University College Cork. He is also an avid Toastmaster.

Michael Pollard
Technology and Administration
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Earliest Childhood Memory of Water:

Standing in a small pool on the Suir one hot summer's day with my mother and brother, bawling for her to take me out.

Why I wanted to work with Waters and Communities:

Having come from a farming community I have always had an affection for nature so I jumped at the chance to work with the Waters and Communities office. I live beside the River Suir, and have spent my younger days fishing and swimming in the river and spent many summers sailing around the coast in Waterford and Wexford. I firmly believe that citizen participation at a local level can deliver real outcomes for local communities. I also believe that, state agencies in collaboration with Non-Governmental organisations, voluntary organisations, private sector and communities can successfully deliver the changes required to achieve healthier waters for future generations. Working with LAWCO gives me the opportunity to be a part of that process.

Michael has worked in IT since leaving Waterford IT 20 years ago. He began his career in the private sector before joining the South Eastern Health Board in Kilkenny as a systems analyst. From there he moved to Tipperary where he worked in IT Networks in Clonmel and more recently in Nenagh after the merger of North and South Tipperary. Michael has a BBS (Hons) in Information Systems Management, a Post Grad in Public Management and is currently completing his thesis for a Masters in Local Government Management. In his spare time he enjoys mountain biking and sailing and has been known to tread the boards as both a director and actor with many drama groups in the south east.

Sheevaun Thompson
Funding
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Earliest Childhood Memory of Water:

Hailing from an inland county it has to be the hour long drive to the coast and spending all day in and out of the sea.

Why I wanted to work with Waters and Communities:

I was looking for a new work adventure. Having worked in the Community and Economic Development section of Tipperary County Council I fully appreciate the importance of community engagement and involvement. I had previously gained 12 years' experience in a regional body and understand the need to work collaboratively with other agencies and stakeholders. When North and South Tipperary merged in 2014 I took over the project management of the TRAP project (Territories of Rivers Action Plans - EU INTERREG IVC) and saw it out to completion. This gave me a flavour of times to come!

Sheevaun has several years of experience gained applying for and delivering on EU funded projects from across a wide spectrum of funding streams from previous employment with Tipperary County Council and the South-East Regional Authority. Sheevaun holds a BA in Public Administration, a Graduate Diploma in Business Administration, and an MA in Public Management. She enjoys playing tennis, hill walking, running and the outdoor life in general.

For further information see www.watersandcommunities.ie

You can also download the Waters and Communities 'Working Together' booklet - http://bit.ly/lawcoworkingtogether

MulkearLIFE - delivering catchment scale river restoration to support the Water Framework Directive in Ireland

MulkearLIFE (www.mulkearlife.com) was a 5½ year, partnership based, integrated catchment management project that focussed on the Mulkear River catchment.

The project was co-funded by the EU LIFE programme with a €1.75 million budget and Inland Fisheries Ireland (IFI) as lead partner, working with Limerick City & County Council and the Office of Public Works (OPW). Significant additional funding came from the National Parks and Wildlife Service. The project ran from 2009 to 2015 covering the entire Mulkear Catchment, comprising an area of some 650km², which forms part of the Lower Shannon Special Area of Conservation, across counties Limerick and Tipperary. The main project objective was to restore degraded habitats along stretches of the Mulkear River and its main tributaries through in-stream rehabilitation works, – this included: the Newport, Bilboa, Dead, Clare-Annagh and Killeengarriff rivers. Project actions were also focused on improving water quality on a number of selected farms. While the key target species were Atlantic salmon, sea lamprey and otter, the project actions benefited a wide range of other fish species, invertebrates, birds and mammals by creating habitat complexity and enhancing the overall biodiversity of the area while improving local community awareness of the importance of healthy freshwater eco-systems.

BIG FREEZE ON THE MULKEAR RIVER

MULKEARLIFE – BUILDING LOCAL PARTNERSHIPS

Degradation and loss of instream habitat, due to river drainage works dating back to 1874, had a negative impact on MulkearLIFE's target species. Such drainage schemes, both recent and historic, prevented rivers from recovering to a more natural state. Consequently, MulkearLIFE implemented various habitat rehabilitation techniques to mimic natural conditions and create habitat complexity. These techniques included the installation of rubble mats, random boulders, paired deflectors and vortex stone weirs and helped to break-up uniform habitat of river channels. Rubble mats, when introduced to rivers that have been subjected to past drainage work, essentially mimic natural riffle areas, which were present pre-drainage.

CONSTRUCTION OF A RUBBLE MAT, AUGUST 2013

The construction of a rubble mat, which on the Mulkear utilised an average of 250 tonne of rock per mat, with rocks ranging from 15 to 25cm in diameter, creates an interlocking cobble type base which reduces the cross-sectional area of the river and increases flow velocities at low summer flows. This resulted in important ecological changes. The faster flowing area on top of the rubble bed is quickly colonised by aquatic vegetation. A considerable variety of invertebrates favour such conditions and colonise the rubble mat in significant numbers. This level of colonisation happened very rapidly (within months). More importantly, the fast flowing nature of the water over the rubble mat provides exceptional habitat for young salmon and trout. With invertebrate colonisation having taken place ample food supplies are provided for such fish. MulkearLIFE installed 28 rubble mats on 10 km of the Mulkear River, utilising well over 5,000 tonne of rock. This work enhanced habitat for salmonids and lamprey species and improved instream and riparian biodiversity. The project also enhanced over 15km of river channel through other instream measures (random boulders, vortex and stone weirs) on the Clare-Annagh, Killeengarriff, Bilboa and Newport rivers, using over 1,500 tonne of rock, with individual random boulders weight of between 1 and 3 tonne.

PARTIAL REMOVAL OF BALLYCLOGH WEIR AND SEA LAMPREY ON A ROCK

To improve the distribution of sea lamprey in the catchment, MulkearLIFE addressed barriers to upstream migration. The sea lamprey population on the Lower Shannon SAC and the Mulkear River is of national importance, but a number of old mill weirs had prevented sea lamprey from fully utilising the catchment. Passage had been monitored by MulkearLIFE through tagging and radio tracking to determine how sea lamprey navigate in-stream obstacles, which habitat they use and their preferred spawning zones. In 2011, MulkearLIFE designed, manufactured and successfully installed fish passes to assist sea lamprey ascend major barriers at Annacotty and Ballyclogh weirs on the Lower Mulkear River, which greatly facilitated passage. From 2011 to 2014 over 93% of sea lamprey passage at Annacotty weir was achieved on MulkearLIFE's new sea lamprey tiles, but problems with passage persisted at Ballyclogh weir until August 2013. Following 15 months of planning and consultation, MulkearLIFE removed a significant section of Ballyclogh weir which was a barrier to salmonid and sea lamprey passage. The reconfigured weir now allowed unhindered passage to the rest of the catchment, with an additional 184kms of river channel opened for sea lamprey. The completion of this work was particularly beneficial for spawning sea lamprey. Research from 2012 to 2014 noted that the total number of sea lamprey

redds recorded in walkover surveys increased from 55 in 2012, 85 in 2013 to 296 redds recorded in 2014 with Ballyclogh weir removed as a barrier. A new set of the tiles were fitted by IFI staff to Annacotty weir in 2016 and sea lamprey passage was once more facilitated and greatly enhanced.

The Mulkear catchment has a good population of otter. In certain areas where otter numbers were low, the project worked to improve breeding and resting habitats. Otter survey work was a critical element of this work. MulkearLIFE conducted five annual catchment wide otter surveys. Based on the findings of these surveys artificial otter holts were installed at sites considered necessary, two of which had been utilised as of June 2015. The project also improved otter habitat through extensive tree planting, enhancing river connectivity and installing artificial otter holts at selected sites, including old oxbow lakes. Such sites had been degraded in past historical drainage programmes.

The Mulkear catchment has a number of non-native invasive plant species that impact negatively on the catchment. The riparian zone is the interface between the land and the watercourse. It is important as a food source and for the provision of cover for young salmon. Native vegetation improves bank function by protecting banks from erosion during flood conditions while invasive weeds lead to riverbank instability, erosion and siltation of gravel beds used by salmon for spawning. Large invasive plants, such as Giant hogweed, Japanese knotweed and Himalayan balsam, reduce biodiversity by out-shading native plant species. From 2010 to 2015, MulkearLIFE and its project partners, the OPW and Limerick City and County Council, treated in excess of 200km of river channel for non-native invasives. This work is ongoing and is primarily focused on giant hogweed, Japanese knotweed and Himalayan balsam, with the emphasis on the control and management of these and related invasives.

MULKEAR CONSERVATION VOLUNTEERS RIPARIAN MANAGEMENT WORK

One of many project highlights, was the establishment of the first ever catchment based conservation volunteers. The Mulkear Conservation Volunteers (MCV) undertook on a voluntary basis, practical river based conservation activities. Over the project duration, the MCV undertook 48 outings (amounting to over 1,120 unit days) improving habitat and enhancing local biodiversity. This included the manual removal of Himalayan balsam at high amenity value sites and other non-native invasive species from various High Nature Value sites throughout the catchment. Other work included installation of otter holts, habitat creation and tree planting, river clean-ups, erecting bird boxes, particularly dipper boxes underneath bridges. The MCV also undertook a number of citizen science initiatives including extensive otter survey work.

FARMER TRAINING IN RIPARIAN MANAGEMENT

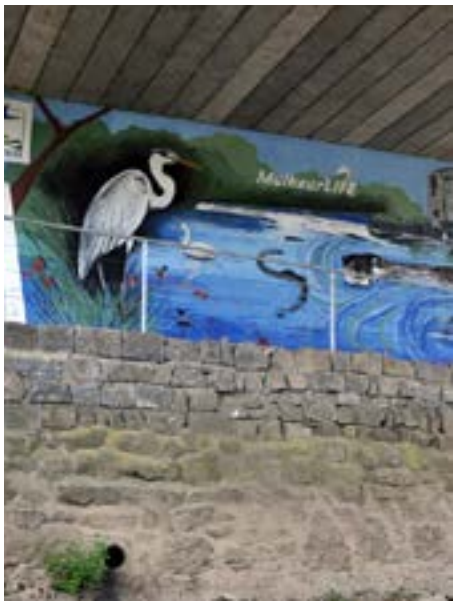
LOCAL FARMER PADDY O'DWYER INSPECTS A NEW WATER TROUGH

MulkearLIFE also worked closely with the local farming community to address local water quality concerns and developed alternative watering solutions for livestock with direct river access, including the widespread provision of new water troughs and pasture pumps away from rivers. It established 12 'pilot learning sites' on farms with extensive river frontage. These farms acted as 'demonstration sites' for other farmers and farm planners.

SCHOOL FIELD TRIP ON THE BILBOA RIVER, AND WORLD FISH MIGRATION DAY ON THE MULKEAR RIVER

One of the most enjoyable and rewarding aspects of MulkearLIFE's work related to the comprehensive Environmental Educational Programme in local schools and within the wider community. A total of 74 school field trips were completed as part of the project's programme. It involved classroom engagements and separate half-day river based field trips, which included kick-sampling, macro-invertebrate identification, electro-fishing, walkover survey work and fish life-cycles. Additionally, MulkearLIFE conducted field-trips and training workshops for over 360 adults. This outreach work in local schools and within the local community is something the project and its partners were immensely proud of. Over 2,000 young adults and children living in the Mulkear catchment now have an enhanced understanding of water quality and their local rivers, riparian habitats and the importance of river connectivity and wildlife corridors. They also have a better understanding of biodiversity and water quality across the entire catchment, the major threat of non-native invasive plant species and a practical appreciation of the seven principles of Leave No Trace. As MulkearLIFE's work ended, the project partners were confident that these young people would continue to act as guardians of the Mulkear catchment and the Lower Shannon SAC as a result of their experiences.

MulkearLIFE reported to the EU in May 2015 and an After-LIFE conservation plan is now in place. The various project partners will continue to implement elements of the project's work in the Mulkear catchment over the next 5 years. Work of this nature will be supported by the new Local Authorities Waters and Communities Office (LAWCO) over the next number of years to promote public awareness, participation and knowledge sharing in the development and implementation of Ireland's new River Basin Management Plan and Programme of Measures.



ECOSYSTEM SERVICES MURAL OF LIFE

Ruairí Ó Conchúir, Community Water Officer, and formerly MulkearLIFE Project Manager

WWW.MULKEARLIFE.COM

ALL PHOTOS BY RUAIRÍ Ó CONCHÚIR

River Funshion Catchment Community – "waiting 35 years for this day"

My name is David Lee, and I'm a member of Kildorrery Trout Anglers Association. In November 2014, I attended a special meeting of the four angling clubs on the River Funshion, namely Mitchelstown, Kildorrery, Glanworth and Kilworth, which was called to discuss the water quality and pollution on the river. A lot of discussion took place as the anglers were concerned over the poor conditions and lack of sizeable trout. It was agreed that an independent survey of the entire catchment was required. I was to take charge and report back at the next meeting. I am also a member of the Sustainable Water Network (SWAN) which helps to keep me updated on water matters, and the Cork Environmental Forum.

In January 2015, I met with Mr Paul Bryan of Southern Scientific Services. It was agreed that samples would be taken from 13 sites in the catchment, including EPA reference sites where biological river surveys are carried out. At a meeting called in April, much discussion was had as to how to fund the €7000 study. Raising the funds took some time as some of the clubs had to borrow the money due to the fact that they also had to pay affiliation and insurance. The four angling clubs also agreed to levy their members. After a programme was agreed, the fieldwork was carried by Stephen O'Shea of Southern Scientific on four dates between 2nd and the 11th of September. Biological monitoring was undertaken by a kick sampling technique for macroinvertebrates. This was carried out over four days and we had five anglers present each day as there was a lot of equipment to be transported to the sites. While this was very interesting, we did not see any of the 'top' insects (i.e. stone fly, mayfly). We did see some caddis fly on one of the days. The final report was published and, as agreed in the contract, 10 copies were supplied. These copies were given to each of the above clubs, and copies were also sent to the EPA Inland Fisheries Ireland (IFI), the Local Authority and SWAN.

Getting to know your Community Water Officer

The next big breakthrough was the appointment by the Local Authority Waters and Communities Office (LAWCO) of 12 Community Water Officers throughout Ireland. We were lucky to get Mr Kieran Murphy to cover County Cork. His primary role is to provide on the ground support to communities in the delivery of Water Framework Directive objectives (i.e. good ecological status).So projects such as pollution mitigation and control, habitat improvement, biodiversity conservation, invasive species control and public awareness will be developed and supported by him where possible with local communities.

Since his appointment I have introduced him to community councils, business people, County Councillors, farming groups, council engineer personnel and members of the public. These introductions laid the groundwork for the first River Funshion Catchment meeting. The idea of these meetings is to create an awareness of our water quality and explain how an Integrated Catchment Management plan could operate in the Funshion, with local people and stakeholders all having an equal say in a bottom-up approach, as suggested by the EPA.

DAVID LEE AND KIERAN MURPHY PLANTING SOME WILLOW BESIDE THE FARAHY, A TRIBUTARY OF THE FUNSHION

Bringing the community together to talk about their water

On November 30th, 66 people attended a public meeting in Mitchelstown. It was the most rewarding day of my life. We had a great spread of personnel from farmers, business people, representatives from five community councils, representatives from the four angling clubs and also from the Fermoy Trout Anglers who helped with the funding for the survey, the local gun clubs, Ballyhoura Development, Avondhu Blackwater Partnership, Inland Fisheries Ireland, Cork Nature Network, Cork Environmental Forum, County Council Engineers, County Councillors, Cork & Limerick County Councils were represented. Mr Donal Daly of the EPA was also in attendance and most obligingly spoke about the Catchments Unit of the EPA and the current state of the water bodies across the country.

The Water Framework Directive, Heritage, and the new Waters and Communities Office

As chair, I welcomed everybody and gave an outline the Water Framework Directive and its purpose. The first of three speakers was Christy Roche, a Genealogy Researcher. He gave a talk on the historical sites along the entire river which is over 40 km in length. Amazingly, the Funshion River has 19 bridges, 16 castles and 300 Heritage sites. It also has 14 large county homes, and Manning Fort where a famous battle took place in the year 1643. This was enjoyed by all.

Fran Igoe gave an excellent talk on the set up of the Waters and Communities Office and its purpose. He also stated that the Water Framework Directive (WFD) was initiated to create a protective framework for natural water bodies. Three stems of the Directive are the protection, enhancement and, where required, the restoration of aquatic ecosystems and dependent terrestrial ecosystems, to promote the sustainable use of water as a resource, to protect water quality, and to mitigate the effects of drought and flooding. The framework takes account of legislation dealing with water quality and related areas such as the Nitrates Directive, as well as the Birds and Habitats Directives.

The Water Framework Directive requires member states to achieve at least good ecological status as defined by the directive by 2015 - which was missed by 2 years.

River Basin Management Plans are the mechanism by which the Directive aims to outline and coordinate the protection and restoration of water bodies grouped into the river catchments wherein they lie. This is a departure from the usual approach to distinguishing boundaries in Ireland therefore maximising the benefits to the local communities, who can be motivated to take ownership in water management. Finally, Fran expressed the need for people to have clean water and he made special reference to companies producing food to have top quality water to maintain their green image and high quality status.

Introducing Kieran Murphy, Community Water Officer

Kieran Murphy was the next speaker. He formally introduced himself as the new Community Water Officer for Cork. He outlined what his role would entail and how communities will be supported in taking ownership of their own rivers, lakes, ground and coastal waters. He went on to give examples of how communities can come together and celebrate their natural water bodies and how funding might be available to achieve WFD objectives. Kieran maintained that not only can successful projects lead to improved water conditions but they can and will increase the pride in a community.

We then had a round table discussion with contributions from attendees such as Bernie Connolly, Cork Environmental Forum, who praised the idea of community development and motivation to get local people having a say in their area, be it Tidy towns or control of aquatic invasive species. She also said the contribution from Christy Roche on the rich heritage along the river shows that people have many different attachments with the catchment and it is important to harness the wealth of these, be they recreational, historical or environmental. At the heart is the river itself, which binds the communities and these interests together.

Mr Jerry Keating proposed a vote of thanks to the speakers and wished the chairman every success in his endeavours to protect the river Funshion Catchment. Jerry was Fisheries' Chief Environmental Officer for many years and has worked with Dr Maura Mulcahy UCC, Dr Gerard Morgan UCC, and with Dr Joe Caffery on lagarosiphon, an invasive species which affected the environmental habitat of Lough Corrib. He has offered to give all the help he can. Having fought for the improvement of rivers throughout the country, 82-year-old Mr Keating was delighted to state: "I have waited 35 years to see this day!"

David Lee, Kildorrery Trout Anglers Association, SWAN, and the Cork Environmental Forum

Turning the tide in Mayo towards protecting and enhancing our finest natural resource

Article courtesy of Mayo Now Magazine - http://www.mayonow.ie/

If Mayo people were asked what our greatest natural resource was we'd probably say our Gaelic Football team, but in reality it's the river that flows through our county. It's ever present and flows through or near many of our towns. Its banks are littered with the history and heritage of our people... but this river and it adjoining lakes are not in the healthiest of condition which, as we know, is due principally to ourselves.

THE RIVER MOY AND A RAINBOW

However, all this may be about to change. A new group, the Moy Catchment Association (MCA), has come together in an effort to start a conversation - a conversation about conservation – about protecting one of the great natural resources we have in our midst. The government has played its part in this objective by establishing a new agency to bring local groups and government departments together. It has a long name, the Local Authority Waters and Communities Office, but its remit is clear, to improve water quality by getting local communities involved.

Its new office for the area is located in Castlebar and the officer for the Moy catchment area is one Mike Kane who lives in Achill. Mike has being involved in other community projects like the Greenway and has already started where he left off - by facilitating. What is obvious to most observers is that the status quo will not resolve the problems that exist in this catchment area. The new group formed before Christmas and is made up of all the fishing clubs and private waters in the Moy catchment area. They've already established a committee with aims and objectives and a mission statement.

The Moy Catchment Association represents clubs, fishery owners and anglers in the Moy catchment area who are committed to working in partnership with communities and stakeholders in the Moy Valley, with Government at national and local level, as well as others who have an interest in improving the ecology, fisheries and wildlife of the area. The pre-Christmas launch was for all anglers in the area. The Chairman for the group, Jim Wilson, reiterated the group's purpose and objectives before introducing Declan O'Mahony, whose film 'River Runner' has being an inspiration for groups interested in returning rivers to their once pristine state. Declan had spent two years making a film about the River Lee and the detrimental affect the dams had on the area. It's widely acknowledged that our wild fish stocks are not what they once were. Much of the problem, we're told, exists beyond our shores and migrating salmon that leave our shores each year have a very high mortality rate. Consequently, this group of concerned angling clubs have come together to look at solving issues under their control and begin a discussion involving all parties who play a role in the management of our greatest natural resource.

One of the first tasks at hand for the newly-formed Moy Catchment Association was to elect an executive committee and put the aims and objectives listed below on paper:

Moy Catchment Association Mission Statement

The Moy Catchment Association represents clubs, fishery owners and anglers in the Moy Catchment area who are committed to working in partnership with communities and stakeholders in the Moy Valley region, with Government at national and local level, as well as others who have an interest in improving the ecology, fisheries and wildlife of the area.

The Moy Catchment Association Aims & Objectives are:

- Involving local communities in the Moy Valley in the regeneration of the catchment area, raising their awareness of the water environment, its wildlife, salmon, trout, sea trout, pike and all native species and its ecology through a programme of education, training and special events.
- Developing a self-sustaining River association in the west of Ireland as the focal point for community-led monitoring, protection and promotion of rivers and the recreational and educational benefits they can offer to the local community and visiting tourists. The MCA aspires to evolve into a River Trust.
- Promoting the conservation and recovery of the Moy Catchment salmon stock - salmon being a 'feature' for which the River Moy basin has been designated as a candidate Special Area of Conservation under the EU Habitats Directive (92/43/EEC), Annex 2 of which categorises the Atlantic Salmon as a 'protected species'.
- Increasing recreational and tourist angling on the river via community-led promotional and tourist-support activities underpinning the work of the local Tourism Office and Inland Fisheries Ireland.
- Working with the farming community and all landowners throughout the catchment to achieve the aims of the Association.
- Educating all school children and adults in our catchment area about the magnificent and priceless resource they have on their doorstep.

How to get involved

If this topic interests members of the public and they would like to hear more, or get involved, the Moy Catchment Association would certainly like to hear from you. Please email garysmyth2@gmail.com

The Moy Catchment Association has started discussions with government agencies such as Inland Fisheries Ireland, as well as the newly formed Local Authorities Water Communities Office (LAWCO). The aforementioned Mike Kane, the Community Water Officer for the area, has being central to the process of getting interested parties communicating and working together.

Early this year the Association, with the help of the Waters and Communities office and Inland Fisheries Ireland, plan to roll out an education package to all national schools in the Moy catchment area. The Association would like to thank Mike Kane from LAWCO and Declan Cooke from the IFI for all their personal efforts in helping the MCA to getting started. The MCA are looking forward to a long, fruitful and respectful working relationship with LAWCO, IFI and all local authorities going forward.

EPA Research Reports

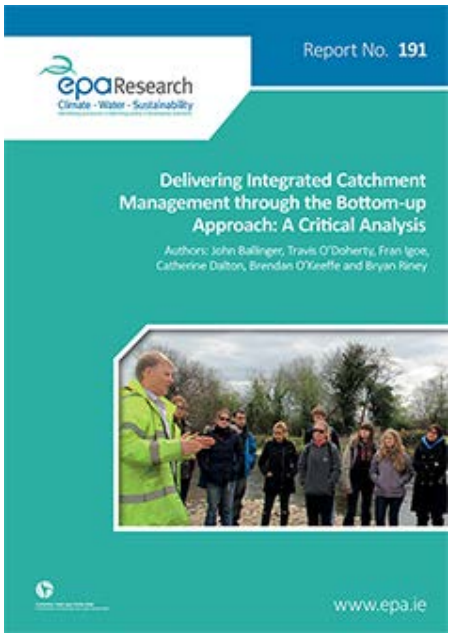
Integrated Catchment Management (ICM) – EPA Research Report recommendations on how to make it happen

Integrated catchment management has become the agreed approach to achieving Water Framework Directive (WFD) objectives and the sustainable use of water and land resources in Ireland. In addition, it provides the core basis and philosophy for the Catchments Newsletter. However, history shows that words written or said, in Newsletters or elsewhere, will not make it happen. So, what do we need to do to make it happen?

The eight steps of Integrated Catchment Management (see Daly, et al. (2016), available at http://bit.ly/catchmentsprogress) are largely technical, with substantial scientific and so-called 'top-down' components. However, inherent to Integrated Catchment Management is that cherry picking some steps will not succeed; all steps need to be undertaken.

Absolutely essential to success are concepts such as 'bottom-up', community, partnership, creating a vision, engagement and collaboration. While there have been significant successes in the scientific and engineering aspects of catchment management to-date, public and community engagement and participation have been inadequate. In the last year, the EPA has funded and published four reports on the latter elements of the Integrated Catchment Management process. The recommendations/lessons/findings in each report are extracted below.

Key lessons from "Delivering Integrated Catchment Management through the Bottom-up Approach: A Critical Analysis" (Ballinger et al, 2016)



Adequate Funding

First, adequate funding should be secured before undertaking collaborative Integrated Catchment Management projects. Resources are required to commence the collaborative process, sustain the process in the long term and, most importantly, to implement the actions in the catchment management plan. Failure to implement the plan creates resentment within the community and will hinder engagement in the future.

Creative Hooks

Second, the use of creative "hooks" to engage local stakeholders is critical to ensure that a wide range of community interests are represented in the process. The most successful projects integrated both social and environmental science to meet community social needs.

Neutral Brokers

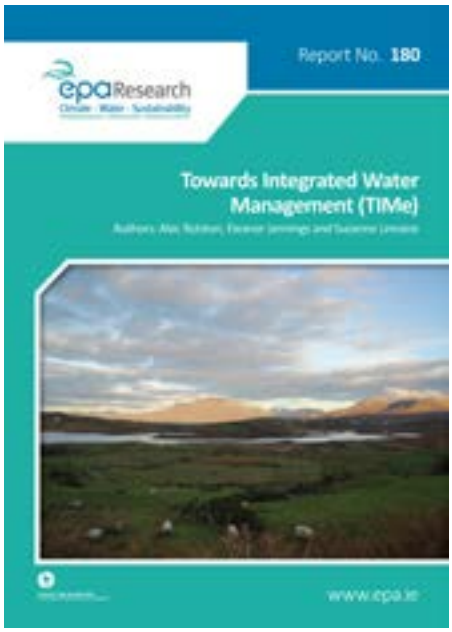
Third, the benefit of statutory authority-led projects is the availability of resources and technical expertise. However, statutory authorities often struggle to engage with local communities (outside traditional stakeholders). An alternative is the use of perceived "neutral brokers", such as non-governmental organisations (NGOs), river trusts or rural development companies to lead the process. This model has met with considerable success overseas. However, the success of this model requires statutory authorities to engage with and support the process. Putting co-operative and predetermined governance structures in place for their involvement with future Integrated Catchment Management projects is essential. The recent establishment of the Local Authority Water and Communities Office will make an important contribution in this regard, and it is expected that this unit will actively support Integrated Catchment Management groups. However, it is unclear how this will influence individual statutory authority involvement in Integrated Catchment Management initiatives.

Download Report: http://bit.ly/eparesearch191

Recommendations in "Towards Integrated Water Management (TIMe)" (Rolston et al, 2016)

1. *Develop a national water management and community engagement framework to provide guidance and consistency for engagement initiatives into the future.*
2. *Investigate priority locations for the establishment of community-managed hubs as focal points for community access to Integrated Catchment Management information and resources.*
3. *Develop strategic initiatives to encourage local businesses to support local water initiatives.*
4. *Develop national Integrated Catchment Management focused primary and secondary school educational initiatives.*
5. *Develop and provide support to Integrated Catchment Management centred citizen science initiatives.*
6. *Increase the number and frequency of local Integrated Catchment Management focused initiatives with which communities can become involved.*
7. *Undertake engagement initiatives to raise awareness of local water management issues and how local communities can be involved in mitigation and support strategies.*
8. *Develop a framework for the appropriate monitoring and evaluation of engagement initiatives.*
9. *Initiate a one-stop website that provides guidance and advice on Integrated Catchment Management.*

Download Report: http://bit.ly/eparesearch180



Key Findings in "AgImpact Project: Identifying Approaches to Improving Knowledge Exchange (KE) in the Irish AgriFood Sector using Expert Opinion" (Carton et al, 2016)

- *The traditional top down, linear knowledge transfer model of research from advisory body to farmer can be improved using a more balanced bottom up–top down Knowledge Exchange approach.*
- *Three groups were identified as being critical in the Knowledge Exchange process of delivering Sustainable Intensification. These were knowledge, policy and implementation groups. The knowledge group are those involved in the generation of knowledge. The policy group are the high-level stakeholders who develop national policies, provide direction and funding, and create the Knowledge Exchange operating environment. The implementation group are the active participants in the "on the ground" exchange and application of the knowledge at regional, local/community or farm level.*
- *The project participants identified a need for improved communication between and within the three groups that will build mutual trust, create a shared Sustainable Intensification vision and deliver the required outcomes.*
- *Education, including lifelong learning, for all agri-food stakeholders, optimised using information and communication technology (ICT), was recognised as an important enabler of the communication process. In addition, the role of primary and secondary education in community-based initiatives was highlighted.*
- *The need for a "knowledge translator" was identified to focus on translating the scientific knowledge into a language and context suitable for the other two groups.*
- *The essential role of the farm advisor in Knowledge Exchange systems within the implementation group was emphasised. New support models for the advisor may be required against the background of the ever-increasing knowledge base and depth required to deliver Sustainable Intensification. The requirement to integrate social science practitioners into the Knowledge Exchange process at implementation level was identified as being critical to facilitating and managing the change in the stakeholder behavioural patterns.*
- *The continued development of integrated SMART (Specific, Measurable, Achievable, Realistic and Time-bound) metrics for Sustainable Intensification was identified as a significant knowledge requirement in facilitating Knowledge Exchange systems. The most urgently required farm-centred metrics are those for water, air, soil and biodiversity. Where possible, these should be systemised and/ or integrated with production metrics. In addition, it was noted that SMART metrics will also be required for the effective monitoring and evaluation of the Knowledge Exchange system itself.*
- *The potential of a community-based (e.g. catchment, producer group, value chain) initiative was identified as the preferred framework for enhancing Knowledge Exchange among the implementation group. This approach facilitates a more targeted and cost-effective approach to Knowledge Exchange systems engaged in realising Sustainable Intensification.*
- *Within a Knowledge Exchange framework, measures that promote a better balanced bottom up–top down approach were highlighted. These included:*

  1. discussion groups, "champion farmers" (i.e. early adopters) and new ways of encouraging farmers to talk to farmers can contribute;

  2. demonstration initiatives to create knowledge demand among stakeholders; these should be as practical as possible in order that outcomes can be seen in a way that promotes learning and curiosity;

  3. citizen science initiatives to promote Knowledge Exchange between implementation and knowledge groups; the

growing use of technology with in-field and animal data collection (sensor networks) will facilitate the process and the farmers will have greater involvement in the knowledge generation;

4. open innovation approaches in which farmers (or other end users) are included in the identification of the problems to be addressed and involved in developing solutions; this approach helps build a coalition of the willing and provides an important channel of communication;

5. recognising the need to identify the knowledge user's position on the technology adoption curve and tailoring the communication strategy accordingly;

6. using incentives to promote the implementation of measures on farms (e.g. champion farmers, tax breaks to support technology adoption, demonstration farms/ catchments, award systems to support sustainable farming like those already used in Ireland or based on those used in New Zealand);

7. making full use of ICT to enhance the communication strategy between and within the groups, for example, greater use of social media, using smartphone and tablet formats, as well as the use of smartphone-friendly media such as YouTube, Vimeo and Twitter.

- *A suggested approach arising from this project is the development of a grant scheme that could be used to initiate a catchment competition focused on providing community stakeholders with funding and resources to implement a better balanced bottom up–top down approach to Knowledge Exchange for Sustainable Intensification within their catchment.*

Download Report: http://bit.ly/agimpact

"Public Engagement in Integrated Catchment Management: StreamScapes Recommendations" (Mark Boyden, 2015)

- *The proper scale at which to address issues is the catchment (localised) level.*
- *Education may be more efficacious than enforcement.*
- *Engage a small critical mass (c. 5%) of local population in resource awareness.*
- *Use multiple (and creative) 'hooks' to engage people on their own terms in the efforts to promote stewardship of water quality.*
- *Schools, corporate and community and voluntary groups can play a key role.*
- *Communications must be jargon free in order to successfully engage citizens.*
- *Redouble efforts to propagate 'best-practice' principles in pursuit of livelihood, recreation, and domestic management (to minimise anthropogenic impacts).*
- *Consider that 'engagement' may best be driven and led by perceived 'honest brokers', for example, Rivers Trusts, environmental NGOs, social scientists, community leaders, agricultural advisors, etc., supported by catchment science and state agency.*
- *Achieve 'joined-up' thinking to facilitate and economise achievement of targets, such as linking green agricultural incentives with deliberate local (water-quality) objectives.*
- *Consider facilitating pilot initiatives where mini-catchment communities largely formulate their own (facilitated) local catchment management plans (with catchment science input).*
- *With regard to River Basin District Governance (in support of public engagement), this report concludes with three linked and inseparable recommendations:*

  A. As the WFD implementation 'governance hub', the EPA WFD Integration & Coordination Unit (WFD I&C Unit) must be adequately resourced and staff offered mid- to long-term tenure to ensure continuity during imminent steep (social) learning curve.*

  B. As it appears at this writing that it will fall to local authorities to drive and deliver 'on-the-ground' public engagement (in addition to implementing a wide range of support measures), adequate funding and staffing must be allocated to enable these functions to achieve excellence.

  C. Finally, a formal, centralised, and highly accessible collation of all public engagement efforts to enable wide and continuous 'social learning' across governance bodies and all sectoral actors is established.

*Now renamed the EPA Catchment Science and Management Unit

Download Report: http://bit.ly/streamscapesresearch

Conclusions

The research and resulting reports were undertaken by four separate teams. Yet, there is a remarkable similarity and consistency in the findings and recommendations of all four. And, they aren't just words on the page, progress is being made on several of the recommendations.

For instance, the Streamscapes approach has been used in many parts of Ireland and has been shown to be successful; catchments as multiple-scale, socio-biophysical systems have been accepted as the framework for water management; an award winning website – www.catchments.ie – is providing an accessible source for information, maps and stories; and the newly formed Local Authority Waters and Communities Office (see www.watersandcommunities.ie for details) has commenced their work in promoting public awareness, knowledge sharing and participation in the protection and management of our natural waters.

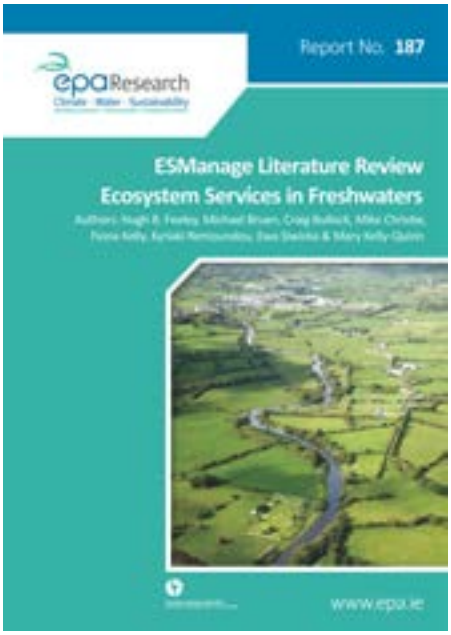
So there is momentum – we need to keep it going, keeping in mind that 'it is people who save rivers, not plans, reports and Newsletters'.

Donal Daly - Catchments Unit, EPA

A fully referenced version of this article will be available on www.catchments.ie

Daly, D., Archbold, M. and Deakin, J. 2016. Progress and challenges in managing our catchments effectively. Biology and Environment: Porceedings of the Royal Irish Academy, Vol. 116B, No. 3 (2016), pp 157-166. Available at: http://www.jstor.org/stable/10.3318/bioe.2016.16

EPA Research Report 187: ESManage Literature Review Ecosystem Services in Freshwaters



The ESManage Literature Review considers how the ecosystem services framework aligns with the objectives of current policy and legislation to inform management of freshwater resources.

Identifying Pressures

Ireland's freshwaters are among the best in Europe. However, they are under increasing pressure from a range of land-use and other anthropogenic pressures, especially from elevated nutrients (nitrogen and phosphorus) and sediment inputs. The continuing loss of high status waters is a key concern. Planned future land-use intensification for food production, together with climate change will further stress aquatic resources both in terms of quality and quantity. The ESManage Literature Review highlights how pressures have implications for a range of ecosystem services derived from freshwaters.

Informing Policy

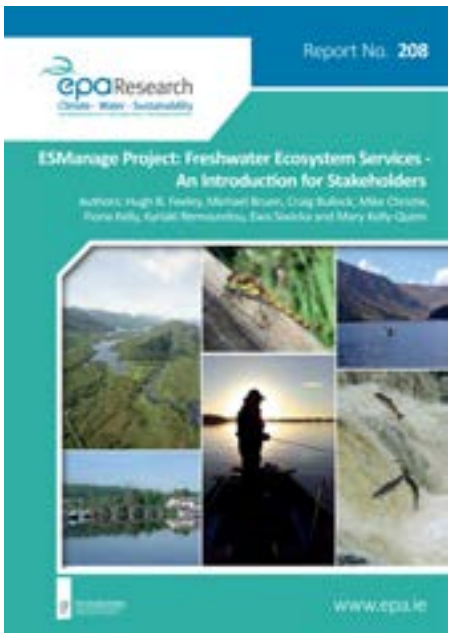
The ESManage Literature Review considers how the ecosystem services framework aligns with the objectives of current policy and legislation to inform management of freshwater resources. The Water Framework Directive (WFD) is the key EU driver requiring Member States to improve and sustainably manage water quality. The specific benefits of incorporating the ecosystem services framework into the implementation of the WFD relate to illustrating how human wellbeing is dependent on good ecological health and widening the focus from good ecological status as an end in itself to showing how it supports societal goals.

Developing Solutions

Identification of the chain of knowledge and data needs, as outlined in the ESManage Literature Review, is a key step in efforts to incorporate the ecosystem services framework into policy related to the management of freshwater resources. This review details these information needs and associated knowledge gaps, especially with respect to understanding the complex ecological linkages between the health and resilience of the ecosystem (critically dependent on biodiversity) and the provision of ecosystem services, converting this understanding into projections of possible future changes in ecosystem services provision that can be understood by the wider public, and identifying the means by which this public can value such changes to ecosystem service provision.

http://bit.ly/eparesearch187

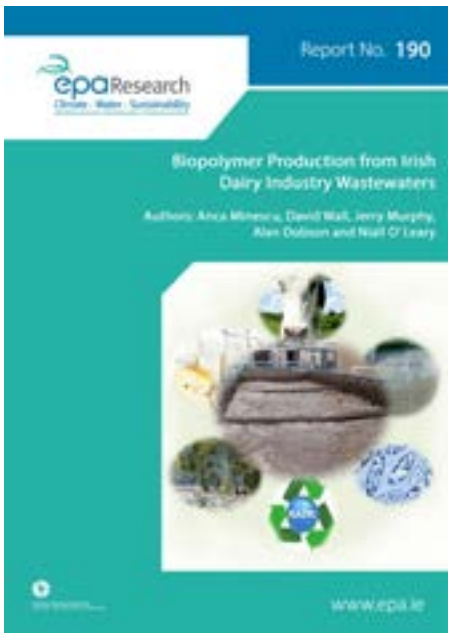
EPA Research Report 208: ESManage Project: Freshwater Ecosystem Services - An Introduction for Stakeholders



The objective of this project is to harness the knowledge and tools required to embed an appreciation of ecosystem services and the ecosystems services approach into policy and decision-making for sustainable management of water resources, as required by the Water Framework Directive

http://bit.ly/eparesearch208

EPA Research Report 190: Biopolymer Production from Irish Dairy Industry Wastewaters



This report examines issues surrounding non-sustainable plastic production, use and disposal and highlights the challenges associated with limited commercial uptake of wholly biodegradable polymers.

Identifying Pressures

This report examines issues surrounding non-sustainable plastic production, use and disposal and highlights the challenges associated with limited commercial uptake of wholly biodegradable polymers. The report also examines dairy processing wastewater in the context of a rapid expansion in Irish milk production/ processing following the 2015 removal of quotas. These pressures inform the research undertaken in this study, which sought to demonstrate the use mixed microbial cultures to produce commercially significant bioplastics from dairy processing wastewater feedstocks.

Informing Policy

This research successfully demonstrated the technical feasibility of polyhydroxyalkanoate bioplastic accumulation from real-time dairy processing wastewater in a laboratory setting.

The broader implications of status quo, trade waste practices versus dairy wastewater valorisation opportunities are also presented together with recommendations for future research focus and the merits for pilot scale

trials. Life cycle analysis of the laboratory process identifies key hurdles to commercialisation in addition to limitations in data collation from industry r.e. comprehensive cradle to grave sustainability modelling. In summary, this study offers broad, cross-policy significance as it integrates waste to feedstock reclassification, environmentally sustainable material provision, petrochemical polymer replacement and non-renewable CO2 displacement.

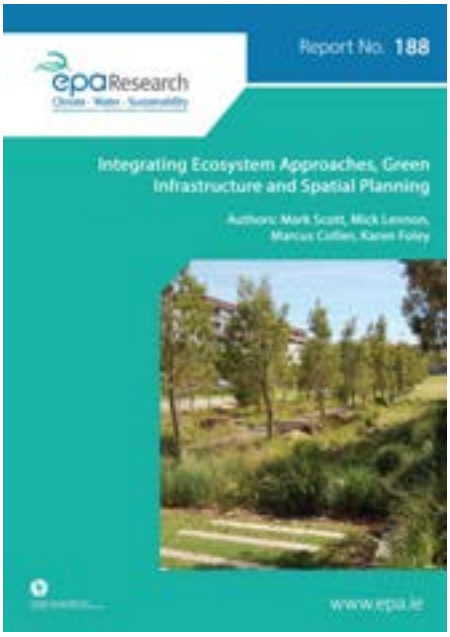
Developing Solutions

This study identified optimised operational parameters for an aerobic dynamic feeding reactor strategy to achieve microbial bioplastic accumulation from dairy processing wastewater feedstocks. Polyhydroxybutyrate was the primary biopolymer generated, but the observation of additional, commercially significant co-polymers suggested further opportunities to develop the process further. Energy profiling and extrapolations of process scale up identified a clear need for pilot scale trialling of the system in order to advance the technology readiness level and facilitate comprehensive demonstration of commercial viability and sustainability.

http://bit.ly/eparesearch190

EPA Research Report 182: Green Infrastructure: A 'How To' Guide for Disseminating and Integrating the Concept into Spatial Planning Practice and EPA

EPA Research Report 188: Integrating Ecosystem Approaches, Green Infrastructure and Spatial Planning



Identifying Pressures

Pressures placed on the planet by human activities pose some of the most complex and demanding challenges facing societies and policy-makers across the globe. Observed increases in storm intensity and the challenges faced in seeking to preserve the quality of our environment while advancing socioeconomic development illustrates that Ireland too is subject to such global pressures and thereby shares in the responsibility to address them. In recent years the Irish planning system has been reshaped in response to the challenges posed by these issues. There now exists enormous pressure on planners and allied professionals to respond to such pressing issues when formulating land use plans.

Informing Policy

These reports outline how the 'Green Infrastructure' (GI) concept can help planners and allied professionals respond to the challenges posed by these pressures when formulating spatial plans. The Green Infrastructure concept addresses multiple issues in an environmentally sensitive manner by promoting spatial connectivity and multifunctionality. This document outlines how employing the Green Infrastructure concept enables those working within the planning system to meet a diverse array of complicated objectives that often seem to conflict. It describes how this can be achieved by simply enhancing certain existing work practices to better facilitate a more context sensitive form of planning that supplies a range of mutually reinforcing social, economic and environmental benefits.

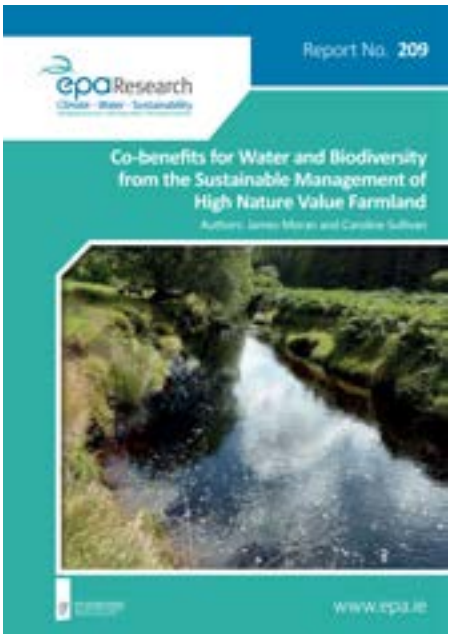
Developing Solutions

These reports seeks to assist planners and allied professionals involved in the formulation of spatial plans by providing a knowledge base and guidance for integrating the GI concept into spatial planning practice. It forms part of a suite of GI-related resources produced and collated in this project. EPA Research 188 provides the evidence base for, and accompanies EPA Research 182, a 'How-To Guide' which describes an interactive workshop that fosters novel perspectives on spatial policy formulation and new collaborative working arrangements between a range professionals.

EPA Research 182 – A How-to Guide: http://bit.ly/eparesearch182

EPA Research 188 – Evidence Base: http://bit.ly/eparesearch188

EPA Research Report 209: Co-benefits for Water and Biodiversity from the Sustainable Management of High Nature Value Farmland



The management of High Nature Value farmland for biodiversity has the potential to have co-benefits for water quality and quantity, and could play a major role in meeting both the requirements of the Water Framework Directive and the Birds and Habitats Directives.

http://bit.ly/eparesearch209

Assessing the impact of the Bellawaddy River on the microbiological quality of the bathing waters of Enniscrone Beach, Co. Sligo

The Bathing Water Directive (2006/7/EC) was transposed into Irish law in 2008. Its objective is to improve the protection of bather's health and introduced stricter standards for water quality and a new method of assessment. It has established a more pro-active approach to the assessment of possible pollution risks, and to the management of bathing waters. It also places considerable emphasis on promoting increased public involvement, and for improved dissemination of information on bathing water quality to the general public.

Bathing waters are now classed into four quality categories; 'Excellent', 'Good', 'Sufficient', or 'Poor' with a minimum target of 'Sufficient' required to be achieved for all bathing waters. The new standards are almost twice as strict as those previously applied and assessment is undertaken on a 4 year data set rather than annually.

Bathing water categories are determined by levels of indicator bacteria in the water called E. coli & intestinal enterococci. This is because they indicate conditions where pathogens harmful to human health are present (usually called Short-Term Pollution). Bathers can become ill as a result of such contamination.

There are two aspects to this contamination.

1. Source of bacteria &
2. The management of bathing

Source:

Up to recently focus has been on urban wastewater treatment plants. However studies have shown that despite major investment in local wastewater infrastructures, bathing waters can still fail to achieve acceptable water quality standards. €5 million was spent on upgrading Enniscrone's waste water infrastructure in 2008. Subsequent audits of the treatment plant have shown good compliance. However, at the time of this study the EPA had warned that previous monitoring results signalled that the bathing water was at high risk of failing to achieve Excellent quality status (it has since failed to attain this status). Some focus is now turning to other aspects like riverine inputs as a source of short-term pollution.

The Bellawaddy River discharges to the bathing water at the bottom left of Fig. 2. It rises in the forested area in the centre background. The River Catchment is small at 18.6 km^2, but the picture shows that there is a substantial area of intensely farmed countryside that can influence the quality of the river water before it discharges to the bathing water.

The aims of this project were to determine if the river was a clear source of short-term pollution at Enniscrone's bathing waters and to evaluate if any environmental aspect can be used to indicate conditions associated with a high risk of short-term pollution.

The project, using local rainfall data, hydrometric data (river level and flow produced from an automatic data-logger installed), microbiological results, loadings and statistical analysis proved that the Bellawaddy River was the main source of short-term pollution events at Enniscrone Beach.

It is important to note that this pollution effect

FIGURE 1 BELOW SHOWS WHAT BATHERS SEE AT MANY BATHING PLACES. IN THIS, AND MANY OTHER CASES THEY DON'T SEE THE UPSTREAM CATCHMENT STORY AS SHOWN IN FIGURE 2.

FIGURE 1: BATHERS ON ENNISCRONE BEACH

is driven by the river's hydrographic response to rainfall intensity (in other words the effect of intense local rain on the water flowing through the river catchment).

Table 1 and Fig. 3 below are examples of some of the project output.

Management of bathing:

Bathing management was the other aspect considered with regard to this short-term contamination of bathing water. New bathing water regulations (2015) have broadened the focus from the retrospective management of water quality to a more predictive/proactive approach in order to protect bathers' health. This prediction or forecasting is difficult to do as microbiological results can take from 18 – 36 hours to produce from the time of sampling. Water contamination may have been present at the sampling time and bathers' health thus compromised. A different metric to indicate periods where water quality may be compromised is therefore required.

The concept adopted for this project was taken from economists who were discussing why they missed predicting the last recession. These were some of their observations:

"One of the many paradoxes facing the practical economist is insatiable demand for economic forecasts alongside overwhelming evidence that forecasting is a complete waste of time."

FIGURE 2: AERIAL VIEW OF THE RIVER CATCHMENT BEHIND ENNISCRONE BEACH

"One of the few really interesting innovations in forecasting methods has been the development of something called Now-casting. The future is all very well, but we have an equally tough task in figuring out where the economy is right now – or what it has been doing over the recent past."

The "Now-casting" metric formulated here involved using the combined sewer network servicing Enniscrone town to measure rainfall intensity (Fig. 4). If a locally intense rainfall event occurs, any extra water in the sewer is diverted and collected in a storm-water tank located at the treatment plant. The water level in this tank is recorded continuously.

Spikes in the level of the storm-water tank were plotted against levels of indicator bacteria in

TABLE 1: CORRELATION BETWEEN THE RIVER LOADINGS OF INDICATOR BACTERIA AND THEIR LEVELS IN THE BATHING WATER

Parameter	Monitoring Location	Monitoring Location	Correlation	Significance
Total coliforms	River	Bathing water	0.8893	0.001
E.coli	River	Bathing water	0.4207	0.01
Intestinal enterococci	River	Bathing water	0.7648	0.001

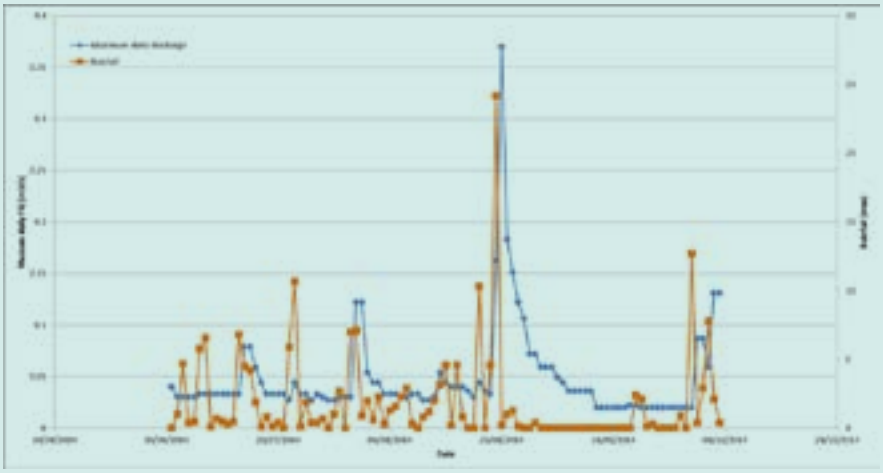


FIGURE 3: HYDRO-METEOROLOGICAL RELATIONSHIP. HYDROGRAPH REPRESENTING MAXIMUM DAILY DISCHARGE OF THE BELLAWADDY RIVER FROM LATE JUNE TO OCTOBER 2014 AT THE HYDROMETRIC STATION AND DAILY RAINFALL RECORDED AT ENNISCRONE GOLF CLUB FOR THE SAME PERIOD

the bathing water for the summer of 2014. The resultant graphs and analysis were able to demonstrate strong covariance between breaches of water quality standards in the bathing water, and peaks in the water level of this storm-water tank.

(Control results showed that any storm-water that may have discharged to the sea did not affect water quality). Similar results were obtained for all three types of indicator bacteria monitored.

This reproducible method using local data could clearly indicate conditions where there was a current risk of short-term pollution at Enniscrone Beach.

The link between the Environment and Public Health is now to the fore in public policy. From the EPA's Strategic Plan "Our Environment – Our Wellbeing" the Director-General Laura Burke states: "Clear, accurate and timely information is a vital component in raising awareness about the environment among the public and key policy and decision makers. As part of our strategic priorities we will be accelerating the development of new approaches and tools, with a particular emphasis on the provision of accessible information to allow people to make informed choices for themselves, their families, their communities and their businesses."

Further research is currently underway by the author to devise an early warning system for this bathing water using data from the river catchment. This new project is trying to obtain relevant upstream catchment data in real-time, so as to identify potential short-term pollution incidents before they reach the bathing water area. Newly generated Pollution Impact Potential maps from the EPA Catchment Unit were used to identify likely zones of pathogen contribution to the river and thus help identify locations in the catchment for monitoring stations

The use of technology like telemetrised hydrometric data-loggers (Fig.6) and automatic rain gauges etc. along with detailed knowledge of the catchment, should produce data that may lead to more effective tools for managing bathing at Enniscrone Beach.

Wayne Egan, Hydrometric & Groundwater Section, EPA Regional Inspectorate Castlebar

This article is a summary of Wayne Egan's project for his recently completed undergraduate degree, which was awarded the Undergraduate Awards Gold Medal (Global) in the Earth & Environmental Section 2016.

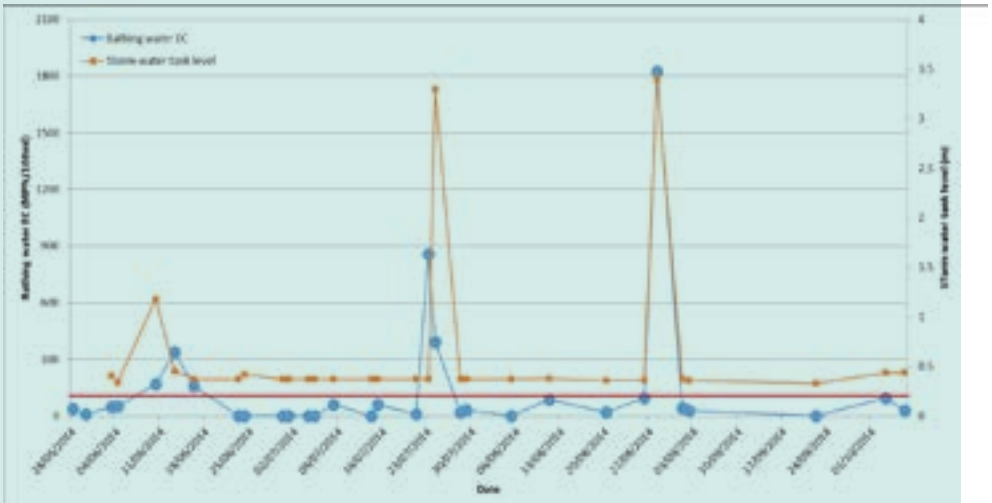
A huge congratulations to Wayne for this achievement.

http://www.undergraduateawards.com/year/winners-2016/

FIGURE 4: ENVIRONMENTAL MANAGEMENT - EXTENT OF COMBINED SEWER NETWORK IN ENNISCRONE

FIG. 6: HYDROGRAPH RESPONSE FURTHER UP THE CATCHMENT - TELEMETRIC HYDROMETRIC STATION ON THE ROSNAMUCKYDUFF RIVER AT TULLYLINN

FIGURE 5: INDICATING CONDITIONS OF CURRENT RISK OF SHORT-TERM POLLUTION. GRAPH OF BATHING WATER E.COLI RESULTS VERSUS STORM-WATER TANK LEVEL FROM JUNE-OCTOBER 2014. E.COLI LIMIT USED IN THIS STUDY IS SHOWN BY RED LINE. NOTE THE 3 BREACHES OF THE LIMIT COINCIDE WITH THE 3 SPIKES IN TANK LEVEL



The Flood of Florence

The 4th November 2016 was the 50th anniversary of the flooding of Florence by the Arno River. Flooding was then not limited to Florence, for example Venice saw the highest high-tide on records (1.92m). Florence was probably the worst hit and so that year event is remembered as "The Flood of Florence".

PIAZZA DELLA SIGNORIA E LOGGIA DEL LANZA

PIAZZA SANTA CROCE

MEASURING THE ARNO FLOODS THROUGH HISTORY - TOP: PLAQUE MARKING FLOOD LEVEL IN 1966. - BOTTOM: PLAQUES MARKING FLOOD LEVELS IN 1333 (BELOW) AND 1966 (ABOVE)

During the month of October 1966 heavy and prolonged rainfall was widespread over Italy, reaching a total monthly average of 214mm, equivalent to 188% of normal rainfall, with peaks in Tuscany of 200-300% of the monthly average.

On 3rd November 1966, hence without any significant time to allow for the discharge of the previous rainfall, an exceptionally heavy rain fell on most of the the Arno River basin, reaching a daily average of 200mm, with a peak of 437.3 mm.

In the early hours of the 4th November the Arno River (along with other, but not all, tributaries throughout the city) burst its banks in Florence, flooded the whole city centre, killing 17 people and damaging or destroying millions of artworks, some of which are still being subject to restoration works.

The Arno River Basin

The hydrographic basin of the Arno River is the fifth largest in Italy, covering a total of 8,228 km^2, the majority of it at elevations below 300m. The River source is on the Falterona Mount, while the mouth is in the Tyrrenian Sea near Pisa, with a course of 241 km.

The vast majority of the river basin is characterised by the presence of low-permeability sandstone and shale, with an effective permeability of <10%, reflected also in the relatively low flow of springs, generally below 50 litres/s.

More permeable ground is present in the lower part of the basin, where alluvial sediments of sand and gravel are located (although usually covered

ARNO RIVER COURSE IMAGE: GOOGLE MAPS

ARNO RIVER HYDROGRAPHIC BASIN

ARNO RIVER LOOKING TOWARDS PONTE VECCHIO, FLORENCE, ITALY (PHOTO: CREATIVE COMMONS, SVEN MANGUARD)

by lacustrine and alluvial clay). Here groundwater is usually between 2m and 8m from surface. Naturally, the shallow aquifer would feed the River. However, the reverse is often the case, as groundwater is subject to intense abstraction both for industrial activities (the area between Florence and Pisa is famous for its tanneries and shoe factories) as well as for human and agricultural consumption.

Despite the size of its basin, the Arno River has a torrent-like behaviour; while the yearly mean flow in Florence is ca. 60m^3/s, the flow can go as low as 2.2m^3/s during prolonged summer droughts. On the other hand, the Arno River is well known for its devastating floods, usually in the Autumn. Historical records account for 171 floods in the period 1177 to 1941, with the most devastating event being the 1966 flood, when a flow of ca. 4,100-4,400 m^3/s was estimated in Florence (when the maximum amount which can flow through the river embankments is calculated to 2,500 m^3/s).

Up to the mid 18th century flooding took place on average every 10 years (there are 55 events recorded between 1261 and 1761, with at least 30 described as heavy and 5 exceptional). It should be noticed that in the last 200 years there have been only 3 floods, two of which described as exceptional. This could be due to the effectiveness of the hydraulic works carried completed in the 18th-19th centuries (see below), which may have managed to reduce flooding risk in Florence and adjacent areas, although not improving but rather worsening the floods in Pisa. Another explanation could be linked to a change in climate at the end of the Little Ice Age, with significant reduction of the frequency and severity of events affecting the whole Arno River basin.

In any case, it is clear that the flooding of 4th November 1966 was caused by an exceptionally severe and prolonged rainfall, due to a peculiar although not unusual interaction between a strong anticyclone based over the Balkans and a deep low pressure located over Italy. The anticyclone acted effectively as a block to the eastward migration of the weather front, causing widespread rainfall over Italy. It is interesting to notice that the above weather situation is always present when exceptional floods occur in Italy. It is also important to notice that rainfall affected most of the Arno River basin, as heavy rainfall only on a section of the river basin would not generate a high flow capable of causing exceptional floods.

In the event of the 1966 flood, a role was also played by the two hydro-electric dams located upstream of Florence (diga di Levane and diga di La Penna). The lakes associated to these dams were full to capacity in those days and water was released in the morning of 4th November. This input proved vital for flooding of the area upstream of Florence, but did not have much of a negative impact on the city. It could be argued that by facilitating flooding upstream of Florence, it somehow alleviated the situation in the city, reducing the volume of water in the Arno River and hence the extent and severity of the flood.

Finally, another contributing factor was the thawing of early snow on the mountains in the upper part of the basin due to warm southern winds accompanying the weather front.

Hydraulic Works

Historically, flooding by the Arno River has not been restricted to Florence but affected the whole length of the river. This is an area which for a most of human history has hosted numerous settlements and consequently through the centuries numerous attempts have been made to alleviate the intensity of the floods through extensive hydraulic works.

The first of such works were carried out in the area of Pisa during the 14th century, simply to re-direct flood water away from the city.

Extensive works were carried out during the rule of the Medici-Lorena (18-19th centuries) to accommodate the growing demand for residential and agricultural land; swamps were reclaimed, river beds straightened and narrowed, floodplains occupied by ever-sprawling urban settlements, hills and mountains affected by extensive de-forestation. To an extent this extensive intervention managed to create a sort of equilibrium through the creation of a network of canals which contained heavy rainfall and reduced the velocity of surface water run-off. At the same time, the reclamation of Val di Chiana swamps diverting water to the Arno River, away from the natural recipient of the Tiber River basin, added 350-650 m^3/s during significant floods, worsening the situation in the Arno River basin.

This equilibrium was dramatically altered during the economic boom following the end of World War II. Economic and social improvement in Italy lead to a significant increase in population, migration from rural areas to urban centers, transfer of workforce from agriculture to industry and services. The network of canals was damaged or destroyed to allow for construction of residential and industrial areas, and the amount of land covered by concrete increased significantly. Moreover, the competent authorities often failed to co-ordinate in planning and intervention and to adequately maintain watercourses, sometimes due to lack of funding.

There is no doubt that these works brought significant economic improvement, alleviated problems during droughts, allowed for the use of the watercourses for transport of goods, and were instrumental in eradicating malaria. However, from the point of view of management of the Arno River basin, they had a dramatic negative impact, increasing volume and velocity of surface water

run-off, favouring landslides and soil erosion, aggravating the severity of floods.

CURRENT SITUATION

According to the 1999 Piano di Bacino - Rischio Idraulico (Arno River Basin Management Plan - Hydraulic Risk Plan published in 1999) storage for ca. 400 million m^3, half of which upstream of Florence, is required to avoid flooding by the Arno River not just in Florence, but in the whole river basin.

The Comitato Tecnico Scientifico Internazionale stated that existing hydraulic works are inadequate to protect Florence from an event of the same scale as the 1966 flood, with exposure to unacceptable risk of loss of human life and artistic treasures. It is considered that a repetition of a similar event would result in a worse economic outcome.

Given the reality of the land use in the basin, the only realistic solution would be to find storage space for flooding waters upstream of Florence (and it is interesting, and sad at the same time, to notice that this conclusion was already contained in the final report published in 1970 by a committee set up in the wake of the 1966 flood).

Unfortunately not much improvement has taken place in the area since the 1966 flood. Works have been carried out in Florence between Ponte Vecchio e Ponte a Santa Trinita, allowing for an increase of flow to 3,400 m^3/s from the 2,500 m^3/s of 1966. This is surely a welcome improvement, but still not sufficient when compared with the 4,100-4,400 m^3/s of 1966 flood. There is a general consensus that not much else can be done within Florence.

Upstream of Florence, hydraulic works to create space for flooding waters have only started in 2014 and are due to be completed in 2022. In the meantime, further settlements curtailed the river floodplains, accompanied by construction of river embankments to protect these built-up areas.

A hydro-electric scheme involving an artificial dam (diga del Bilancino) has been completed on one of the Arno River's main tributaries upstream of Florence. However, this scheme is not considered to be significant in mitigating the flood risk.

The national weather forecasting system has greatly improved, which should eliminate the surprise factor which played an important role in 1966 (e.g. these days an early alarm could be raised allowing for some mitigating actions, like emptying the artificial lakes and moving art works to safer locations).

Back to the Future?

Models designed for the prediction and management of floods in the basin indicate that Florence city centre would not be at risk in a case of a flow up to ca. 3,400 m^3/s, when the Arno River would break its banks and start flooding the lower part of the city centre (area Santa Croce). However, other parts of the town (Parco delle Cascine, a historical park extending for ca. 160 hectares downstream of the city centre) would be flooded with a volume of 2,800 m^3/s.

It is clear that with a river flow comparable to the event of 1966, the centre of Florence could escape flooding only if the river heavily flooded the areas upstream of the city. In any case, while the city may escape, there would be extensive and severe floods affecting the area downstream of the city almost to the outskirts of Pisa.

Davide Gallazzi, Environmental Consultant

A fully referenced version of this article will be available on www.catchments.ie

Pollution Source Assessment in Sydney's Drinking Water Catchments

Despite the obvious differences in climate and landscape, the experience of catchment management in Australia and Ireland has many similarities. This article describes the system used by Water New South Wales (WaterNSW) to assess the pollution characteristics of Sydney's drinking water catchments.

In 2015 I drove with my family across the flat red expanse of western New South Wales, where lakes were often dry and rivers reduced to strings of stagnant pools. One year later the lakes were overflowing and the rivers overtopping their banks. Australia is, as Dorothea Mackellar famously wrote, a land of 'droughts and flooding rains'. In comparison to Ireland, which on world terms is blessed in terms of water quantity, quality and reliability, Australian rivers vary dramatically month to month and year to year, from boom to bust and back again.

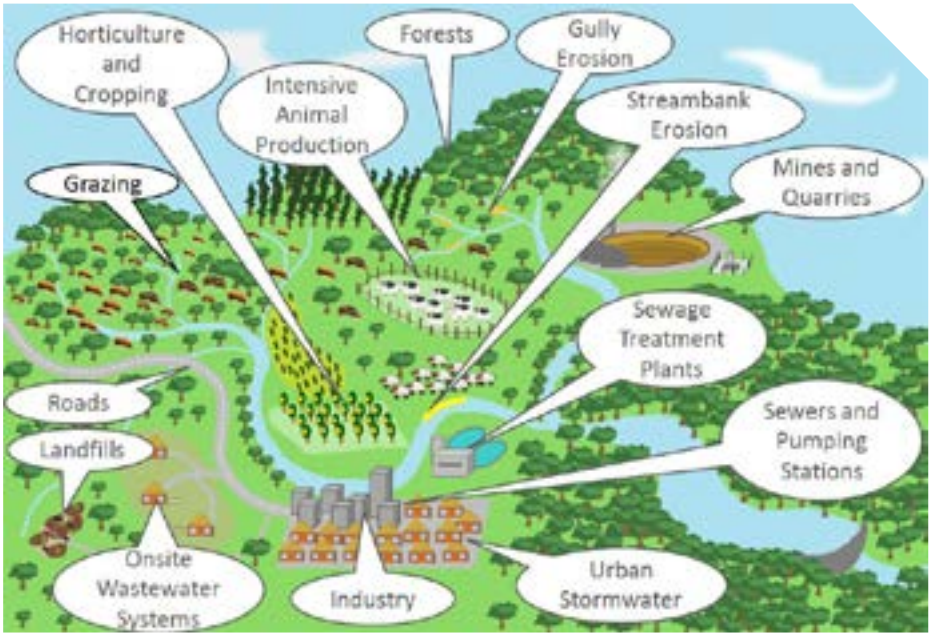
I work at WaterNSW, which manages the waterways, storages and catchments that supply Sydney's drinking water and irrigation water across New South Wales. In order to deal with that variability, our storages and catchments are extremely large. Lake Burragorang, the main reservoir in Sydney's water supply system, is one of the largest domestic water supply storages in the world, and at over 16,000 km^2, Sydney's drinking water catchments are almost the size of Connaught. These catchments contain a massive diversity of land uses including grazing, dairies, horticulture, urban areas, industry, mining and native forests. The task of managing pollution sources in these catchments is therefore complex.

LAKE BURRAGORANG

NEWS AND ARTICLES

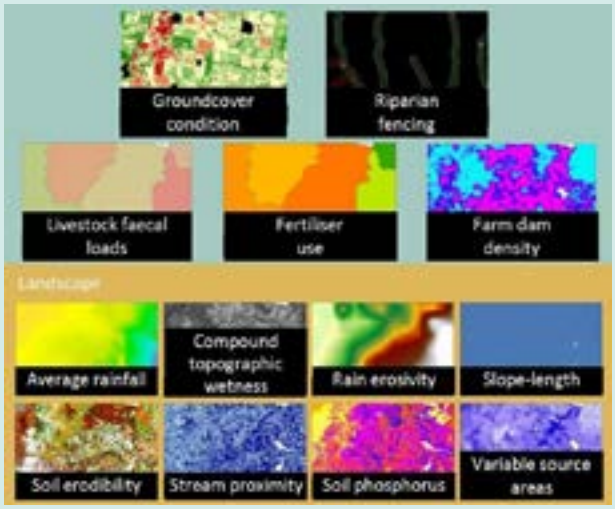
Of course there are differences in climate and landscape between Ireland and Australia, but there are similarities in the challenges we face in managing our waterways, the key sources of pollution, and the actions available to address them. At WaterNSW we have legislative power to minimise the impact of new developments on water quality. We use more consultative methods when addressing existing pollution sources unless there has been a clear pollution incident or breach of licence conditions. Our approach is to fund a programme of catchment interventions in partnership with communities, including sewer upgrades, riparian fencing to exclude stock from streams, and dairy effluent management.

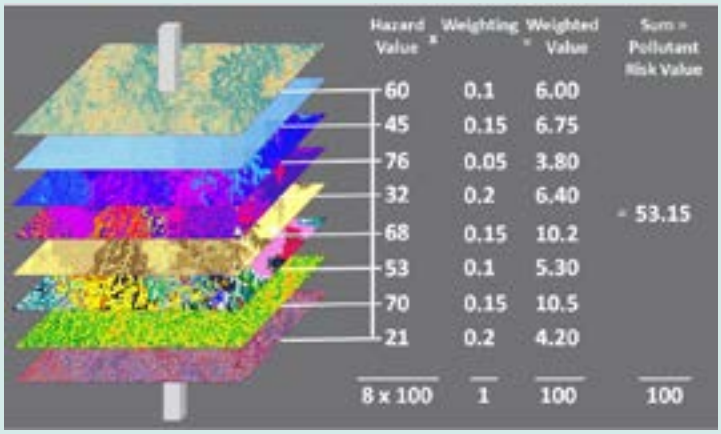
Our main aim is to minimise pollution at inflows to water storages, so all significant pollution sources are a high priority, even if their receiving streams remain at an acceptable standard in terms of overall environmental health. One challenge in this work is determining where within a large diverse catchment to spend limited resources – which geographic areas, which land uses, which properties.



POLLUTION SOURCE MODULES

INPUTS TO THE POLLUTION SOURCE ASSESSMENT TOOL GRAZING MODULE





THE WEIGHTED SUM OF RISK CRITERIA, THE GREY COLUMN REPRESENTS ONE GRID CELL

Like the waterbody characterisation being carried out in Ireland under the Water Framework Directive, WaterNSW uses monitoring for a suite of chemical and biological contaminants to identify streams with elevated pollutant concentrations, and also apply pollution source tracing methods to pinpoint major sources. These activities are labour and cost intensive and therefore are mainly used to investigate specific critical issues and in compliance investigations.

A more efficient method was needed to prioritise the non-critical majority of pollution sources in Sydney's drinking water catchments. To meet this need I have, for a number of years, developed and managed a pollution source risk assessment tool for WaterNSW named, creatively, the Pollution Source Assessment Tool (PSAT).

The Pollution Source Assessment Tool uses a geographic information systems (GIS) platform to assess the risk from all significant sources of pathogens, nitrogen, phosphorus and suspended solids in the drinking water catchments of Sydney. The pollution sources have been grouped into 14 different classes, and each class is addressed by a separate risk analysis, which we refer to as a 'pollution source module'. Each module contains either point or diffuse sources.

Teams of subject matter experts provide input into risk assessment criteria, inputs and weightings which are unique to each module. Spatial datasets and scientific data are collected or generated to inform these criteria. The diagram above illustrates the inputs to the grazing module.

The heart of the assessment for each module is a simple multi-criteria analysis, where each criterion (input) is converted to a set of index values for every site (point sources) or 25m grid cell (diffuse sources). The index values are then weighted and summed to create overall risk ratings in point or grid cell form. These range between 0 and 100.

These outputs provide useful information for prioritising within different pollution source modules, but not between them. For example they enable us to identify the critical source areas for grazing, but not the relative priority of grazing over horticulture.

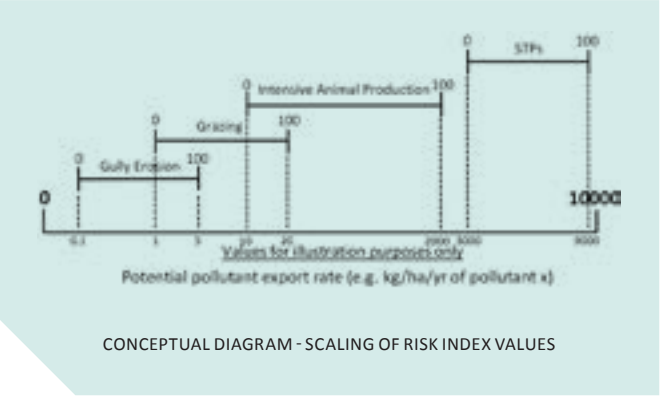
In 2015 we added a scaling process to the Pollution Source Assessment Tool to enable comparison between modules, and to improve our ability to communicate the benefit of proposed catchment interventions. This involves transforming the risk index values in each of those outputs into a common scale (estimated annual pollutant export rates) which is compatible across all pollution source modules.

To do this, we compiled a database of export rates for single land uses which were obtained from published pollutant runoff monitoring studies. This was used as a basis for estimating the minimum, maximum and median pollutant export rates for each module, which were then used to transform and scale each set of risk index values to create estimates of annual pollutant export rates.

Over such a large spatial scale, and with limited resources for small catchment monitoring, this scaling process is an estimate only, however it opens up an enormous range of uses and possibilities for use of the Pollution Source Assessment Tool in decision making and for validation of the results which were not possible in previous years.

The scaled outputs are stored in the form of a collection of spatial datasets: sites for point sources and grid cell values for diffuse sources. These can be summed for any combination of modules and by any set of spatial regions – subcatchments, local government areas, urban areas or larger grid cells.

Scaled Pollution Source Assessment Tool outputs have been used in a variety of ways in catchment intervention planning: at full catchment scale to enable the allocation of funding between grazing, sewer and urban programmes, at subcatchment scale to communicate focus areas within the catchments, and also at the individual property level to identify potential locations of rural grant programmes.



CONCEPTUAL DIAGRAM - SCALING OF RISK INDEX VALUES

Another advantage of the scaling results is that we can use them to estimate annual export rates for each of the catchments of monitoring sites in our supply system. We can then compare these values with manual loads estimated from monitored water quality data. By calculating the ratio of monitored load to estimated export rates we can examine where the risk assessment and/or scaling process may be over or under estimating the risk from pollution sources or areas. In short, it allows us for the first time to use an independent dataset (long term average monitored load) to validate and refine the assessment.

As is the case in Ireland with the information available at www.catchments.ie, we have found that the simple act of gathering a comprehensive database of information about pollution sources has many benefits in catchment management in addition to the risk assessment itself.

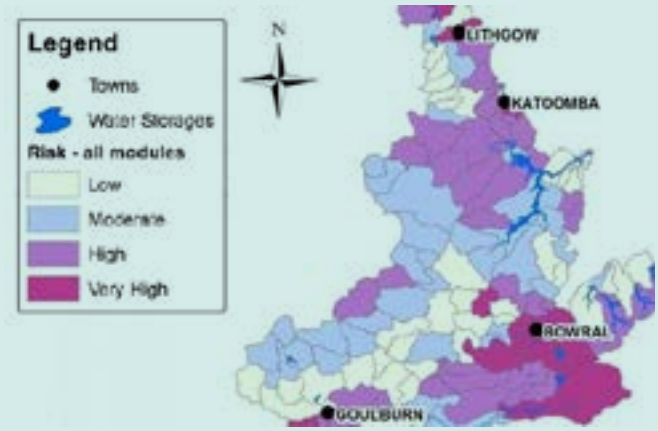
The Pollution Source Assessment Tool has improved understanding, challenged assumptions, driven scientific research and guided thinking and decision making, giving value far beyond the simple prioritisation of catchment programmes.

Ben Scott, Spatial Science Program Manager, Water NSW, Sydney, Australia

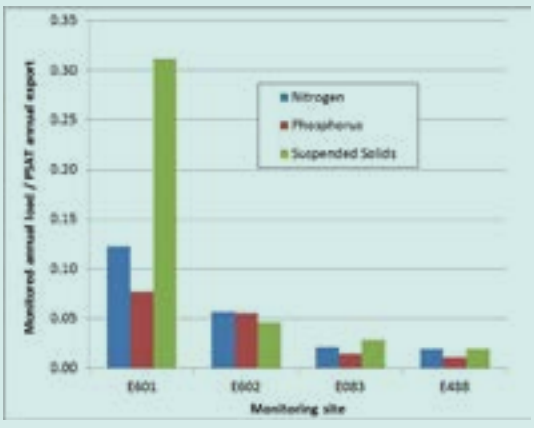
http://www.waternsw.com.au/

SCALED POLLUTION SOURCE ASSESSMENT TOOL OUTPUTS BY PROPERTY

SCALED POLLUTION SOURCE ASSESSMENT TOOL OUTPUTS BY PROPERTY



SCALED POLLUTION SOURCE ASSESSMENT TOOL OUTPUTS BY POINT SOURCE



RATIO OF MONITORED ANNUAL LOAD TO SUMMED POLLUTION SOURCE ASSESSMENT TOOL EXPORT RATES

The impacts of Climate Change on Irish groundwater resources

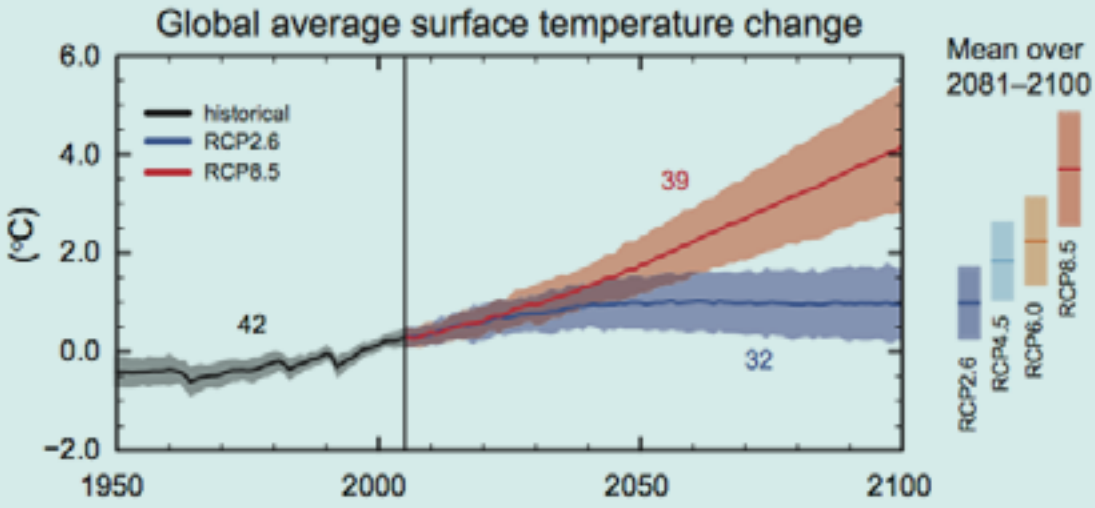


FIGURE 1: TEMPERATURE EVOLUTION IN THE LAST 60 YEARS AND PROJECTIONS UNTIL THE END OF THE CENTURY UNDER DIFFERENT REPRESENTATIVE CONCENTRATION PATHWAYS. (SOURCE: IPCC, 2013)

Groundwater resources in Ireland

As the largest store of available fresh water, groundwater is a priceless resource that needs to be protected. The importance of this resource in terms of water supply is clear; in Ireland around 25 % of the water supplies come from groundwater, with this proportion rising in rural areas, where houses are not connected to the public mains supplies but have private wells instead. In addition, groundwater also plays a vital role in less visible ways such as maintaining the river base flow, or providing water to ecosystems like fens or turloughs.

Accurate estimations of groundwater recharge are necessary to quantify the groundwater resources available. Furthermore, recharge estimates have other applications, for example the issuing of abstraction licences or the preservation of the ecology of a certain area. Recharge calculations can be carried out in a large range of spatial and temporal scales, depending on the purpose of the investigation. In the case of water resources management, recharge is typically calculated at catchment scale since catchments are the normal unit of water management.

Climate Change and projections for Ireland

It is known that climate has been changing over the earth's history causing cold periods, such as glaciations, and warmer periods. During the last 150 years global temperatures have experienced a significant increase, with rises being more acute in the last half century. Historically, the climate changes experienced by the Earth were linked to tectonic processes, volcanic activity or changes in the incoming solar radiation. In contrast, the changes that have occurred in the last century and a half are partly due to anthropogenic activities such as changes in land use and the increase in emissions of greenhouse gases and aerosols (IPCC 2013). To summarize, there are two drivers of the current changing climate: the natural forcing and the anthropogenic activities. The long-term changes in climate patterns due to the combination of these two drivers are known as global climate change (Figure 1).

A research project coordinated by Met Eireann generated updated simulations for Ireland, using the results of the fifth assessment report from the International Panel on Climate Change as a baseline. The results show that mean temperatures are likely to increase by about 1.5°C by mid-century with respect to the reference period (1981-2000). Moreover, winters are expected to be wetter and summers drier. An increase in the frequency and intensity of rainfall events is also predicted (Gleeson et al. 2013).

Implications of changes in recharge rates

Groundwater recharge mainly occurs by infiltration of the rainfall or by transfer from another water body. The main discharges occur naturally to rivers and ecosystems, and as seepage along the coast. Artificial discharges include abstractions by pumping wells or drainage works. As a consequence, any changes in groundwater recharge could affect both natural outflows and water supply abstractions. Regarding rivers, a reduction in baseflow would lower the river stage during dry periods and could lead to a deterioration in river water quality due to a higher concentration of pollutants. Groundwater dependent ecosystems could face similar problems. Furthermore, these ecosystems are highly sensitive to changes in water levels so a variation of a few centimetres can potentially affect the flora and fauna inhabiting them.

Natural springs occur when the groundwater table intersects with the land surface. Therefore, a relatively small depletion of the groundwater level could lead to a reduction of springs flows or even dry them up completely.

In another vein, source protection areas are delineated around springs and wells to protect their zone of contribution against possible polluting activities. In a hypothetical scenario, with lower recharge rates the area of the contribution zone to a given water source would increase in order to maintain the same abstraction rate (Hunter Williams and Lee, 2000). Therefore, the size of protection area would need to increase correspondingly.

Groundwater quality could also deteriorate if there is a reduction in groundwater recharge. Moreover, since changes in rainfall patterns and intensity are also anticipated, it could alter the mobilization of pollutants in the soil. For example,

the flushing of contaminants accumulated during dry periods in the soil could be enhanced by higher rainfall intensities.

Finally, in coastal aquifers there is a natural equilibrium between the saline water and the discharging groundwater. This equilibrium prevents coastal aquifers from becoming salinized, but can be easily disturbed by overexploitation of the aquifers or a depletion of groundwater levels. This issue is not particularly important in Ireland under the current climatic and abstraction conditions, but it could change in the future if recharge decreases and exploitation of coastal aquifers is intensified.

Assessing the impacts: from catchment to national scale

Most of the existing impact studies in groundwater are at catchment scale, since these are natural divisions of larger river basins. This helps to simplify the groundwater estimations as catchments can be treated as independent systems with defined properties. The smaller variation in some characteristics such as land use, soil and subsoil type, and lithology and aquifer type simplifies the understanding of the different processes occurring. It can then be used in other locations with similar characteristics or in a wider area.

Some relevant properties such as permeability, porosity or the presence of fractures, depend on some of the catchments characteristics mentioned above (e.g: subsoil type, lithology (rock type), etc.). These features have an important limiting effect on the amount of water that can reach the water table and be stored within the aquifers. Because of that, the response of the aquifers towards possible climate alterations depend on the local settings and so, the magnitude of the impact of climate change depends on the characteristics of each catchment.

This is especially relevant in Ireland where the range in subsoils and aquifer properties is particularly large. For example, glacial deposits cover a significant part of the Island, and they are characterised by having low permeability (Figure 2). As a consequence, the infiltration down to the underlying groundwater bodies will be lower than in areas covered by more permeable materials such as alluvial sands and gravels (Misstear et al., 2008).

Similarly, the range of lithologies across the island leads to diverse aquifer types with contrasting properties. Nevertheless, two thirds of the country are underlain by aquifers regarded as "Poorly Productive" because of their restricted capacity to store and transmit water.

The combination subsoil and aquifer type control the recharge rates and the groundwater storage. For this reason, it is expected that climate change will have an unequal impact across the country, depending on local settings.

The aim of this four year research project, funded through iCRAG (Irish Centre for Research in Applied Geosciences) and based at Trinity College Dublin, is to determine how these properties control recharge to be able to assess the possible impacts of climate change. To do so, three study catchments with contrasting properties have been selected so far: The Mattock (Co. Louth), Nuenna (Co. Kilkenny) and Dripsey (Co. Cork) (Figure 3). In these areas, groundwater recharge under current climatic conditions has been calculated and the sensitivity of the results tested by varying the assumed catchment properties mentioned previously. Other variables such as rainfall amount, its intensity or seasonal variation are also modified to see how groundwater could be affected under these hypothetical climatic conditions.

Acknowledgements

We want to acknowledge the Geological Survey of Ireland and the Environmental Protection Agency for providing respectively GIS datasets of the subsoils of Ireland and catchments contours used in this article to generate Figures 2 and 3.

Èlia Cantoni, Irish Centre for Research in Applied Geosciences, Laurence Gill, Trinity College Dublin and Bruce Misstear, Trinity College Dublin

A fully referenced version of this article will be available on www.catchments.ie

FIGURE 2: MAP OF IRELAND SHOWING THE PREDOMINANT SUBSOIL TYPES IN THE COUNTRY. THE AREAS IN BLUE CORRESPOND TO GLACIAL DEPOSITS

FIGURE 3: MAP OF IRISH CATCHMENTS WITH THE SELECTED STUDY AREAS HIGHLIGHTED IN BLUE.

Resources

How to read and understand a scientific paper: a guide for non-scientists

From vaccinations to climate change, getting science wrong has very real consequences. But journal articles, a primary way science is communicated in academia, are a different format to newspaper articles or blogs and require a level of skill and undoubtedly a greater amount of patience. In this article from the London School of Economics and Political Science Jennifer Raff gives a helpful guide for non-scientists on how to read a scientific paper. These steps and tips will be useful to anyone interested in the presentation of scientific findings, and raise important points for scientists to consider with their own writing practice.
http://bit.ly/understandingsciencepapers

Irish Times - Another Life: Shannon deserves better than gutter treatment

We were thrilled to get a mention in The Irish Times from Micheal Viney, who described the Catchments Newsletter as 'a lively and engaging science magazine'. We can't take too much credit for this as we are just sharing the stories of all the amazing hard work done by people across Ireland – but the kind words were very much appreciated! His article looks at the construction of Integrated Constructed Wetlands and their multiple benefits, and draws heavily on an article in the last issue of the Catchments Newsletter by Rory Harrington.
http://bit.ly/irishtimescatchments

Catchment Management Network Presentations

The EPA Catchments Unit held an event for the network for the public bodies involved in catchment management on February 24th 2017. The event covered the Draft River Basin Management Plan, the characterisation of our catchments to date and how this information is recorded in the WFD application, investigative assessments, plans for catchments assessments and workshops over the next 6 months, and other topics like urban pathways, forestry measures to promote water quality, the National Dairy Sustainability Initiative, Flood Plans, Regional Implementation Plans and the new Waters and Communities Office. Thanks to all the speakers and everyone who attended – it was great to see all the progress being made on working on these issues together.

All presentations are available at https://www.catchments.ie/2017-catchment-management-network-meeting/

Get Involved – The Sustainable Communities Initiative

Community has always been important to us here is Ireland. We might be famous for our globe-trotting ways but we are passionate about our home turf – in the most local sense. Get Involved encourages communities to come together to preserve the best aspects of their local areas, to protect their environment and to create local jobs. Above and beyond the competition, Get Involved is about encouraging people to take positive action and to become responsible for their local areas. Projects gain enormous support through Get Involved. The initiative was developed by Local Ireland, a group that represents 51 local newspapers and each of the Get Involved projects is paired with one of these local news brands. The partner newspaper provides coverage of the project as work progresses and sometimes even offers hands on assistance too! The Sustainable Energy Authority of Ireland (SEAI) are the proud sponsors of this initiative, which brings clear benefits to local economies and the environment by helping communities to become low-carbon, resource-efficient and economically resilient.

http://get-involved.ie/
http://www.seai.ie/

Ireland's Oldest Goats – visit them in Mulranny, County Mayo

Mulranny officially has some of Ireland's last remaining 'Old Irish' goats. The goats have lived on the hills close to the village for as long as anyone can remember. A collaborative team led by geneticists from Trinity College Dublin have just published the results of a landmark DNA study in the Royal Society Biology Letters.

"The study highlights an endangered feral herd living in Mulranny, Co. Mayo, as a unique population in need of protection. Mulranny goats show a genetic similarity to extinct 'Old Goat' populations that lived on the Isle of Skye in the 1800s. They can therefore be considered among the last remaining 'Old Irish' goats".

Mulranny Tourism on Facebook: https://www.facebook.com/Mulranny

Scientific Paper: http://rsbl.royalsocietypublishing.org/content/13/3/20160876

Farm Hazardous Waste Collection Campaign

The Farm Hazardous Waste collection campaign began in 2013 and has to date involved 7,000 farmers who have used 36 one-day collection centres to safely manage and dispose hazardous wastes from across Ireland. This 4 minute video explains the process and key issues surrounding hazardous waste on farms.
YouTube Video: http://bit.ly/epafarmwaste

Online Training in Watershed Management (US EPA)

The US EPA have some really useful training resources for watershed management –'watersheds' is their word for 'catchments'. The website offers a variety of self-paced training modules that represent a basic and broad introduction to the watershed management field. Modules include an Overview, Ecology, Change, Analysis and Planning, Management Practice and Community and Social. Modules vary in the time they take to complete, from ½ hour to two hours. Obviously this is aimed at a US audience, but many of the lessons are transferable – The EPA Catchments Unit uses a modified version of the US EPA's Steps for its own approach to Integrated Catchment Management.
https://www.epa.gov/watershedacademy/online-training-watershed-management

Burren Winterage School 2016– an overview

This 'School Report' gives an overview of the Burren Winterage School, which was held from the 27th -29th of October 2016 in Kilfenora, Co. Clare. A total of 104 people attended. Seventy-two of these were farmers. The School aims to be accessible to anyone interested in High Nature Value (HNV) farmland issues and so the format was designed to facilitate this. A Burren farmer chaired each of the sessions over two days and around a quarter of the speakers were farmers from HNV farmland areas. The remaining speakers comprised of people working with farming groups, researchers and national and EU policymakers. There were five themed sessions; Farming for Nature: An EU Perspective, Engaging and motivating 'farmers for nature', Incentivising farmers to deliver positive impacts for nature, Building capacity among farmers to deliver more for nature and Workshop on High Nature Value Farming – time for an Irish Network?
http://bit.ly/burrenschoolreport

Prestigious environmental award for pioneering project improving some of Yorkshire's finest countryside (UK.gov) - Upper Aire project wins the Green Apple award

A pioneering scheme that is leading the way in improving some of Yorkshire's best countryside has won a prestigious UK award.

The Upper Aire Project won the Green Apple award for its work on improving the environment and wildlife, particularly fish, in the River Aire and its surrounding catchment area. The project is run by the Environment Agency, Yorkshire Wildlife

Trust and the Yorkshire Farming and Wildlife Partnership, with the support of local businesses and landowners.

Environment Agency fisheries officer Pete Turner, who leads the project and collected the award, said: "I'm really proud of this project and I'm over the moon we won this award, especially as the award is for partnership working, which is a major reason it is such a success. A landowner taking part in the scheme, Philip Metcalfe, said: "The Upper Aire Project team made a really compelling case for converting some marginal land at the top end of Otterburn Beck to wet woodland. Soil is my most precious resource, so any extra ways of keeping it on the land instead of seeing it washed into local becks are really welcome. Doing that successfully means everyone wins – I keep my soil and the water quality will improve".

Alan Thwaite, who also runs a farm in the area, said: "The Upper Aire Project installed 13 leaky dams in the gullies which drain water from the land above my farm. At Christmas we had record-breaking rainfall but our farmhouse didn't flood, despite this being a fairly regular occurrence until then. There's no question in my mind that the two things are related".

This article contains UK.gov public sector information licensed under the Open Government Licence v3.0.
http://bit.ly/ukgreenapple

Natural Capital: An Overview (UK.gov)

UK.gov also have a useful summary report on Natural Capital. The benefits derived from natural resources include food, recreation and clean air and water. The aim of valuing these resources is to quantify better the cost of their degradation. This briefing summarises how to value natural capital, discusses the advantages and challenges of approaches and describes some initiatives to secure natural capital for the future.
http://bit.ly/uknatcapoverview

Ireland's Content Pool – free content to promote Irish Tourism

Bring your content to life with this free resource for positive tourism related purposes. This brilliant website from Fáilte Ireland and Tourism Ireland has image, video and copy collections which show people, landscapes and the Irish lifestyle across a range of experiences including festivals, activities, cities, rural life and food.

https://www.irelandscontentpool.com/

Irish Uplands Forum Strategy 2016-2020

The Irish Upland Forum (IUF) is a voluntary body established in 1995, to assist upland communities to face the many economic, social and environmental challenges arising in the upland districts of Ireland. Its members include farmers, recreational users, ecologists, tourism and other countryside service providers who represent those who live, work or recreate in the Irish Uplands. The primary focus of the Forum is the pursuit of a partnership approach to sustainable upland management of upland areas and to support upland community groups to address local challenges. Their strategy for 2016-2020 is now available online.
http://irishuplandsforum.org

Water purification by Mother Nature and its benefits for society

Water for drinking, home and public use, as well as for agriculture and industry is provided for free by Mother Nature or, as scientists and policy-makers put it, by ecosystem services. A study led by the European Commission's Joint Research Council puts the benefits of this "free" service at €16 billion a year at European level, a conservative estimate in terms of actual consumption by economic sectors and households.

http://bit.ly/mothernaturewater

Inland Fisheries Ireland on Morning Ireland - protection of waterways contributes €836m to economy every year

This segment on Morning Ireland with Ciaran Byrne, CEO Inland Fisheries Ireland, covers their annual report which highlights their work across the country, and gives some fascinating statistics on the hard work done to preserve our precious and dwindling stocks of fish – a vital national asset to Ireland, and the local communities that depend on angling for tourism.
http://bit.ly/ifimorningireland

Second year of 'catch and release' in the Fane River

This article in the Dundalk Democrat covers how for the second year in a row, the River Fane is open for the fishing of salmon and seatrout (over 40cm), on a "catch and release" basis. That means that anglers are not allowed to kill salmon or seatrout (under 40cm may be killed). They must fish with a single, barbless hook and not fish with a worm.
http://bit.ly/riverfanedundalk

Caring of the green: Ireland wakes up to the value of public parks with Green Flag awards

The new Green Flag scheme awards open spaces that balance sustainability with human activity. This Irish Times article covers this award scheme which rates the management of parks across six criteria including safety, cleanliness, conservation, community involvement and sustainability.

http://bit.ly/itgreenflags greenflagaward.org

New podcast episode on seaweed from the Sustainable Water Network (SWAN)

SWANsounds, which highlights water protection & policy issues around Ireland while also featuring the work of SWAN's members, has a new episode online: 'Irish Seaweed: Time-Honoured Traditions and New Appetites'. For generations, the vast resource that is Irish seaweed has gone largely ignored by all but a devoted smattering of traditional harvesters along the west coast, but a new boom in popularity means that's starting to change. With change, however, comes new pressures on an already creaking regulatory framework. Follow along as SWAN talks to Coastwatch Ireland about the wonderful underwater worlds of seaweed ecosystems, only to surface in the daunting realm of existing policy. Finally, curious about what's going to happen to traditional harvesters when big corporations come on the scene, SWAN gets perspective from both sides.
Listen here http://bit.ly/2knFhHY or search for SWANsounds in the iTunes store.

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