



River Restoration Centre 22nd Annual Network Conference

What are we doing to & for our rivers?

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Welcome

...from Martin Janes, RRC Managing Director

I'm delighted to be able to welcome you to the 2021 River Restoration Centre Annual Network Conference!

Firstly, a huge thank you for supporting the RRC. Without RRC's members and supporters, we would not be able to do what we do.

For the second year we needed to push back the date of the conference, this time to give us the best shot possible of holding an in-person meeting. With that came the issues of delays and uncertainty for presenters, programme, bookings, etc. as we waited to see what the pandemic would permit us to plan for. As a team we thank you again for being patient, supportive and understanding when all too often the answer to your question has been "I'm not sure, we'll let you know as soon as we can".

But we are here now – the time, the place, the Zoom link... and the challenge of seamlessly integrating 200 people in Harrogate with 120 people in slippers. We have planned for what we can, and also for what we cannot, so wherever you are seated and whatever footwear you are sporting, let us know how it works for you.

I must thank all of the presenters, workshop coordinators and sponsoring organisations for rising to the challenge of preparing or pre-recording talks, displays, posters, videos and networking workshops and site visits - so we can package all of this up to keep you busy and to allow you to get the most out of these two days.

The title and theme for this year is 'What are we doing to and for our rivers', reflecting the fact that despite our far better understanding, there are still very big pressures on freshwater systems – pollution, abstraction, management, development. But, at the same time, we are now better equipped and informed to challenge, combat and change this, with policies strategies and mechanisms coming through that are more integrated, bigger in scope and scale, and have the backing of politicians. The question is at what stage will 'what we are doing to' our rivers be as positive as 'what we are doing for' them?

The UK River Prize Awards continues into its 7th year. We have two fantastic finalists reaching from Southern to Northern England. We hope you will join us in celebrating their achievements, and also recognising the individual achievements of this year's nominated River Champions. This event is open to all through the Zoom link, so please feel free to invite your very own 'river champions' to take part.

Finally, I would like to say thank you to everyone who has supported RRC throughout the years. Receiving my 25 years 'milestone' gift last year made me think how far we have all come in that time. It has not got easier, it is still not well enough funded, but 'our community' of individuals and organisations passionate about river systems, and our impact and what we can now achieve has grown enormously.

Have a great two days.

Martin Janes, Managing Director

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PROGRAMME OF EVENTS

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Session 1

Chair: Martin Janes (River Restoration Centre)

10:00	River Restoration Centre introduction & welcome Martin Janes (<i>River Restoration Centre</i>)	15 mins
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10:15	<u>Natural Course: Delivering Water Framework Directive on a River Basin District Scale</u> Dan Gower (Environment Agency)	15 mins
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10:30	<u>Performance of an environmentally aligned flood alleviation scheme: the Burn of Mosset at Forres, Scotland 10-years on</u> Rachael Todd (Atkins)	15 mins
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10:45	Discussion	15 mins
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11:00	SHORT BREAK with coffee and tea	35 mins
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11:35	Unmanaging our rivers George Heritage (Dynamic Rivers)	15 mins
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11:50	<u>What a load of rubbish?! The impacts of anthropogenic litter on biodiversity in urban streams</u>	15 mins
	Hazel Wilson (University of Nottingham & Atkins)	

12:05	<u>Appropriate use of large wood structures for river restoration and management - how to ensure effectiveness while managing risk</u> Hamish Moir (cbec)	15 mins
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12:20	Discussion	15 mins
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12:35	LUNCH in Carriage Suite	60 mins
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Session 2

Ballroom

Large wood structures

Chair: Ann Skinner (RRC)

Drawing Room

Natural Capital & Net Zero

Chair: Jo Cullis (Jacobs)

Billiard Room

River processes

Chair: Marc Naura & Hannah Joyce (RRC)

13:35	<u>Characterising Leaky wooden dams for Working with Natural Processes</u> Chloe Carter (University of Hull)	<u>Natural Capital Baseline Assessment: Protecting Nature's Benefits in the Thames Estuary</u> Helen High (JBA Consulting)	<u>Identifying reference conditions for Sweden's lost boulder-bed rivers</u> Richard Mason (Umeå University)	15 mins
13:50	<u>Biodiversity benefits of 'dam' good river restoration</u> Ashley Deane (Severn Rivers Trust)	<u>Integrating Natural Capital within the Broadland Futures Initiative</u> Penelope Borton (Jacobs)	Restoring Beltie Burn Susan Cooksley (James Hutton Institute)	15 mins
14:05	Discussion	Discussion	Discussion	10 mins

Session 2 – continued...

14:15	<u>Catchment-scale geomorphological modelling of leaky dams using CAESAR-Lisflood</u> Josh Wolstenholme (University of Hull)	<u>How catchment restoration can help achieve Net Zero Carbon</u> Katie Chorlton (JBA Consulting)	<u>Geomorphology and design: Involvement in an iterative design process</u> Rhys Kibble & Josh Moore (Jacobs)	15 mins
14:30	<u>Restoring the River Camel SSSI/SAC through removal of Grogley gauging weir</u> Kevin Skinner (Atkins)	<u>Inner city river restoration – Albany Park Flood Alleviation Scheme</u> Stephen Henry & Stephanie Dufour (BMT)	<u>NSM: the most important component of NFM</u> Neil Entwistle (University of Salford)	15 mins
14:45	Discussion	Discussion	Discussion	10 mins
14:55	Posters & Exhibition in Carriage Suite with tea and coffee <i>Vote for your favourite poster</i>			45 mins

Session 3				
	<u>Ballroom</u>	<u>Drawing Room</u>	<u>Billiard Room</u>	
	Practical project delivery	NFM Modelling: tools & strategies	Engaging your audience	
	Chair: Kevin Skinner (Atkins)	Chair: Emma Wren (Mott MacDonald)	Chair: Christianne Tipping (RRC)	
15:40	<u>The SUNRISE Project - Rediscovering the urban Trent</u> Richard Guy (Staffordshire Wildlife Trust)	<u>Monitoring and modelling strategies for Natural Flood Management. A case study from the South East of England</u> Benjamin Tonkin (University of Surrey)	<u>Game Changing approaches for catalysing action</u> Diana Pound (Dialogue Matters)	15 mins
15:55	<u>Largest River Island Restoration in the UK (so far!)</u> Nick Mott (Staffordshire Wildlife Trust)	<u>Innovative Modelling Tools for Whole Catchment Modelling to Assess Natural Flood Management</u> Duncan Kitts (BMT)	<u>Can you engage with communities on a catchment scale?</u> Nim Kibbler (Forth Rivers Trust)	15 mins
16:10	Discussion	Discussion	Discussion	10 mins

Session 3 – continued...

16:20	<u>LIFE Dee River catchment based approach to river restoration</u> Joel Rees-Jones (Natural Resources Wales)	<u>Modelling catchment wide NFM interventions in different conditions</u> Ryan Jennings (JBA Consulting)	Measuring the Impact of Citizen Science (MICS) John Wheatland (River Restoration Centre)	15 mins
16:35	<u>Low cost gauging weir retrofit using cylindrical roughness elements for upstream fish passage of non-salmonids</u> Daniella Montali-Ashworth (Five Rivers)	<u>Leeds FAS2 NFM: Using digital tools to plan and manage the delivery of NFM</u> Paul Millard (Mott MacDonald)	Discussion	15 mins
16:50	Discussion	Discussion	Discussion	10 mins
17:00	Short break to move to Keynote Session			10 mins

Session 4

Ballroom

17:10	Keynote Address - Tony Juniper, Chair, Natural England	25 mins
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17:35	Discussion – <i>what are we doing to & for our rivers?</i>	20 mins
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17:55	Poster competition winner, final announcements & close Martin Janes (<i>the River Restoration Centre</i>)	5 mins
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18:00	End of Day 1	
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EVENING SESSION



**19:00 FOR 19:30 – UK RIVER PRIZE AWARDS DINNER &
RIVER CHAMPIONS 2021**

BALLROOM

--- FRIDAY 22ND OCTOBER ---
Session 5

12

Session 5

09:00	CHOICE OF ONE WORKSHOP OR ONE SITE VISIT	3 hours
Billiard Room Workshop C	Regency Suite: Workshop D	
Citizen Science in river restoration: co-designing and managing for impact	CatchmentLIFE: A tool describing pressures and impacts on species and ecological communities	
<p>Facilitator: Earthwatch & RRC</p> <p>Understanding the impact of citizen science activities can help provide evidence to evaluate projects, which can be used to secure funding, but also to develop, manage and sustain more meaningful and effective citizen science activities. This workshop aims to explore how to set up sustainable citizen science activities and how to measure the impacts of citizen science in river restoration projects. We will reflect on techniques for setting up citizen science activities following a co-design process, which puts the citizens at the heart of 'citizen science' to help identify priorities for monitoring. There will be case study examples and opportunities for participants to discuss and share their experiences of citizen science.</p> <p>The second part of the workshop will explore the multi-dimensional impacts of citizen science in river restoration and how we can measure those impacts. We will discuss the experience of the audience on their views of impact in their citizen science projects. We will introduce a platform for measuring impact and participants will have opportunity to discuss and try the platform. Participants will be able to learn about the set up and measurement of the impacts of citizen science.</p>	<p>Facilitator: Marc Naura (RRC) & South East Water</p> <p>The integrity of freshwater ecosystems globally is being threatened by a multitude of anthropogenic stressors, including varying forms of pollution, flow regime modifications and hydromorphological alterations. Understanding & quantifying these pressures on freshwater ecosystems remains a critical problem within river management.</p> <p>To address this knowledge gap, RRC collaborated with South East Water and other project partners to develop a research bid for the 'Ofwat Innovation in Water Challenge' initiative. The overarching aim of the project was centred on developing a tool entitled 'CatchmentLIFE', which will be able to quantify pressures & impacts on different ecological responses, including species & biotic communities. CatchmentLIFE will link to datasets from major UK organisations and enable users to input and share their own data.</p> <p>From the outset of this project, we are very keen to glean end-user inputs and requirements to refine CatchmentLIFE and ensure that its functionality and operability is compliant with the needs of different stakeholders. As such, we are inviting participants to have a direct involvement in refining a tool that they will later use to guide river management strategies. In addition, participants will gain theoretical knowledge and practical experiences on how habitat modelling techniques can be incorporated in catchment-wide river management strategies.</p>	
12:00	LUNCH	60 mins

Session 5

09:00

CHOICE OF ONE WORKSHOP OR ONE SITE VISIT

3 hours

Site Visit 1 River Tutt

Facilitator: Yorkshire Wildlife Trust

Improving the ecological quality of the River Tutt by reducing sedimentation and improving fish habitat as well as improving the quality and connectivity of bankside semi-natural habitats.



Site Visit 2 Rodley Nature Reserve

Facilitator: Yorkshire Water

Towards the North West of Leeds, this project looked to create a [bypass channel around Rodley weir](#), aiming to improve fish passage on the River Aire.



12:00

LUNCH

60 mins

<hr/> Session 6 New funding mechanisms and how can we use them Ballroom <hr/>		
Chair: Fiona Bowles (RRC)		
13:00	<u>Carbon Offsetting - achieving Net Zero by 2030</u> Lydia Burgess-Gamble (Environment Agency)	15 mins
13:15	Sources of funding for England SSSI river restoration programme Jenny Wheeldon (Natural England)	15 mins
13:30	<u>Natural Environment Investment Readiness Fund - Changing the way we fund the Environment</u> Alison Baker (Environment Agency)	15 mins
13:45	Panel session Questions for speakers and wider discussion of opportunities Guest panel	45 mins
14:30	<hr/> END OF CONFERENCE <hr/>	



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Thanks to the 2021 partners:

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On Thursday 21st October, one of the shortlisted finalists will be announced as the winner of the 2021 UK River Prize.

The River Restoration Centre (RRC) awards the UK River Prize to celebrate the achievements of those individuals and organisations working to restore our rivers and catchments, and recognises the benefits to society of having a healthy natural environment. After much deliberation the judges selected the two finalists below. The overall 2021 Winner will be presented with the trophy on Thursday evening.

The two selected finalists for the 2021 UK River Prize:

Finalist	Recognised for	Lead applicant
River Keekle Restoration <i>Cumbria</i>	Restoring natural processes to a plastic-lined river	West Cumbria Rivers Trust
EPIC – Enhancing Places, Inspiring People <i>West Sussex</i>	Urban stream regeneration and community partnerships	Ouse & Adur Rivers Trust

“The global pandemic has put plans on hold, reduced the capacity of most organisations big and small and required adaptation to very different ways of working, and yet the call to protect and restore our rivers is stronger than ever. These two NGO-led projects demonstrate the value of long-term perseverance and determination, the desire to affect change and improve our river environments and the benefits that those actions bring.”

Martin Janes, Managing Director, River Restoration Centre

2021 UK River Prize Finalist

River Keekle Restoration (Cumbria)

Restoring natural processes to a plastic-lined river

The issue

A 2.5 km section of the River Keekle in West Cumbria was diverted around a mine from 1987 to 1995. The natural course was restored in 1996, but with 8 million tonnes of spoil buried underneath, restoration comprised a 3 metre clay cap topped with an HDPE plastic liner and stone boulder weirs. Flooding in 1998-99 washed most of the stone downstream and destroyed parts of the liner. The damage worsened over time, resulting in many areas where the river flowed under, over and around the liner, causing mass erosion. Concern grew that erosion of the clay cap could result in heavy metals from the spoil entering the River Ehen, of which the Keekle is a tributary. This would gravely affect fish populations (particularly Atlantic salmon) and England's largest colony of the critically endangered freshwater mussel, which relies on the salmon for part of its life-cycle.



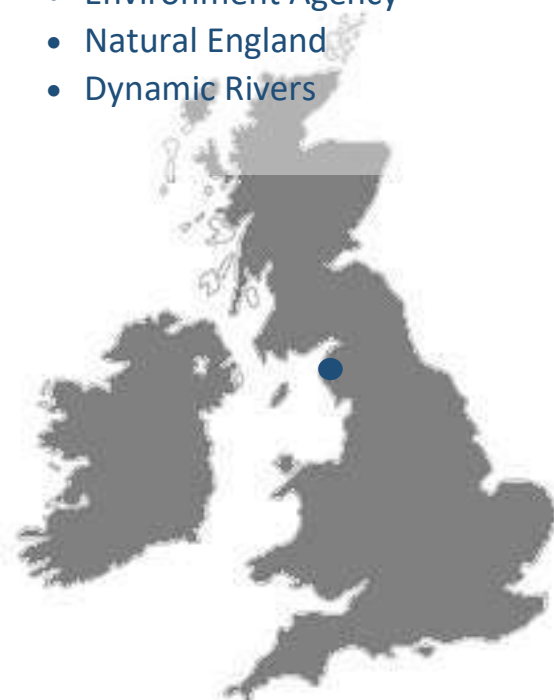
The project

The plastic liner was removed from the 2.5 km stretch and replaced with stone, gravels, cobbles and boulders, creating a fully functioning, ecologically thriving river with good water quality that is re-connected to its flood plain. The project was split into two phases:

Phase 1 (2019): Plastic removed from a 170 metre trial site, testing removal methodologies.

Phase 2 (2020): Removal of the remaining plastic and restoration of the entire stretch.

All plastic removed was recycled. For the next five years, electro-fishing and habitat surveys will be conducted to monitor salmonid habitat improvement and the University of Salford will monitor the geomorphology using drone surveys. The Environment Agency continues to monitor water quality.



In numbers

2.5km of river restored
180tonnes of HDPE plastic removed and recycled
16,000tonnes of stone imported
1.8ha new wetland created
5 tonnes of carbon stored per year in the wetland
2,000 ripariantrees planted
1 ha of wildflower meadow re-seeded
6 years planning and research
2 years delivery
20 weeks of on-the-ground construction
£1.5million total cost



Environmental challenges and solutions

The degree of previous modification made the project unique. A system audit suggested a pool-rapid morphology was appropriate in the main river, grading to a lower energy pool-riffle system as the gradient reduced downstream.

In-river habitat was very uniform pre-restoration. The design incorporated pools, riffles, rapids, steps, point, lateral and mid-channel bars, split channels, back channels and river cliffs. No bank protection was used, giving the river space to behave naturally. The variety of features and habitats will develop and sustain multiple species of fish, insects and macrophytes.



Freshwater wetlands cover 6% of the Earth's surface but hold up to 30% of all carbon contained in soil. Per year, temperate UK wetlands accumulate carbon at an average rate of 278 g/m^2 , so the 1.8 ha wetland created at the Keekle will accumulate around 5 tonnes of carbon, offsetting approximately 75,000 km of car travel.



2021 UK River Prize Finalist

EPIC – Enhancing Places, Inspiring People (West Sussex) **ARUP** *Urban stream regeneration and community partnerships* **ATKINS**

Member of the SNC-Lavalin Group

This project has daylighted, through realignment, a 1km section of the Broadwater Brook, located on the edge of Worthing, West Sussex. This ephemeral chalk spring-fed stream is fed by groundwater from the South Downs National Park, augmented by surface water runoff from urban infrastructure. Part of the Teville Stream catchment it was classified (2019) as a heavily modified waterbody with “Bad” ecological status under the Water Framework Directive. Prior to the project the stream was open for the top 500m before entering a series of culverts under an industrial estate and landfill site, meeting the road drain of North Worthing and the A27, resulting in a watercourse degraded by contaminants and high sediment load.

Realignment was the only option to deliver the required improvements and designs needed to consider the streams ephemeral nature, accounting for high and low flows, as well as the complex nature of the site with constraints including land contamination, a 1:3000 gradient and the presence of services including the Rampion onshore cable, a mains sewer, a chemical effluent pipe and high voltage electricity cable. Low maintenance sediment traps were constructed at the upstream extent whilst composite banks and marginal shelves sit next to a V-shaped low-flow channel to account for seasonal changes in flow dynamics whilst enabling colonisation by marginal vegetation and providing habitat for a range of species.

The project had been conceived by the Environment Agency in 2010 as part of the Defra pilot for a Catchment Based Approach. Having received planning permission in 2012 the project was then dropped due to the construction cost and complexities around delivery. The Ouse & Adur Rivers Trust were approached by the landowner in 2015 to reinvigorate the project and in 2016 a first round application to the Heritage Fund was successful in bringing the required development funding to the project, followed by a second-round application in 2018 with match funding from the Environment Agency and Rampion Offshore Wind Ltd. The original designs were altered, and new consents obtained with construction undertaken in the summer of 2019 over a period of 14 weeks.

In addition to the river enhancements, the project has added resilience to the landscape through the transformation of the surrounding maize fields into 6.9 hectares of wildflower meadow, planting 2.2km of hedgerow and 500 trees and constructing 3 new ponds alongside additional marginal wetland habitats. The project has also provided multiple benefits to the local community, creating access to new green space and river trail in a heavily urbanised area, creating opportunities for practical river conservation and activities to improve habitat and biodiversity.

Project partners

- Ouse & Adur Rivers Trust



Over the past 3 years the project has hosted over 250 events to inspire, educate, and involve the local community with over 1,000 people getting involved. The local area is within the top 2% of deprived communities in the Country and activities were targeted at those who are often under-represented in environmental projects, many of whom weren't aware the site existed prior to the project. This has upskilled and raised awareness, creating a river and access which already has a sense of ownership from those who have helped to create it. Activities included planting 2.2km of hedgerow, 500 trees, plug planting 5000 wetland plants, in-channel habitats, ecological monitoring, infrastructure design & construction, water testing, litter clearance and general maintenance. This has resulted in formation of Sompting River Rangers, a volunteer group directed by a project partnership based steering group.

The landowners were key partners throughout the process, and we worked closely to ensure that changes to the landscape were undertaken in a way which enabled future management and agricultural use whilst benefiting the water environment, biodiversity value of the landholding and the local community. Additional partnership involvement in the project was received from the Environment Agency who provided, funding, advice and guidance on land contamination and the numerous permits/consents and, along with the River Restoration Centre, assisted with checking designs. This collaborative approach enabled us to ensure that the complexities of the site were considered in the design process. Alongside this we worked with asset owners in developing plans to mitigate services, ensuring that agreeable and cost-effective design solutions were found.

The team were keen to learn as much as possible from this project and monitoring and evaluating the quality of habitat, species colonisation and composition, and how water quality parameters have improved or changed because of the works. Setting SMART objectives through a logic model monthly monitoring of the site began in 2017 and has been assisted by the University of Brighton along with several local experts from a variety of fields.

Whilst this monitoring is ongoing, results to date show that, compared to pre-construction, the ecological condition of the stream and surrounding landscape has improved dramatically. Outputs:

- Phosphate levels within the channel reduced from a mean of 3.6mg/l to a mean of 1.3mg/l
- Nitrate levels reduced from a mean of 5.47mg/l to 3.8mg/l with testing highlighting seasonal spikes from the South Downs following rainfall and further investigation is being undertaken.
- BMWP scores have increased from a mean of 48 to 69 and with freshwater invertebrate diversity increasing from 29 to 75 recorded species.
- Fish diversity has increased from 1 species to 7 species
- Overall species diversity across the site has increased from 179 (2017-2019) to 543 (2019-2021)
- Landscape permeability is increased, and surface water flows reduced through increasing landscape roughness and creating retention areas.
- Flood risk to the industrial estate has been reduced through increased channel capacity.
- Engagement with local communities and business through water quality and plastics campaigns have instigated behavioural change through higher appreciation of the water environment.

Further long-term monitoring is being undertaken across a range of parameters to assess effectiveness of silt traps on a variety of priority substances. Results will be disseminated as and when available.

We would like to thank the Heritage Fund, Environment Agency, Rampion Offshore Wind & Sussex Community Foundation who provided funding & support in overcoming project constraints through a difficult period of delivery. To the landowners, the Sompting Estate Trust, whose vision and patience allowed the site to be created and also put a legal covenant on the land to protect it for the next 25 years. We would like to thank our designers, EdenValeYoung and our contractors, SalixRW, who both went well beyond what we would expect to ensure that we achieved our ambitions for the watercourse within a fixed budget.

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2021 River Champions

'River Champions' seeks to celebrate the outstanding efforts of individuals contributing to river restoration. Below is a brief introduction to the 2021 River Champions, more information about each will be showcased by the RRC over the next year on our website and social media platforms.

Danny Teasdale

Pretty much all of Danny's spare time involves voluntary work. He drives and coordinates whole communities to participate in voluntary work within their local environment. He created the Ullswater Community Interest Company and supports work on the ground. Danny is a member of the local community and his relationships with farmers has encouraged more strategic and joined up working.

Jean Wilson

Jean gives up a considerable amount of time to help with work on the River Wyre. She has also given up space in her house and garden for lab work and equipment! Jean's main roles are consultant ecologist, educational adviser and community engagement co-ordinator. She was the instigator of the BioBlitz's which records as many species as possible in 24 hours.

Jo Bradley

Jo dedicates a lot of time to voluntary clean ups and has been cleaning up rivers for more than 20 years. She helps organise and support litter picks across the UK supporting local groups to create public awareness of the detriment to rivers with a focus on plastics, microplastics and urban pollution. She is inspirational and has reached out to local authorities, water companies, developers, MPs and the general public.

John Whiting

Over the years John has dedicated an inordinate amount of time to voluntarily improving rivers. As a Trustee of the Ouse & Adur Rivers Trust, John attends board meetings, develops Trust governance and attends events to promote the work of the trust. John has been instrumental in developing the organisation to its current position as well as developing and delivering several fish pass projects across the catchment.

Rick Battarbee

As coordinator of Addingham Environment Group and a member of Addingham 4 Becks Project, Rick helped shape the project as steering group member and Beck Steward. He has been instrumental in moving the project forward and linking it into wider work along the River Wharfe. Alongside this Rick has worked with the Addingham Primary School Scheme to create a wetland reserve for learning, biodiversity and SuDS.

Tony Booker

Tony is the Chair of the Colne Valley Fisheries Consultative. His main role is to engage and coordinate angling clubs. Most recently, Tony has worked with the Herts & Middlesex Wildlife Trust to deliver workshops arming angling clubs with the skills to develop management plans for their sites. Tony has also engaged Affinity Water and Thames Water to deliver water testing, to locate pollution sources and develop solutions to tackle these.





Meet the RRC Team

Martin Janes – Managing Director

Martin's role combines expert advice and business management. He works with our core funders to ensure RRC provide the expertise they need. He uses his restoration experience within the technical team, represents the river restoration community on steering groups, and oversees RRC management.

Marc Naura – Science & Technical Manager

Marc provides technical advice and expertise on river restoration schemes, helps develop research bids, develops decision support tools and plans training courses. He is interested in what technology and science can do to help practitioners and environmental managers in their decision-making.

James White – Science & Technical Officer

James provides scientific and technical expertise on different projects. His responsibilities entail delivering training courses, pursuing research funding opportunities and studying application of best-practice restoration techniques. He is currently working on a project funded by the World Bank, aiming to characterise the hydromorphological status of rivers and lakes across Bulgaria.

John Wheatland – Science & Technical Officer

John provides technical and scientific advice on several different projects. He is currently working alongside other members of the RRC team on the Measuring Impact of Citizen Science (MICS) project, which aims to develop tools for evaluating the impact of citizen science on society and the environment.

Hannah Joyce – Science & Technical Officer

Hannah provides technical advice as well as developing research opportunities and training courses. She is working on the Measuring Impact of Citizen Science (MICS) project, funded by the EU Horizon 2020 research and innovation programme.

Joshua Robins – River Restoration Adviser

Josh provides technical river restoration advice to enquiries and projects. He assists with all project stages including scoping new projects, site visits, providing best practice advice, and evaluating success. Josh manages RRC's annual events program, and plans and delivers training courses and site visits.

Alexandra Bryden – Information Officer

Alex manages the National River Restoration Inventory (NRRI), RiverWiki and UK Projects Map, edits the bulletin and social media platforms, updates the RRC website, and supports events planning and project site visits. She also helps out with technical enquiries and training course preparation and delivery.

Nicola Mackley – Centre Administrator

Nicola runs the bookings process for the Annual Network Conference and acts as the RRC's Membership administrator, managing the contacts database and distribution lists. Nicola assists the team with everything that happens in the office and manages incoming calls and emails for the organisation.

Jackie Hinton – Accounts Technician

Jackie undertakes the management accounting functions of the business and works alongside the Managing Director and Science and Technical Manager with business planning, project management and support to the Board. Jackie carries out invoicing and purchasing tasks, as well as day to day accounts.



the River Restoration Centre

Working to restore and enhance our rivers

RRC Training Course Series

RRC training courses are open to anyone with an interest in the topics we offer, including NGO's, wildlife and river trusts, statutory agencies, consultants, contractors, and early-stage researchers interested in linking science to practitioner's needs. These are the courses we currently offer:

Introduction to Hydromorphology (Level 1)

This practical 1-day overview course will introduce participants to hydromorphology.

Developing a Catchment-wide Restoration Plan

This course introduces participants to a methodology for developing a catchment-wide restoration plan to help identify pressures and impacts.

River Habitat Survey Certification

This is a 4-day course where surveyors are introduced to the basics of hydromorphology through fieldwork and presentations. We recently amended this course to be able to hold as a hybrid with some online modules followed by fieldwork.

Mapping for Natural Flood Management (NFM)

This course uses aerial photo interpretation, GIS, fieldwork, lab work and geomorphology to indicate historical floodplain boundaries, surface runoff pathways and demonstrate potential areas of flood storage.

Hydromorphology for River Restoration (Level 2)

This course builds on the introductory course and provides more in-depth knowledge of hydromorphological driver/process/form/pressure interaction.

Desk-based assessment for river restoration planning & catchment management

This course teaches you to find, display and interpret existing data to aid river restoration projects and catchment strategy.

Advanced Hydromorphology (Level 3)

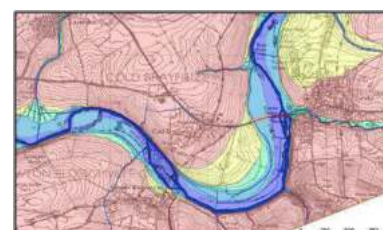
This course builds on and applies the concepts of the Level 1 & 2 courses. It involves detailed hands-on application of basic sediment transport equations and flow regime equations.

River Erosion Management

This course will provide an introduction to the types and drivers of river bed and bank erosion, techniques for monitoring erosion, and approaches to manage and control erosion in different settings.

Putting Ecology into River Restoration: An Introduction

This course provides an introduction on how ecological principles can be incorporated within river restoration strategies, with specific reference to freshwater macroinvertebrates.



Online dates	Course
17 th November 2021	Introduction to Hydromorphology
1 st December 2021	Putting Ecology into River Restoration: An Introduction
8 th December 2021	Developing a Catchment-wide Restoration Plan
26 th January 2022	River Erosion Management
9 th February 2022	Hydromorphology for River Restoration
23 rd February 2022	Advanced Hydromorphology



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ABSTRACTS

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Session 1

NATURAL COURSE: DELIVERING WATER FRAMEWORK DIRECTIVE ON A RIVER BASIN DISTRICT SCALE

C. HIGSON¹, M. TURNER², D. TURNER³, P. NELSON⁴, S. PLATTS-KILBORN⁵

1 Environment Agency, 2 Greater Manchester Combined Authority, 3 Rivers Trust, 4 Natural England, 5 United Utilities

A 10 year programme, designing projects to better understand and overcome some of the biggest barriers to the EU Water Framework Directive in the North West, delivering real improvements to rivers and the water environment. It's a collaboration of public, private and third sector organisations working together to co-design, co-finance and co-deliver projects which are particularly ambitious, highly scalable, and build from previous successes and lessons learned. Its approach has maximised the collaborative nature of teams, and delivers the best projects to meet our objectives, improve the water environment & provide multiple benefits for the wider environment, resulting in finding innovative solutions around individual constraints and limitations, including human resources, policies, finance and procurement. We give an overview of the approach taken to river basin district scale improvements, look at the successes to date, and feature challenges faced and lessons learned along the way.

PERFORMANCE OF AN ENVIRONMENTALLY ALIGNED FLOOD ALLEVIATION SCHEME: THE BURN OF MOSSET AT FORRES, SCOTLAND 10-YEARS ON

R. TODD¹, M.F. JOHNSON², C. THORNE², P. EDWARDS, J. CASTRO

1 Atkins, 2 University of Nottingham

Repeated flooding of Forres, Scotland by the Burn of Mosset led to construction of a flood alleviation scheme (FAS) featuring a small dam and flood basin, upstream of the town. It was known that the orifice through the dam would be vulnerable to blockage by sediment and large wood and therefore the Burn Management Works (BMW) were used to fully reconnect the Burn to its floodplain, aiming to trap sediment, wood and debris. Here we present 10 years of post-project monitoring, which demonstrates the schemes success at fulfilling its primary function of storing sediment and wood. Its evolution from a single-thread, trapezoidal channel, to a complex mosaic of anastomosed channels, ponds and wetlands set within a wet meadow also led to mutual, ecological benefits. The results show how it is possible to use a restored multi-channel-wetland-floodplain system to reduce flood risk as part of a FAS, while avoiding the need for frequent maintenance by restoring and working with natural processes.

UNMANAGING OUR RIVERS

G. HERITAGE¹

1 Dynamic Rivers

The majority of the rivers in the UK only look and behave in the way that they do because of historic and contemporary management controlling their behaviour. System dynamism has been replaced by enforced stasis in an effort to maximise the exploitation of fluvial assets, creating totally unnatural systems with fundamentally altered flow and sediment transport regimes where almost all functional habitats have been lost. Such mismanagement is reducing as costs to control rivers escalate and state funding for such activities dwindles with some 'misbehaving' rivers providing valuable clues regarding their true nature that can be used to re-naturalise other systems. Here we report on simple and effective techniques to 'Unmanage' fluvial systems from tributary streams to floodplain wetlands, targeting key weaknesses in the managed landscape to resurrect system dynamism. Such interventions are both cheap and easy to achieve and require no further management to maintain their effectiveness.

WHAT A LOAD OF RUBBISH?! THE IMPACTS OF ANTHROPOGENIC LITTER ON BIODIVERSITY IN URBAN STREAMS

H. WILSON¹, M.F. JOHNSON², C.R. THORNE², M.P. EICHHORN³

1 University of Nottingham & Atkins, 2 University of Nottingham, 3 University College Cork

Anthropogenic litter (solid manufactured waste) is widespread, persistent and difficult to manage in UK rivers. Despite an understanding of the effects of litter in oceans, little is known about its impact on life in rivers. Conventional wisdom is that litter is bad for organisms, although anecdotal evidence show that eels and native crayfish use car tyres and bottles as habitat, and that fish shoal around shopping trolleys. This presentation reports new research on the effects of litter on the ecology of urban streams. While relationships between litter and organisms are complex, we found little evidence that even high levels of litter are associated with reduced biodiversity. Conversely we found diverse and distinct communities of invertebrates colonising litter. Litter may in fact be a substitute for natural habitats in rivers lacking diverse morphologies and substrates due to urbanisation. We consider the implications of our findings for urban river restoration and clean-up events.

APPROPRIATE USE OF LARGE WOOD STRUCTURES FOR RIVER RESTORATION AND MANAGEMENT - HOW TO ENSURE EFFECTIVENESS WHILE MANAGING RISK

H. MOIR¹

1 cbec

Large Wood Structures (LWS) are increasingly being implemented as 'nature-based' measures for river restoration and management applications. This includes for the purposes of the reinstatement/ enhancement of natural physical and ecological processes but also as more sustainable ('green') river engineering (e.g. bank protection). Such measures offer significant potential benefits to river environments, especially over more traditional 'hard' engineering approaches that are less sensitive to natural physical and ecological processes. However, in practice, there is often still significant resistance to the implementation of such measures, with concerns as to their long-term stability and efficacy. We present empirical and analytical data from a number of LWS case studies that demonstrate, 1) their positive influence on geomorphic process/ form, 2) the associated biotic response, 3) the hydraulic mechanisms by which they deliver the intended objectives (e.g. physical evolution, habitat provision, bank protection) and 4) considerations of long-term stability. The case studies represent a range of physical environments (upland, high energy rivers to lowland chalk streams), project objectives (physical/ ecological enhancement and bank protection) and methods of construction (representing a refining of design/ build approaches as practical lessons have been learned through modelling and monitoring). The analytical studies include modelling of complex LWS that show the varying degrees of near bank energy dissipation and geomorphic forcing in the channel, depending on structure size, type and orientation. In particular, the realignment of a highly dynamic river using LWS as controls on geomorphic process is demonstrated using both morphodynamic modelling and repeat topographic surveys. The case studies presented identify the fundamental role that LWS provide in terms of the physical and ecological evolution of river environments, the 'active' manner in which they protect riverbanks from erosion through dissipation of flow energy (i.e. rather than simply translating this downstream, as rock armour does) and that, properly designed and implemented, they remain stable under high flow conditions without the requirement for securing through 'hard' engineered measures (e.g. cables, ground anchors etc).

NOTES



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Session 2: Parallel Sessions

Large wood structures

CHARACTERISING LEAKY WOODEN DAMS FOR WORKING WITH NATURAL PROCESSES

C. CARTER¹

1 University of Hull

There has been a move in the last 10 years to Work With Natural Process and use nature-based solutions to help manage and mitigate against flooding including Natural Flood Management. The use of Leaky Wooden Dams to provide flood storage and to 'slow the flow' is a popular feature of many NFM schemes. In their most basic form LWDs are woody material placed into a river in the aims of mitigating against flooding. However, there is currently no agreed upon definition or classification of LWDs. Therefore, the lack of clarity on what LWDs are has led to confusion and disagreement. This research provides a comprehensive definition and classification system to overcome this confusion and disagreement and underpin future research and monitoring of LWD.

BIODIVERSITY BENEFITS OF 'DAM' GOOD RIVER RESTORATION

A. DEANE¹

1 Severn Rivers Trust

Within headwaters of the SW Peak District, Cheshire Wildlife Trust are delivering Natural Flood Management (NFM) interventions. Large Woody Debris (LWD) features heavily in the NFM toolkit to restore hydrological and ecological resilience of lotic systems. Restoring rivers with LWD enhances biocomplexity of in-channel habitat. Using a case study, this presentation focuses on biodiversity benefits of 'dam' good river restoration. LWD engineered log dams were installed in 2km of Black Brook. Flow regimes and habitat complexity became more heterogenous. Macroinvertebrate assemblages increased in abundance, richness and diversity. Additionally, notable increases of fine sediment accumulated within immediate upstream vicinity of LWD dams. By comparing intervention reaches with control reaches we were able to demonstrate tangible spatial and temporal benefits of artificially introduced LWD. Future NFM schemes could yield multiple benefits if LWD is installed to enhance freshwater habitats.

CATCHMENT-SCALE GEOMORPHOLOGICAL MODELLING OF LEAKY DAMS USING CAESAR-LISFLOOD

J. WOLSTENHOLME¹, C. SKINNER¹, D. MILAN¹, D. PARSONS¹

1 University of Hull

Most natural flood management modelling is hydrological and focuses on flood risk without accounting for geomorphology. We argue that the long-term effectiveness of NFM interventions require an understanding of the nested hydrogeomorphological processes at work within river catchments, particularly those related to bed scour, sediment transport and deposition, and the associated feedbacks following implementation of leaky dams. Leaky dams that are designed to attenuate the hydrograph and 'slow-the-flow', may cause sediment storage as well as scour, potentially impeding the effectiveness of a leaky dam to reduce flood risk after a single storm event. Using the new 'Working with Natural Processes' toolbox in CAESAR-Lisflood, the influence of different storm scenarios on a series of leaky dams in a hypothetical catchment based on a site in North Yorkshire is assessed. The effectiveness of the model at representing the influence of the dams on hydrogeomorphology is also assessed.

RESTORING THE RIVER CAMEL SSSI/SAC THROUGH REMOVAL OF GROGLEY GAUGING WEIR

K.S. SKINNER¹, J.E. BURKE², A. BULCOCK¹, N. LOWDEN¹

1 Atkins, 2 Environment Agency

Grogley weir, and associated infrastructure, sat within the River Camel SAC and SSSI near Ruthernbridge, Cornwall. The 2012 SSSI strategy identified that the modifications were adversely impacting the SSSI, designated for a range of riparian wetland habitats and the presence of notable species including otter, Atlantic salmon and bullhead. An alternative gauging method was sourced and thus the structure was no longer required. In 2020, the infrastructure was removed and the reach re-naturalised. This included the removal of the weir, sheet piling and

gabion baskets along with around 60-65m of block stone along both banks. The new, exposed banks were battered back, seeded and Bionet added to reduce the potential for erosion while the reach stabilised via vegetation establishment. A series of wood deflectors were also added to improve habitat heterogeneity and provide cover for fish. This presentation details the scheme and subsequent monitoring that will be used to assess performance.

Session 2

Natural Capital & Net Zero

NATURAL CAPITAL BASELINE ASSESSMENT: PROTECTING NATURE'S BENEFITS IN THE THAMES ESTUARY

H. HIGH¹, R. NGAI¹, K. CHORLTON¹, S. MASLEN¹, R. GUDKA²

1 JBA Consulting, 2 MHCLG

Understanding the value of natural capital in the Thames Estuary is imperative for informed decisions to protect and enhance the natural assets and their services on which the community depends for its social, cultural and economic wellbeing. This is important given the pressures of climate change and future development in London and its environs and, as such, has been recognised by the government in their recent pledge to protect vital resources and support nature recovery. This study used qualitative, quantitative and economic analysis to build the 'best available' picture of natural capital and where the greatest benefits can be achieved now and in the future. In consultation with a wide range of stakeholders, priority areas and opportunities to deliver net gains and provide resilience to the natural and cultural environment were developed. The study will aid long-term natural capital management and investment commensurate with commitment for economic growth in the Thames Estuary.

INTEGRATING NATURAL CAPITAL WITHIN THE BROADLAND FUTURES INITIATIVE

P. BORTON¹

1 Jacobs

The Broadland Futures Initiative (BFI) is a Strategy defining flood risk management across Norfolk and Suffolk Broadland, Eccles to Winterton coast and Great Yarmouth for the next 100 years, adopting an adaptation pathways approach. The BFI has a strong natural capital (NC) focus and is unique in that:

- A baseline NC assessment was undertaken prior to option development, allowing NC to be embedded within design.
- A regional and local approach was taken including: Regional NC opportunity 'heat-mapping' of the 340km² study area and 60 individual NC flood compartment reports, identifying opportunities for co-benefits in relation to NC enhancements and flood risk management.
- Recommendations identified 'win-win' scenarios wherein co-benefits such as expansion of wet woodland to promote blue-green infrastructure benefits also provide water storage capabilities.

The presentation will explore methods used and lessons learnt, particularly in relation to stakeholder management and data.

HOW CATCHMENT RESTORATION CAN HELP ACHIEVE NET ZERO CARBON

J. BROOMBY¹, K. CHORLTON¹, S. ROSE¹, L. HODGKINSON¹, S. MASLEN¹

1 JBA Consulting

Understanding how catchment restoration projects can contribute to Net Zero Carbon targets requires an understanding of baseline conditions and projecting the impacts of emissions of changes in management and land uses. These two case studies explore the potential carbon sequestration of working with natural processes in two settings – upland farming and in an estuary. We worked with the Yorkshire Dales Rivers Trusts to assess the carbon sequestration potential of natural flood management on two traditional hill farms in the Upper Wharfedale valley, assessing how measures could be used to offset farming emissions and enhance existing sequestration. At Skeffling on the Humber Estuary, we have explored the potential carbon sequestration benefits resulting from managed realignment. We have determined the sequestration rates of different habitat types to produce a current carbon sequestration baseline value and compared this with the future potential through managed realignment.

INNER CITY RIVER RESTORATION – ALBANY PARK FLOOD ALLEVIATION SCHEME

J. BROOKS¹, K. KIMBALL¹

1 BMT

Inner city river restoration is an opportunity to create multi-purpose green space bringing wider benefits to disadvantaged communities. The Turkey Brook in London was a heavily channelised river with high maintenance costs due to deteriorating concrete banks. Modelling predicts overtopping could potentially flood over 200 properties. Climate resilience and sustainable urban regeneration was designed into the Albany Park Amenity and Biodiversity Masterplan. This provided the opportunity to create a flood alleviation scheme for the Turkey Brook, transforming a neglected parkland into a valuable green space creating cycleways, multi-recreational use, education/ amenity space and linking with the wider transport network. Flood risk is mitigated through the creation of 49,900 m³ of offline flood storage. As well as ensuring much lower whole life costs there were many environmental advantages to naturalising the channel and creating reed beds/ wetlands, meadows and enhanced woodland habitat.

Session 2

River processes

IDENTIFYING REFERENCE CONDITIONS FOR SWEDEN'S LOST BOULDER-BED RIVERS

R. MASON¹, L. POLVI¹

1 Umeå University

Identifying the target or natural state of a river is a challenge as very few unimpacted (reference) sites remain. In northern Sweden, most semi-alluvial boulder-bed rivers were cleared and channelised for timber floating and restoration is based on aesthetics and practical experience rather than empirical data. This study aims to quantify the range in geomorphological characteristics of reference sites. We undertook a large-scale field campaign to survey 20 reaches (100m) across rivers in northern Sweden. At each river we measured the grain size distribution and patterns in boulders and large wood. Sites varied in morphology from steep channels to low-gradient reaches with high floodplain connectivity. The median grain size ranged from 0.16 to 1.2m, with up to 500 large boulders within 100m. These results are important for habitat restoration in boulder-bed streams worldwide and the challenges and opportunities for identifying reference conditions from near- natural rivers.

GEOMORPHOLOGY AND DESIGN: INVOLVEMENT IN AN ITERATIVE DESIGN PROCESS

R.H. KIBBLE¹, J.L. MOORE¹

1 Jacobs

River engineering has a long history of being unsympathetic in design towards rivers, leading to a range of contemporary issues. Geomorphologists play a crucial role in the design process, helping to identify where these issues may manifest and encouraging interventions which allow for rivers to function sustainably in the future.

This paper provides an example from the UK where a multi-discipline team have worked alongside the client and stakeholders to develop a restoration design for a heavily modified river, following the removal of abstraction infrastructure. The approach adopted by the team was based on a recognition of early and continued engagement with specialists throughout the design process, a thorough understanding of baseline conditions, and regular feedback to client/stakeholders. The outcome was an outline design which evolved from continued review to provide significant betterment for a range of ecological, hydrological, sustainability and geomorphological receptors.

NSM: THE MOST IMPORTANT COMPONENT OF NFM

G. HERITAGE¹, N. ENTWISTLE²

1 Dynamic Rivers, 2 University of Salford

Flood driven bedload transport and deposition can have a severe impact on flood risk and studies have shown that flood driven sedimentation can influence local flooding to a greater extent than climate change. This type of sedimentation has been exacerbated by channelization. mobilized bed material generally passes along channelised sections accumulating in lower energy reaches downstream potentially increasing local flood risk in urban areas. This study utilises repeat LiDAR the River Caldew above Carlisle to investigate the balance of erosion and deposition associated with channel switching from an engineered and managed single thread channel to an incipient wandering system. Such behaviour is significant with regard to reducing downstream flood risk with less coarse sediment flux occurring through to vulnerable reaches in Carlisle and suggests that naturalisation of channelised systems above flood vulnerable urban areas can have a very significant impact on flood mitigation.



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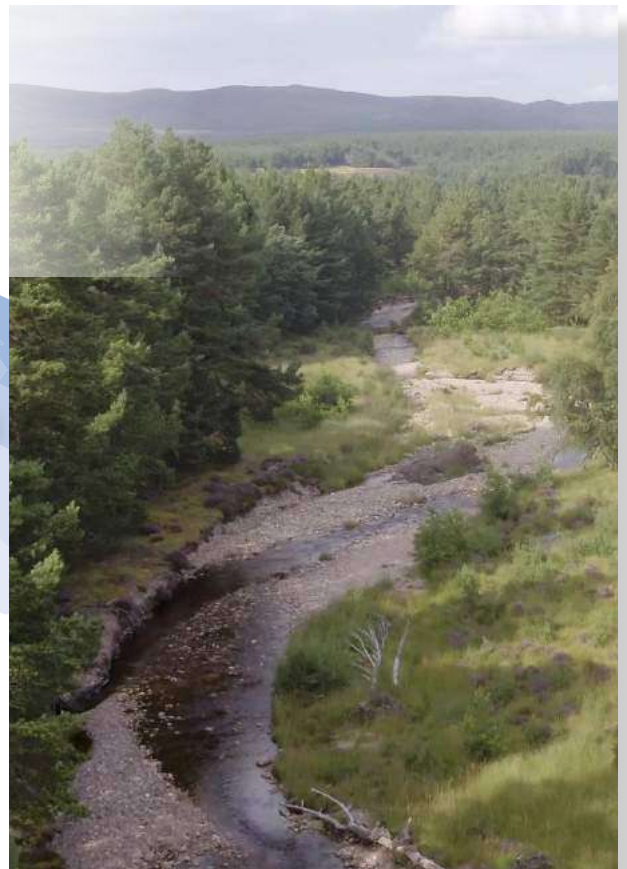
- Floodplain reconnection
- Upland landuse management
- Flood hydrographic attenuation and desynchronization

Fisheries and Barriers Management

- Habitat surveys
- Barrier assessment & fish pass screening evaluation
- Mitigative habitat design and construction
- Management of fisheries monitoring programmes

Hydropower Support

- Assessment of geomorphic and hydrological characteristics
- Scoping and design of measures to mitigate impacts to physical form/ process and aquatic ecology
- Planning and review of license applications
- Assessment of the status of local fisheries



designing with nature

Session 3: Parallel Sessions

Practical project delivery

THE SUNRISE PROJECT - REDISCOVERING THE URBAN TRENT

M. LAWRENCE¹ R. GUY², N. MOTT², M. GARDNER¹

1 Environment Agency, 2 Staffordshire Wildlife Trust

The ERDF SUNRISE Project (2018-2021) was devised to enhance biodiversity in urban greenspaces in Stoke-on-Trent and Newcastle-under-Lyme, Staffordshire. With partners including Staffordshire Wildlife Trust and the Environment Agency, project delivery focussed on habitats adjoining the Trent and its tributaries, capitalising on their function as green corridors through the towns. The presentation will focus on several river restoration schemes including:

1. a 500m diversion of the Trent within a brownfield site earmarked for development. A new channel has been excavated and “naturalised” to replace a concrete channel described by the EA as the worst remaining section of the Trent. The project is due for completion in Oct '20 and featured on BBC Countryfile in September '20.
2. a 400m re-meandering and enhancement of the Trent within the campus of Staffordshire University, restoring morphological diversity, and improved habitat diversity into a historically straightened section of river.

LARGEST RIVER ISLAND RESTORATION IN THE UK (SO FAR!)

N. MOTT¹, S. BENTLEY², V. BUNTER¹, M. SANDERS¹

1 Staffordshire Wildlife Trust, 2 AquaUoS

Cherry Holme is an 8.8 hectare river island in Staffordshire. When the River Trent was deepened during engineering works in the 1960s the secondary channel connection was severed and it was infilled with dredged material. Phase 1 of the restoration was completed in March 2013. 400 metres of palaeochannel was excavated to create a functional backwater. Willows were keyed back into the backwater to promote habitat complexity. Phase 2 of the restoration was completed in September 2020. 250 metres of palaeochannel was excavated to reconnect Cherry Holme as a river island for the first time in nearly 60 years! All gravel from the former river bed was retained. 700 cubic metres of cobbles were imported from the adjacent Barton Quarry to promote the formation of a point bar, a mid-channel bar and riffles. The main aim of this scheme was to restore the natural processes associated with a multi-thread system.

LIFE DEE RIVER CATCHMENT BASED APPROACH TO RIVER RESTORATION

J. REES-JONES¹

1 Natural Resources Wales

LIFE Dee River is a £6.8 LIFE funded project aimed at restoring the River Dee, the largest river in North Wales and a Special Area of Conservation. It is the first river restoration project in Wales which addresses multiple issues across such a large, cross-border catchment. Project Manager, Joel Rees-Jones, will discuss the whole catchment-based approach to rehabilitating and restoring natural processes, features and physical habitats within the SAC, focusing on barriers to fish migration, modifications to river channel and banks, and improving land management practices. The presentation will include case studies on interventions carried out to date, monitoring work, expected results, as well as highlighting what has worked well, and lessons learnt. We are happy to refine the talk nearer the time to fit the theme of the programme.

LOW COST GAUGING WEIR RETROFIT USING CYLINDRICAL ROUGHNESS ELEMENTS FOR UPSTREAM FISH PASSAGE OF NON-SALMONIDS

D. MONTALI-ASHWORTH¹

1 Five Rivers

A fish pass design comprising of porous cylindrical roughness elements has been developed with research showing that the passage efficiency of a Crump weir was increased (>80%) for roach when retrofitted with a staggered array of these elements. Swim path analysis indicated fish utilised low velocity zones in the wake of clusters to facilitate passage. Fish exhibited a range of sinuous swimming behaviours while manoeuvring through the array to ascend the weir, the most common of which was zigzagging between two lines of porous cylinders. Results showed that optimal conditions for fish passage can be obtained through tailoring array layout so that the area of low velocity and spacing between the cylinders is maximised whilst increasing the overall flow resistance created by the pass.

Session 3

NFM Modelling: tools & strategies

MONITORING AND MODELLING STRATEGIES FOR NATURAL FLOOD MANAGEMENT. A CASE STUDY FROM THE SOUTH EAST OF ENGLAND

B.R. TONKIN¹, B. MARTI-CARDONA¹, S.J. HUGHES¹, L. LI¹, N. PHILPOTT²

1 University of Surrey, 2 Environment Agency

Leaky Barriers (LB) are an example Natural Flood Management (NFM) method, which consist of placing logs across a channel supported on both banks. Despite their common adoption, there are relatively few studies that have quantified the hydraulic effect of peak flows and associated inundation effects. This research seeks to address this evidence gap, providing practical tools to enable effective monitoring and modelling of LB's. Enhanced monitoring data (river level and extents) was captured for validation and calibration over an extended period (2018-2021). This study has shown that excluding overtopping as a hydraulic feature of a LB results in associated error in water level of 0.3m for peak flow event of 0.9m³/s (for LB height of 0.64m). The inclusion of permeability to the LB hydraulic unit (0.1m gap) resulted in 0.06m reduction in water levels. The results of this hydraulic modelling may have significant implications for the representation of LB's as hydraulic units.

INNOVATIVE MODELLING TOOLS FOR WHOLE CATCHMENT MODELLING TO ASSESS NATURAL FLOOD MANAGEMENT

D.R. KITTS¹, J. STOBART¹

1 BMT

Natural Flood Management (NFM) options are commonly assessed using a range of modelling tools which are used to determine the influence on flood risk hydrology. Existing modelling approaches either use a broad-scale or a detailed reach-scale approach and as such there is a trade-off between the area and detail that can be represented. The nature of NFM is often distributed and reach-scale modelling approaches does not represent the potential interactions and impact on catchment hydrology. Catchment scale modelling can model distributed measures but often simplify processes, ignore the detailed features or be computationally expensive, limiting the number of potential options that can be assessed. Innovative hydraulic modelling tools will be presented which address current limitations by allowing a nested approach to represent fine scale NFM options at a larger catchment scale whilst also representing topographic detail throughout the whole catchment.

MODELLING CATCHMENT WIDE NFM INTERVENTIONS IN DIFFERENT CONDITIONS

R. JENNINGS¹, S. ROSE¹, I.H. PORTER¹, N. HYSLOP²

1 JBA Consulting, 2 Environment Agency

During the original Belford NFM project (2007-2015) numerous runoff attenuation features, plus other NFM features, were installed and monitored in the catchment upstream of Belford in Northumberland. JBA have constructed a 2D HEC-RAS model of the whole rural catchment to represent the pre-NFM and as-now NFM situations. We have explored how the current condition and capacity of the RAFs compare to the exact same catchment in previous conditions. The presentation will describe the modelling processes and challenges faced when representing multiple distributed NFM interventions across a catchment and their changing conditions over time.

LEEDS FAS2 NFM: USING DIGITAL TOOLS TO PLAN AND MANAGE THE DELIVERY OF NFM

P. MILLARD¹

1 Mott MacDonald

Mott MacDonald is working with the Environment Agency to develop a suite of digital tools to streamline delivery of the Leeds FAS2 Natural Flood Management project. The 'NFM Sites' platform enables the coordination of hundreds of prospective sites through the delivery process; from site identification to design of a site concept and beyond.

Session 3

Engaging your audience

GAME CHANGING APPROACHES FOR CATALYSING ACTION

D. POUND¹

1 Dialogue Matters

There is no time to lose. We need fresh approaches. Linear and silo thinking got us into this mess - we need Systems Thinking. Doom and gloom results, at best, in short term action - we need hopeful, determined and sustained action. Poor practice participation disempowers and provokes resistance - we need co-design and co-delivery to play to strengths. Incremental change is too slow - we need rapid transformations. And science is not the only way of knowing - we need all our knowledge. This presentation will make that case that with fresh approaches we can do so much more to solve the climate and nature crisis.

CAN YOU ENGAGE WITH COMMUNITIES ON A CATCHMENT SCALE?

N. KIBBLER¹

1 Forth Rivers Trust

The RiverLife: Almond & Avon in SE Scotland (Forth Catchment) comes to an end in 2021. An ambitious project to reconnect migratory fish passage along the River Almond, through the efforts of a partnership based project. FRT share reflections of the practical application of ensuring community buy in and further engagement along side just getting a digger in the river.

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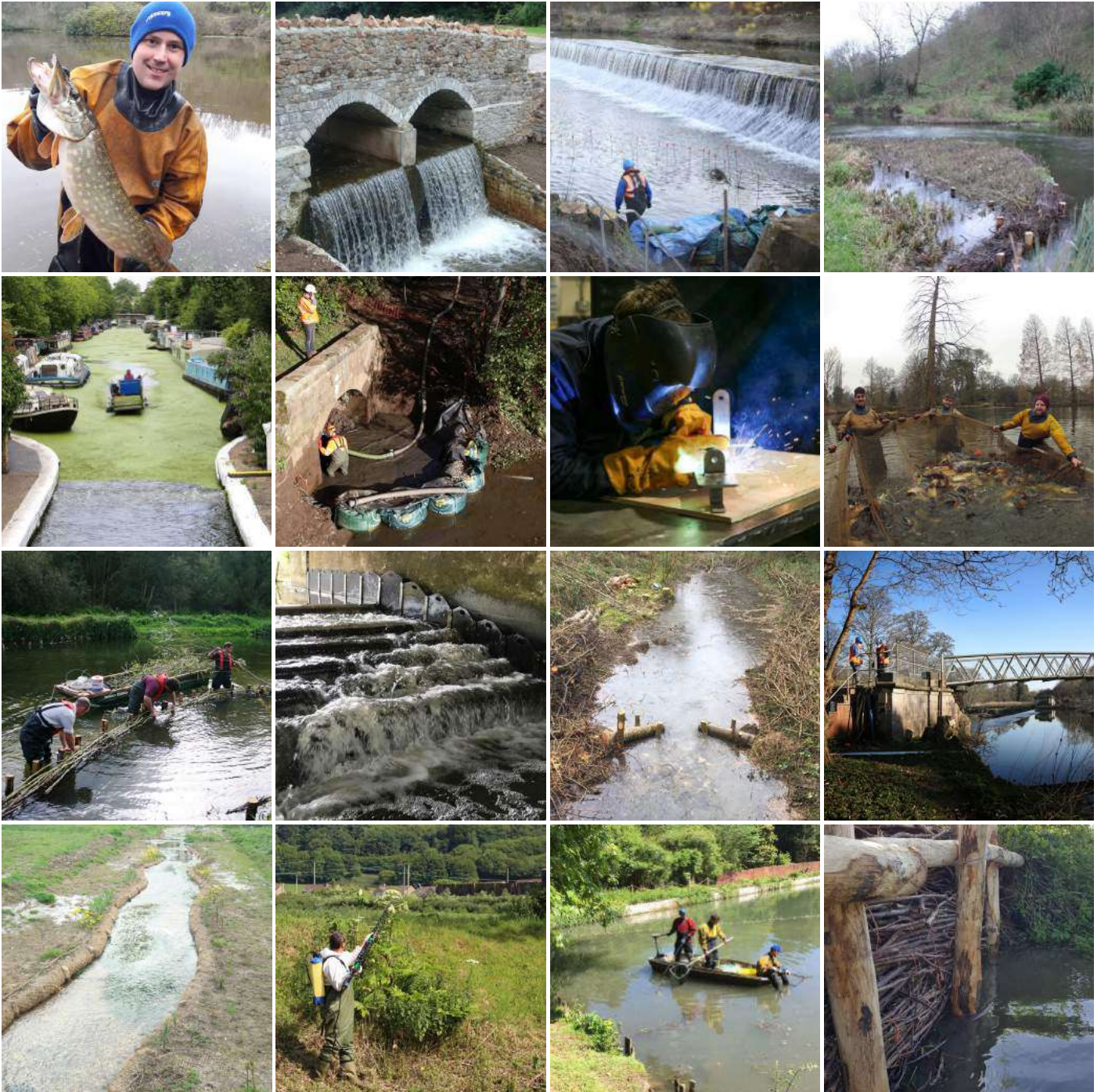


Restoring at Source
Mire restoration on Dartmoor for South West Water
and Dartmoor National Park Authority

WATER INDUSTRY WATER ENVIRONMENT SPECIALISTS

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RIVER RESTORATION - FLOOD ALLEVIATION SCHEMES - LAKE, POND & RESERVOIR REFURBISHMENT
FISH & EEL PASSAGES - UPPER CATCHMENT MANAGEMENT - SEDIMENT MANAGEMENT
AQUATIC VEGETATION MANAGEMENT – INVERTEBRATE SURVEYS - FISHERIES MANAGEMENT
INVASIVE SPECIES MANAGEMENT - ENVIRONMENTAL SURVEYS - AQUATIC HERBICIDE APPLICATION

Session 5: Workshops

Workshop A: Working with Natural Processes

Facilitators: Fiona Bowles (RRC), Stewart Clarke (National Trust), Jenny Wheeldon (Natural England) & Rich Jefferies (Environment Agency)

We are facing major climate and biodiversity crises, and emerging evidence suggests that part of the answer lies in working with natural processes to restore self-sustaining, biodiverse, resilient and adaptive ecosystems. Particular promise is shown by approaches that allow keystone species to flourish (beavers, rewilding), or approaches that promote self-sustaining natural geomorphic systems (Stage Zero valley restoration, removing artificial pressures), which increase biodiversity and the resilience of systems to climate change.

Letting nature do the work means reducing human control on natural systems - and it is critical to do this jointly with the people who already live and work within systems. This workshop will investigate how to fit nature-based approaches into our living, human, natural catchments.

Workshop attendees will discuss how to encourage uptake of techniques working with natural processes in UK catchments, and how we can support their success in order to harness the power of nature to fix existing problems and to face new ones.

Workshop B: Biodiversity Net Gain

Facilitators: Lucy Shuker (Thames21) & Environment Agency

A workshop with case studies for the new Biodiversity Net Gain River Metric with Q&A and interactive sessions.

Workshop C: Citizen Science in river restoration: co-designing and managing for impact

Facilitators: Earthwatch & RRC

Understanding the impact of citizen science activities can help provide evidence to evaluate projects, which can be used to secure funding, but also to develop, manage and sustain more meaningful and effective citizen science activities. This workshop aims to explore how to set up sustainable citizen science activities and how to measure the impacts of citizen science in river restoration projects. We will reflect on techniques for setting up citizen science activities following a co-design process, which puts the citizens at the heart of 'citizen science' to help identify priorities for monitoring. There will be case study examples and opportunities for participants to discuss and share their experiences of citizen science.

The second part of the workshop will explore the multi-dimensional impacts of citizen science in river restoration and how we can measure those impacts. We will discuss the experience of the audience on their views of impact in their citizen science projects. We will introduce a platform for measuring impact and participants will have opportunity to discuss and try the platform. Participants will be able to learn about the set up and measurement of the impacts of citizen science.

Workshop D: CatchmentLIFE: A tool describing pressures and impacts on species and ecological communities

Facilitators: Marc Naura (RRC) & South East Water

The integrity of freshwater ecosystems globally is being threatened by a multitude of anthropogenic stressors, including varying forms of pollution, flow regime modifications and hydromorphological alterations. Understanding & quantifying these pressures on freshwater ecosystems remains a critical problem within river management.

To address this knowledge gap, RRC collaborated with South East Water and other project partners to develop a research bid for the 'Ofwat Innovation in Water Challenge' initiative. The overarching aim of the project was centred on developing a tool entitled 'CatchmentLIFE', which will be able to quantify pressures & impacts on

different ecological responses, including species & biotic communities. CatchmentLIFE will link to datasets from major UK organisations and enable users to input and share their own data.

From the outset of this project, we are very keen to glean end-user inputs and requirements to refine CatchmentLIFE and ensure that its functionality and operability is compliant with the needs of different stakeholders. As such, we are inviting participants to have a direct involvement in refining a tool that they will later use to guide river management strategies. In addition, participants will gain theoretical knowledge and practical experiences on how habitat modelling techniques can be incorporated in catchment-wide river management strategies.

Site Visit 1: River Tutt

*Facilitators: **Yorkshire Wildlife Trust***

Improving the ecological quality of the River Tutt by reducing sedimentation and improving fish habitat as well as improving the quality and connectivity of bankside semi-natural habitats.



Site Visit 2: Rodley Nature Reserve

*Facilitators: **Yorkshire Water***

Towards the North West of Leeds, this project looked to create a [bypass channel around Rodley weir](#), aiming to improve fish passage on the River Aire.



Session 6

CARBON OFFSETTING – ACHIEVING NET ZERO BY 2030

L. BURGESS-GAMBLE¹

1 Environment Agency

At the Environment Agency we emit 180,000 tonnes of carbon, the greatest proportion of which comes from our construction activities and our supply chain. To reduce our emissions, we have set the target of reaching Net Zero by 2030, to achieve this we will need to reduce the carbon emitted from both our operations and supply chain by 45%. Once this has been achieved we will then need to offset the remaining residual carbon emissions by investing in a cost-efficient mix of approaches which remove an equivalent or larger amount of carbon from the atmosphere. This is known as offsetting. We are developing a robust evidence base to help us understand how best to offset our carbon emissions. In this presentation I will share the outcomes of our review of different habitat creation measures and their potential to store carbon, this will include river floodplain restoration and wetland creation. I will also define the Environment Agency's preferred approach to offsetting.

NATURAL ENVIRONMENT INVESTMENT READINESS FUND - CHANGING THE WAY WE FUND THE ENVIRONMENT

K. BROADHEAD¹, A. BAKER², A. SLANEY², R. MASKILL²

1 Environment Agency/Natural England, 2 Environment Agency

The Natural Environment Investment Readiness Fund launched in February 2021 and seeks to demonstrate the way environmental projects can be privately financed. The 25 Year Environment Plan and Green Finance Strategy set the tone for the need to open up private sector investment in funding environmental projects in the future as part of a green recovery. Pilot projects are already underway and we would hope to report the successes and learning opportunities from these in October alongside new information on the projects that have been funded in the first round of the scheme. This fund will provide the shift in change and approach needed in unlocking private sector investment which has the potential to open up huge opportunities to the future of funded river restoration, as well as other, activities.

NOTES



Nature Driven Design

River Restoration and Wetland Design Solutions

Royal HaskoningDHV is an environmental and engineering consultancy with a strong track record in the planning, design and implementation of river restoration, fish passage enhancement and catchment management projects across the UK.

We use our 'Nature Driven Design' approach to improving the water environment through the restoration of natural processes, recognising the importance of working with natural river processes to deliver sustainable river improvements in a multi-use landscape.

Our current projects include:

- **River channel and floodplain restoration:** Design of channel restoration and gravel augmentation measures on the **River Torridge, Devon** and development of nature-based flood management solutions on the **Combe Haven, East Sussex**.
- **Fish passage enhancement:** Design of fish passage solutions on the **Pembroke River, Pembrokeshire** and **River Wandle, Sutton**.
- **Consenting and site supervision:** Construction project management and site supervision of restoration measures on the **River Nith, Dumfriesshire** and consenting for the restoration of the **Ugbrooke Stream, Devon**.
- **Nutrient and contaminant management:** Development of a nutrient budget calculator and design of treatment wetlands to manage phosphate runoff in the **Rivers Parrett, Tone and Brue in Somerset**, and monitoring and design of a nature-based solution to immobilise mercury-contaminated sediments in the **North River, Surrey**.

POSTER PRESENTATIONS

1

Prediction of logjam upstream backwater rise

E. FOLLETT¹

1 Cardiff University

2

Ecological responses of two chalk rivers to gravel addition

L. DOLMAN¹, A. VOWLES¹, P. KEMP¹

1 University of Southampton

3

‘Stage Zero’ made easy: Swindale Foot naturalisation

G. HERITAGE¹, L. SCHOFIELD², O. SOUTHGATE³, G. FOSTER³, N. ENTWISTLE⁴

1 Dynamic Rivers, 2 RSPB, 3 Environment Agency, 4 University of Salford

4

Restoration of the River Dove: The River Continuum of Stakeholder Engagement

C. ZAPITIS¹, T. BROOKS², T. JACKLIN³

1 Natural England, 2 Environment Agency, 3 Wild Trout Trust

5

The MICS Platform: Measuring the Impact of Citizen Science

J. SPRINKS¹, L. CECCARONI¹, U. WEHN², H. JOYCE³

1 Earthwatch Europe, 2 IHE Delft Institute for Water Education and University of Gothenburg, 3 River Restoration Centre

6

Assessing the efficacy of offline water storage ponds for Natural Flood Management

T. H. LOCKWOOD¹

1 University of Bristol

7

Pembroke Mill Ponds Fish Passage Project

P. BRUNNER¹, M. DONOGHUE¹, S. JEETUN², H. JOBSON³

1 Royal HaskoningDHV, 2 ACE, 3 West Wales Rivers Trust

8

Torridge Gravel Augmentation Project

P. BRUNNER¹, M. PROUT², M. TURLEY³

1 Royal HaskoningDHV, 2 Ebsford Environmental, 3 Devon Wildlife Trust

9

Options for NFM at Rural Sites

R. HAW¹

1 Envireau Water

10

River Camel Phosphate Management Strategy

O. BOWERS¹, P. THORNTON¹, I.A. DENNIS¹

1 RoyalHaskoningDHV



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DELEGATE LISTS

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David	Brown	Environment Agency
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Neil	Burrows	AECOM
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Tom	Cook	Environment Agency
Rachel	Coombes	AECOM
Dale	Cox	Natural Resources Wales
Tim	Crabb	Environment Agency
Stuart	Craxford	Natural Resources Wales
Gen	Crisford	National Trust
Gemma	Culbert	Northern Ireland Civil Service
Sally	Curran-Parry	Natural Resources Wales
Becky	Davies	Natural Resources Wales
Ieuan	Davies	Natural Resources Wales
Jayne	Dobson	Dún Laoghaire Rathdown County Council
Charlie	Dodd	AECOM
Emily	Dresner	Natural England
Rob	Dryden	Environment Agency
Roey	Egozi	Soil Erosion Research Station
Judy	England	Environment Agency
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Hilary	Foster	Natural Resources Wales
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Anna	Gee	AECOM
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Jason	Jones	Natural Resources Wales
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Mert	Thompson	DAERA
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Rowenna	Baker	Ouse & Adur Rivers Trust
Alison	Baker	Environment Agency
Lyndon	Baker	Atkins Ltd
Hannah	Barclay	Environment Agency
Megan	Barnes	Mott MacDonald
Aaron	Batsman	Canal & River Trust
Tristan	Baxter-Smith	River Nene Regional Park CIC
Bethan	Beech	National Trust
Hilla	Beinish	Yad Ha Nativ - Agma
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Harry	Bull	RJBull Environmental Contractors
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James	Caldwell	North York Moors National Park Authority
Sarah	Caleb	Affinity Water
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Katherine	Causer	Environment Agency
Adam	Cave	Environment Agency
Luigi	Ceccaroni	Earthwatch
Nick	Chapman	Jacobs
Tamsin	Chisnall	Arup
Katie	Chorlton	JBA Consulting
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Harry	Clark	South East Rivers Trust
Stewart	Clarke	National Trust
Sarah	Clarke	Yorkshire Dales Rivers Trust
Ian	Creighton	West Cumbria Rivers Trust
Lev	Dahl	Eden Rivers Trust
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Dewi	Davies	National Trust
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Nathalie	Harris	Norfolk Rivers Trust
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Nick	Mott	Staffordshire Wildlife Trust
Andrew	Mountain	Soluform
Corinne	Muir	River Nene Regional Park CIC
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Ruth	Needham	Trent Rivers Trust
Gemma	Nelmes	Stantec
Daniel	Newton	Arup
Leela	O'Dea	frog environmental
Dave	Ottewell	Natural England
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Rachel	Paget	Ouse & Adur Rivers Trust
Matt	Parr	Environment Agency
James	Peake	Five Rivers Environmental Contracting
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David	Penny	Natural Resources Wales
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Susan	Perry	Welland Rivers Trust Ltd
Hilary	Phillips	River Thame Conservation Trust
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Ruth	Reaney	Natural England
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Natasha	Todd-Burley	Jeremy Benn Associates
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Sangeetha	Viswan	Environment Agency
Isabel	Wapenhans	Arup
Kerry	Ward	Land & Water Services Ltd
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Iain	Weir	Stonbury Limited
Phoebe	Weller	Five Rivers Environmental Contracting
Alistair	Whitby	Ouse & Adur Rivers Trust
Joey	Whitehead	Ebsford Environmental Ltd
Simon	Whitton	Natural Resources Wales
James	Wilkinson	Natural England
Gareth	Williams	Environment Agency
Hazel	Wilson	University of Nottingham and Atkins
Beth	Wilson	Severn Rivers Trust
Jean	Wilson	Wyre Waters Catchment Partnership
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