

River Restoration Centre Annual Network Conference 2022

Making river restoration mainstream

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Welcome

Martin Janes
RRC Managing Director



Welcome to the 2022 River Restoration Centre Annual Network Conference.

We are so pleased to be able to see you all again. After the last two years of running this event in ever-changing situations and with little defined certainty, this year feels much more calm and pre-planned. Such a big part of this conference is meeting up with old and new faces, discussing ideas, developments, findings and opportunities. We are extremely glad that so many of you have decided to return in-person in what are still, health-wise and financially, uncertain times.

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. We are always looking at how we can do more to inform, empower, guide, train and support the river restoration community, so come and have a chat with us over these two days. Thanks also to our sponsors, who help subsidise the conference fees for trusts, students and volunteers – please make the most of the opportunity to speak to them in the exhibition space.

As ever, you gave us a fantastic response to the invitation to present your work, ideas, concerns and lessons – this allowed us to build the programme into presentation sessions, discussions and workshops, site visits and posters. If you are new to this event, it really is 'current thinking' – what is happening now, who is doing what, what still needs to be done and how – all told by the practitioners who are making it happen.

The title and theme for this year is 'Making river restoration mainstream'. We, all together, have achieved so much over the past few decades – challenging public perception and expectation, increasing knowledge and understanding, widening our field of view to water and land management. But is river restoration 'mainstream'? We are in the Decade of Ecosystem Restoration, so by the end of 2030 can we get to the position where restoration of river ecosystems no longer needs 'promotion', is not seen as a 'pilot', but is simply what people expect?

The 2022 UK River Prize Awards evening will feature four exceptional Finalists this year. We hope you will join us in celebrating their dedication and achievements. As with previous years, we will also be recognising the individual achievements of this year's nominated 'River Champions'. This evening Awards event is open to all through the RRC webpage Zoom link, so please feel free to invite others to join in.

Like all of you, I too would love to go to every session, but then we would be here for a week (of course, a very enjoyable and informative one), but one we would struggle to run and you would struggle to attend. So your challenge is to fit as much as you can into these two days.

Have a great conference.

Martin Janes, Managing Director

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PROGRAMME OF EVENTS

DAY 1: - - - TUESDAY 28TH JUNE - - -

Session 1

Kenilworth Suite

Chair: Martin Janes (River Restoration Centre)

10:00	River Restoration Centre introduction & welcome Martin Janes (<i>River Restoration Centre</i>)	15 mins
10:15	<u>Establishing common river restoration principles: part of 'making it mainstream'</u> Glenn Maas (Environment Agency)	15 mins
10:30	<u>River & Floodplain Restoration and the 25 Year Plan</u> Lev Dahl (Eden Rivers Trust)	15 mins
10:45	Discussion	15 mins
11:00	SHORT BREAK with coffee and tea	35 mins
11:35	<u>Mainstreaming river restoration in the water industry</u> Nicola Nineham (Mott MacDonald)	15 mins
11:50	<u>Enforcement of Hydromorphological Harm in Wales</u> Oliver Lowe & Hilary Foster (Natural Resources Wales)	15 mins
12:05	<u>Landscape Recovery: Restoring England's Rivers and streams</u> D-J Gent (Environment Agency)	15 mins
12:20	Discussion	15 mins
12:35	Lunch in Restaurant and Exhibition Room	60 mins

Session 2				
<u>Kenilworth Suite</u> Naturally functioning systems		<u>Stratford</u> Reinstating natural processes in confined urban environments	<u>Avon Suite</u> Working with landowners & farming communities	
Chair: Phil Boon (River Restoration Centre)		Chair: Jason Winslow (RSK)	Chair: Ann Skinner (River Restoration Centre)	
13:35	<u>The role of vegetation in Nature Based Restoration and Management</u> Matthew O'Hare (cbec eco-engineering UK)	<u>Kingshurst Brook Restoration</u> Andrew Apanasionok (Warwickshire Wildlife Trust)	<u>Wansbeck Nature Recovery and River Restoration Plan</u> Neil Burrows (AECOM)	15 mins
13:50	<u>River Restoration and Climate</u> George Heritage (Dynamic Rivers)	<u>Reconnecting ourselves and our rivers with the European Eel</u> Jack Wootton (Forth Rivers Trust)	<u>Dynamic and up the hill: Restoration on the Larig</u> Amelia Heath (Forth Rivers Trust)	15 mins
14:05	Discussion	Discussion	Discussion	10 mins

Session 2 – continued...

14:15	<u>Will beavers make river restoration practitioners redundant? Beavers and the future of river restoration</u> Stewart Clarke (National Trust)	<u>Integrating river restoration within engineered flood risk management schemes – improving the chalk river habitat of Houghton Brook</u> Matt Ross (Mott MacDonald) & Mattie Biddulph (Environment Agency)	<u>Natural Environment Investment Readiness Fund (NEIRF) & The Power of Synergy-Catchment Scale Restoration in the Esk Valley, North York Moors National Park</u> Christopher Watt (North York Moors National Park Authority)	15 mins
14:30	<u>Implementing stage zero in the Evenlode catchment: from strategy to design and delivery</u> Eleanore Miles (Atkins)	<u>Engineered Floating Ecosystems: An innovative tool for urban aquatic biodiversity gain and ecological restoration</u> Nick Schreiner (Biomatrix Water)	Discussion	15 mins
14:45	Discussion	Discussion	Discussion	10 mins
14:55	Posters & Exhibition in Exhibition Room with tea and coffee <i>Vote for your favourite poster</i>			45 mins

Session 3				
<u>Kenilworth Suite</u>		<u>Stratford</u>	<u>Avon Suite</u>	
Catchment planning		Addressing fine sediments & nutrients	Citizen Science survey methods	
Chair: Sally German (Arup)		Chair: Jennifer Collins (WSP)	Chair: Marc Naura (River Restoration Centre)	
15:40	<u>Roch catchment WFD & enhancement strategy</u> Adam Chapman (Environment Agency)	<u>An Integrated Approach to Catchment Restoration on a River SAC</u> Emma Smail (Trent Rivers Trust)	<u>Citizen Science as a conservation tool</u> Amy Fergusson (Forth Rivers Trust)	15 mins
15:55	<u>A BRILLiant Action Plan</u> Emma Lewin (Atkins)	<u>Evidence-led mitigation of fine sediment pollution on the Tyne</u> Jack Bloomer (Tyne Rivers Trust)	<u>ObstacEELS – citizen science aiding the migration of the European eel</u> Wanda Bodnar (Thames Estuary Partnership) & Azra Glover (ZSL)	15 mins
16:10	Discussion	Discussion	Discussion	10 mins

Session 3 – continued...

16:20	<u>Delivering nature-based solutions to catchment restoration</u> Mark Turner (Greater Manchester Combined Authority)	<u>Multiple benefits of river and wetland restoration</u> Sarah Williams (Wessex Water)	<u>Developing a collaborative approach to citizen science river habitat monitoring and assessment: Citizen River Habitat Survey (cRHS)</u> Marc Naura (River Restoration Centre), Mark McLoughlin (Natural Resources Wales & Resilient Greater Gwent Partnership), Caroline Matthews (Blaenau Gwent County Borough Council & Resilient Greater Gwent Partnership) South East Wales case study Caroline Matthews (Blaenau Gwent County Borough Council & Resilient Greater Gwent Partnership)	15 mins
16:35	<u>A framework for prioritising river restoration based on assessment of catchment pressures & impacts</u> Josh Robins (River Restoration Centre)	<u>Nature based solutions: innovative lake restoration – Rostherne Mere</u> Ben Dugdale (Natural England)	<u>East Anglia case study: Citizen RHS - Hitting the Sweet Spot?</u> Jon Balaam (The Greensand Trust/Upper & Bedford Ouse Catchment Partnership)	15 mins
16:50	Discussion	Discussion	Discussion	10 mins
17:00	Short break to move to Keynote Session			10 mins

Session 4
KEYNOTE SESSION
Kenilworth Suite

Chair: Martin Janes (River Restoration Centre)

17:10	Keynote Address <u>Professor David Sear (University of Southampton)</u>	25 mins
17:35	Discussion	20 mins
17:55	Poster competition winner, final announcements & close Martin Janes (<i>the River Restoration Centre</i>)	5 mins
18:00	END OF DAY 1	

EVENING SESSION



**19:00 FOR 19:30 – UK RIVER PRIZE AWARDS DINNER &
RIVER CHAMPIONS 2022**
KENILWORTH SUITE

- - - WEDNESDAY 29TH JUNE - - -

DAY 2:

Session 5

09:00

CHOICE OF ONE SESSION OR ONE SITE VISIT

3.5 hours

Kenilworth Suite

Avon Suite

A: Integrated land and water management:
rivers and their connections to wider
environmental and resource management

**B: Co-delivery innovative solutions to
catchment challenges**

Facilitator: Robert Grabowski (Cranfield
University)

Facilitator: Helena Soteriou (Thames Water)

This workshop session will focus on the policy and regulatory landscape for environmental management is undergoing dramatic changes. As a river restoration and management community, we must incorporate them into our practice to enact positive change in river systems. We must also use this opportunity to highlight the wider importance of rivers to the environment and people. 'Ecosystem services' has helped to widen discussion beyond economic benefits and there has been great progress in demonstrating the social benefits, it can still be challenging to convince others that rivers truly matter.

The water sector now constitutes a significant portion of the resources and funding available for river restoration work in the UK, so it is vital that water companies and river restoration practitioners work together effectively to deliver catchment-scale improvements. This presentation and discussion session will look at some of the challenges and opportunities associated with collaboration, as well as some of the innovative approaches to collectively delivering river restoration work across sectors.

In this workshop, we will share knowledge to co-create an up-to-date summary of the policy, regulatory and scientific dimensions to integrated land-water management to support river restoration. The end goal is to lay the groundwork for an open access publication aimed at environmental managers and practitioners.

An example of this is Thames Water's 'smarter water catchments' initiative, using collaboration at all stages of the process, from agreeing objectives, understanding data, through to co-creation and co-delivery of solutions.

A mixture of presentations and group discussions will be used to share experiences and practical guidance that will help participants overcome barriers within their own organisations and projects.

How does NFM fit into ELMS?

David Brown (Environment Agency)

Regenerative Land Management - A new way forward

Felicia Rhodes (Arup)

Facilitating Restoration at a catchment-wide scale through Collaboration: The Example of the Cheshire Hub

Esther Taylor (United Utilities)

12:30

LUNCH

60 mins

Session 5		
09:00	CHOICE OF ONE SESSION OR ONE SITE VISIT	3.5 hours
<p style="text-align: center;"><u>Stratford</u></p> <p style="text-align: center;">C: Making the most of funding and investment opportunities</p>		
<p>Facilitators: Jenny Collins (WSP) & Josh Robins (River Restoration Centre)</p> <p>This workshop will cover multiple funding streams that are likely to play a big part in how our river restoration objectives and goals are achieved. It will focus on:</p> <ul style="list-style-type: none"> • Defining suitable river restoration projects that fit funding opportunities and will deliver against project partner aspirations. • How to develop 'investment ready' river restoration projects – advice and guidance from experience. • Identifying a range of green finance, funds and opportunities – e.g. net gain, National Highways, blended funding, Nature for Climate tree planting. <p>Participants will hear from presenters that will provide details on new funding opportunities as well as case studies of their application. There will also be discussion sessions where participants can share their experiences and suggest ideas to overcome challenges associated with funding for river restoration.</p> <p><u>The NFM Fund – a novel way to reduce flood risk on motorways and trunk roads</u> Marc Huband (Atkins)</p>		
12:30	LUNCH	60 mins

Session 5

09:00

CHOICE OF ONE SESSION OR ONE SITE VISIT

3.5 hours

Site visit 1: Blyth Mill rural wetland restoration

Facilitator: Warwickshire Wildlife Trust

As part of a multi-year project on the river Blythe, funded by the European Agricultural Fund for Rural Development (EAFRD) Water Environment Grant, Blythe Mill has been a key site for large-scale conservation works on species-poor floodplain to create wetland scrapes and wet meadow areas. One of the main targets of these ongoing works has been to make the site more attractive to wintering waders. The project involved the creation of 10 scrapes and inset floodplain feature, which generated 5000m cubed of spoil which was removed from the floodplain. The site was seeded with a wet meadow seed mix. We also planted several thousand plug plants of wetland perennial plants around the scrapes and planted trees along the river. The project involved close collaboration between the Environment Agency, Natural England, Tame Valley Wetlands (Warwickshire Wildlife Trust), Land owner, tenant, designer, contractor and volunteers. Blythe Mill is one of six main sites for improvement along the River Blythe SSSI, and works over the past 3 years have contributed to improving the river for biodiversity and create more attractive places for people to access nature.



Site visit 2: Kingshurst Brook renaturalisation project

Facilitator: Warwickshire Wildlife Trust

The Kingshurst Brook is an urbanised tributary of the River Cole at Meriden Park, Solihull. In April 2017, Solihull Metropolitan Council began work to restore a disused amenity boating lake in Meriden Park, which had been created by placing a large weir on Kingshurst Brook. Over time, the lake had silted up resulting in low water oxygen levels and a strong hydrogen sulphide smell. While this work narrowed the lake, lowered the weir and increased water velocity, it was not enough to prevent silt deposition and boost oxygenation, thus further restoration was needed. In September 2021, as part of the Love Your River Cole project, Warwickshire Wildlife Trust and partners completed a second phase restoration of the Kingshurst Brook, with the aim of creating a well-functioning stream channel and transform the former lake into a range of habitats to support enhanced biodiversity. Interventions involved the creation of wetland features, installation of riffles and cobble ramp to improve fish passage, installation of Natural Flood Management features and the removal of a substantial amount of rubbish from around the site. The improvements to the river, as well as the installation of a dipping platform on the restored lake, also enhanced the park for local residents and visitors, creating a more aesthetically pleasing area to access and connect with nature.



12:30

LUNCH

60 mins

Session 6			
	<u>Kenilworth Suite</u> Assessing the impact of Natural Flood Management	<u>Stratford</u> Gravel movement in rivers	<u>Avon Suite</u> Tools & guidance for river restoration
	Chair: Mike Norbury (Mott MacDonald)	Chair: George Heritage (Dynamic Rivers)	Chair: Jo Cullis (River Restoration Centre)
13:30	<u>Assessing the use of earth bunds as Natural Flood Management features</u> Jeremy Teale (Durham University)	<u>Sustainable Sediment Management at Thornton-le-Dale, North Yorkshire</u> Neil Williams (AECOM)	<u>National Culverts Study – Assessing forestry watercourse crossings in Wales</u> Victoria Smith (Arup), Rhodri Thomas (Arup) & Oliver Lowe (Natural Resources Wales) 15 mins
13:45	<u>Landwise NFM - Englefield Estate evaluating the efficiency of leaky barriers for NFM</u> Ryan Jennings (JBA Consulting) & Gabby Powell (University of Reading/Stantec)	<u>Torridge Gravel Augmentation Project - A Rock 'n' Roll Approach to River Restoration</u> Peter Brunner (Royal HaskoningDHV)	<u>The CIRIA natural flood management manual: measures to restore river-floodplain connectivity</u> Matt Ross (Mott MacDonald) 15 mins
14:00	<u>The journey of delivering NFM in a large catchment</u> Ed Byers (South East Rivers Trust)	<u>Effective and sustainable river restoration: 4D monitoring of a large upland gravel-bed river</u> Neil Entwistle (University of Salford)	<u>An Ecological Network Tool for the North West River Basin District</u> Lorna Drake (Natural England) 15 mins
14:15	Discussion	Discussion	Discussion 15 mins
14:30	SHORT BREAK TO MOVE TO FINAL SESSION		10 mins

Session 7

Making river restoration mainstream

Kenilworth Suite

Chair: Fiona Bowles (River Restoration Centre)

14:40	<u>The Fall and Rise of River Restoration</u> Peter Downs (cbec eco-engineering UK)	15 mins
14:55	<u>The relationship between perception of healthy river morphology and ecosystem function</u> Julia Casperd (Harper Adams University)	15 mins
15:10	<u>Promoting Adaptation to Changing Coasts – a tale of two estuaries</u> Mike Williams (Environment Agency)	15 mins
15:25	<u>The Catchment Based Approach (CaBA) – A collaborative approach to environmental improvement</u> Rob Collins (The Rivers Trust)	15 mins
15:40	Discussion	20 mins
16:00	Closing remarks & summary Chair	10 mins

16:10	END OF CONFERENCE with tea & coffee
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On Tuesday 28th June, one of the four shortlisted finalists will be announced as the winner of the 2022 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 four finalists below. The overall 2022 Winner will be presented with the trophy on Tuesday evening.

The four selected finalists for the 2022 UK River Prize:

River Nar, Norfolk – ‘Castle Acre Common WEG Project’

Lead: Norfolk Rivers Internal Drainage Board

Partners: River Nar Restoration Group

River Ribble, Yorkshire – ‘Ribble Life Together’

Lead: Ribble Rivers Trust

Partners: Ribble Life Catchment Partnership

Swindale Beck, Cumbria – ‘Swindale Valley Restoration Project’

Lead: RSPB Haweswater

Partners: United Utilities, Environment Agency, Natural England

Turkey Brook, London – ‘Albany Park River Restoration Project’

Lead: Enfield Council

Partners: Environment Agency

“This year’s river prize entries covered a fascinating range of projects from catchment scale to reach scale, rural to urban. All had achieved amazing outcomes within challenging circumstances. As usual, it was difficult choosing between them, but all four finalists are great examples of excellent river restoration projects. Well done and keep them coming.”

Ann Skinner, UK River Prize judge and River Restoration Centre Board

2022 UK River Prize Finalist

River Nar (Norfolk)

Castle Acre Common WEG Project

HOLKHAM



Project aims

The primary driver here was the restoration of hydrological connectivity and process-driven self-restoration to a 2km section of the river that had historically been diverted to the edge of the floodplain and perched to build up a head of water to drive a mill.

This type of channel diversion and perching is common on chalk streams, and has the effect of divorcing the river from the floodplain, and of lowering the gradient over long reaches. This creates a sediment retention issue, especially now that the mills are not worked, which has historically, in turn, precipitated dredging/management works which have tended to exacerbate the problems. Diffuse agricultural pollution and nutrients from sewage become locked within these sorts of channels, leading to nutrient spiralling – from the sediment to the water-column and back again – each time flows or other activities disturb the bed material. But at no point can the river flush, escape its banks or place this nutrient loading on the floodplain. The nutrient enrichment and channel morphology skews the habitat in favour of a more limited and pollution-tolerant community of invertebrates and plants. In the pre-existing channel there was a notable absence of ranunculus, for example.

The overall aim, then, was to restore the channel to the centre of the floodplain and thus to restore the true gradient, natural channel dimensions (which will allow high flows to escape the banks and flood marginal habitats) and a natural meandering planform and pool-riffle sequence, enlivened by large woody debris together with floodplain wetland features (Stage Zero) over parts of the project site: all with the overall aim of restoring hydrological connectivity between the river and supporting floodplain and of increasing biodiversity and favourable habitat for rheophilic species of fish, plants and inverts.



Project partners

- Norfolk Rivers Internal Drainage Board
- River Nar Restoration Group



Planning and design involved a full topo survey to establish the best corridor for the new channel, assessment of historic maps and nearby relic and existing natural meanders to form baseline dimensions and the careful plotting of a course that navigated the new channel along a line that would find gravel at the correct depth for the projected bed level (so that gravel was neither too shallow, not too deep along the chosen course) and which also incorporated relic sections of the original channel and various ditch networks subsumed into the project as wetland features.

The project encompassed an 1800m reach of chalk stream, and included the excavation of 1200m of new channel and 600m of restored / recovered original channel, as well as a 300m back channel to feed surface flow to circa 10 acres of flooded woodland. Of the 1600m of pre-existing channel 95% was retained to form flooded calcareous fen type habitat. The overall floodplain area now restored to lateral connectivity with the stream amounts to circa 50 acres.



Construction

Delivery was undertaken in two phases: 450m of new channel in 2019 and the remainder in 2020 and '21. The new channel was excavated with 360 diggers and the spoil was either taken off-site and used to fill an old quarry pit, or spread very thinly across the floodplain. The channel – roughly 5m wide and 0.90m deep – was cut down to the undamaged gravel beds under the peat of the floodplain and then sculpted into a gentle pool-riffle-meander sequence, with multiple terraces and point bars to create marginal habitat. The shape of the channel was modelled on reference natural meanders immediately upstream of the project site.

A second phase was the placement of a very large volume of heavy timber, root-wads, and whole limbs of oak, alder and ash. These were carted on to site by a heavy horse and forwarder, rolled into place and pinned with split chestnut posts and cord. Aesthetically, the intention was imitate natural tree-fall and wind throw. But functionally, these structures added immediate heterogeneity to the naked, new channel and greatly accelerated the speed at which the channel vegetated. They also provided “undercut” type cover for the fish and added turbulence to the flows.

A Stage Zero area was created by diverting a proportion of the flow along a meandering secondary channel to feed water first to an analogue beaver pond, and then on across the floor of an old poplar plantation. In the furthest downstream reach of the project, whole trees have been dropped into and across the stream to send more flow across the floodplain and create a saturated wet-woodland valley floor area.

Results: restoring natural processes

The diverted, perched and impounded pre-existing channel form at this project site (typical of many reaches of English chalk stream) disables natural fluvial and ecological process, by a) greatly reducing gradient (and therefore flow velocity) and morphological heterogeneity and b) by divorcing the stream from the floodplain.

Natural processes are a function of natural channel shape and gradient and consist of a two-way relationship between the physical form of the river and the ecological engineering that form enables. In consultation with NE we took the decision to introduce nothing to the site except the changes made to the physical form, allowing the form to shape the habitat and later the plant and animal occupants of that habitat to shape the form. The in-stream plants established within one year of Phase 1 included extensive beds of starwort, berula and ranunculus, but rare marginal plants too, including bog-bean. It is notable too (at the time of writing April 2022) that benthic algae is more or less absent from the substrate of the new channel but prevalent in the side, spring-fed channel, suggesting the new channel will favour rheophilic invertebrates as well as plants.

An unexpected but notable impact has been the way in which the Konik ponies interact with the meander planform to improve the biodiversity of the plant communities: they graze (and poach) the point-bars on the inside of the meanders, but not the banks above the undercuts on the outside of the bends (see pictures in accompanying folder).

Another impact of note is the way in which a stream returned to its natural level in the floodplain creates a scour line at the margin between the gravel floor of the river bed and the clay-peat banks above. On the outsides of bends this scour line becomes a significant undercut, as the stream nibbles away at the motile gravel and sand but not the cohesive upper layer. These undercuts provide fantastic refuge habitat for larger fish. Early results of NRT monitoring suggest a very healthy fish community, with all the size classes from juvenile 0+ and 1+ to large 5+, whereas in the pre-existing channel the size range was more restricted to 2+ and 3+. This suggests that the fish have responded well to the increased heterogeneity of habitat in the new channel.

Interestingly, the Stage Zero flooded woodland is already populated with bullheads and some juvenile trout. Also of note is how in the Stage Zero area the diversion of flow from the perched leat to the base of the floodplain has resulted in a matrix of flooded channels and backwaters: the river has cleared it's own pathway along a course from which it was diverted centuries ago.

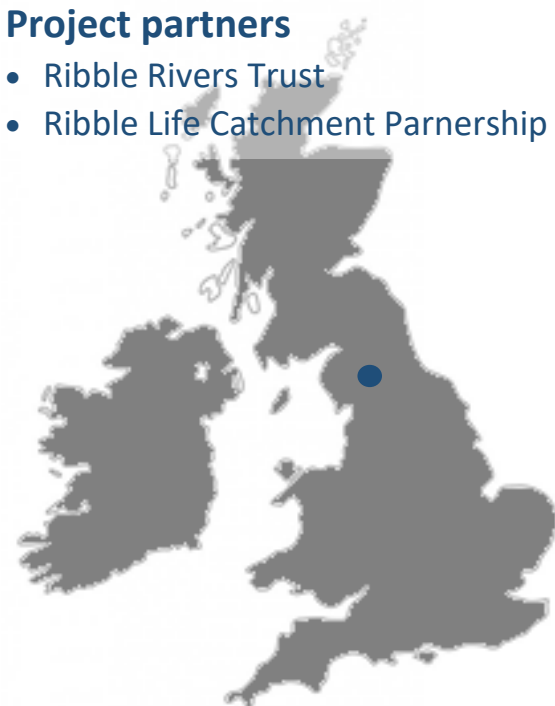
Project partners

- Ribble Rivers Trust
- Ribble Life Catchment Partnership

Project summary

For the past eight years Ribble Life Together has been the flagship programme of the Ribble Life Catchment Partnership. Lead by Ribble Rivers Trust (RRT), it brought together over 20 diverse partner organisations delivering significant improvements worth around £3.2 million to the Ribble Catchment benefiting both people and the environment. Since it started, this partnership project has engaged with 46 new organisations and communities, and the catchment has been left in a significantly better state thanks to this project, including:

- Planting over 24 hectares of woodland across 30 sites
- Delivering 15 wetland projects
- Building 14 fish passes, unlocking 184km of river habitat
- Improving access and interpretation and installing sensory art across the catchment
- Investing in our use of data and evidence, expanding our knowledge to help us continue improving the catchment after this programme is finished



What we achieved

April 2017 to March 2022

13622 
volunteer hours

11836
conversations
about rivers

64 
river wise
primary schools
4364
children involved
in Rivers in the
Classroom

11 
work
experience
placements

327
volunteer
events

14 
fish pass
projects
with 184kms of river
habitat unlocked

33 
Fabulous
Farmers
supporting
healthy rivers

62 
training
events

29 
short
river
films

325
people
trained
in river survey
techniques

161 
public
events

52 
river
clean ups

15 
circular walk
route and
walk guide

12 
river arts
projects

46 
organisations and
community groups
working together
for healthier rivers

16000  metres
of water
course
fencing

The contribution to the catchment of this project has been immense with over 720 Ha of habitat restored or created and at least 40km of river enhanced for wildlife and people. Highlights include:

- Restoration of nearly 700 Ha of peat at Cam End Common, a huge peat stabilisation project improving water quality, habitat and reducing flood risk downstream
- Fish passes on Hyndburn Brook which could allow salmon to swim into the centre of Accrington
- Large woodlands and wetlands in the Skirden Beck catchment which will improve water quality, habitat and reduce flood risk in Bolton-by-Bowland.

64 
 river wise
 primary schools
4364
 children involved
 in Rivers in the
 Classroom

Equally important has been the thousands of people engaged through the project from school children to farmers and land managers – people with the power to change behaviours and become stewards of the environment in the future. Ribble Rivers Trust employed apprentices for the first time, providing opportunities for people to take their first steps in a career of river conservation. The programme also benefited from a staggering 13,622 hours of volunteer time, with new volunteers carrying our citizen science as well as conservation volunteering such as tree planting.



Additionally, the Ribble Life Together programme has allowed RRT to try new engagement methods – including arts projects, river walks, 360degree photos and a podcast – as well as trying new methodologies for capital projects, in order to learn and develop as an organisation. Alongside other initiatives like Natural Course, RLT has enabled investment to develop the evidence base we have for the catchment, including the innovative “Health and Wellbeing Evidence Base” which has since been adopted country-wide. Improving our evidence is essential to enable partners to develop and secure funding to continue to improve the catchment in the future – a real legacy for the Ribble Life Together.



33
 fabulous
 farmers
 supporting
 healthy rivers





2022 UK River Prize Finalist

Swindale Beck (Cumbria)

Swindale Valley River Restoration Project



United
Utilities



Environment
Agency



ARUP
ATKINS

Member of the SNC-Lavalin Group

Project summary

Despite its relatively remote setting the Swindale Valley has been altered for agriculture, often to the detriment of the natural environment. The Swindale Beck was straightened, deepened and embanked over 16 years ago. Extensive areas of peatland were drained, species rich hay meadows were fertilised and overgrazed, and native woodland degraded. Water abstraction to supply Haweswater reservoir focused on maximum abstraction at the expense of natural river flows.

Our aim was to deliver a range of interventions in Swindale that would reverse impacts of past land management and water use practices and would benefit wildlife and water quality, reduce downstream flood risk and enhance the natural environment, all delivered within a farmed landscape.

Our ambitious and holistic approach has restored a large area of blanket bog at the top of the Swindale Valley by blocking moorland drains which will result in increased carbon storage, a raised water table and naturally purified water whilst also providing a home to a wide range of specialist wildlife. Extensive tree planting now stores carbon, slows surface water flows and increases water percolation into soil reducing flood peaks downstream. The sympathetic management of the SSSI floodplain hay meadows has resulted in further biodiversity gain.

When it came to the water environment, we wanted to restore a naturally functioning self-sustaining system. Survey and modelling results suggested that this would be a meandering system, creating variable flows that would underpin sediment transportation and deposition for riffles, pools and gravel bars, and provide areas suitable for salmonids to spawn in. Salmonids can now access this upstream habitat via a new UU fish pass and abstraction intake designed to mimic natural flows by taking varied amounts of water at different times. Further works to moderate flood flow inputs to the main river from the tributary and drain network has seen valley fan flows rejuvenated, drains diversified, and the incipient avulsion seen at Swindale Foot has been encouraged using a rock rapid constructed formed from embankment material. This area is now a 5-hectare functional anastomosing wetland.

The Swindale project is now one of the most high-profile projects delivered in the Lake District National Park and is being used as an exemplar to enthuse others to seek similar restoration opportunities. A 3-mile trail around the valley has been created and interpretation installed (2020).

Project partners

- RSPB Haweswater
- United Utilities
- Environment Agency
- Natural England

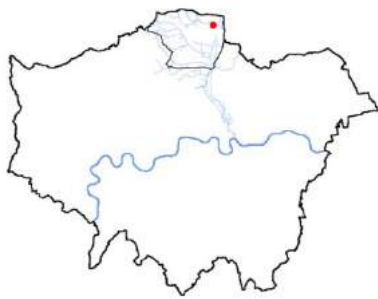




Blanket bog, hay meadow, rush pasture, valley mire and woodland habitats have all been improved, and long-term sustainable management is ensured through the RSPB/United Utilities management plan. Within the flowing-water system there have been considerable improvements to diversity and extent of different hydraulic habitats, over half a hectare of new in-channel habitat now exists (a 35% increase). Flooding now follows a natural pattern in the re-meandered reach but permanently wet floodplain areas remain limited, this was deliberate in order to maintain the SSSI hay meadow habitats and contrasts with the permanent wetting of over 5 hectares of floodplain at Swindale Foot and the rejuvenation of over 40 hectares of fen, marsh, swamp and bog in the upper catchment.

The range of interventions have improved habitats for a broad range of key species including snipe, curlew, golden plover, skylark, meadow pipit, whinchat, stonechat, tree pipit, dipper, common sandpiper, grey wagtail, linnet, golden ringed dragonfly, keeled skimmer dragonfly, small pearl bordered fritillary, zircon reed beetle, otter, melancholy thistle, globeflower, bistort, saw-wort, bog orchid, bog rosemary, bog myrtle and freshwater pearl mussels. Monitoring of salmonid redds at Swindale Foot and through the re-meandered reach suggests that spawning is improving, and this is likely a reflection of the increased volume and range of sediment stored in the system, with a larger proportion of finer gravels now being deposited, providing increasingly diverse and dynamic habitat. Repeat drone based Digital Elevation Models have revealed sediment accumulation in-channel in the form of riffles, shoals and bars, and across floodplain areas as splays.

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2022 UK River Prize Finalist

Turkey Brook (London)

Albany Park River Restoration Project

SUPPORTED BY
MAYOR OF LONDON



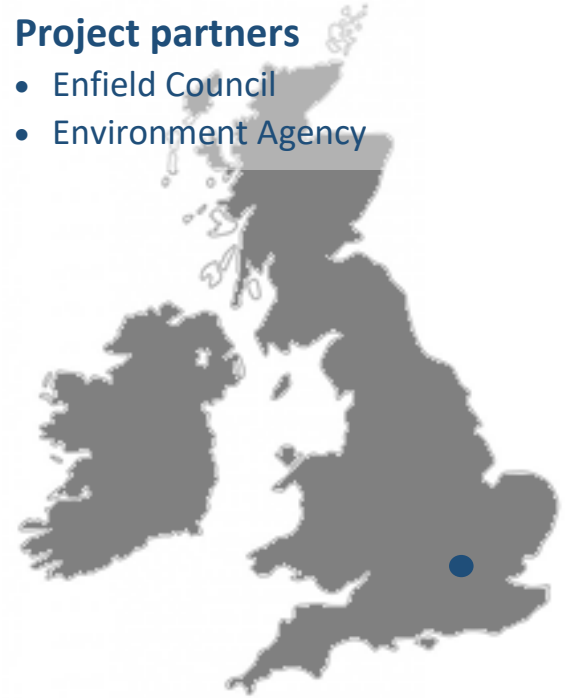
Project summary

Albany Park is a large open space in the north-east of the London Borough of Enfield. Prior to delivery of the scheme, the Turkey Brook main river ran along the northern boundary of the park in a heavily engineered channel with concrete and masonry walls on both sides. Consequently, the river had very low habitat value and was not connected to groundwater or the floodplain which meant it was vulnerable to drought and experienced high velocity flows during flood events. The channelised nature of the river also meant that it was not an integral part of the park, it could only be seen when standing close to the top of the concrete wall so many park users did not even recognise it as a river.

The project has restored 400 metres of Turkey Brook by excavating a new naturalised channel that brings the river into the park. As well as creating new habitat for wildlife and a diverse landscape for park users to enjoy, this work facilitated the creation of a flood storage area that reduces flood risk to over 400 properties.

Project partners

- Enfield Council
- Environment Agency



Albany Park Masterplan



The engineered river before



Planting with contractor and volunteers

Project timeline

- **2014** – initial public consultation
- **2019** – planning approval obtained
- **August 2020** – works commence on site: 25,000 cubic metres of soil excavated
- **October 2021** – works completed 50,000 cubic metres of water stored during extreme flood events



The naturalised river channel June 2022



Aerial view of the river shortly after completion in 2021

The project improves biodiversity by creating a range of new habitats including wetland, woodland and wildflower meadow. The amenity and educational value of the park is improved by including an outdoor classroom and better access to nature through the provision of new footpaths. Constructed wetland features help to mitigate the impact of urban pollution from the local drainage network. Wildlife seen since completion of the scheme include:

- Kingfishers
- Little Egrets
- Dragonflies
- Fish species (Rudd, Roach and Dace)



The outdoor classroom by the riverbank



Sustainably Managing Rivers

The future of our rivers depends on what we do today. Whether it be developing catchment management strategies, designing river realignments or delivering habitat creation through restoring rivers and wetlands, our water team are committed to creating a better environment for now, and for the future.

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Member of the SNC-Lavalin Group



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2022 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.

Alan Winstone

Alan is the North Wales Rivers Trust Chairman and is involved in delivering projects as well as the strategic direction of the organisation. Alan retired after 35 years working as a Fisheries Scientist and Environment Manager with Natural Resources Wales and its predecessor organisations.

Andrew Shaw

Andrew is part of the local community-led Loweswater Care Programme, aiming to improve the water quality of Loweswater lake. He carries out algal monitoring voluntarily every month. His data gave a baseline to work towards improvements including monitoring the lake's response to catchment-based interventions.

Arved Schwendel

Arved volunteers his spare time to help advise on local restoration projects in York such as the Hull Road Park Beck project. Before Arved advised on the project, the beck restoration was being poorly planned and managed. He gives up his free time to conduct River Habitat Surveys and fixed-point photography.

Becky Malby

Becky leads the Ilkley Clean River Group, which has successfully achieved the first River Bathing Water Designation in England. Becky's tireless efforts have raised the profile of sewage pollution in the media, and she has held the local authority, and water company to their word to improve the River Wharfe.

Bruce Durham

Bruce tirelessly campaigns for river improvement and flood prevention in the Harborough District. He is a Flood Warden, Tree Warden and Chair of Harborough Woodland Community Volunteers. He brings people together to plant trees, improve flood prevention and obtain feedback from the local community.

John Wollaston

John volunteers to help out with practical conservation tasks and specialised surveys. He has wonderful knowledge about rivers and wildlife which has helped when planning new and complicated practical tasks. His knowledge and willingness to learn more means we can undertake more specialised surveys and monitoring.

Mike Farrell

Mike goes above and beyond his day job to help restore the rivers of North and West Cumbria. Over the last 25+ years, he has undertaken hundreds of river restoration projects, planted tens of thousands of trees, engaged hundreds of children and families to enjoy and appreciate the environment.

Uy Hoang

Uy Hoang is an enthusiastic Google mapper! He uploads panoramas around waterways to Google in areas which are not mapped, and has now mapped 90% of the Thames, or around 150,000 photographs. In doing so his photographs have been used by the Canal and Rivers Trust to find old assets and act as a database.





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.

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)

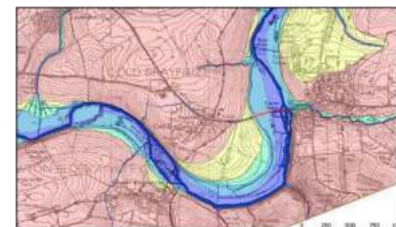
This course builds on and applies the concepts of the Level 1 & 2 courses. It involves detailed hands-on application of basic sediment transport equations and flow regime equations.

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.



Find out more about courses & register interest on the RRC website
www.therrc.co.uk/rrc-courses-and-workshops



the River Restoration Centre

Working to restore and enhance our rivers

Scientific Advances in River Restoration

6th–8th September, 2023

University of Liverpool, UK

www.therrc.co.uk/SARR



The SARR conference will unite scientists globally within one meeting covering all disciplines of river restoration. Scientists can present their work, discuss ideas, create new collaborations and advance challenges in river restoration science.



NATURE DRIVEN DESIGN

River Restoration Solutions



Royal HaskoningDHV is a specialist environmental consultancy with a track record of award-winning planning, policy and implementation projects across the UK in the water sector. We have a strong team of experts in geomorphology, engineering, hydrology and ecology with experience in working across Europe and the UK.

‘Nature Driven Design’: 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.

Habitat Restoration:

Design and construction of river restoration and gravel augmentation measures on the River Torridge, Devon in order to reinstate habitats for salmonids; and habitat restoration of Stover Lake SSSI, Devon in order to restore ecological favourable condition.

Fish Passage Enhancement:

Design of fish passage solutions on the River Wandle, South East England; design and construction support for the one of the largest fish passes in the England – Holme Sluice, Nottingham; and barrier removal design along the River Worth, Yorkshire.

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. Norfolk nutrient management strategy; and River Axe SAC, Devon water cycle study.

Consenting and Site Supervision: Construction project management and site supervision of restoration measures on the River Nith, Dumfriesshire; and post consent support for the restoration of the Ugbrooke Stream, Devon.

Any questions? For further information about our work, come and visit our stand, or contact **Dr Ian Dennis**, Water Environment Sector Lead

ian.dennis@rhdhv.com or 01444 476632



the River Restoration Centre

Working to restore and enhance our rivers

ABSTRACTS

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BRINGING WATER TO LIFE



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Restoring rivers to help nature thrive

We partner with our clients to create nature-based solutions which enhance biodiversity, restore natural processes and leave a sustainable legacy.

Contact us:

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Session 1

ESTABLISHING COMMON RIVER RESTORATION PRINCIPLES: PART OF 'MAKING IT MAINSTREAM'

G.MASS¹, P. BOON², J. DODD³, M. JANES⁴, H. MOIR⁵, J. TOONE⁶, A. TREE⁷

1 Environment Agency, 2 Freshwater Biological Association, 3 Edinburgh Napier University, 4 River Restoration Centre, 5 cbec eco engineering UK Ltd, 6 Natural Resources Wales, 7 NatureScot

River restoration in the UK and across Europe has never before offered such a wealth of opportunity for action in our catchments, and the scale of ambition continues to grow. Over the last two years we have worked with colleagues across Europe, working towards a standard for river restoration. The restoration principles are based on existing knowledge and supported by case studies. Underpinning these principles is the re-establishment of natural processes, leading to the sustainable evolution of riverine ecosystems and their habitats. We summarise our developing work and its contribution to the conference theme, including:

- The core principles of restoration
- The aims of river restoration
- The spectrum of approaches to river restoration with a focus on those that restore both physical and ecological aspects
- The identification of opportunities for restoration and possible constraints
- The different scales of restoration
- The importance of monitoring and appraisal

RIVER & FLOODPLAIN RESTORATION AND THE 25 YEAR PLAN

L. DAHL¹

1 Eden Rivers Trust

The government's 25 year Environment Plan has the potential to drive ecological restoration, fight pollution and reduce the UK's contribution to global climate change. However, as well as the opportunities, there are a number of challenges and uncertainties associated with this plan. As part of the Cumbrian River Restoration Strategy, and with close links to the farming community, Eden Rivers Trust are ideally placed to take advantage of the opportunities and help combat the challenges presented by the 25 year plan. Using 2 recent projects undertaken on working farms as case studies, this presentation will look at how the 25 year plan is affecting river and floodplain restoration within the Eden catchment.

MAINSTREAMING RIVER RESTORATION IN THE WATER INDUSTRY

N. NINEHAM¹

1 Mott MacDonald

The water industry has a key role to play in the health of our rivers. Since AMP5 companies have recognised river restoration as a way to improve resilience of rivers impacted by their activities and meet their environmental obligations. More recently, river restoration has been increasingly embedded in the WINEP and many water companies have commissioned specific river restoration frameworks. This shift towards large frameworks, a move from investigations to the delivery of restoration work on the ground, and ever growing enthusiasm for nature-based solutions, means river restoration is becoming a mainstream part of the water industry, bringing opportunities for nature recovery and to build restoration capacity. This trend is set to continue, with proposed changes to the WINEP and regulatory promotion of catchment and nature-based solutions. We will illustrate this evolution with our projects for different water companies, covering a range of drivers, opportunities and challenges.

ENFORCEMENT OF HYDROMORPHOLOGICAL HARM IN WALES

O. LOWE¹, H. FOSTER¹

1 Natural Resources Wales

Illegal works to watercourses are the opposing and exasperating side of the river restoration movement. Unconsented works to straighten, dredge, culvert and otherwise engineer natural rivers is the bane of the restorer's life – flying in the face of all we believe, and the goals we work so hard to achieve. It therefore adds further insult to injury when regulatory powers appear hindered, constrained, and impotent to act. This presentation outlines the findings of a Natural Resources Wales (NRW) Task & Finish group set up to address hydromorphological harm following the unprecedented increase in unconsented work undertaken during Lockdown 1. The presentation will prescribe the applicable legislation, regulatory tools available, and provide examples of the types of activities where legal Notices are now being issued by NRW to stop, prevent and restore hydromorphological harm to rivers, and the impact that the improved regulatory response is having in Wales.

LANDSCAPE RECOVERY: RESTORING ENGLAND'S RIVERS AND STREAMS

D-J. GENT¹, N. ROBINSON¹

1 Environment Agency

Landscape Recovery is one of three new Environmental Land Management (ELM) schemes, with a focus on the most radical and ambitious large-scale, land-use change and habitat restoration. The Environment Agency will be administering projects under the river restoration theme. Keen to share latest developments of the scheme and how farming incentives can help in the restoration of England's rivers and streams.

NOTES

Nature-Based Specialists for Freshwater & Coastal Environmental Management

River and Floodplain Restoration

- Nature-based restoration design
- Catchment-scale prioritisation
- Construction supervision
- Wetland development/ enhancement

Natural Flood Management (NFM)

- Floodplain reconnection
- Upland landuse management
- Flood hydrograph attenuation and de-synchronisation

Sustainable Nature-Based River Engineering and Management

- Large wood habitat enhancement and bank protection
- Integrated constructed wetlands and sustainable urban drainage
- Sediment management
- Asset protection through sustainable channel stabilisation

Peatland Restoration

- Channel restoration
- Hydrological assessment
- Restoration planning and design
- Field surveys

Fisheries and Barriers Management

- Habitat surveys
- Barrier assessment & fish pass screening evaluation
- Barrier management design
- Fisheries habitat enhancement designs

Hydropower Support

- Geomorphic and hydrological assessments
- Scoping and design of measures to mitigate impacts to physical form/ process and aquatic ecology



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every

river

is

important

frog environmental work with the construction industry to protect rivers during restoration projects, essential maintenance works and the development of new infrastructure



Session 2: Parallel Sessions

Naturally functioning systems

THE ROLE OF VEGETATION IN NATURE BASED RESTORATION AND MANAGEMENT

M. O'HARE¹

1 cbec eco-engineering UK Ltd

Unlike most other riverine biota, vegetation does not just respond to its physical habitat it also plays an important role in fluvial geomorphological and hydrological processes. This presentation will discuss how vegetation both responds to nature-based restoration and how it also has the capacity to influence restoration trajectories too. The role of specific riverine plants and assemblages will be covered in the context of British river types. For 'stage 0' type restoration the ecosystem engineering role of plants is especially important; here establishment processes can have long term implications for the success of a project. The steps required to achieve success will be described.

RIVER RESTORATION AND CLIMATE

G. L. HERITAGE¹, S. BENTLEY¹

1 Dynamic Rivers

Funding for river and floodplain restoration and naturalisation projects is often myopically focussed around flood risk reduction and single species drivers. It is clear, however, that our fluvial systems are presently contributing to climate change as their associated water-based habitats have been all but destroyed and no longer capture carbon. This paper reviews the sequestration processes operating on naturally functioning fluvial systems, presenting the latest research quantifying their value and comparing these statistics with our degraded managed systems. It also reviews the negative impact that a fundamentally disrupted sediment transport system has on downstream flooding and presents valuable new data linked to sediment capture by fully connected river and valley bottom systems. Such data and associated insights will provide river practitioners with important new justification for future schemes and drive the land management agenda towards restoring system functionality.

WILL BEAVERS MAKE RIVER RESTORATION PRACTITIONERS REDUNDANT? BEAVERS AND THE FUTURE OF RIVERS RESTORATION

S. CLARKE¹

1 National Trust

With beavers present in an increasing number of catchments in Great Britain and government proposals on free-living beavers in England expected sometime this year, it looks as though beavers are here to stay. These ecosystem engineers have been absent from our catchments for hundreds of years but have the potential to make rapid and significant changes to headwaters, river reaches and wetlands. I will explore what the science tells us we might expect to see and consider how beavers might fit within our toolkit for river and wetland restoration drawing on experiences from National Trust and other projects.

IMPLEMENTING STAGE ZERO IN THE EVENLODE CATCHMENT: FROM STRATEGY TO DESIGN AND DELIVERY

E. MILES¹, D. GASCA¹, L. RHYMES², P. ST PIERRE², R. COX³

1 Atkins, 2 Environment Agency, 3 Blenheim Estate

Stage zero floodplain reconnection is a landscape-scale method of river and floodplain restoration that creates a mosaic of habitats with multiple ecosystem service benefits. In the UK, we are often constrained by where and how we can deliver these ambitious schemes. To this regard, in the Evenlode catchment (Oxfordshire) a data-based strategy and feasibility study for identifying the most likely and realistic places for delivering multiple stage zero schemes was developed with the organisations of the Evenlode Catchment Partnership and local landowners. A stage zero scheme was then built as a pilot. Adaptive design and dynamic delivery techniques were

used minimise intervention in the channel and floodplain during construction. Working with natural processes limited carbon and financial cost. The paper will describe the complete story of the scheme and demonstrate how landscape-scale floodplain restoration might be feasibly delivered.

Session 2

Reinstating natural processes in confined urban environments

KINGSHURST BROOK RESTORATION

A. APANASIONOK¹

1 Warwickshire Wildlife Trust

Completed in 2021, the Kinghurst Brook restoration was a two phase project to restore an artificial lake back into a functioning stream channel. Phase 1 created an extensive area and narrowed the lake. Phase 2 built on this work to fully restore the stream channel. The project is situated in a well-used public green space in one of the most economically disadvantaged areas of the West Midlands. Public benefit and community inclusion were as important to its success as river and habitat improvements. The stream was not functioning geomorphologically, was a barrier to fish passage and had water quality issues which Phase 2 addressed. We also expanded the extent of the wetland area which will provide a high quality habitat to urban wildlife. It is a great showcase as to what can be achieved and how an effective partnership can overcome significant challenges.

RECONNECTING OURSELVES AND OUR RIVERS WITH THE EUROPEAN EEL

J. WOOTTON¹

1 Forth Rivers Trust

Nature recovery is a general term that we all hope to be working towards, but our approaches can be very different. These “recoveries” can take the form of technical solutions to rewilding. These can be extremely expensive or very cost effective. The toolbox is open and we are trying anything and everything. The Forgotten Fish Project attempts to take a step back and look at what is slowing progress in general and work from there.

Over the last few years this project has been trialling methods of reconnecting our rivers and freshwater habitats in some of the most urbanised areas in Scotland. The aim is to reconnect our freshwater in an affordable and engaging manner. Specific focus is given to forgotten species that play large ecosystem roles such as the European eel. With our largest and most ambitious project starting this year we want to share our work to date.

INTEGRATING RIVER RESTORATION WITHIN ENGINEERED FLOOD RISK MANAGEMENT SCHEMES – IMPROVING THE CHALK RIVER HABITAT OF HOUGHTON BROOK

M. ROSS¹, M. BIDDULPH²

1 Mott MacDonald, 2 Environment Agency

The construction of formal flood storage areas is a way to emulate natural floodplain function in semi-urban to urban locations, and for rivers which already suffer poor morphology such schemes can create opportunities to improve in-channel and riparian habitats. This presentation will share lessons learned from a recently constructed Environment Agency FSA scheme within a tributary catchment of the River Lee near Luton. We will focus on the contribution of geomorphologists during design, and their further influence on design adaptation working with the contractor during construction. The watercourse had been historically straightened and deepened and no longer retained natural chalk stream morphology or function. A river realignment through the new FSA was designed and constructed together with outfall and in-channel improvements, resulting in more varied and natural conditions along 750m of the brook.

ENGINEERED FLOATING ECOSYSTEMS: AN INNOVATIVE TOOL FOR URBAN AQUATIC BIODIVERSITY GAIN AND ECOLOGICAL RESTORATION

G. FULFORD¹, N. SCHREINER¹

1 Biomatrix Water

Historically, urban Rivers have been viewed as a force to control within rigid, hard sided conveyances. Restoring urban waterways would often mean removing buildings and critical infrastructure at significant cost. Modular floating ecosystems provide an opportunity to reintroduce critical riparian habitat within the rigid, urban framework. These modular floating structures are planted with native aquatic species and then formed into islands and floating banks. The plants and their suspended root structure provide valuable habitat structure both

above and below the water surface. Additionally, plant metabolism and the attached growth, subsurface biofilm have been shown to achieve Total Nitrogen and Total Phosphorous removal rates of up to 1.3 and 0.3 g/m²/day respectively. As such, Floating Ecosystems offer a practical and cost-effective tool for urban, waterscape restoration, and in 2022 they will be implemented as part of 20 independent restoration schemes across the UK alone.

Session 2

Working with landowners & farming communities

WANSBECK NATURE RECOVERY AND RIVER RESTORATION PLAN

N. BURROWS¹, N. D. WILLIAMS¹, W. DACKUS¹

1 AECOM

AECOM is delivering a Nature Recovery Network Plan for river restoration and habitat creation across the 330km² River Wansbeck catchment, working with Natural England and the Environment Agency to engage farming communities and implement sustainable nature-based solutions. Just two of the 11 water bodies in the Wansbeck Operational catchment are meeting WFD objectives. The catchment plan uses Natural England's Nature Networks Evidence Handbook and Feature Manipulation Engine to create a resilient ecological network based on automated geomorphological modelling of a wide range of open access remote sensing data. The resulting thematic mapping is highly engaging and attracted widespread interest when presented in local community workshops. As a result, a shortlist of agreed and feasible restoration opportunities have been developed to justify funding commitments that will re-connect rivers, floodplains, habitats and biodiversity across the entire catchment.

DYNAMIC AND UP THE HILL: RESTORATION ON THE LARIG

A. HEATH¹

1 Forth Rivers Trust

The river Larig is an upland and dynamic river, that is representative of many Scottish rivers: historically overgrazed and deforested. These require protection and enhancement in order to continue to provide excellent water quality-based habitats for freshwater wildlife in a climate change-based future.

Here we track and reflect on the delivery of several restoration and afforestation-based projects undertaken in the last 2 years. These have involved tree planting in high deer density areas, riparian planting, tying together habitats for connectivity, working with landowners on bank protection and installation of large woody debris/flow deflectors to increase habitat availability and quality. We reflect on the delivery of these components, the synchronicity between land management and nature restoration. We also look forwards to a whole catchment approach to delivering what this river needs in the next 20 years and a natural based solution to being prepared for climate change.

NATURAL ENVIRONMENT INVESTMENT READINESS FUND (NEIRF) & THE POWER OF SYNERGY- CATCHMENT SCALE RESTORATION IN THE ESK VALLEY, NORTH YORK MOORS NATIONAL PARK

C.T. WATT¹

1 North York Moors National Park Authority

The North York Moors National Park Authority in partnership with Palladium are developing a model for restoring and creating habitats such as species-rich grasslands, riparian woodland and riverside meadows at a catchment scale through private investment. This signifies a step change from public funding to private finance for unlocking opportunities for nature recovery over the long-term. Working in conjunction with Esk Valley Farmers has facilitated discussion, ideas and restoration plans therefore allowing modelling to progress. The farming group, coupled with good working relations has removed the barrier to engagement for exploring a new concept enabling synergy and progression. Poor farmer input was identified as a risk upon project commencement. It is recommended other projects following this direction should endeavor to begin with strong working relationships through working groups to overcome engagement challenges when exploring new methods for catchment scale nature recovery.

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Session 3: Parallel Sessions

Catchment planning

ROCH CATCHMENT WFD & ENHANCEMENT STRATEGY

A. GEE¹, A. CHAPMAN²

1 AECOM, 2 Environment Agency

The Roch catchment has been significantly impacted by its industrial legacy & other anthropogenic pressures to the detriment of its morphology and biodiversity. Studies undertaken over the past 12 years have identified measures that could enhance the riverine environment and improve the WFD status. Although the benefits of these measures are clear, the mechanisms for obtaining funding and delivering projects on the ground are less straightforward. AECOM, the Environment Agency & Groundwork have developed a catchment-wide delivery strategy based around three central considerations: environmental impacts, cost benefit and engagement with the local community & other schemes. The strategy incorporates key metrics that are increasingly used to facilitate project delivery (including Natural Capital Accounting and Biodiversity Net Gain) at the start of the process, providing the Environment Agency with the information needed to take projects from planning to delivery in an integrated way.

A BRILLIANT ACTION PLAN

E. J. T. LEWIN¹, K. CAUSER²

1 Atkins, 2 Environment Agency

The BRIL action plan project (Natural Course EU LIFE IP funded) identified and developed the opportunities for environmental and socio-economic improvement of the Irk catchment. The development of actions for the catchment were identified based on digital data and online stakeholder engagement. They were prioritised based on how they contributed to environmental improvement, climate change, funding opportunity, socio-economic benefit and feasibility. Natural Capital Assessment and a desk-based Biodiversity Net Gain assessment were then used to identify the potential cost benefit of the top 20 actions and potential beneficiaries and funding streams were identified for these. This information was combined into an action plan for the catchment, available for the public to view online and be presented to the beneficiaries with the aim of securing funding for the actions. This presentation focuses on the methods used and lessons learnt from this process.

DELIVERING NATURE-BASED SOLUTIONS TO CATCHMENT RESTORATION

M. TURNER¹

1 Greater Manchester Combined Authority

Natural Course is an EU LIFE Project accelerating progress towards the objectives of the Water Framework Directive and developing an integrated approach to water management. A series of evidence led nature-based solutions have been implemented delivering multiple benefits. Small-scale water management solutions have been implemented at sites in Greater Manchester. Natural flood management interventions have been implemented in the fringes of the Pennines. Large wetland features have been created at the former Bickershaw Colliery in Wigan and at Hillylaid in Lancashire. Catchment wide nature-based solutions have been developed through a programme of natural flood management across the Wyre catchment and through the restoration and extension of wetlands around Rostherne Mere, Cheshire. Natural Course has identified future challenges including how to mainstream a nature-based approach and moving from delivery of demonstration projects to catchment and neighbourhood scale initiatives.

A FRAMEWORK FOR PRIORITISING RIVER RESTORATION BASED ON ASSESSMENT OF CATCHMENT PRESSURES & IMPACTS

J. ROBINS¹

1 River Restoration Centre

There are many challenges associated with catchment planning that we need to overcome if we are to achieve our ambitions. RRC has developed a framework for producing catchment river restoration plans using experiences learnt from catchments across the UK. It has been designed to be adaptable, to account for differences in river environments, funding, survey methods, expertise, and more. The framework helps to assess complex pressure-impact relationships and make evidence-based decisions on the prioritisation of river restoration. This presentation will cover some of the key principles of our framework and lessons we have learnt along the way.

Session 3

Addressing fine sediment & nutrients

AN INTEGRATED APPROACH TO CATCHMENT RESTORATION ON A RIVER SAC

E. SMAIL¹, R. NEEDHAM¹

1 Trent Rivers Trust

The River Mease is a typical lowland, meandering river, designated as a SSSI and a SAC for small fish species, water crowfoot habitat and otter. It is currently in unfavourable SSSI condition and failing under the Water Framework Directive; its primary pressures are phosphate pollution and habitat modifications. The Trent Rivers Trust and others have put the Catchment Based Approach into practice to deliver river restoration and phosphate reduction projects at a catchment scale. We have worked with a range of stakeholders to bring tangible benefits to this highly designated river, including working closely with farmers to deliver outcomes, with constructive engagement on the pressures on rivers, leading to long term positive changes in farm management. So far since 2019 we have restored 7.65km of the Mease and 13.12ha of floodplain and are embarking on a detailed monitoring programme to evaluate the impacts.

EVIDENCE-LED MITIGATION OF FINE SEDIMENT POLLUTION ON THE TYNE

J. BLOOMER¹

1 Tyne Rivers Trust

Fine sediments arising from abandoned metal mines, agriculture, commercial forestry and other land-uses negatively affect the ecology of the River Tyne from its headwaters to the estuary. Further, it can have severe socio-economic consequences by increasing operational costs of industries that rely on the river for navigation or water extraction. To meaningfully tackle this problem at a catchment-wide level, evidence-led delivery of interventions at scale is required. This talk discusses the use of sediment fingerprinting analysis to identify subcatchments that contribute most to the problem, followed by precise identification of major fine sediment sources within those subcatchments. This method maximises the cost-effectiveness of work to tackle the issue. Further, the robust approach has attracted interest from businesses impacted by fine sediment pollution, thereby maximising investment potential of the project and, ultimately, its possible environmental impact.

MULTIPLE BENEFITS OF RIVER AND WETLAND RESTORATION

S. WILLIAMS¹

1 Wessex Water

Two large scale wetlands were created upstream of a surface water reservoir, to improve water quality entering the reservoir from two sources, the Durleigh Brook and the Bridgwater & Taunton canal. The main drivers for the scheme were sedimentation and eutrophication coming from the catchments, resulting in loss of reservoir storage capacity and algal blooms, with the latter impacting on processes at the water treatment works. In addition to water quality benefits, the project has delivered a river restoration and a floodplain wetland, a separate constructed wetland, biodiversity, carbon and amenity benefits.

Inflows and outflows from both wetlands are monitored and we can compare the data with the before long-term data. Sediment is being trapped in the new wetlands and total phosphorus concentrations reduced. Biodiversity has increased in both the overall site and the river, calculated using the Defra Biodiversity Metric and undertaking species surveys.

NATURE BASED SOLUTIONS: INNOVATIVE LAKE RESTORATION – ROSTHERNE MERE

B. DUGDALE¹

1 Natural England

Diffused water pollution (DWP) from agriculture significantly contributes to the nutrient load apportionment within rivers and lakes, especially in rural catchments, and is a primary factor in protected sites not meeting favourable condition targets. Through the Natural Course EU Life project, Natural England have been developing nature-based solutions, designed to reduce agricultural DWP pressures, whilst improving both biodiversity and water quality.

At Rostherne Mere, we've created wetland habitat and installed multiple willow dams within targeted inflows, to intercept agricultural run-off and reduce nutrient concentrations. Working directly with the landowner – we've introduced multiple sustainable farming practices including arable reversion, lower stocking rates, seasonal rotational grazing, and stock exclusion areas. All of which help to reduce the impacts of DWP whilst increasing species richness and abundance throughout the site. We're continuing to replicate the success at Rostherne across our Northern Meres – currently failing WFD status whilst supporting our Nature Recovery Network strategy.

Session 3

Citizen Science survey methods

CITIZEN SCIENCE AS A CONSERVATION TOOL

A. FERGUSON¹

1 Forth Rivers Trust

As a rivers' trust we can look at citizen science as an invaluable resource. People undertaking some of the activities on the ground to collect information on a wider scale possible than with staff alone. At Forth Rivers Trust we have a number of opportunities that encourage volunteers to undertake activities which allow us to cover as much ground in our catchments as possible, especially in urban and residential environments. Not only does this provide us with data – data that does not need to be in depth to achieve valuable results in management of these landscapes - but it provides a sense of ownership for volunteers and members of communities and allows them an outlet to look after and monitor their water environment; contributing to the conservation that is being seen on a global scale.

OBSTACEELS – CITIZEN SCIENCE AIDING THE MIGRATION OF THE EUROPEAN EEL

W. BODNAR¹, A. GLOVER², A. FORBES³

1 Thames Estuary Partnership, 2 Zoological Society of London, 3 Thames Rivers Trust

Man-made structures such as locks and weirs litter rivers causing major problems for many fish species, including the Critically Endangered European Eel. One of the key conservation objectives for eel and other fishes is to restore migratory pathways by removing redundant structures or adding passes to structures that cannot be removed. To do this, we need to know where these structures are and assess their impact on migrating fish. This is the purpose of ObstacEELS, a citizen science method used for systematically surveying migratory barriers, that has been developed and piloted within the Thames Catchment Community Eels Project. ObstacEELS data collection uses the newly revamped River Obstacles app, and utilising GIS technology, data collected are incorporated into the Fish Migration Roadmap. The Roadmap is a web mapping application that enables the visualisation of structure locations, and can be used to make data-driven decisions to reprioritise them to improve migratory pathways.

DEVELOPING A COLLABORATIVE APPROACH TO CITIZEN SCIENCE RIVER HABITAT MONITORING AND ASSESSMENT: CITIZEN RIVER HABITAT SURVEY (CRHS)

M. McLOUGHLIN¹, C. MATTHEWS², M. NAURA³

1 Natural Resources Wales, 2 Blaenau Gwent County Borough Council, 3 River Restoration Centre

Understanding the condition of our river habitat is a fundamental component in planning, decision making and delivery of river restoration and management. However, the approach taken to monitoring river habitat and assessing river habitat condition often relies heavily on statutory organisations as well as highly qualified and accredited specialist experts. Citizen science can, however, offer an alternative option as part of an integrated river habitat monitoring and assessment strategy.

Here we discuss a regional collaborative partnership approach to developing and delivering citizen river habitat survey (cRHS) as a consistent methodology and framework to monitoring and understanding the condition of our river habitat, to support long term collaborative involvement in restoration planning and delivery and help building ecosystem resilience in the face of change.

The presentation will include a broad overview of the cRHS methodology, introduce the online cRHS platform, as well as a discuss the regional collaborative partnership approach taken to embed this framework across South East Wales.

EAST ANGLIA CASE STUDY: CITIZEN RHS - HITTING THE SWEET SPOT?

J. E. BALAAM¹

1 The Greensand Trust/Upper & Bedford Ouse Catchment Partnership

The RRC developed the Citizen River Habitat Survey (cRHS) methodology as a 'citizen science' version of the full RHS, to encourage engagement in surveying without significantly compromising the quality of results. The Upper and Bedford Ouse Catchment Partnership (UBOCP) needed to ground truth desk-based research, to support a catchment-wide Restoration Strategy. Our volunteers have been amongst the first to pilot the cRHS, and this presentation takes two different perspectives:

- Firstly, the volunteers themselves. It uses the evaluation of their training to ask about their experience and whether they feel confident in applying it in the 'real world'? If we are to 'mainstream' river restoration, the success of tools such as cRHS is critical.
- Secondly, from the point of view of those using the results, is the quality good enough? How does it compare to RHS results?

Ultimately, could cRHS support the largest systematic survey of our rivers in decades?

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Session 4

Keynote

Professor David Sear (University of Southampton)

David did his PhD in the late 1980's under the supervision of Malcolm Newson on the impact of the Kielder reservoir hydropower scheme on sediment dynamics and channel morphology, followed by a postdoc funded by the then National Rivers Authority and managed by Dr Andrew Brookes, then the only geomorphologist at Thames Water. During this time, he visited every NRA area office to understand how erosion and sedimentation were managed by the then flood defence teams. This project resulted in the development of a business case for applied fluvial geomorphology and the development and application of the fluvial audit as a tool for sediment management. In 1993 David moved away from the dynamic gravel bed rivers of the north to the University of Southampton and the chalk streams. He worked with Malcolm Newson, Mike Clark and the GeoData Institute to evolve fluvial audit into a platform for understanding river geomorphology and identifying strategic river restoration options. Over the intervening 29 years, David's research has highlighted the importance of conserving chalk stream gravel beds, improved our understanding of fine



sediment impacts on instream ecosystems, led to fundamental theoretical understanding of pool-riffle sequences, the role of large wood in driving floodplain and channel patterns in lowland rivers and the development of the process-based approach to restoration. He was an early Director of the River Restoration Centre and convinced the late Nigel Holmes that RRC should host an annual conference of science and practitioners in River Restoration. Indeed, David chaired the first session of the first RRC conference. David has advised the Environment Agency, Scottish Environment Protection Agency and Natural England on fluvial geomorphology and River Restoration, indeed his work underpinned the geomorphic aspects of Natural England's River Restoration Strategy. He sits on the Defra/Environment Agency TAG on strategy and policy in Flood Risk management. He was a contributor to the Foresight Future flooding report. With Malcolm Newson he has helped train staff in the Environment Agency, Natural Resources Wales, Scottish Environment Protection Agency and others, and his undergraduates and postgraduates continue to support the work of river restoration and river science. He is a National Geographic explorer (think jungles and machetes) and Fellow of the Royal Geographical Society. He loves rivers, research and teaching but hates administration. He's proudly East Anglian, helped rediscover the lost city of Dunwich off the Suffolk coast. The things that make him proudest are his family and the fact he had a part in the business case that led to the mainstreaming of geomorphology in UK river management.

Session 5: Workshops

A: Integrated land and water management: rivers and their connections to wider environmental and resource management

Facilitator: Robert Grabowski (Cranfield University)

The policy and regulatory landscape for environmental management is undergoing dramatic changes. As a river restoration and management community, we must incorporate them into our practice to enact positive change in river systems. We must also use this opportunity to highlight the wider importance of rivers to the environment and people. 'Ecosystem services' has helped to widen discussion beyond economic benefits and there has been great progress in demonstrating the social benefits, it can still be challenging to convince others that rivers truly matter.

In this workshop, we will share knowledge to co-create an up-to-date summary of the policy, regulatory and scientific dimensions to integrated land-water management to support river restoration. The end goal is to lay the groundwork for an open access publication aimed at environmental managers and practitioners.

HOW DOES NFM FIT INTO ELMS?

D. BROWN¹

1 Environment Agency

There are three tiers to ELMS, and NFM would appear to fit most logically into the Local Nature Recovery category. Catchment Sensitive Farming Officers can help promote and administer within this, but will this deliver what we would like it to and is the focus right?

Using examples from NFM in the Northwest of the UK, and current understanding of where we are with ELMS, along with the current data around the Carbon/farming agenda, the aim is to promote discussion on this topic, noting that all the answers are not necessarily there.

REGENERATIVE LAND MANAGEMENT - A NEW WAY FORWARD

F. RHODES¹, I. RAYNER¹, L. BINGHAM¹

1 Arup

The way we manage catchments is changing as we transition towards net zero carbon economies, with land-based conservation and restoration having the potential to provide >30% of cost-effective climate change mitigation required before 2030. This requires holistic, nature-based alternatives to traditional, intensive land use practices to facilitate ecosystem function and services across catchments. Regenerative Land Management (RLM) is central to achieving this through restoration, protection and enhancement of land to not only address the environmental, social and economic challenges of the future but to repair the damage caused by impacts of practices past and present. This workshop will explore what RLM is and how it can contribute to flood and drought risk management, carbon sequestration and biodiversity targets. The session will consider emerging changes in policy in the UK, such as the transition to ELMS and different funding routes, as well as applications at the global scale.

B: Co-delivery innovative solutions to catchment challenges

Facilitator: Helena Soteriou (Thames Water)

The water sector now constitutes a significant portion of the resources and funding available for river restoration work in the UK, so it is vital that water companies and river restoration practitioners work together effectively to deliver catchment-scale improvements. This workshop will look at some of the challenges and opportunities associated with collaboration, as well as some of the innovative approaches to collectively delivering river restoration work across sectors.

An example of this is Thames Water's 'smarter water catchments' initiative, using collaboration at all stages of the process, from agreeing objectives, understanding data, through to co-creation and co-delivery of solutions.

A mixture of presentations and group discussions will be used to share experiences and practical guidance that will help participants overcome barriers within their own organisations and projects.

FACILITATING RESTORATION AT A CATCHMENT-WIDE SCALE THROUGH COLLABORATION: THE EXAMPLE OF THE CHESHIRE HUB

E. TAYLOR¹

1 United Utilities

A collaborative approach is essential in allowing for the holistic and catchment centric view needed to facilitate restoration at a catchment-wide scale. Through Natural Course, the Cheshire Hub was formed, bringing together key organisations to collaboratively develop a joined-up, improved understanding of the Cheshire catchment. By sharing data on catchment performance and water quality, the Hub identified operational issues, likely causes and targeted interventions to deliver the greatest benefit. Outcomes include farm plans promoting greener farming methods for the Tatton and Grosvenor Estates, catchment plans for Valley Brook and Northern Meres and reactive media trials at Rostherne Mere. Through a lessons learnt log the Hub recognised how collaboration could be enhanced. This is being embedded as the Cheshire Hub continues, and has set the foundations for the establishment of a Fylde Hub, allowing for further knowledge building and restoration at a catchment-wide scale.

C: Making the most of funding and investment opportunities

Facilitators: Jenny Collins (WSP) & Josh Robins (RRC)

This workshop will cover multiple funding streams that are likely to play a big part in how our river restoration objectives and goals are achieved. It will focus on:

- Defining suitable river restoration projects that fit funding opportunities and will deliver against project partner aspirations.
- How to develop 'investment ready' river restoration projects – advice and guidance from experience.
- Identifying a range of green finance, funds and opportunities – e.g. net gain, National Highways, blended funding, Nature for Climate tree planting.

Participants will hear from presenters that will provide details on new funding opportunities as well as case studies of their application. There will also be discussion sessions where participants can share their experiences and suggest ideas to overcome challenges associated with funding for river restoration.

THE NFM FUND – A NOVEL WAY TO REDUCE FLOOD RISK ON MOTORWAYS AND TRUNK ROADS

M. HUBAND¹, T. EMBLEY², J. SANDERS³, E. SHAW⁴, P. ORSI⁵

1 Atkins, 2 National Highways, 3 Mersey Rivers Trust, 4 Don Catchment Rivers Trust, 5 Sylva Foundation

Over the past 3 years National Highways (NH) has invested £1.2M working with local Rivers Trusts and landowners to develop and pilot the 'NFM Fund'. This has opened up a new way for linear infrastructure providers to manage flood risk on a network. Rather than building measures on their own land NH has been able to fund landowners in the catchment to target measures at locations identified as effective for managing flood risk on the road network. Using an online bidding platform, landowners were free to set their own price. With no limit to investment they could pitch ideas that suited both their landholdings and ambition.

The paper sets out key lessons learnt from piloting the Fund across 3 catchments. It focuses on the collaborations that made the pilot possible. It also considers how upscaling of the initiative may well be dependent on more comprehensive valuation of multiple benefits and a further escalation of collaboration to fully realise these additional benefits.

Site Visit 1: Blyth Mill rural wetland restoration

Facilitator: Warwickshire Wildlife Trust

As part of a multi-year project on the river Blythe, funded by the European Agricultural Fund for Rural Development (EAFRD) Water Environment Grant, Blythe Mill has been a key site for large-scale conservation works on species-poor floodplain to create wetland scrapes and wet meadow areas. One of the main targets of these ongoing works has been to make the site more attractive to wintering waders. The project involved the creation of 10 scrapes and inset floodplain feature, which generated 5000m cubed of spoil which was removed from the floodplain. The site was seeded with a wet meadow seed mix. We also planted several thousand plug plants of wetland perennial plants around the scrapes and planted trees along the river. The project involved close collaboration between the Environment Agency, Natural England, Tame Valley Wetlands (Warwickshire Wildlife



Trust), Land owner, tenant, designer, contractor and volunteers. Blythe Mill is one of six main sites for improvement along the River Blythe SSSI, and works over the past 3 years have contributed to improving the river for biodiversity and create more attractive places for people to access nature.

Site visit 2: Kingshurst Brook renaturalisation project

Facilitator: Warwickshire Wildlife Trust



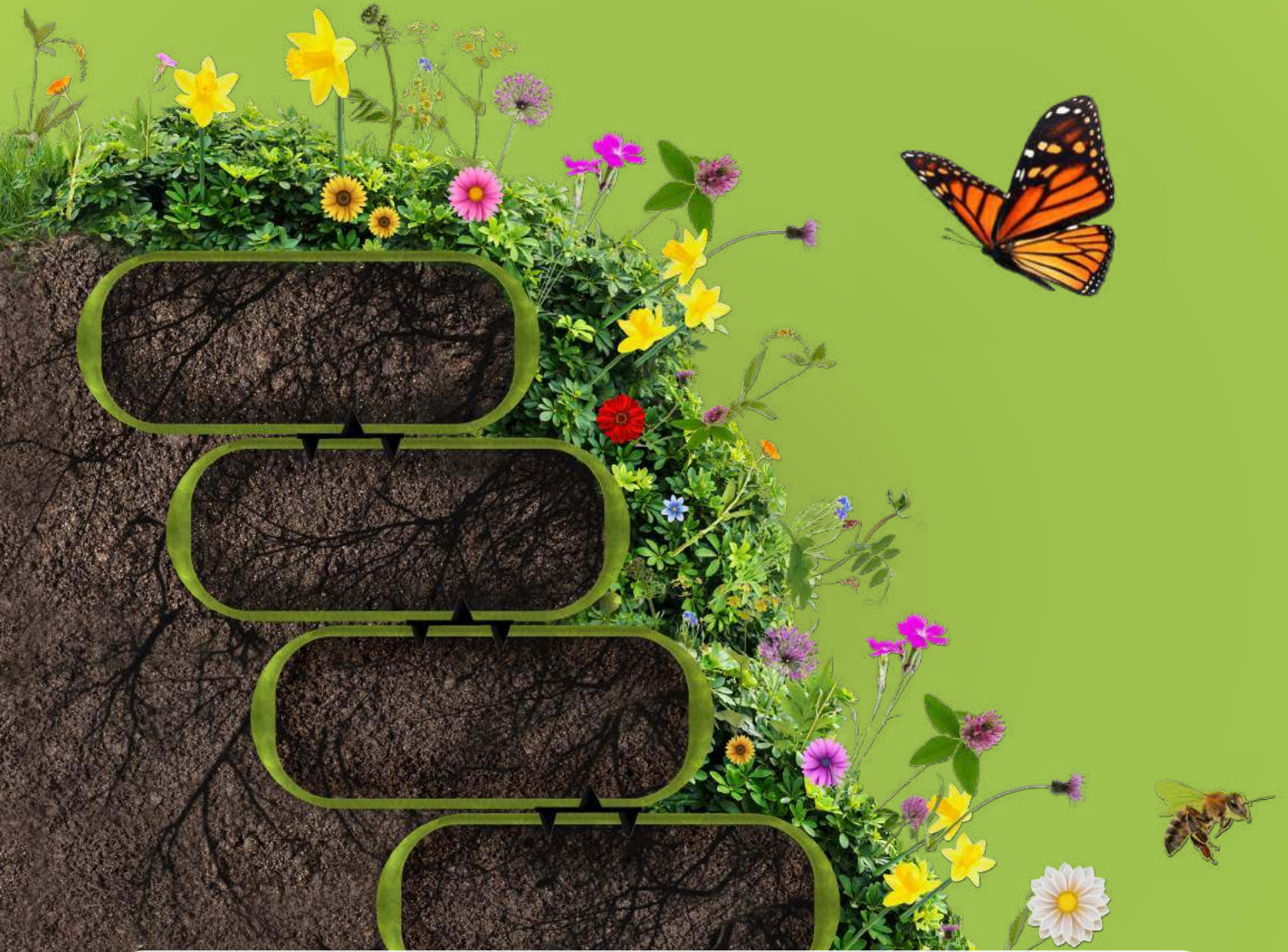
The Kingshurst Brook is an urbanised tributary of the River Cole at Meriden Park, Solihull. In April 2017, Solihull Metropolitan Council began work to restore a disused amenity boating lake in Meriden Park, which had been created by placing a large weir on Kingshurst Brook. Over time, the lake had silted up resulting in low water oxygen levels and a strong hydrogen sulphide smell. While this work narrowed the lake, lowered the weir and increased water velocity, it was not enough to prevent silt deposition and boost oxygenation, thus further restoration was needed. In September 2021, as part of the Love Your River Cole project, Warwickshire Wildlife Trust and partners completed a second phase restoration of the Kingshurst Brook, with the aim of creating a well-functioning stream channel and transform the

former lake into a range of habitats to support enhanced biodiversity. Interventions involved the creation of wetland features, installation of riffles and cobble ramp to improve fish passage, installation of Natural Flood Management features and the removal of a substantial amount of rubbish from around the site. The improvements to the river, as well as the installation of a dipping platform on the restored lake, also enhanced the park for local residents and visitors, creating a more aesthetically pleasing area to access and connect with nature.

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Session 6

Assessing the impact of Natural Flood Management

ASSESSING THE USE OF EARTH BUNDS AS NATURAL FLOOD MANAGEMENT FEATURES

J. TEALE¹, J. L. A. KNAPP¹

1 Durham University

The lack of empirical evidence to support Natural Flood Management (NFM) initiatives still presents a barrier to widespread implementation of NFM techniques. The disconnect between practitioners and academics also remains a central issue in improving uptake of NFM by landowners. We assess the effectiveness of five earth bunds in creating temporary storage of flood water in the upper catchment of the Wear. Arduino-based sensors in each of the bunds record the frequency of flood storage. Changes in soil hydraulic conductivity and soil chemistry are also measured throughout the year to assess bund stability and potential benefits to water quality. Finally, vegetation surveys are carried out to gain insights on soil recovery after the installation of the bunds, providing a measure of suitability for the land to be used for grazing. Working with the EA and the landowner, this work aims to develop an improved understanding on the design requirements for earth bunds as NFM features.

LANDWISE NFM – ENGLEFIELD ESTATE EVALUATING THE EFFICIENCY OF LEAKY BARRIERS FOR NFM

R. JENNINGS¹, G. POWELL²

1 JBA Consulting, 2 University of Reading

We are going to talk about a pilot natural flood management (NFM) project partnered with Englefield Estate and Pang Valley Flood Forum in Berkshire. This is a collaborative project where knowledge is being co-produced. Through modelling and level monitoring we are evaluating the efficiency of leaky barriers for NFM. Our talk will cover the themes of 'land use and restoring nature' and 'working in partnership'. The key message we'd like the audience to take away is that the effectiveness of leaky barriers can be quantified in an effort to advance the evidence base for NFM.

THE JOURNEY OF DELIVERING NFM IN A LARGE CATCHMENT

E. BYERS¹

1 South East Rivers Trust

The Medway Natural Flood Management (NFM) Project delivered a wide range of nature-based solutions within several sub-catchments and demonstration sites across a large catchment within Kent from 2018-2022. Over four years, the South East Rivers Trust and local partners have moved from having little experience of delivering NFM to completing a suite of interventions of varying types. Experience was continually gained along the way, with adaptation and openness to learning key to successes. The talk will be a candid, practical and pragmatic guide to the realities of delivering NFM projects. It will cover areas such as the process of identifying target sites, engagement, trying and testing a variety of delivery techniques and the pitfalls of monitoring. Importantly, lessons learned will be shared to help inform and steer other projects who may be starting out on their journey.

Session 6

Gravel movement in rivers

SUSTAINABLE SEDIMENT MANAGEMENT AT THORNTON-LE-DALE, NORTH YORKSHIRE

N. D. WILLIAMS¹, V. MURRAY², A. GEE¹, L. REES¹, R. COOMBES¹

1 AECOM, 2 Environment Agency

AECOM and the Environment Agency analysed causes of sedimentation in Thornton Beck at Thornton-le-Dale, North Yorkshire. Local residents are concerned about channel capacity, flood risks, aesthetics, and the role of upstream land uses. Sediment had not been surveyed or monitored, but this is the case for most UK rivers. AECOM used fluvial audit and sediment budgets, including open access remote sensing and sediment transport theory, to synthesise data and produce catchment maps of quantified sediment sources, deposition, and management options. The map-based systems approach illustrated a complex subject to local residents. The catchment sediment yield was shown to be low, and that local channel maintenance including dredging and channel enlargement cause excess sedimentation. The study provided measurable costs and benefits for justifying catchment management decisions, and the feasibility of the options was quantified in terms of possible 'sediment savings' and flood risk benefits.

TORRIDGE GRAVEL AUGMENTATION PROJECT – A ROCK 'N' ROLL APPROACH TO RIVER RESTORATION

P. BRUNNER¹, M. PROUT², M. TURLEY³

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

Despite its undisputed ecological value, the River Torridge in North Devon has experienced significant land use changes which have resulted in the depletion of gravels once present in the upper catchment. As the Torridge has a limited supply of coarse material, the upper catchment has become depleted of gravels. This has left the riverbed and bank vulnerable to erosion, causing the channel to deepen and widen, degrading the limited gravels/riffles that remain, and reducing habitat suitable for fish spawning.

This presentation will provide an insight on how a Gravel Augmentation Plan for reintroducing gravels along the River Torridge was successfully implemented in partnership with land managers and land owners in the catchment to assist in restoring the Torridge to a form that enables better geomorphological and ecological condition through the creation of riffles and pools; channel narrowing; and provision of bank protection.

EFFECTIVE AND SUSTAINABLE RIVER RESTORATION: 4D MONITORING OF A LARGE UPLAND GRAVEL-BED RIVER

N. S. ENTWISTLE¹, G. L. HERITAGE², O. SOUTHGATE³, R. WILLIAMSON², R. POWELL⁴

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

Naturally functioning gravel-bed rivers are dynamic, biodiverse, store sediment on well-connected floodplains, and slow downstream flood flows. Effective and sustainable river restoration; primarily through the structural alteration of channel form, requires an advanced mechanistic understanding of how flow and sediment transport regimes affect biota and ecosystem processes. Here we critically examine system response to the 2021 restoration of Goldrill Beck, Cumbria, using monitoring through repeat drone based orthophotography and DTM outputs. Coupled with 2D modelling we provide a low-cost insight into different river controls and system resilience following a geomorphologically effective flood event. The recorded changes suggest a process-based approach to monitoring, utilising scientific understanding, is needed to address the challenges for future ecosystem management, whilst providing valued evidence for effective communication to stakeholders, partners and local communities.

Session 6

Tools & guidance for river restoration

NATIONAL CULVERTS STUDY – ASSESSING FORESTRY WATERCOURSE CROSSINGS IN WALES

V. SMITH¹, R. THOMAS¹, J. HOWELLS², O. LOWE²

1 Arup, 2 Natural Resources Wales

Natural Resources Wales (NRW) manage the Welsh Government Woodland Estate which covers almost 6% of land in Wales and contains thousands of watercourse crossings, mostly intersecting small, upland streams. Due to their low capital cost and ease of installation, pipe culverts make up most of these crossings, but these are often undersized causing habitat fragmentation, forming barriers to fish passage and disrupting sediment transport. NRW is uniquely placed as both a land manager and environmental regulator to lessen the impact of watercourse crossings across the Estate. The National Culvert Study has gathered best and current practice in the design of culverts and bridges to develop a Wales-wide approach to the assessment of whole life costs and appraisal of watercourse crossing options. The output is a decision tree and supporting costing tool which guides evidence-based decision making towards the most cost effective and least environmentally damaging crossing option.

THE CIRIA NATURAL FLOOD MANAGEMENT MANUAL: MEASURES TO RESTORE RIVER-FLOODPLAIN CONNECTIVITY

M. ROSS¹

1 Mott MacDonald

The CIRIA natural flood management (NFM) manual (launch spring 2022) will be a springboard to increase the uptake of nature based solutions to help mitigate flood risk and co-deliver habitat restoration and improved climate resilience, to help us address the nature and climate emergencies. Mott MacDonald has worked alongside project partners including the River Restoration Centre, the Yorkshire Dales Rivers Trust and the iCASP group hosted by the University of Leeds to produce the manual. It provides practical guidance and workflows to empower a broad range of users to understand multi-disciplinary perspectives in designing and delivering natural flood management. The guidance will increase confidence that NFM can deliver the intended benefits and therefore lead to the implementation of more effective NFM schemes at a greater scale across the UK. We will explore in detail the NFM measures that restore river-floodplain connectivity and share some of the tools and methods included.

AN ECOLOGICAL NETWORK TOOL FOR THE NORTH WEST RIVER BASIN DISTRICT

T. F. SMART¹, L. DRAKE¹

1 Natural England

Given finite resources, strategic prioritisation of interventions will be vital to tackle climate change and biodiversity loss, while maximising ecosystem service provisioning. Through the Natural Course EU LIFE+ project, Natural England developed an Ecological Network Tool for wetlands and woodlands covering the entire northwest river basin district from Cheshire to Cumbria. The Tool combines circuit-based connectivity software with habitat suitability models to identify priority areas where habitat creation/restoration can be most effective and have the greatest positive impact on connectivity. The Tool is designed to be used alongside other datasets on, for example, water quality and WFD issues, flood risk, and green social prescribing to highlight areas where nature-based solutions can achieve multiple environmental and social benefits. The Tool is a catalyst for investment in the water environment and has already identified several pipeline projects to deliver nature recovery.

Session 7

Making river restoration mainstream

THE FALL AND RISE OF RIVER RESTORATION

P. W. DOWNS¹

1 cbec eco engineering UK Ltd

Contemporary river restoration began ca.1990. Approaches based on morphological 'carbon copy' veered rapidly towards process-based renaturalization and limiting factors-based rehabilitation. Ironically, as the restoration concept broadened, adding factors such as flood risk management, ecosystem services and human well-being, practices became more channel-based and conservative: sustained environmental gains were probably minimal. The last decade has however seen practices reinvigorated around broader scale operations to restore channel-floodplain complexes. Nature-based solutions demand catchment-scale assessment of water and sediment fluxes, biomic (aka Stage 0) restoration focuses on re-connecting incised channels with their floodplains, and nature-culture hybrid approaches embrace the co-evolution of nature with human action. The resulting palette of restoration options offers potentially significant environmental gains to help tackle the global freshwater biodiversity crisis.

THE RELATIONSHIP BETWEEN PERCEPTION OF HEALTHY RIVER MORPHOLOGY AND ECOSYSTEM FUNCTION

J. M. CASPERD¹

1 Harper Adams University

Conservation efforts to restore rivers and their ecosystem services may be hampered by farmers perception of the nature and status of the aquatic ecosystems located on their land. It is important, therefore, to promote the understanding of the function and ecosystem services of such natural capita and the manner in which it may be restored through engagement. Linking the perception of river morphology with direct benefits in terms of water retention, net biodiversity gain and achievement of carbon net zero through appropriate management of the riparian zone will be key with the advent of ELMS (gov.uk, 2021). The relationship between actual and perceived river form (as determined by RHS's and questionnaires to farmers) and ecosystem function is explored in this paper.

PROMOTING ADAPTATION TO CHANGING COASTS – A TALE OF TWO ESTUARIES

M. WILLIAMS¹

1 Environment Agency

PACCo has two arms – the Lower Otter Restoration Project at Budleigh Salterton, Devon and the Basse Saône: 2050 project at Quiberville, Normandy

The €26m twin projects are both managed realignments – returning the floodplains to how they were 200-plus years ago, before land at both sites was reclaimed for agricultural use – designed to adapt to the changing climate. The work will result in 100ha of mudflats and saltmarshes being created across the two sites. These will improve biodiversity, offering new habitats for a variety of wading birds, and act as carbon sinks. As part of the PACCo project, a "how to" guide will be developed setting out all of the aspects of the two schemes, in order for other bodies in coastal regions to assess whether a similar managed realignment scheme might be suitable for their areas.

THE CATCHMENT BASED APPROACH (CABA) – A COLLABORATIVE APPROACH TO ENVIRONMENTAL IMPROVEMENT

R. COLLINS¹, D. CRILLY²

1 The Rivers Trust, 2 Environment Agency

CaBA drives collaborative water management across England. Globally unique in its national coverage and framework of support, CaBA encompasses more than 100 catchment partnerships, each with a diverse range of cross-sector partner organisations. The partnerships pool resources and expertise and work through consensus to deliver a range of catchment-wide environmental benefits including improved water quality, flow, habitat restoration and flood risk management. Nature based solutions underpin much of the delivery by CaBA partnerships, providing multiple benefits for the environment and people. The partnerships have built considerable social capital within local communities and through the deployment of citizen scientists to improve local data and evidence. CaBA is set to play a key role in the implementation of Environment Agency river basin and flood risk management plans whilst its involvement with Local Nature Recovery Strategies will help optimise beneficial environmental outcomes.

NOTES

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POSTER PRESENTATIONS

1

Instream wood is a double-edged sword providing ecosystem services (nitrogen removal) and dis-services (greenhouse gas production)

B. C. HOWARD¹, N. KETRIDGE², S. ULLAH², S. KRAUSE²

1 University of Birmingham, Small Woods Association, 2 University of Birmingham

2

International Natural & Nature Based Features Guidelines

A. RUSSELL¹, E. MORRISH¹

1 Environment Agency

3

Case Study: Lewes Winterbourne River Restoration: Outline Design

P. DUFFELL¹, C. GRANGE¹, R. BREAKSPEAR¹

1 Wood plc

4

Case Study: River Anton River Restoration: Outline Design

R. M. D. BREAKSPEAR¹, R. GAMBLE², C. WOOLHOUSE²

1 Wood Group UK Ltd, 2 Southern Water

5

A decade of FreshWater Watch: The global citizen scientist water quality toolkit

H. L. MOORHOUSE¹, C. HENDERSON¹, S. LOISELLE¹

1 Earthwatch Europe

6

Biodiversity net gain and capital flood defence projects

D. DUNSFORD¹, C. ESSERY¹

1 Environment Agency

7

Bringing back "The Back"

N. McLEAN¹

1 Stantec

8

Fine sediment can drive natural ecosystem recovery in rivers

R. C. GRABOWSKI¹

1 Cranfield University

9

Ryevitalise Landscape Partnership Scheme

H. RAMSDEN¹, J. CALDWELL¹

1 Ryevitalise

10

White Cart Water, Glasgow - Pollock Park

K. PERRY¹

1 GeoGrow

11

Ground Penetrating Radar for quantification of fine sediment accumulation and buried bedforms as a tool to inform river restoration

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1 York St John University, 2 University of Hull

12

Catchment Restoration

M. JAMES¹, M. SLATER¹, M. WADDELL¹

1 South East Water

13

Staplegrove Wetlands: A Nature Based Solution to Achieve Nutrient Neutrality

G. NELMES¹, R. RIDDINGTON¹

1 Stantec

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The 'how' of NFM: The newly released CIRIA NFM Manual

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