River Restoration Centre
14th Annual Network Conference

Scaling up our Aspirations for River Restoration and Management

Delegate Pack

Including programme, abstracts, workshop and site visit information, and notepaper

30th April and 1st May 2013

Whittlebury Hall and Spa, Northampton, England

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14th Annual Network Conference

Scaling up our Aspirations for River Restoration and Management

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Sponsored by:

Welcome!

May I wish you a warm welcome to this year's River Restoration Centre Annual Network Conference at Whittlebury Hall Hotel and Spa. Now in its 14th year, we are delighted that this year's conference has attracted over 300 delegates making it the best attended to date. The continued success of this event owes much to the enthusiastic contributions of both presenters and attendees. Without your participation by speaking, listening and sharing, we wouldn't be able to organise and run such a successful conference.

Following on from the Government's investment of £92M in 2012 to help deliver river and catchment improvement works, RRC has played an active role as an independent adviser to the Environment Agency and DEFRA to support the overall Catchment Restoration Fund programme of 42 projects in England. Our focus on the technical and project evaluation elements will ensure that we all learn as much as possible from the significant spend on restoration taking place over the next few years. In Scotland and Northern Ireland we have also been working to support new proposals through advisory work. In addition to providing technical advice, we aim to represent practitioners and the wider restoration community at policy and strategy steering groups and we work closely with our supporting statutory agencies, the Environment Agency, the Scottish Environment Protection Agency, Natural England, Scottish Natural Heritage, Rivers Agency and the Northern Ireland Environment Agency.

We are in the process of expanding our well used Manual of River Restoration Techniques, updating the existing ones, some more than a decade after construction works were finished, to follow their progress. To reflect the changing nature of restoration and catchment management practices, we are also adding 19 new techniques from a number of sites from across the UK to reflect best practice design and implementation.

Through our role in the EU LIFE+ RESTORE project we have communicated restoration best practice to a wider European audience, working in partnership with the Environment Agency, our RESTORE partners and the European Centre for River Restoration (ECRR). Through the ongoing suite of events and exchange of experiences, I know we have and we will continue to considerably add to the information resource available to UK river managers. The RESTORE River wiki

resource offers an insight into exemplar and best practice case studies from across Europe and a recently published guide, targeted at developers and landscape architects, demonstrates how to incorporate river restoration opportunities in spatial planning and development schemes. Both are well worth a look and you are able to pick up a copy of the guide from the RESTORE display stand.

We continue to grow as an organisation and the future looks prosperous. A programme of site visits, training events and workshops to share best practice have kept us busy in the past twelve months and we will continue to do as much as we can to support, advise and guide you and your colleagues to meet the ambitious targets set by national, regional and international directives. We have listened to your feedback from last year's conference and we hope the range and breadth of presentations, posters, workshops and site visits provides us with plenty to look forward to!

Finally, my sincere thanks goes out to all of those who have supported the RRC over the years, and I hope you enjoy, share and learn lots in the next couple of days.

Martin Janes,
Managing Director

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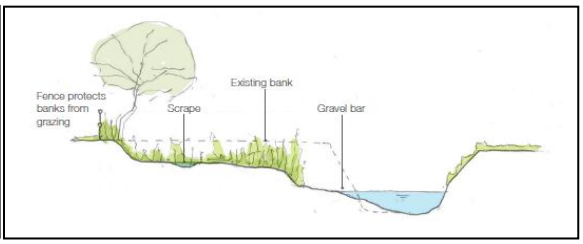
Visit our stand, meet our people and enter our quiz. Every entry wins a prize. First prize is an Angler's Swiss Army Knife!

ARUP at the River Restoration Centre Network Conference



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PROGRAMME OF EVENTS

DAY 1: - - - TUESDAY 30TH APRIL - - -

09:00	REGISTRATION in Hotel Reception Area REFRESHMENTS in the Lounge	60 mins
	Brooklands Suite **CHAIR: Andrew Gill** *(Cranfield University and RRC Chair)*	
10:00	**Welcome and Introduction.** Andrew Gill *(Cranfield University and RRC Chair)*	20 mins
10:20	**Keynote Address** Dr. Paul Leinster *(Environment Agency)*	25 mins
10:45	**Discussion.**	10 mins
10:55	**Announcements**	5 mins
11:00	BREAK *With tea and coffee*	30 mins
	Session 1:	
	JOINED UP THINKING IN CONSTRAINED RIVERS	
	CHAIR: Martin Janes *(RRC)*	
11:30	**Lodge Burn Flood Alleviation Project: Weirs, tears and engineers.** Gareth Greer *(Rivers Agency)* et al.	15 mins
11:45	**Identifying opportunities for restoration with flood risk management benefits: the development of a national screening tool in Scotland.** Heather Forbes *(Scottish Environment Protection Agency)* et al.	15 mins
12:00	**£24M of catchment-scale restoration.** Jerry Gallop *(Environment Agency)* et al.	15 mins
12:15	**Discussion.**	15 mins
12:30	LUNCH in the Lounge	60 mins

Session 2:

	Brooklands Suite ECOSYSTEM SERVICES: THE THEORY IN PRACTICE	**Grand Prix Suite** DESIGNING RESTORATION FOR DESIGNATED RIVERS	
	CHAIR: Bella Davies *(Wandle Trust)*	**CHAIR: Mervyn Bramley** *(Independent Engineer & Environmentalist and RRC Board)*	
13:30	**Using Ecosystem Services Approaches to Develop Catchment Plans and Deliver Multiple Benefit Projects.** Dave Webb *(Environment Agency)*	**Irfon SAC project – the results** Simon Evans *(Wye and Usk Foundation)*	15 mins
13:45	**Optimising the benefits of channel maintenance: an ecosystem services assessment.** Jim Rouquette *(University of Sheffield)* et al.	**The Phased Naturalisation of the River Ribble SSSI at Long Preston Deeps: A Story of Cooperation and Compromise.** Neil Entwistle *(University of Salford)* & George Heritage *(JBA)*	15 mins
14:00	**Discussion.**	**Discussion.**	10 mins
14:10	**River restoration in an industrial, urban catchment – experiences from the Don.** Karen Eynon *(Don Catchment Rivers Trust)* et al.	**River Kennet – a strategic approach to restoration and assessment.** Judy England *(Environment Agency)* et al.	15 mins
14:25	**Catchment Management Delivery in South West England.** Martin Ross *(South West Water)*	**Waterbody improvement within a heavily confined flood alleviation scheme at Tregaron, Wales.** David Hetherington *(ARUP)* et al.	15 mins
14:40	**Discussion.**	**Discussion.**	15 mins
14.55	POSTER SESSION in the Lounge *With tea and coffee*		40 mins

	Session 3:			
	Grand Prix Suite TOOLS FOR RIVER RESTORATION	**Brooklands Suite** DELIVERING THE WFD AND MORE	**Monza Room** PASSAGE FOR MIGRATORY FISH AND EELS	
	CHAIR: Dan Alsop *(Chartered Engineer & RRC Board)*	**CHAIR: Jenny Mant** *(RRC)*	**CHAIR: Shaun Leonard** *(Wild Trout Trust)*	
15:35	**Deculverting of the River Darwen, Darwen, Lancashire.** Kevin Skinner *(Atkins)* et al.	**The Changing Nature of River Restoration.** Ben Smith *(Kings College, University of London)* et al.	**Improving Eel Passage on the River Wandle.** Tim Longstaff *(Wandle Trust)* et al.	15 mins
15:50	**The Mersey Life and WFD Project: Helping to deliver WFD objectives in the North West by drawing on schemes identified in the Mersey Life Project.** Gerard Hawley *(Penny Anderson Associates)* et al.	**Tackling WFD mitigation measures for impounded water bodies: is river restoration an option?** Daniel Newton *(ARUP)*	**Catchment based restoration of a waterbody using partnership groups.** Paul Frear *(Environment Agency)* et al.	15 mins
16:05	**Environmental River Enhancement Programme (EREP) surveying, identifying and enhancing drained river catchments.** Brian Coghlan *(Inland Fisheries)* et al.	**Morphological Restoration to Deliver Water Framework Directive Environmental Objectives.** Greg Whitfield *(Environment Agency)*	**The Wissey Siphon – Fish pass.** Kye Jerrom *(Environment Agency)* & Marcus Widdison *(Aquatic Control Engineering)*	15 mins
16.20	**Discussion.**	**Discussion.**	**Discussion.**	15 mins
16:35	SHORT BREAK TO MOVE TO FINAL JOINT SESSION			15 mins

Session 4:

Brooklands Suite

ENERGY GRADIENTS IN RESTORATION: FROM THE NENE TO NORWAY

CHAIR: Nick Clifford *(Kings College London)*

16:50	**Rottall Burn Restoration: Unconstrained Opportunity.** Kenneth MacDougall *(EnviroCentre Ltd)* et al.	15 mins
17:05	**Improving the River Nene - Nene Valley Nature Improvement Area.** Oliver Burke *(Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire)* et al.	15 mins
17:20	**Restoration in a regulated river – Mitigation High Head Hydro.** Bjørn Otto Dønnum *(E-Co energy)* et al.	15 mins
17:35	**Discussion.**	15 mins
17:50	**Going for Gold Awards – the RRC Olympic Challenge awards.**	15 mins
18:05	END OF DAY	

19:00 **PRE-DINNER DRINKS RECEPTION**

In the Lounge.

20:00 **3 COURSE CONFERENCE DINNER**

In the Brooklands Suite.

DAY 2: **- - - WEDNESDAY 1ST MAY - - -** **Registration Opens at 8:30am**

Session 5:

9:00 CHOICE OF SITE VISIT OR WORKSHOP — 3 hours 30 mins

See Below for Workshop Outlines

Presentations within the sessions will provide context and experiences.

Brooklands Suite	**Luffield Room**	**Melbourne Room**	**Priory Room**
Workshop A: HEAVILY MODIFIED RIVERS: WHAT IS REALISTIC?	**Workshop B:** USING LARGE WOOD IN RIVERS	**Workshop C:** BREAKING BARRIERS: REMOVE, REPLACE OR RETAIN?	**Workshop D:** LATERAL THINKING: FLOODPLAINS AND WETLANDS
Define the role of WFD in HMWBs & outline problems. Discussion of the limitations and issues surrounding HMWB restoration. Discussion of what can realistically be achieved. Define a baseline for achieving realistic 'Good Ecological Potential'. Discussion of the use of the Urban River Survey (URS) as a method of assessment.	Outline how 'large wood' is being used in river restoration and its benefits. Discussion of the effectiveness of large woody debris as a restoration tool. Using wood as a natural bank stabilisation material, where structural support is needed. Addressing the common concerns around dislodged wood moving downstream.	Discussion of the best way to deal with in-channel barriers Outline of tools developed to help with decision making Examples of the practicalities of installing fish passes and natural bypass channels, lowering, notching or removing weirs. Assessing gauging weirs for removal or replacement Hydropower use of low head weirs – conflicting policy drivers?	Achieving connectivity that delivers multiple benefits (flood risk, water quality, ecology etc.) Wider ecosystem services provided by functioning floodplains and wetlands – valuing the benefits. Techniques used - urban, rural and community led examples.

WORKSHOP SPEAKERS/PRESENTERS (Order may be subject to change)

WORKSHOP A:	WORKSHOP B:	WORKSHOP C:	WORKSHOP D:
Can catchment management planning deliver urban river restoration? David Lerner *(Sheffield University)*	**The effect of large woody debris on stream community structure across an enrichment gradient.** Murray Thompson *(Natural History Museum)* et al.	**Prioritising barriers for removal or repair: A case study of the River Wey.** Lynda Eakins *(University of Southampton)* et al.	**Fobney Island River and Wetland Restoration and other case studies.** Lyndon Baker *(Jacobs)* & Graham Scholey *(Environment Agency)*
River Restoration in Heavily Modified and Artificial Waterbodies: How to achieve Good Ecological Potential in extremely un-natural rivers. Patricia Xavier *(ARUP)* et al.	**Hydromorphological appraisal of the use of large woody debris in the Restoration of the River Lathkill, Derbyshire.** Ian Drew *(Manchester Metropolitan University)*	**Learning from practical experience of delivering WFD solutions on the River Aire, Yorkshire.** Kate Colledge *(ARUP)* et al.	**RSPB increasing catchment biodiversity whilst managing flood risk, the creation of Beckingham Marshes Reserve.** Michael Copelston *(RSPB)* & Martin Van Nieuwenhuyzen *(Aquatic Control Engineering)*
Urban River Survey. Lucy Shuker *(Environment Agency)* et al.	**Using woody debris to rehabilitate degraded watercourses.** Nick Mott *(Staffordshire Wildlife Trust)*	**Kentchurch Weir Removal – How the River has Adjusted after Two Winters and a Very Wet Summer.** Alexander Humphreys *(Atkins)* & Peter Gough *(Natural Resources Wales)*	**Restoration and reconnection of a water meadow to the River Ise floodplain.** Robin Field *(Nene Valley NIA)* et al.
Restoring the 'Red River': Designing a stable functional morphology for a historically brick lined channel. Sebastian Bentley *(JBA)* et al.	**Large Woody Debris, Woody Debris or Revetment ?** Jack Spees *(Ribble RiversTrust)*	**Gauging Weirs: addressing the needs of different stakeholders.** Di Hammond *(RRC)* et al.	

12:30	LUNCH	65 mins

Session 6:

	Brooklands Suite CATCHMENT-SCALE & MORPHOLOGICAL PROCESS LED RESTORATION	**Monza Room** TOOLS OF THE TRADE: HELPING YOU UNDERSTAND YOUR RIVER	**Indianapolis Room** COMMUNITY ENGAGEMENT AND DELIVERY	
	CHAIR: Kevin Skinner *(Atkins & RRC Board)*	**CHAIR: Andy Pepper** *(ATPEC Ltd & RRC Board)*	**CHAIR: Fiona Bowles** *(Wessex Water & RRC Board)*	
13:35	**Development of a catchment-scale river restoration prioritisation strategy for the River Till, Northumberland.** Carolyn Mills *(cbec eco-engineering UK Ltd)* et al.	**Restoration Techniques, Mitigation Measures and Channel Management** Lydia Burgess Gamble *(Environment Agency)* et al.	**Evaluating the Catchment-Based Approach – Transferrable lessons for national implementation.** Clare Black *(Cascade Consulting)* et al.	15 mins
13:50	**An Application of the Process Restoration Philosophy on a Scottish Upland River.** Hamish Moir *(cbec eco-engineering UK Ltd)*	**Use of space-for-time substitution (or the ergodic hypothesis) in river restoration: Examples from South East England.** Andrew Brookes *(Jacobs)*	**Pontbren Project – a farmer led approach to catchment restoration.** Mike Townsend *(The Woodland Trust)*	15 mins
14:05	**Catchment scale river restoration and WFD implementation: Restoring wildlife and floodplain on the Sussex Ouse (MORPH)** Ian Dennis *(Royal Haskoning)* & Sally Chadwick *(Environment Agency)*	**RRC Manual of River Restoration Techniques Update** Jenny Mant *(RRC)* et al.	**Farming For Food and Cleaner Rivers: The Catchment Sensitive Farming Approach and Outcomes – 6 Years On.** James Grischeff *(Natural England)* et al.	15 mins
14.20	**Discussion.**	**Discussion.**	**Discussion.**	15 mins
14.35		BREAK With tea and coffee		40 mins

Session 7:

Brooklands Suite

MAKING THE MOST OF EUROPEAN FUNDS

CHAIR: Bart Fokkens *(ECRR)*

15:15	**Integrated management of river catchments – the 'TRAP' project.** Rob Collins *(The Rivers Trust)* et al.	15 mins
15:30	**European River Corridor Improvement Plans (ERCIP).** Claire Gray *(London Borough of Lewisham)* Tabitha Lythe *(London Borough of Lewisham)* Dave Webb *(Environment Agency)* Tom Wild *(South Yorkshire Forest Partnership)*	15 mins
15:45	**Sharing best practice across Europe & the European Riverprize.** Alastair Driver *(Environment Agency)* & Martin Janes *(RRC)*	15 mins
16.00	**Discussion.**	15 mins
16:15	END OF CONFERENCE	

Resources we use to communicate best practice

National River Restoration Inventory (NRRI) and RESTORE River Wiki

The NRRI is one of the RRC's most valued resources – and its data is available to all RRC members. It is the largest inventory of river, watercourse and floodplain restoration, enhancement and management efforts in the UK. Data includes details of the project location, objectives, techniques and comments on their success/failure. Information on monitoring, the catchment and cost is also recorded and projects are linked to our directory of contacts. Our online map shows a subset of the data held.

Through the LIFE+ RESTORE project (RRC are the 'West Europe' lead organisation), an online 'Wiki' inventory has been launched to showcase exemplar projects across Europe. Visit the RESTORE project website (www.restorerivers.eu) to access this.

To contribute a project, send us information, or fill in the form on our website.

River Restoration News

The River Restoration Centre's bi-annual newsletter is available online six months after it is distributed to RRC members. It features articles on UK projects and tools to illustrate developments in best practice.

River Restoration Centre Bulletin

The River Restoration Centre's monthly e-newsletter provides updates on recent news, day-to-day activities of the RRC and recent projects or events. This is emailed to our mailing list, and it is posted on the RRC website and through our Social Media websites (Facebook, Twitter, LinkedIn, and YouTube).

To contribute to the Newsletter or the Bulletin, please get in touch with us.

River Restoration Centre Social Media

Visit our Website and YouTube channel and follow us on Twitter and Facebook. On LinkedIn, the 'River Restoration Professionals' group is a key forum for discussion.

Restoring Europe's Rivers

RESTORE is a partnership for sharing knowledge and promoting best practice in river restoration across Europe. It encourages the restoration of European rivers towards a more natural state for increased ecological quality, flood risk reduction and social and economic benefits.

RESTORE is supported by LIFE+ funding from the European Commission and works closely together with the European Centre for River Restoration (ECRR).

RESTORE Website

The RESTORE project website (www.restorerivers.eu) is an online resource where good practice from across the partnership is collated and made available to a wider audience. More information about the RESTORE project and partners can be found here, along with details of the latest news, publications and upcoming events. The website also provides guidance on how to carry out river restoration as well as information on the multiple benefits of restoration.

RESTORE River Wiki

Through the LIFE+ RESTORE project an online 'Wiki' inventory has been launched to showcase river restoration projects across Europe. This interactive source of information is a key tool for sharing best practices and lessons learnt for policy makers, practitioners and researchers of river restoration.

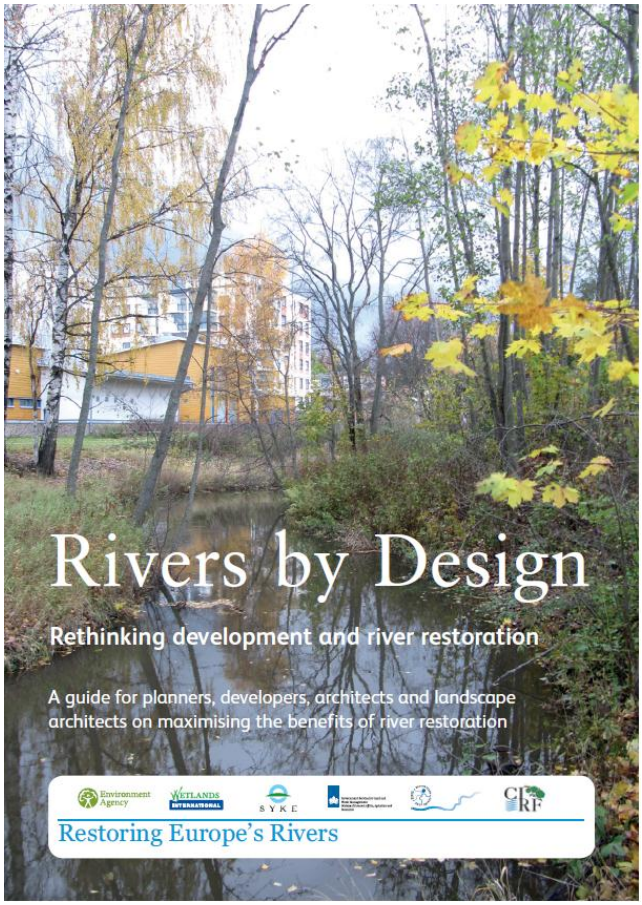
The database currently holds 365 river restoration case studies from 24 counties!

The River Wiki can be accessed by visiting the RESTORE project website. You can contribute to the River Wiki by registering online and adding your project.

Rivers by Design

Rethinking development and river restoration – A guide for planners, developers, architects and landscape architects on maximising the benefits of river restoration.

Rivers by Design is a new RESTORE publication that shows planners, architects and developers the crucial role that they can play in river restoration. It provides practical advice and information to maximise the ecological, social and economic benefits of development by integrating water management into the planning and design at all scales.



Step-by-step guidance on planning projects ensures the goals of sustainable development are achieved to meet the needs of people and the environment.

A series of case studies from RESTORE demonstrates successful examples of how well located, planned and designed development can increase ecological quality, reduce flood risk and create social and economic benefits such as improved recreational facilities and public spaces.

Rivers by Design is now available to download from the RESTORE project website.

Contact RESTORE

RESTORE coordinator – Toni Scarr
E-mail: restore@environment-agency.gov.uk
Website: www.restorerivers.eu

The RESTORE project is made possible with the contribution of the LIFE+ financial instrument of the European Community

and works in partnership with ECRR

Meet the RRC Staff

Many of you may have seen this feature in our monthly bulletins. It's our way of introducing ourselves in order to make you aware of what we do. Feel free to come and meet us in person over the next few days!

"I am the Membership Officer, responsible for looking after current members as well as dealing with enquiries from potential new members. I organise the summer site visit programme and manage the Annual Network Conference".

Ian Brown, Centre Administrator

"I coordinate the day to day administration of the Centre, and I am the first point of contact for enquiries. I support the planning and delivery of the Conference; help to maintain the National River Restoration Inventory and distribute the RRC Bulletin and Newsletter. I provide general support to other members of staff as required".

Tracy Burton, Administrative Assistant

"I provide case-specific advice and through the RESTORE project I have helped plan events and contributed to a river restoration guide for developers and planners. I am editor of the bulletin and a big part of my role is trying to improve the way that RRC communicates with different groups so if you have suggestions, come and find me".

Nick Elbourne, Restoration Adviser and Communications

"I am involved in updating the Manual of River Restoration Techniques as well as helping coordinate the RRC's role in the Catchment Restoration Fund. I compiled the programme for the 2013 RRC conference and also work on the River Nene Nature Improvement Area project with Simon Whitton (also RRC)".

Anna Gee, Projects Officer

"I have over 20 years' experience in catchment hydrology and in more recent years, hydroecology, working for the Environment Agency and its predecessor and then at an environment consultancy. A key part of my role is advising on potential options for river restoration, which has taken me to rivers all over the UK. I also help with the day to day management of some of the RRC projects and I have co-hosted a number of RESTORE workshops in the UK, Netherlands and Ireland".

Di Hammond, Senior Projects Adviser

"My role combines technical advice on river restoration, representing practitioners and the wider restoration community on steering groups and managing the business. I work with our core funder representatives (Environment Agency, the Scottish Environmental Protection Agency, Natural England, Scottish Natural Heritage, Rivers Agency and the Northern Ireland Environment Agency) to ensure that RRC provides the expertise they need. I also manage the RRC's input to the RESTORE project".

Martin Janes, Managing Director

"I manage the advisory work, associated budgets and technical team. I support business development activities by forging closer links with science institutions and practitioners. In addition I provide technical advice to practitioners and policy makers through advisory visits, training course and RESTORE events. I have a background in fluvial geomorphology".

Jenny Mant, Science and Technical Manager

"My interest in fluvial restoration brought me to the RRC as an Erasmus placement scholar. I later became RRC's Information Assistant to help develop the National River Restoration Inventory and the RESTORE River Wiki. In the future I plan to undertake a PhD in freshwater and river ecosystem ecology".

Laura Muñoz-Puelles, Information Assistant

"I previously worked on Regional Development Agency activities as a Business Co-ordinator and Accounts Technician before joining the RRC. I now spend my working life carrying out the RRC's bookkeeping and management accounting functions".

Emma Turner, Accounts Technician

"I am involved in updating our Manual of River Restoration Techniques as well as contributing to the RRC's role in the Catchment Restoration Fund. I also help to update the RRC website and the RESTORE River WIKI resource".

Vicky West, Projects Officer

"I previously worked as a Fisheries Officer with the Environment Agency in both the Thames and Wales regions. I am now investigating the geomorphology and physical habitats of the 69 waterbodies that comprise the River Nene catchment to identify reasons for Water Framework Directive failure and am working up projects to remedy some of the issues found".

Simon Whitton, River Restoration Adviser to the Nene Valley NIA

"My role is to support a range of advisory visits, assess river restoration works and deliver technical advice. I also compile case studies; update the National River Restoration Inventory and RESTORE River WIKI and edit the RRC newsletter. I help to plan and organise the annual conference and RESTORE project events".

Ulrika Åberg, Restoration Adviser and Information

From top to Bottom, left to right:

Simon Whitton – River Restoration Adviser to the Nene Valley NIA
Ulrika Åberg – Restoration Adviser and Information
Di Hammond – Senior Projects Adviser
Anna Gee – Projects Officer
Ian Brown – Centre Administrator
Emma Turner – Accounts Technician
Vicky West – Projects Officer
Nick Elbourne – Restoration Adviser and Communications
Laura Muñoz-Puelles – Information Assistant
Jenny Mant – Science and Technical Manager
Tracy Burton – Administrative Assistant
Martin Janes – Managing Director










————Guidance Document————

The RRC is pleased to announce

An update of the
Manual of River Restoration Techniques

The Manual aims to provide practitioners with an understanding of what has gone before so that each new project benefits from ideas that may be incorporated and improved upon.

The first edition of the manual focused on the techniques utilised in restoring the rivers Cole and Skerne in 1995. It was RRC's intention that the manual would be expanded to include additional techniques drawn from other notable projects, particularly those that feature different types of rivers. Following this update, there will be 66 techniques across 36 projects.

"This manual collates a wide range of river restoration case studies and is a significant contribution to promoting best practice. Its new web-based format will make it easy for river managers to access best practice examples, and will help them to implement the environmental improvement included in River Basin Management Plans" (Dr. Lydia Burgess-Gamble, Research Scientist, Environment Agency).

The techniques are presented in 12 separate parts of the manual, each part encompassing a significant activity, or objective. These may typically be included in a restoration project brief, and may be useful in achieving specific objectives.

"The manual has been an invaluable tool, both as a reference source for information, and also as 'prod' for thinking outside the box in river enhancement and restoration. I look forward to using the new version, and in recommending it to all others who dabble, or even paddle, in rivers" (Judith Bankhead, Conservation Officer, Northern Ireland Rivers Agency).

The update has been funded by the Environment Agency, the Scottish Environment Protection Agency, Scottish Natural Heritage, the Northern Ireland Rivers Agency and with financial contribution from the LIFE financial instrument of the European Community through the RESTORE project.

A press release to launch the updated Manual will be sent out to the RRC mailing list and through the RRC Bulletin in due course.

NOTES…

ABSTRACTS

Sponsored by:

KEYNOTE ADDRESS

BROOKLANDS SUITE

Working With Others to Protect and Enhance Rivers

PAUL LEINSTER

Chief Executive – Environment Agency

Dr Paul Leinster CBE – Chief Executive of the Environment Agency for England

He was appointed in June 2008. Paul joined the Environment Agency in 1998 as Director of Environmental Protect becoming Director of Operations in March 2004. Paul's previous employers include SmithKline Beecham, BP International and Schering Agrochemicals. Paul has a degree in Chemistry and a PhD in environmental engineering from Imperial College and an MBA from the Cranfield School of Management.

NOTES…

WORKING WITH OTHERS TO PROTECT AND ENHANCE RIVERS

PAUL LEINSTER

Chief Executive – Environment Agency (England)

Abstract

Rivers with a healthy ecology provide many benefits to people, wildlife and the economy. Physical modification is the single largest reason why rivers in England are not demonstrating a healthy ecology. Further risks arise from a changing climate and the spread of non-native invasive species. Naturally functioning rivers are more resilient. We value river restoration as an important tool to manage these risks.

River restoration is best considered within the context of integrated catchment management. We are actively supporting new partnerships and projects under a catchment based approach. This work is helping us, better identify the pressures that matter and deliver solutions that are more relevant to local communities.

We have developed a number of information tools with the River Restoration Centre this year and would encourage you to look at case studies on river restoration from around Europe: http://riverwiki.restorerivers.eu and a recently published guide for planners, developers, architects & landscape architects on maximising the benefits of river restoration www.restorerivers.eu

SESSION 1:

JOINED UP THINKING

IN CONSTRAINED RIVERS

BROOKLANDS SUITE

Lodge Burn Flood Alleviation Project: Weirs, Tears and Engineers

GARETH GREER *et al.*
Conservation Officer – Rivers Agency

Identifying opportunities for restoration with flood risk management benefits: the development of a national screening tool in Scotland

HEATHER FORBES *et al.*
Scottish Environment Protection Agency

£24M of catchment-scale restoration

JERRY GALLOP *et al.*
Environment Agency

NOTES…

LODGE BURN FLOOD ALLEVIATION PROJECT: WEIRS, TEARS AND ENGINEERS

G. GREER[1], G. CAMPBELL[2] & J. TEMPLETON[3]

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[2] Graduate Trainee Civil Engineer – Rivers Agency, Hydebank, 8 Hospital Rd, Ballydollaghan, Belfast
[3] Senior Engineer – Atkins Global, 71 Old Channel Road, Belfast

Abstract

The Lodge Burn catchment is situated on the north coast of Northern Ireland with a mix of rural and urban land use. Current flood risk and future development plans within the catchment dictated that a flood alleviation scheme was required through the town of Coleraine, involving culvert replacement and floodwall construction. The urban portion of the stream had been degraded through the construction of an 'on-line' pond which promoted excessive sedimention and restricted fish passage. Electrofishing surveys had demonstrated the poor connectivity for migratory fish between the upper and lower sections of the catchment. Passage was also restricted by a perched culvert which ran underneath a building. The flood alleviation scheme provided a 'once-in-a-lifetime' opportunity to address these hydromorphological issues and improve the amenity value of the stream. Works began in January 2011 and were completed in September 2012. Completed works included weir removal and channel restoration, the creation of a step-pool fish pass and a replacement embedded culvert with a natural substrate base. This presentation will provide an overview of the completed works and discuss some of the issues raised when trying to incorporate WFD objectives within a flood alleviation scheme.

Keywords: Flooding, WFD; weir removal; channel restoration; step-pool fish passage; CEEQUAL

IDENTIFYING OPPORTUNITIES FOR RESTORATION WITH FLOOD RISK MANAGEMENT BENEFITS: THE DEVELOPMENT OF A NATIONAL SCREENING TOOL IN SCOTLAND

H. E. FORBES[1], J. GARRITT[2], & N. NUTT[3]

[1] *Senior Policy Officer, Flood Risk Management – SEPA, Clearwater House, Heriot Watt Research Park, Edinburgh, EH14 4AP*
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[2] *Policy Adviser, Water Soils and Species – Forestry Commission Scotland, Silvan House, 231 Corstorphine Road, Edinburgh,EH12 7AT*
[3] *Engineer – Halcrow a CH2M Hill Company, 16 Abercromby Place, Edinburgh, EH3 6LB*

Abstract

To deal with current and future flood risk, we need to improve our understanding of flood risk and deploy more sustainable approaches to tackling these risks. This means managing whole flooding systems in a way that takes account of all interventions that can affect flood risk. A key element of this approach involves looking at the sources and pathways of flood waters and managing the natural landscape in a way that can help store or slow these waters (frequently termed natural flood management or NFM). In order to target NFM measures at areas where they will have the greatest potential to reduce flood risk, SEPA and Forestry Commission Scotland commissioned Halcrow to outline a screening process to identify opportunity areas for coastal and fluvial NFM measures. This screening process does not directly recommend which specific measure should be implemented where, but instead facilitates the identification of areas within catchments where certain types of NFM measures may help to mitigate flood risk and that are worthy of further investigation.

Three tools have been developed to undertake the fluvial screening of opportunity areas for NFM. The first of these tools identifies areas within a catchment which contribute most to the generation of fluvial and pluvial flows so that runoff reducing activities, such as woodland planting, can be targeted to areas where they will be most effective. A second tool identifies areas within a catchment where there is the greatest potential to increase floodplain storage through slowing the flow of water across the floodplain. A third fluvial screening tool identifies areas of heightened hydromorphological activity such as actively eroding gullies, reaches liable to future aggradation or areas of potential channel avulsion. Measures to manage morphology-driven flood mechanisms can then be identified, such as planform restoration or the management of channel instability. The development and delivery of this approach to screening for opportunity areas for NFM forms an important part of SEPA's responsibility under the Flood Risk Management (Scotland) Act 2009. The outputs will feed into SEPA's forthcoming appraisal of the most sustainable flood risk management measures and be detailed in flood risk management strategies and plans produced by SEPA and local authorities respectively. By offering a source-pathway-receptor approach to flood risk, this approach will also help engage and inform stakeholders such as land managers as well as those charged with shaping and implementing delivery mechanisms.

Keywords: Flood risk management planning; natural flood management

£24M OF CATCHMENT-SCALE RESTORATION

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Abstract

Society needs water for life. To provide this, we need to reduce pollution that comes from the way land is used and improve the landscape through which water flows.

The Department for Environment, Food and Rural Affairs (Defra) has created the Catchment Restoration Fund to support this aim. A £28 million fund, providing between £8 million and £10 million for three years ending in 2015, has been allocated for projects to be delivered in 2012/13, 2013/14 and 2014/15.

The Environment Agency is administering the Catchment Restoration Fund (CRF) to support third sector groups to bring forward projects that will at a catchment level:

- restore natural features in and around watercourses
- reduce the impact of man-made structures on wildlife in watercourses
- reduce the impact of diffuse pollution that arises from rural and urban land use

The first two rounds of 131 bids have been considered. These were prioritised using River Basin Liaison Panels and technically assessed by our experts and partners in Natural England and the River Restoration Centre. Forty-two of the bids have been approved, with a total value of just over £23m over the three years, supplemented by over £5m of additional partners' funding and contributions: this match-funding is likely to grow in light of our CRF awards. Over 300 water bodies will receive habitat improvement, improved access for fish or reductions in diffuse pollution as a result of these projects, making significant steps towards more waters at good status as well as providing wider benefits to society and the environment. These funds also bolster the contributions from hundreds of partners in local communities, led by charitable organisations such as Rivers Trusts, Wildlife Trusts the RSPB and other local action groups.

The presentation will provide an update on the current fund status, a summary of key project delivery to date, an overview of the outcomes associated with the work currently being undertaken and a forward look to new projects being considered in round 3 (March 2013).

Keywords: Catchment Restoration Fund; habitat improvement; diffuse pollution

NOTES…

Channel at Warwickslade, New Forest, 11 months after restoration

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SESSION 2:

ECOSYSTEM SERVICES: THE THEORY IN PRACTICE

BROOKLANDS SUITE

Using Ecosystem Services Approaches to Develop Catchment Plans and Deliver Multiple Benefit Projects

DAVE WEBB
Biodiversity Technical Specialist – Environment Agency

Optimising the benefits of channel maintenance: an ecosystem services assessment

JIM ROUQUETTE *et al.*
NERC/EA Research Fellow - University of Sheffield

River Restoration in an industrial, urban catchment – experiences from the Don

KAREN EYNON *et al.*
Project Officer - Don Catchment Rivers Trust

Catchment Management Delivery in South West England

MARTIN ROSS
Environmental Manager – South West Water

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USING ECOSYSTEM SERVICES APPROACHES TO DEVELOP CATCHMENT PLANS AND DELIVER MULITPLE BENEFIT PROJECT.

D. WEBB

Biodiversity Technical Specialist – Environment Agency , Swift House Frimley david.webb@environment-agency.gov.uk

Abstract

The river basin management plan process recognises the importance of public engagement and integrated working across a range of sectors. However the narrow remit and language of the Water Framework Directive does not convey the range of environmental, social and economic benefits of delivering Good Status.

Integrated working and community participation is common to both the Catchment Action Plan Approach and England Biodiversity Strategy. A component of the England Biodiversity Strategy is the application of Ecosystem Services to enable the value of the natural environment to be understood and realised. The presentation will examine the use of ecosystem services in both planning and delivery of multiple benefit river restoration schemes and will demonstrate how this improves integration of work streams and increases investment.

In conjunction with the Wandle Trust the Agency has been using ecosystem services approaches to develop a vision and action plan for the River Wandle. As part of the process, workshops involving local communities and interest groups were organised with ecosystem services providing a framework and common language for considering and bringing together different and diverse policies and initiatives operated by different organisations. Broad themes were identified from which both commonality of purpose and the inter-connectiveness of issues can be clearly understood. This has resulted in a holistic vision to be produced and assisted in the identification and delivery of multiple benefit river restoration projects.

The emerging plan has been able to integrate both habitat and urban diffuse pollution measures using community volunteers. The approach has also enabled a link between delivering catchment action plan measures and green infrastructure measures (All London Green Grid) to be made and has made a direct link to the Wandle Valley Regional Park.

The presentation will describe in detail the process and results of the process and look at the Wandle Park project as an example of a multiple benefit river restoration project.

Keywords: Ecosystem services; River Wandle; public engagement; integrated working

OPTIMISING THE BENEFITS OF CHANNEL MAINTENANCE: AN ECOSYSTEM SERVICES ASSESSMENT

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Abstract

The ecosystem approach and the evaluation of ecosystem services has gained considerable attention from government departments, environmental organisations and the research community in recent years and forms a key part of government environmental and water policy. However, the questions surrounding the practical application of an ecosystem services approach to flood risk maintenance work have not been fully explored, which means that our current understanding of what it could mean for day-to-day flood risk management operations is limited. How can such an approach be applied in practice and is it beneficial? This is particularly pertinent for small scale maintenance activities, which account for the majority of Environment Agency Flood and Coastal Risk Management (FCRM) activity. Here we explore the application of ecosystem service assessments to inform FCRM maintenance decisions.

We examine three case studies that explore very different aspects of FCRM maintenance activities. In the first case study silt is building up in a flood relief channel in the Bristol area and decisions are required regarding the extent of maintenance activities to be undertaken. The second example considers whether embankments should be maintained adjacent to an area of agricultural land in North Yorkshire. The third case study explores the implications of a change in the degree of pump drainage in a drained agricultural area adjacent to the River Trent in the East Midlands.

In all three case studies an ecosystem services assessment was performed in conjunction with local Environment Agency staff. This considered the wider benefits achieved through a number of alternative maintenance regimes at the three sites. The availability of data, the level of detail required for such an assessment, and the appropriateness of alternative methodologies was examined. The findings are presented here and will help to inform the discussion about development of tools that will allow those tasked with taking decisions about FCRM work to take an ecosystem services approach when assessing maintenance options.

Keywords: Ecosystem services; flood risk management; channel maintenance; stakeholder engagement

RIVER RESTORATION IN AN INDUSTRIAL, URBAN CATCHMENT – EXPERIENCES FROM THE DON CATCHMENT

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Abstract

Even in medieval times the Don Catchment was a centre of manufacturing, with its high gradient headwaters, charcoal and iron ore sustaining a flourishing water powered metal working industry. When the industrial revolution unfolded, local expertise, innovation and abundant coal went on to turn the Don Valley of Sheffield and Rotherham into the heartland of the British steel industry. The price for the River Don was its ecological death.

Yet remarkably, in recent decades the Don has not only begun to recover but to thrive. However there are many outstanding problems. One that needs resolving to meet the catchment's WFD targets is the finding of passage solutions for the numerous weirs that impound the catchment. These are inhibiting the development of diverse and sustainable fish populations, for example by preventing salmon from reaching their spawning grounds in the headwaters. The Don Catchment Rivers Trust (DCRT) is seeking to address this issue with a program of fish passage enhancements. In this presentation we draw on our experiences to discuss the challenges and opportunities associated with improving river connectivity in a former industrial heartland.

Working in an industrial catchment has been problematic for a number of reasons. One of the biggest is simply the sheer number of impoundments in the catchment. 41 substantial weirs impound the Don alone, while the EA puts the catchment total at 475. To finance connectivity restoration the Trust is looking into the use of low cost easements on weirs. The heritage value of the weirs is another issue. Several are listed, and one particularly impressive structure is a national monument. Consequently an archaeological consultant has been employed to provide guidelines that can be used by the DCRT and other river trusts working with weirs. The legacy of industry has also throw up some unpleasant surprises. Contractors working on one fish pass discovered black bituminous sediment in the river bed. This halted the progress of the project and required specialist disposal.

But while the challenges of restoring an urban catchment are huge, there are some advantages. By being a population centre, there is a high concentration of people with a passion for improving the ecology of their local rivers, as is evidenced by the numerous groups working to do so in the Don Catchment. The many people who live and work in the catchment also means that the potential for restoration work to be widely felt is great.

Keywords: Urban, industrial; weirs; fish passage; heritage; contaminated sediment; Don

CATCHMENT MANAGEMENT DELIVERY IN SOUTH WEST ENGLAND

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Abstract

South West Water is undertaking an £8.8m programme of catchment management projects called 'Upstream Thinking' in Devon, Cornwall and on Exmoor. From 2010 to 2015 some 700 farms and 2,000 hectares of upland SSSIs will be improved to reduce erosion, soil carbon and manure loss for the benefit of reservoirs and rivers used for drinking water supply.

By slowing rates of water flow from the land, reservoirs and rivers supply will be protected. Interrupting the flood hydrograph and ensuring improved flows in droughts offers additional protection and benefits to downstream customers, businesses and biodiversity. Further projects are being developed for the next water industry business plan period from 2015 to 2020 which will include 'rewards for farming clean reliable water' and will signpost landowners to opportunities for carbon offsetting payments.

Many research questions arise about the effects of catchment management and eight UK universities are undertaking collaborative work with South West Water to identify the effects of changes as wetted moorland increases and farms release less sediment, fertilizers and other pollutants to watercourses. Upstream Thinking for farmed land is being delivered by Westcountry Rivers Trust, Devon Wildlife Trust and Cornwall Wildlife Trust as they all have extensive knowledge of the ways to optimise and improve farming activities so that farm incomes increase. Upland work is being implemented with Dartmoor and Exmoor National Park Authorities, the Environment Agency, Natural England and English Heritage. Landowner, commoner and tenant interests are fully addressed along with those of a wide range of stakeholders.

The Natural Environment Research Council has awarded two six-month internships at PhD level to develop Paid Ecosystem Service payment schemes for the value of water and carbon management being achieved by participants in the programme, and the outcomes will be presented.

More profitable farming is allowing the land to be used less intensively, with benefits to water systems and biodiversity. The Upstream Thinking programme is endorsed by regulators including the Environment Agency, Natural England and the Drinking Water Inspectorate, with its cost being significantly less than South West Water's customers' willingness to pay for additional environmental improvements. The presentation will describe several case studies across South West Water's operating area, with the positive results and gains which are being achieved to date.

Keywords: Catchment management; paid ecosystem services; water company and third sector collaboration; benefits for farmers and landowners; biodiversity gains.

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SESSION 2:

DESIGNING RESTORATION FOR DESIGNATED RIVERS

GRAND PRIX SUITE

Irfon SAC project – the results

SIMON EVANS
Deputy Director – Wye and Usk Foundation

The Phased Naturalisation of the River Ribble SSSI at Long Preston Deeps: A Story of Cooperation and Compromise

NEIL ENTWISTLE[1] & GEORGE HERITAGE[2]
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[2] *Head of Hydromorphology – JBA*

River Kennet – a strategic approach to restoration and assessment

JUDY ENGLAND *et al.*
Evidence Scientist - Hydromorphology – Environment Agency

Waterbody improvement within a heavily confined flood alleviation scheme at Tregaron, Wales

DAVID HETHERINGTON *et al.*
Senior Fluvial Geomorphologist - ARUP

NOTES…

IRFON SAC PROJECT - THE RESULTS

S. EVANS

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Abstract

The Irfon Special Area of Conservation project (ISAC) is a LIFE+ funded partnership between the Wye and Usk Foundation (WUF), Environment Agency Wales, The Rivers Trust, The National Museum of Wales and supported by Countryside Council for Wales. The project is the latest in a 15 year sequence of projects conducted by the WUF which is working to systematically recover the Wye and Usk on a catchment scale.

The Irfon is a 327km^2 high energy spate river system that drains a lowly populated region within Powys in mid Wales and is a major tributary of the Wye. The presentation covers the results of a sucessful three year LIFE+ Nature project. It details the methods employed that have brought the features of the SAC into favourable conservation status. The project has corrected acid water problems, naturalised flows, completed 30km of habitat restoration and developed captive breeding for whiteclawed crayfish and freshwater pearl mussel. Courtesy of a comprehensive monitoring programme it has strong evidence of both spatial and temporal improvements that will ensure not only that the SAC features are now in favorable condition but also that when the 10 water bodies within the Irfon sub-catchmnet are next assessed they will all be in Good Ecological Status.

We hope that the results of the project will be an inspiration for other river managers to instigate similar works.

Riverine SACs are by nature different to other SAC's as they are a function of a much larger catchment. This presentation explains how the problems in river SAC's can be addressed sucessfully by taking in the whole catchment and explains how LIFE+ has recognised this and funded this ground breaking project.

Keywords: Irfon SAC; Good Ecological Status; white clawed crayfish; freshwater pearl mussel; LIFE+

THE PHASED NATURALISATION OF THE RIVER RIBBLE SSSI AT LONG PRESTON DEEPS: A STORY OF COOPERATION AND COMPROMISE

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Abstract

The River Ribble SSSI at Long Preston is presently failing Water Framework Directive condition limits with specific issues focussed around fisheries and hydromorphology. Natural England and the Environment Agency wished to adopt a minimum intervention river and floodplain naturalisation approach to improving the SSSI and commissioned a catchment baseline assessment and targeted fluvial audit to determine the appropriate local morphology and sustainable channel dynamics that would function under the present flow and sediment regime. Two distinct channel types were identified (wandering and passive meandering) allowing appropriate morphological reinstatement targets to be set along the SSSI.

Historic river training and flood bank construction were found to have profoundly affected channel behaviour and a programme of floodplain reconnection through flood bank removal and realignment was proposed alongside more local reconnection of dormant floodplain palaeo-features. Two phases of restoration have been delivered by the Environment Agency over the last two summers involving landowners and other river users in a coordinated plan of action based around the original restoration proposals. The works have required close cooperation between DEFRA organisations including the Environment Agency, Natural England and Forestry Commission and strong liaison with user communities. Compromise was necessary to account for the current usage pressures on the river and floodplain, however, significant process and form alteration has been achieved demonstrating the advantages of working to restore river and floodplain processes to facilitate naturalisation rather than adopting a soft engineering approach towards river stabilisation. Wetter than average conditions in the catchment have activated the floodplain reconnection sites along the river impacting on in-channel sediment transport and overbank sedimentation regimes and an overall slowing of erosion of the bed and banks has been observed. These are reported on together with future plans linked to stakeholder engagement designed to extend the naturalisation further through the SSSI.

Keywords: River naturalisation; floodplain reconnection; soft engineering

RIVER KENNET - A STRATEGIC APPROACH TO RESTORATION AND ASSESSMENT

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Abstract

A strategic approach to whole river restoration has been applied to the River Kennet and Lambourn SSSI. The approach has been based upon identifying key habitat features, linking geomorphology and ecology and a phased implementation that encourages natural recovery. The aim of the restoration plan is to achieve favourable condition for the SSSI and Good Ecological Status to comply with the Water Framework Directive.

We present an illustrated update of the plans progress and the results of the monitoring and assessment of the work. We finish with details of our planned for future integrated assessments.

Keywords: Kennet; SSSI; WFD; monitoring; assessment

WATERBODY IMPROVEMENT WITHIN A HEAVILY CONFINED FLOOD ALLEVIATION SCHEME AT TREGARON, WALES

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Abstract

Historically, there have been long-standing conflicts between flood alleviation scheme engineers and fluvial geomorphologists with regards to the implementation of river modifications. This is especially the case in river corridors that are confined within built-up urban areas. In these circumstances flood alleviation engineers are concerned with minimising flood risk by creating within-scheme conditions that allow for maximum capacity and efficient conveyance. This focus is not always conducive to the promotion of geomorphologically-healthy and diverse conditions that work with natural processes.

This paper explains how principles of fluvial geomorphology had a large influence on the design, construction and post project monitoring of a flood alleviation scheme on a river designated as a SSSI/SAC within a heavily confined river corridor; without adversely impacting on flood risk and the species it was designated for under its SSSI status. The proposed scheme was to lower the river bed by 200mm to increase the overall capacity of the channel. The challenge was to ensure that the physical features required by the SSSI species (inc Salmon and Ranunculus) were retained, but that the surrounding infrastructure and properties were not at risk of being undercut as a result of scour in this confined high energy channel. A soft engineering approach was taken to promote local morphological diversity and flow diversity, utilising information from up and downstream natural river reaches, and general geomorphological principles. The proposed layout was modelled using a 1D hydraulic model to understand the effects of the reprofiling on flows, allowing for a basic assessment of coarse sediment transport to be undertaken. Geomorphologists were present on site throughout construction to ensure that designs were implemented appropriately. A combination of terrestrial laser scanning and contact GPS surveys were used to monitor morphological adaptation post construction, to determine how bed material adjusts post construction within a confined channel (vertically and laterally).

This scheme was completed before WFD became a driver for ensuring that geomorphological principles are incorporated into FAS; however, it is a good example of how levels of flood protection can be maintained in challenging circumstances with no deterioration of the water body status

Keywords: River restoration; SSSI; salmon; ranunculus; flood alleviation scheme; geomorphological principles; soft engineering

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SESSION 3:

TOOLS FOR RIVER RESTORATION

GRAND PRIX SUITE

Deculverting of the River Darwen, Darwen, Lancashire

KEVIN SKINNER *et al.*
Principal Consultant: Hydromorphology & River Restoration/Management - Atkins

The Mersey Life and WFD Project: Helping to deliver WFD objectives in the North West by drawing on schemes identified in the Mersey Life Project

GERARD HAWLEY *et al.*
Principal Scientist – Penny Anderson Associates

Environmental River Enhancement Programme (EREP) surveying, identifying and enhancing drained river catchments

BRIAN COGHLAN *et al.*
Fisheries Technician – Inland Fisheries

NOTES…

DECULVERTING OF THE RIVER DARWEN, DARWEN, LANCASHIRE

K. SKINNER[1], M. KIELKOWSKI [2], J. WALKER [3], T. CALLAGHAN[4] & P. MOSCROP [5]

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Abstract

An opportunity to de-culvert a section of the River Darwen, Darwen, Lancashire, was identified in early 2011. This was undertaken as a part of a multifunctional approach from the EA (using funding from Flood Risk Assets and Environmental Programmes) with in-kind contributions from Darwen Borough Council and the landowner (Lucite International). The removal of the Brookside Culvert extended over a 120m river length in the Shorey Bank area.

Atkins was involved through the full life cycle of the project. This included a geomorphological survey of the River Darwen (November 2011) undertaken to understand the baseline conditions and investigate potential enhancement opportunities. The opportunities focused on improving morphological diversity as well as improving connectivity for fish passage up and downstream. In addition to the de-culverting, the potential for the works to influence WFD requirements for this specific water body were also considered. Options for larger scale restoration works were limited due to i) localised contamination, ii) presence of a rare plant (Narrow Small Reed) located on the site, iii) presence of large stands of Japanese Knotweed and iv) proximity of adjacent buildings and infrastructure.

A previous survey of the inside of the culvert (by Atkins and VolkerStevin) identified that the culvert was lined in stone-sets. Limited deposition occurred along the bed due to the high bed gradient and the man-made uniformity of this feature. As a result, innovative instream options were required to enhance diversity. Measures were developed by Atkins and installed by VolkerStevin (framework contractor) in April 2012. A series of fixed weirs and small deflectors, with key stones, were installed along the stone-set lined channel to pro-actively create features akin to those that have been observed in adjacent reaches. The installed features have produced a more heterogeneous bed and provided a range of velocity conditions that are suitable for fish to migrate through the previously culverted section. Since installation, the fixed features have proved resilient surviving a flow event with a return period of 1 in 20 years. Prior to the culvert removal no fish were observed in the culverted reach. Fisheries surveys (September 2012) undertaken by the EA following removal of the culvert found 12 Brown Trout (70-180mm) and 11 Bullhead. The scheme demonstrates how novel solutions can lead to improvements in habitat even under very constrained circumstances.

Keywords: Deculverting; River Darwen; instream measures; fish surveys

THE MERSEY LIFE AND WFD PROJECT: HELPING TO DELIVER WFD OBJECTIVES IN THE NORTH WEST BY DRAWING ON SCHEMES IDENTIFIED IN THE MERSEY LIFE PROJECT

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Abstract

Throughout the UK there are numerous river and catchment strategies focussing on ecological enhancement and public access to these environmental resources. However, many of these strategies do not focus on the delivery of benefits and services associated with Water Framework Directive (WFD) objectives. To this end the Mersey Life and WFD Project demonstrates the processes involved in linking ecological river enhancement schemes with the WFD. The Environment Agency-sponsored Mersey Life Project (MLP) provided a broad selection of small to catchment-wide projects designed to bring about improvements for wildlife and people living within the catchments of the Mersey, Goyt and Bollin. Environmental problems were identified and solutions considered, giving rise to a strategy for action and a portfolio of potential projects with clearly defined benefits.

Achieving either good ecological status or potential in a timely and cost-effective manner for our waterbodies presents a challenge. Yet it is clear that the core aims of the MLP and WFD are very similar and implementing schemes identified in the MLP could contribute to meeting WFD objectives. The review also adopts a landscape-scale perspective recognising the fundamental role rivers can play in improving green infrastructure and in the provision of ecosystem services. Where there are multiple benefits there is also a potential to increase the number of partners and open new funding streams. The Mersey Life and WFD Project uses a GIS platform to review the Environment Agency WFD database to evaluate what the WFD targets are and where there are shortfalls. Simultaneously, it reviews the MLP portfolio of schemes and selects those that contribute most effectively to meeting WFD targets and achieving wider environmental gains. The end result is a prioritised set of projects ready to roll out.

The presentation aims to explain how the project has worked and makes reference to specific case studies for illustration. If the MLP can be used in this way it may be that there are other projects that presently lie dormant but could, perhaps with some modification, be used in a similar manner.

Keywords: Catchment restoration; Water Framework Directive; river restoration; river rehabilitation; WFD targets; ecosystem services; green infrastructure

ENVIRONMENTAL RIVER ENHANCEMENT PROGRAMME (EREP)
SURVEYING, IDENTIFYING AND ENHANCING DRAINED RIVER CATCHMENTS

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Abstract
A large number of Ireland's major fisheries catchments were arterially drained since 1945 and continue to be subject to channel maintenance. The Environmental River Enhancement Programme (EREP) is a programme of works designed to address hydromorphology issues raised by the Water Framework Directive through a series of capital works and enhanced maintenance strategies. The programme focuses on salmonid channels and aims to deliver fisheries 'improvement' to 100 km of channel annually.

The EREP programme developed the Fish Population Index (FPI) survey to allow rapid fish stock and habitat assessments in catchments where little or no information is available on fish communities. The FPI electrofishing protocol is built around a standard 10 minute electrofishing interval. This time interval is standard in channels of all sizes and encompasses appropriate ecological units (e.g. riffle-pool- glide).

In 2009 and 2010 the Killimor system, a major sub-catchment of the Shannon, containing the Cappagh and Kilcrow Rivers was surveyed using the FPI. Two distinct fish communities were observed between the systems. The fish community compositions of the Cappagh channels were dominated by brown trout (*Salmo trutta*) while in the Kilcrow channels it was dominated by minnow (*Phoxinus phoxinus*). This divergence in fish communities reflects the prevalence of poor water quality status in the Kilcrow River catchment.

Digitizing FPI survey data with water quality and channel gradient GIS layers, it is possible to identify areas of river with enhancement potential for brown trout and Atlantic salmon (*Salmo salar*). Fisheries data also identifies imbalances in the fish communities and in population structure of target species. This allows work programmes to be tailored to each river reach, addressing biological bottlenecks such as limited spawning areas and inadequate or unsuitable nursery areas with specific enhancement structures or strategies that are consistent with the expected hydromorphology.

Keywords: Catchment management; GIS; gradient; water quality; Fish Population Index Survey

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SESSION 3:

DELIVERING THE WFD AND MORE

BROOKLANDS SUITE

The Changing Nature of River Restoration

BEN SMITH *et al.*
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Tackling WFD mitigation measures for impounded water bodies: is river restoration an option?

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Morphological Restoration to Deliver Water Framework Directive Environmental Objectives

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THE CHANGING NATURE OF RIVER RESTORATION

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Abstract

River restoration is increasingly being used as a tool to meet legislative requirements under the EU Water Framework Directive (WFD). The requirement not just to conserve but to enhance and restore rivers places river restoration at the centre of the set of measures with which states can meet WFD objectives and the WFD is now the major driver of restoration activities both in the UK and across Europe.

This paper uses data from the RRC National River Restoration Inventory and an analysis of international literature to assess the effect of the WFD on the nature of river restoration projects. Projects are analysed before and after implementation of the WFD in terms of their stated motivation and aims, size, types of technique used, location within the catchment and degree of channel modification according to the River Habitat Survey.

The period after the implementation of the WFD is marked by a clear shift to a more ecological framing of river restoration. Little change was found in size of project, however more instances of catchment-wide schemes are found after the WFD. Analysis shows an increase in projects carried out on less modified reaches, which may be due to larger potential for ecological improvement in these sites. Analysis of techniques highlights the diversity of approaches and relationships between catchment location and type of technique used.

The increasing ecological focus of stated goals for restoration, and its use as a tool to fulfil legislative requirements, places a greater emphasis on the need for appropriate monitoring to clearly demonstrate the ecological benefits of restoration projects. Identifying which measures can be expected to improve river ecology given different combinations of limiting factors will be crucial in order for river restoration to play an integral role in sustainable river management.

Keywords: WFD; NRRI; motivation; technique; project characteristics

TACKLING WFD MITIGATION MEASURES FOR IMPOUNDED WATER BODIES: IS RIVER RESTORATION AN OPTION?

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Abstract

Yorkshire Water Services (YWS) is funded in AMP5 to investigate Heavily Modified Water Bodies (HMWBs) comprising reservoir assets; and their compliance with Good Ecological Potential (GEP) objectives under the EU Water Framework Directive (WFD). This paper will present both a Water Company and Consultant perspective looking at overall drivers and the challenge of delivery respectively. The aim of the investigation is to establish the technical feasibility, costs and benefits of the generic mitigation measures developed by UKTAG for impounded HMWBs under fish passage, hydromorphological, and physic-chemical water quality drivers. In order to achieve this, YWS has developed a suite of tailored mitigation measure trials for implementation over the 2011-2015 period; designed to address known Cause of Failures on watercourses downstream of reservoirs, including impacted flow, sediment, and physico-chemical regimes.

Water bodies downstream of reservoirs are subject to a modified hydromorphological regime due to the artificial storage and release programmes that are used to manage water supplies. This situation commonly results in unnaturally stable flows passing through a channel inherited from the river's previous regime that is often not fully functional as healthy hydraulic habitat. In instances where operational changes to reservoir flow release regimes are not currently feasible, channel profile modification can be used as an alternative means of influencing flow continuity, improving sediment regimes, and enhancing aquatic habitat diversity and quality.

Yorkshire Water, in partnership with Arup and the Environment Agency, has developed two river restoration pilot sites on heavily impacted inter-reservoir reaches within the Don and Wharfe catchments. The sites are trialling river restoration techniques as an alternative and/or supplementary solution to flow release modification. The trials incorporate a comprehensive monitoring programme of works (ecological and geomorphological) in order to develop an evidence base into the effectiveness of the mitigation measure actions. This, in turn, will inform cost-benefit analysis of a range of potentially transferable and sustainable river management solutions, in order to inform YWS's PR14 and AMP6/7 investment plan, as well as the programme of measures under the second River Basin Management Plan (RBMP) cycle.

Keywords: HMWBs; WFD; river restoration; impoundments; modified flows; geomorphology; habitat; fish; GEP; monitoring

MORPHOLOGICAL RESTORATION TO DELIVER WATER FRAMEWORK DIRECTIVE ENVIRONMENTAL OBJECTIVES

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Abstract

Morphological pressures are one of the most significant factors causing or contributing to failure to meet WFD environmental objectives. The Environment Agency recognises the need to invest in morphological restoration if it is to achieve these objectives. There are many different drivers for – and benefits of – restoration schemes. Given current resources we should promote schemes that deliver for multiple drivers but priority for the Environment Agency is to achieve WFD environmental objectives. The purpose of this paper – supported by case examples - is to communicate, to wider river restoration practitioners, what is required of Environment Agency staff who may be involved in the planning and/or prioritisation of morphological restoration schemes required under the Water Framework Directive (WFD). In 2011, a morphological restoration position statement was produced for staff working internally within the Environment Agency. The position applies to those schemes that the Agency either leads on or contributes resources toward, and provides some key principles that are intended to guide morphological restoration to deliver sustainable outcomes. It has not been formally communicated to an external audience until now, but the Agency recognises the importance of disseminating the guiding principles in order to facilitate its own staff and others to plan schemes that not only help achieve WFD objectives but that also maximise benefit to the environment and to society. As competent authority for WFD, the Environment Agency will seek to ensure that the principles contained in this position statement are applied to WFD restoration schemes led by other organisations and groups. Morphological restoration schemes may ultimately be unable to address the full range of pressures causing failure of WFD objectives. However, this should not stop action towards improving morphological conditions if this will contribute to delivery of WFD objectives.

Keywords: River restoration; morphological presssures; Water Framework Directive

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SESSION 3:

PASSAGE FOR MIGRATORY FISH AND EELS

MONZA ROOM

Improving Eel Passage on the River Wandle

TIM LONGSTAFF *et al.*
Catchment Project Officer - Wandle Trust

Catchment based restoration of a waterbody using partnership groups

PAUL FREAR *et al.*
Fisheries Technical Officer – Environment Agency

The Wissey Siphon – Fish pass

KYE JERROM[1] & MARCUS WIDDISON[2]
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IMPROVING EEL PASSAGE ON THE RIVER WANDLE

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Abstract

Populations of elvers (young eels) have declined by up to 98% in the last 30 years with causes being attributed to a range of factors, one of which is man-made obstructions which interrupt their migration and dispersal patterns. The River Wandle in south London has been highly modified and was once known as the hardest worked river for its size in Europe due to the number of mill wheels in operation. As a result it has a legacy of weirs and other obstructions which prevent the free passage of fish and other aquatic species.

Despite these obstructions eels are present in the River Wandle. Where possible the obstructions would ideally be removed, however, on such a highly urbanised river with flood risk being a real issue, this is not always possible. As a result the Wandle Trust has designed and installed a number of eel passes which bypass weirs and has linked these passes with an eel monitoring project run by the Zoological Society of London. When combined with video camera footage, the eel trapping associated with the monitoring project has provided enlightening information on the efficacy of these eel passes. As a result a series of modifications have been made to the design of this type of eel pass so that it can successfully transfer eels upstream. This information has been applied to subsequent eel passes installed on the Wandle to maximise eel migration at the catchment scale. It also demonstrates the importance of monitoring the effectiveness of river improvement measures and the danger of assuming that mitigation measures applied under the Water Framework Directive are a success if they are not properly monitored.

Keywords: Eel passage; urbanised rivers; monitoring; WFD

CATCHMENT BASED RESTORATION OF A WATERBODY USING PARTNERSHIP GROUPS. LOW COST: NON-TECHNICAL SOLUTIONS – A CASE STUDY

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Abstract

The Cong Burn is a 15km long, heavily modified urban watercourse in Chester-le-Street, County Durham. It has undergone significant improvements in water quality in the last decade. Despite these improvements the water-body fails to attain Good Ecological Status under Water Framework Directive for fish due to significant obstructions to fish passage and mine-water discharges. Habitats in the mid and upper reaches of the watercourse are typical, gravel rich trout zones, but a series of obstructions prevents re-colonisation from migratory fish species including sea trout, lamprey and eel. The restoration of watercourse connectivity and mine-water treatment was achieved using a volunteer workforce, a local contractor and an advisory role for Environment Agency Fisheries Officers. The restoration was achieved by the removal of an impoundment weir, previously used for water abstraction, the installation of concrete baffles into three culverts, a rock-ramp fish easement and the construction of a reedbed mine-water treatment system. Sea trout were observed spawning above a baffled culvert for the first time in living memory and initial fisheries survey data are indicating an improvement in fish numbers. The overall project budget was £55,000 and project management was carried out by third party volunteers.

Keywords: Restoration; catchment; salmonids; water quality; low-cost; third sector

THE WISSEY SIPHON - FISH PASS

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Abstract

The EA have completed the successful installation of the first UK Siphon Fish pass. The fish pass is part of Water Framework Directive (WFD) invested improvements that will improve the ecological status of both the Cut Off Channel and the River Wissey. The Upper Wissey is currently a confirmed failing water body under WFD, of which fish are a failing feature. The project is funded by the Environment Programme and European WFD funding.

What we did and why: The Dutch design was borrowed and updated for UK needs. The fish pass is primarily designed to help coarse fish move upstream and past the Wissey diversion sluice which is currently acting as a barrier to fish migration. It will also aid the passage of salmonid species and eels whilst ensuring the flood defence integrity of the site is maintained.

The Siphon Fish pass is essentially a pool and riffle pass within a pipe that uses "siphon" technology to create a flow of water from a higher water course/location to a lower one. The built in monitoring technology and reporting will help us understand it's effectiveness but also the impact to fish of other structures within the same system by looking at the migration of specially 'acoustic' tagged fish.

EA content: 1) About the lower Ouse system, the Cut Off Channel and the Wissey. 2) The history of the problem, the structure (diversion sluice – what it does), why it's a problem (priority), and finding the right fix. 3) WFD pressures (coarse fish), Eels and sea trout. 4) Five year monitoring program and what it will show.

ACE content: Realising the first UK's Siphon Fish Pass, design specifications, installation, site constraints and overcoming them.

Keywords: WFD; Fish pass; siphon; coarse fish; salmonid; eel; flood defence; innovation

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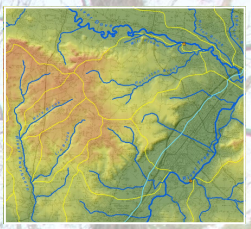
Consultant Ecologists



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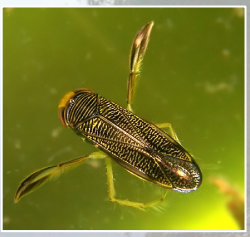

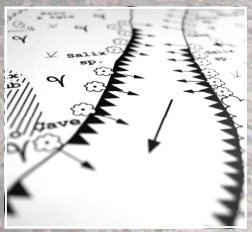

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SESSION 4:

ENERGY GRADIENTS IN RESTORATION: FROM THE NENE TO NORWAY

BROOKLANDS SUITE

Rottall Burn Restoration: Unconstrained Opportunity

KENNETH MACDOUGALL *et al.*
Projects Director – EnviroCentre Ltd

Improving the River Nene – Nene Valley Nature Improvement Area

OLIVER BURKE
Conservation Manager – Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire

Restoration in a regulated river – Mitigation High Head Hydro

BJØRN OTTO DØNNUM *et al.*
Environmental manager – E-Co energy

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ROTTAL BURN RESTORATION: UNCONSTRAINED OPPORTUNITY

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Abstract

The Rottal Burn was restored from 650m of straightened channel into a new 1,100m long meandering channel in the summer of 2012. This paper details the progress of this restoration project through the design and planning stages, to the construction works. The Rottal Burn is a tributary of the River South Esk in Glen Clova, Angus, which is a designated Special Area of Conservation for Atlantic salmon and freshwater pearl mussel. In 2010 the Esk Rivers and Fisheries Trust secured funding from the SEPA Water Environment Fund for a restoration design which EnviroCentre were commissioned to progress.

A detailed assessment of the river and surrounds was undertaken to identify possible restoration options. This included detailed surveys of the geomorphology, hydrology, channel hydraulics, surrounding ecological and fisheries habitat. The existing channel had been historically straightened and subject to regular dredging with gravels stockpiled in embankments alongside the channel. Although spawning habitat was present, the lack of variation in habitat resulted in low numbers of juvenile salmonids. The restoration design effectively had three main zones. The upper zone had the steepest gradient and was routed through existing agricultural fields with lower bank heights. The middle zone had a shallower gradient and the channel was routed through remnants of relict channel which had remained a relatively wet, marshy area. Finally the lower zone had a shallow gradient through agricultural fields to the confluence with the River South Esk. Large woody debris in the form of trees with rootballs were included in sections of the restoration.

The construction works were designed to create the restored channel without any import or export of material, requiring careful planning through the design and the construction phase. The works commenced in the spring of 2012 with a two phase construction programme. The new channel was constructed during late spring and time allowed for vegetation to grow before diverting flow from the existing channel into the new channel in late summer. There were a number of challenges facing the construction phase including the remote location, services on site, weather conditions and the limited growing season at an altitude of 220m above Ordnance datum. A monitoring network has been installed across the works which will be used to assess the longer term performance of the project. This includes a series of fixed reference points, detailed baseline topographic survey and river flow/level gauge.

Keywords: River realignment; channel design; high energy; large woody debris; salmonid habitat

IMPROVING THE RIVER NENE - NENE VALLEY NATURE IMPROVEMENT AREA

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Abstract

The Natural Environment White Paper identified that England's habitats were fragmented and vulnerable to change and champions a Bigger, Better and more Joined Up approach to nature conservation at a landscape scale, but how is this step change in nature conservation to be achieved on the ground when applied to a riverine environment? The paper will look at the Nene Valley Nature Improvement Area (NIA), one of 12 new NIA approved in 2012, and how working through an integrated approach it hopes to achieve multiple objectives on the ground. The Nene Valley sits in one of the highest growth areas in the UK with a broad range of factors influencing the river's condition.

The Nene Valley NIA covers over 41,000ha and at its heart lays the Upper Nene Valley Gravel Pits Special Protection Area (SPA), an internationally important site for overwintering Wetland Birds. One of the unique selling points of this multi discipline; multi-partner project is to ensure that the natural environment and the built environment are mutually beneficial to each other. The five key areas covered within the project are: growth and development, public awareness and access, improved ecological status of the river, landowner engagement with benefits for biodiversity and the potential for ecosystem services to provide an income.

The NIA project team includes a River Restoration Officer based at River Restoration Centre and River Nene Regional Park (RNRP), Natural Development Officer based at Northamptonshire County Council, Land Advisor based at the Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire and RNRP, and a Post Doctoral Research at the University of Northampton. They are working together to achieve the NIA aims and to ensure that the project is self-sustaining in the long-term. Alongside the NIA staff, the RSPB, as part of public awareness and access, are leading on a consultancy project investigating access and disturbance issues within the SPA.

Keywords: Nature Improvement Area; partnership project; riverine; wetland birds

RESTORATION IN A REGULATED RIVER - MITIGATION OF HIGH HEAD HYDRO

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Abstract

The River Aurlandselva in western Norway (County Sogn og Fjordane) was developed for hydropower in the period 1969 – 1986 by E-CO Energy. The river system is characterized as a heavily modified water body, and finding ways of increasing the environmental performance of the river system without a significant impact on hydropower production is important.

In 2009 a new research project was started in order to develop a better understanding of the river and its sea-trout and salmon population. After a habitat assessment of the river, it was evident that lack of suitable spawning gravel was a bottleneck. A program for adding spawning gravel was started, and the response was immediate; sea-trout started using it the day after it was placed in the river. So far, a total of 450 m3 spawning gravel has been used to create spawning habitat increasing the available habitat by an order of magnitude, from 0.1% to 1% of the wetted area. In addition to adding gravel, the river bed has been loosened by the means of an excavator to provide more available high quality habitat for young-of the-year (YOY) and 1 and 2 year old parr. This is particularly important during wintertime, when the minimum ecological flow is 3 m^3/s, and wetted area is at a minimum.

Results show after 4 years that we have an increase in YOY production in the area close to the new spawning areas, and we have an overall increase in the fish population. In addition to presenting results from the on-going monitoring, we will present the newly developed master plan for restoration works in River Aurlandselva.

We believe that this plan will be the right tool for compensating the negative effects on the fish stocks without any significant negative impact on hydropower production.

Keywords: Heavily modified water bodies; spawning gravel; salmon; sea-trout; weir modification; restoration plan; hydropower

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RIVER RESTORATION CENTRE OLYMPIC CHALLENGE

Competition was fierce given the calibre of entries received. These projects were nominated as category winners. *The Olympic Challenge prizes will be awarded on day one of the Conference.*

1. **Sinderland Restoration Project** - lasting more than a decade including monitoring, the Sinderland Brook project was delivered in planning phases (**Marathon** category).

2. **River Wensum Great Ryburgh Restoration -** results after a year have shown a significant improvement in terms of habitat, flow diversity and water quality (**Sprint** category).

3. **Mayesbrook Climate Change Park Project** - a diverse partnership of public, private and voluntary organisations helped to deliver restoration at Mayesbrook Park (**Relay** category).

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4. **Little Lever Weir Removal** - As part of a catchment-scale strategy to remove redundant structures, works to aid the removal of a collapsing weir 2m in height on the River Irwell helped to reconnect a large section of the river. (**High-jump** category).

5. **Lough Neas Emergency works** - Following high flows, a reconstruction project including stakeholder consultation was completed in four days in Northern Ireland (**Hurdle** category).

6. **Fobney Island** – An innovative restoration plan developed over several years aimed to establish an ecologically successful river and wetland and multi-purpose recreational area for wildlife and people. The approach and end product earned this project gold (**Freestyle** category).

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SESSION 5:

WORKSHOP A:

HEAVILY MODIFIED RIVERS: WHAT IS REALISTIC?

BROOKLANDS SUITE

Urban River Survey

LUCY SHUKER *et al.*
Geomorphology Technical Specialist – Environment Agency

Can catchment management planning deliver urban river restoration?

DAVID LERNER
Director, Catchment Science Centre – Sheffield University

River Restoration in Heavily Modified and Artificial Waterbodies: How to achieve Good Ecological Potential in extremely un-natural rivers

PATRICIA XAVIER *et al.*
Engineer – ARUP

Restoring the 'Red River': Designing a stable functional morphology for a historically brick lined channel

SEBASTIAN BENTLEY *et al.*
Senior Hydromorphologist - JBA

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URBAN RIVER SURVEY

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Abstract

Building upon current understanding of the chronic physical pressures upon heavily modified rivers, this paper offers insights for the bio-physical assessment and integrated catchment management of urban rivers based upon research experience and practical knowledge gained from restoration and rehabilitation projects happening across the London tributary catchments.

This paper reports on the progress of the Urban River Survey (URS) as a method of assessment of bio-physical habitat in the context of channel engineering at the catchment, 'landscape' and reach scales. Using case studies on the River Wandle and Mayes Brook this paper explores the suitability of URS for baseline data collection and post-project appraisal in the context of restoration works currently being planned or delivered either with Catchment Restoration Funding or as part of wider catchment scale environmental rehabilitation projects.

Indicators of early success in terms of bio-physical habitat and geomorphological process recovery can be illustrated via URS Indices, Classifications and the multi-variate Principal Component Analysis results using the URS Matrix tool.

Combining the URS results with other baseline and appraisal data as part of catchment planning strategies can help to scientifically underpin evidence for the improvement of the ecological status of urban rivers. Furthermore, effective stakeholder engagement relies on the clear communication of current conditions and restoration objectives: such as those demonstrated by the case study examples presented.

Keywords: Urban River Survey; URS; integrated catchment management; bio-physical habitat restoration

CAN CATCHMENT MANAGEMENT PLANNING DELIVER URBAN RIVER RESTORATION?

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Abstract

The Bradford Beck is in need of some TLC. It is not a very big river (catchment of 60 km^2), but it is the only watercourse the city has. When Bradford became the wool processing capital and the wealthiest city of the UK in the nineteenth century, the Beck suffered. It was seen as a drain and sewer, and was reported to catch fire quite often in the 1850s. It was straightened, canalised and culverted, like many other urban rivers. Now water quality has improved, but is rated poor under the Water Framework Directive; it also fails on morphology. Almost no-one in Bradford knows it is there except the professionals who deal with flooding and water quality, and it has zero or negative social and environment value to the city.

In one of the pilots of the Catchment Based Approach to catchment management, the Aire Rivers Trust led the development of a catchment management plan for the Bradford Beck. In the process, it became clear that the Beck is in a 3-way catch-22 situation:

- The Beck is mostly out of sight and inaccessible and so there is little pressure to improve it;
- Water quality is poor, so there is little interest in improving the morphology or making it accessible;
- The artificial morphology restricts access and makes it difficult to diagnose the pollution sources.

However there are opportunities; the Beck runs under the city centre and through a major development area and so could become a social and economic asset if cleaned up and restored. How do we get the first move made? Is it through raising awareness and access (relatively cheap, but doesn't improve the WFD status), through tackling misconnections (complex governance and expensive), or through starting river restoration (expensive)?

This presentation will expand on the issues, and the strategy that is being developed by the new Friends group to drive forward a set of projects which will engage the key institutions (Bradford Council, Yorkshire Water and the Environment Agency) in different ways.

Keywords: Urban river; catchment based approach; access; culverting; water quality

RIVER RESTORATION IN HEAVILY MODIFIED AND ARTIFICIAL WATERBODIES: HOW TO ACHEIVE GOOD ECOLOGICAL POTENTIAL IN EXTREMELY UN-NATURAL RIVERS

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Abstract

The aim of River Restoration is to naturalise a reach or waterbody to ensure variable flow and morphological conditions that encourage biodiversity are reinstated. Given that every site is unique, it is no simple matter to develop effective solutions that are both economic and sustainable for the long term evolution of the waterbody. This inherent complexity that lies behind every river restoration scheme increases exponentially when the waterbody is sited within a dense conurbation, or is an entirely artificial channel, such as an agricultural drainage network developed over millenia to reclaim land from saltmarsh. Under the WFD, all heavily modified and artificial waterbodies (HMWBs) are required to achieve GEP between now and 2027 (unless certain exemptions apply). This paper: (a) presents a review and characterisation of all the failing HMWBs in Wales, the Midlands and the North-East regions to draw out common trends and issues, and (b) introduces initial approaches to acheive GEP in two very different situations in the HMWB category: (i) urban flood-engineered channels and (ii) artificial rural drainage channels that are often under LLFA and IDB management.

Urban flood engineered waterbodies are controlled primarily for conveyance of high flows, often with sheer walls, few instream features and culverted in places for long stretches. Examples include the Sud Brook in Cheltenham and the River Dafen in Llanelli. The key aim is to work within economic and feasibility constraints to introduce pockets of habitat, while maintaining the primary function of flood conveyance. Solutions include the use of recessed vegetation ledges and creation of refuges and offline habitat.

In the contrasting situation, drainage channels such as the Gele in North Wales are entirely artificial, created to drain and deliniate land, in the UK some examples are thought to date back 5000 BP. The key aim in these waterbodies is how to define GEP in an artificial environment, and then use that as a baseline to develop appropriate and proportionate mitigation measures.

A great body of knowledge and experience has been built up in the river restoration sector in recent years. The next stage is to take these lessons learned into the most challenging of enviroments, to ensure that GEP is acheivable for even our most un-natural waterbodies.

Keywords: HMWBs; river restoration; GEP; Mitigation Measures Assessments; solutions

RESTORING THE 'RED RIVER': DESIGNING A STABLE FUNCTIONAL MORPHOLOGY FOR AN HISTORICALLY BRICK LINED CHANNEL

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Abstract

The River Medlock at Clayton Vale and Philips Park is a single thread, sinuous channel. The channel has been engineered to create a brick-lined two-stage channel through this reach. This brick-lining was completed in 1912. The engineered channel has only a very limited in-channel morphological and flow diversity (with an almost uniform width and depth throughout the reach), a consequence of the unchanging steep gradient and immovable changing planform. The high flow energy prevents any significant sediment deposition on the channel bed, except in backwaters and over the second stage of the channel on the inside of several bends. This shows that the river through this reach could maintain morphological features (such as point bars, riffles and rapids) if given the chance to do so.

Under present flow conditions, the high velocities are considered to be a barrier to fish passage, due to velocities of >2m/s under low flow conditions and 3-4m/s during higher flow events within the channel. A hydromorphic audit and geomorphological modelling has shown that removing the brick-lining through the downstream section of Clayton Vale and through Philips Park of the River Medlock, alongside morphological restoration of the channel, will improve the hydromorphology and fish passage through the study reach. Hydromorphic diversity can be created through removing the brick-lining and implementing morphological features such as rapids/riffles and pools to dissipate the flow energy associated to the steep gradient through the study reach. These features are common upstream of the study reach and have been used as analogue features for the design of these features. Channel energy levels remain high through the steep gradient restored reach, however, the potential for significant lateral erosion may be reduced through careful design and sizing of these morphological features. Indicative dimensions for the features and bed material sizes have been provided in this assessment. Limitations to the complete morphological restoration include buried services, contaminated land and construction material and this presentation reports on the constrained naturalisation design being implemented through Clayton Vale as part of a phased approach to restoration.

Keywords: Urban channel restoration; pools; riffles; rapids; naturalisation design

NOTES…

SESSION 5:

WORKSHOP B:

USING LARGE WOOD IN RIVERS

LUFFIELD ROOM

The effect of large woody debris on stream community structure across an enrichment gradient

MURRAY THOMPSON *et al.*
PhD Student - Natural History Museum

Hydromorphological appraisal of the use of large woody debris in the Restoration of the River Lathkill, Derbyshire

IAN DREW *et al.*
Senior Lecturer – Manchester Metropolitan University

Using Wood Debris to rehabilitate degraded watercourses

NICK MOTT
Senior Wetlands Ecologist – Staffordshire Wildlife Trust

Large Woody Debris, Woody Debris or Revetment?

JACK SPEES
Trust Director – Ribble Rivers Trust

NOTES…

THE EFFECT OF LARGE WOODY DEBRIS ON STREAM COMMUNITY STRUCTURE ACROSS AN ENRICHMENT GRADIENT

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Abstract

The natural physical and biological states of rivers have been severely altered by long-term exploitation and modification. As a consequence river restoration is critical to help mitigate impacts on biodiversity-ecosystem functioning.

River habitat enhancement is often used to reinstate ecosystem properties yet many rehabilitation studies focus on target species (e.g. brown trout) or assemblages (e.g. macroinvertebrates). Little is known of the potential effects at the more complex organisational levels that bind these components together (i.e. food webs, communities, ecosystems). To test the effectiveness of large woody debris (LWD) as a restoration tool, five chalk streams were sampled before and after at control and treatment sites.

Previous studies have indicated that ecological response is constrained in systems with high nutrient concentrations. In this study therefore, macroinvertebrates have been sampled from 19 calcareous streams with naturally occurring LWD and a range of nutrient levels to test for a threshold whereby habitat supersedes water quality as the primary ecological determinant.

Results indicate that total invertebrate abundance and species richness are significantly higher in the presence of woody debris, and that this relationship is not affected by nutrient concentrations. Fish response is less clear, however, the inclusion of data relating to other groups enabled assessment of biomass stocks, food webs, and body-size distributions. The effects of the abundance and biomass of fish and macroinvertebrates on structural properties of ecosystems will also be explored.

Keywords: Biomass; food web; macroinvertebrate; nutrients

HYDROMORPHOLOGICAL APPRAISAL OF THE USE OF LARGE WOODY DEBRIS IN THE RESTORATION OF THE RIVER LATHKILL, DERBYSHIRE

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Abstract

Natural in-stream large woody debris (LWD) was once viewed as problem inhibiting the passage of water and was commonly removed. Now the benefits of LWD are well documented as contributing to channel hydraulic, morphological and biological diversity to the extent that LWD is purposely placed in channels as a river restoration measure. This study presents an in depth case study of the hydromorphological impact of introduced LWD on the River Lathkill, and outlines the ecological implications of its use as a restoration tool. Detailed maps of the channel around the LWD show interlinked trends between flow velocity, bed topography and river bed material size distribution around the structures. As expected the introduction of LWD in the River Lathkill has created a more hydraulically diverse and geomorphologically complex river channel and the specific hydrological characteristics of the river have allowed these changes to be assessed in more detail than would normally be possible.

Keywords: Large woody debris; hydromorphology; ecology; post project monitoring

USING WOODY DEBRIS TO REHABILITATE DEGRADED WATERCOURSES

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Abstract

Attitudes towards woody debris are changing. It is increasingly being viewed as a catalyst for the natural recovery of our watercourses and a cost-effective form of rehabilitation for many of our degraded watercourses. In Staffordshire, stream enhancement schemes using woody debris have been carried out in earnest since 2000. A variety of techniques have been experimented with including 'Chop & Drop', 'ELJs' (Engineered Log Jams), 'Rootwads' and island creation. This has been coupled with a Regional and National campaign to promote the importance of woody debris as a vital component of our watercourses for wildlife, sediment storage, better water quality and natural flood management.

The following case studies provide a taste of some of the demonstration sites that have been set up in Staffordshire:-

1. Example of natural recovery: the River Churnet at Dimmings Dale. Relaxation of main river maintenance by the Environment Agency has seen this reach of the river 're-snag' itself over the past 12 years. Accumulations of fallen trees and drifting woody debris have formed into impressive log jams during this time. Ongoing liaison with anglers, the Forestry Commission and other interested parties has been necessary to ensure that the benefits mentioned above are recognised and celebrated.

2. River island creation: the Rivers Tame and Trent at Croxall, Barton Quarry and Catton Hall. Nearby examples of natural river island formation provided us with 'reference conditions' to design new islands as part of wider WFD river rehabilitation schemes carried out along this 4km reach between 2009-13. Living willow trees were dug into suitable riffles and positioned, mid-channel, with the rootplates facing upstream. The trees were secured in place with gravels and left to develop adventitious roots.

3. Rootwads and 'Chop & Drop': Stafford Brook, a headwater stream at Cannock Chase. This watercourse was engineered into a single, straight, embanked channel during the early 20th Century. A rehabilitation scheme, using rootwads and the selective felling of multi-stem alders and silver birch, was implemented in 2012-13. Monitoring of indicator and flagship species such as the 'Logjammer' Hoverfly, Lipsothrix craneflies, white-clawed crayfish, bullhead, brown trout and brook lamprey will help inform evaluations about how successful this work has been.

Keywords: Woody debris; river rehabilitation; chop & drop; rootwads; indicator species

LARGE WOODY DEBRIS, WOODY DEBRIS OR REVETMENT?

J. SPEES

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Abstract

Ribble Rivers Trust undertook an investigation into the "Reasons for Failure" on two upland, high gradient streams that join to form the Ribble. Following identification of a range of factors, and in partnership with the EA, a restoration trial was started. This included riparian fencing and tree planting, but also identified the need to restore geomorphological processes to ensure more suitable salmonid habitat. Much research into various restoration techniques was employed, and a series of proposals drawn up. The final proposal used windblown timber inserted into the river bank to provide habitat, create bed scour points, and reduce bank erosion. This was considered Large Woody Debris (LWD) installation; questions have been asked if this is LWD or just revetment?

The presentation will lead through the selection process and seek to encourage discussion around whether this was a successful technique and whether there is confusion over what constitutes LWD installation and if this miscommunicates project outcomes.

Keywords: River restoration; large woody debris; revetment; habitat creation

NOTES…

SESSION 5:

WORKSHOP C:

BREAKING BARRIERS: REMOVE, REPLACE OR RETAIN?

MELBOURNE ROOM

Prioritising barriers for removal or repair: A case study of the River Wey

LINDA EAKINS *et al.*
PhD Student - University of Southampton

Learning from practical experience of delivering WFD solutions on the River Aire, Yorkshire

KATE COLLEDGE *et al.*
Engineer – ARUP

Kentchurch Weir Removal – How the River has Adjusted after Two winters and a Very Wet Summer

ALEXANDER HUMPHREYS[1] & PETER GOUGH[2]
[1] Senior Engineer – Atkins
[2] Senior Technical Specialist – Natural Resources Wales

Gauging Weirs: addressing the needs of different stakeholders

DI HAMMOND *et al.*
Senior Projects Advisor – the RRC

NOTES…

PRIORITISING BARRIERS FOR REMOVAL OR REPAIR: A CASE STUDY OF THE RIVER WEY

L.R. EAKINS[1], S.SHERIDAN[2], K.E.PARKS[3]& P.S.KEMP[4]

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Abstract

Current understanding suggests that the most cost-effective and quickest means of improving the ecological condition of rivers is to mitigate for the habitat fragmentation caused by river impoundments. There is a drive to identify redundant structures that might be removed and critical barriers where fish passes could be constructed. However, prioritisation of proposed restoration projects remains contentious, with multiple stakeholder groups competing for limited resources without clear and validated catchment scale restoration planning methods employed. The current scoring and ranking systems for barrier prioritisation consider structures independently and not as an interconnected network. This project utilises the River Wey as a case study to demonstrate how a catchment scale approach and optimisation modelling can be used to prioritise barriers for removal or repair, considering both environmental and socio-economic constraints.

A complete inventory of structures in the River Wey catchment was created by combining multiple existing Environment Agency databases. This resulted in the identification of 835 structures within the catchment, including dams, weirs, sluices, locks and culverts. A resultant GIS based database and maps quantified the barrier network, abundance and density of structures and the impoundment effect caused. A coarse resolution barrier passability score, for both upstream and downstream movement, from zero (impassable) to one (passable) based on fish swimming and leaping abilities was included in the prioritisation process. A sample of representative barriers were surveyed to quantify passability to target fish species (Sea trout, European eel and cyprinids) based on structural and hydraulic characteristics. Of the 84 structures surveyed to date (not including locks), 23 were impassable to all target fish and 36 were impassable to all but adult trout, in the upstream direction. Only five surveyed structures were fully passable to all target fish. Due to the large number of structures a method to reduce field survey time, through use of existing Environment Agency data on structure dimensions, is under development and validation data is presented here.

During prioritisation, barrier passability, barrier density and impoundment effect, distance from the tidal limit, distance between barriers, habitat quality and socio-economic constraints were included. An expert opinion meeting was held to identify the believed top ten critical barriers and the results compared to a catchment scale optimisation model. This case study demonstrates that a catchment scale approach to the management decisions involved in river restoration projects must be taken to ensure that limited resources are efficiently allocated.

Keywords: Prioritisation; barrier removal; fish passage; catchment scale; connectivity

LEARNING FROM PRACTICAL EXPERIENCE OF DELIVERING WFD SOLUTIONS ON THE RIVER AIRE, YORKSHIRE

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Abstract

As the campaign continues to remove barriers to fish migration on the River Aire in Yorkshire, numerous methods are being adopted. These are on a spectrum - with the highly efficient, but heavily engineered, conventional fish passes at one end and river restoration schemes at the other. One scheme just completed at Rodley, that lies at the centre of this spectrum, comprises a hybrid, naturalised rock ramp fish by-pass channel. Arup's role as consultants helping our clients to deliver these schemes has taught us a variety of lessons. These are opening up opportunities to achieve greater efficiency in the delivery of measures to achieve compliance with the Water Framework Directive. Barriers to fish migration take many forms. One size does not fit all in terms of the best way to tackle these projects and a flexible approach is essential.

This paper describes some of the learning experiences related to team working, early contractor involvement, consultation, design, procurement, construction risks and costs.

Keywords: River Aire; fish passage; barriers; WFD; delivery; engineering; geomorphology

KENTCHURCH WEIR REMOVAL - HOW THE RIVER HAS ADJUSTED AFTER TWO WINTERS AND A VERY WET SUMMER

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Abstract

In 2012, we presented a paper at the River Restoration Centre's Annual Conference on the removal of Kentchurch Weir on the River Monnow. The removal of the weir was carried out in August 2011, and since then the river has been adjusting to the change during a period in which we have experienced some of the heaviest rainfall on record. The project team has maintained its commitment to monitoring the change in ecology and fluvial processes. In particular, some interesting and very revealing geomorphology is being observed. Furthermore, we are specifying river restoration works to provide some bank stability where management is necessary. This presentation will follow on from the presentation that was given to the conference in 2012, detailing how the River Monnow has been adjusting to a major weir removal, and how the geomorphological processes at work have been monitored and managed.

The presentation will also outline how we are capturing and sharing the lessons that we are learning from the Kentchurch project, as it is an excellent case study and point of reference relevant to many other sites. Weir removal is by far the most effective means of restoring a river to its natural state in terms of ecological and fluvial processes. However, it is still a relatively rare achievement for a major weir due to the challenges in identifying and understanding the risks. We intend to contribute with our experience and lessons from Kentchurch in order to help other schemes become more viable.

Keywords: Weir removal; kentchurch; fish passage; monitoring; river restoration; bank stabilisation

GAUGING WEIRS: ADDRESSING THE NEEDS OF DIFFERENT STAKEHOLDERS

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Abstract

Gauging structures provide a tried and tested way of deriving flows by measuring water levels and calculating the related flow. Structures create a loss of sediment and ecological continuity along rivers and hence become one of the barriers to achieving Water Framework Directive requirements. The removal of structures, whilst good for ecology, morphology, fish, and in some instances to improve flood capacity, can be a problem where a structure is being used for gauging purposes. Long term flow and level data may be required for both operational (for example flood and drought monitoring, water resource management, environmental management) and strategic purposes (for example climate change modelling, hydrological modelling for long term water resource management). A conflict can exist where structures are used to collect this valuable data, but also have a detrimental effect on aquatic ecology and geomorphological connectivity.

The Gauging Station Project was aimed at developing guidance for the removal of gauging structures, or where the ability to gauge flows needs to be retained, to identify alternative gauging options that minimise impacts on flow and sediment dynamics and biological connectivity. Suitable alternatives will be considered primarily by developing case studies, taking into account river type, location and flow gauging needs.

The objectives were to outline the current review procedure and decision making process in the UK relating to gauging station removal; to identify and provide a range of options that will benefit physical river processes, flow conditions and ecological connectivity; short list potential gauging structure removal or alternative options and present these as case studies, outline the technical feasibility and estimates of option costs and demonstrate the benefits of structure removal for fish, hydromorphology, ecology and Flood and Coastal Risk Management (FCRM).

Keywords: Gauging weirs; WFD; barriers

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SESSION 5:

WORKSHOP D:

LATERAL THINKING: FLOODPLAINS AND WETLANDS

PRIORY ROOM

Fobney Island River and Wetland Restoration and other case studies

LYNDON BAKER[1] & GRAHAM SCHOLEY[2]
[1] *Geomorphologist – Jacobs*
[2] *Project Officer (Fisheries and Biodiversity - Environment Agency*

RSPB increasing catchment biodiversity whilst managing flood risk, the creation of Beckingham Marshes Reserve

MICHAEL COPLESTON[1] & MARTIN VAN NIEUWENHUYZEN[2]
[1] *Site Manager, RSPB Langford Lowfields and Beckingham Marshes – RSPB*
[2] *Sales Manager – Aquatic Control Engineering*

Restoration and reconnection of a water meadow to the River Ise floodplain

ROBIN FIELD *et al.*
Land Advisor – Nene Valley NIA

NOTES…

FOBNEY ISLAND RIVER AND WETLAND RESTORATION

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Abstract

This abstract aims to present the successful river and wetland restoration of Fobney Island, Reading, Berks. Fobney Island is a 6ha site boarded by the Kennet and Avon Canal to the north and the re-aligned River Kennet to the south.

Prior to restoration works the site was an area of rough grassland with little amenity value and relatively poor habitat diversity. Fobney Island was identified with the principal aims to enhance the existing river channel, improve connectivity between the river and floodplain, create permanent and ephemeral wetland features and enhance the recreational value of the site.

The project steering group included representatives from the EA, Reading Borough Council, Thames Water and Thames Rivers Trust. Additionally, other local community groups were actively engaged throughout. The EA appointed Jacobs as design consultants and Land & Water as contractors.

A matrix of wetland scrapes and pools, scrubs and hay-meadow habitat was created with the aim of attracting diverse wildlife. The river works included the creation of a new riffle and enhancing an existing one. Large woody debris was introduced by carefully pushing trees into the channel. A new backwater has also been formed providing refuge habitat for fish fry. The scheme also enhanced the recreational and amenity potential of the island, including circular walks, which take in views of the river and wetland, and two new bird hides.

Construction of the island was completed in autumn 2011 and handed back to the Local Authority. Prior to hand over the project steering group had produced a 5-year management plan and worked together to establish a budget to support it.

This project demonstrates a highly successful collaboration to deliver a large river and floodplain restoration project in a publicly owned site, securing long term management with involvement from the local community.

Keywords: River restoration; floodplain restoration; habitat creation; riffle creation; large woody debris; floodplain lowering; partnership.

INCREASING CATCHMENT BIODIVERSITY WHILST MANAGING FLOOD RISK, THE CREATION OF RSPB BECKINGHAM MARSHES

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Abstract

Creating wetland habitats in multi-functional landscapes has many challenges. This workshop and presentation will highlight how numerous partners including Environment Agency, RSPB, and the IDB have evolved solutions to creating biodiversity within a Flood Storage Reservoir with complex geology and hydrological demands.

Working in partnership with the Environment Agency, the Beckingham Marshes project has created 95 hectares of wet grassland supporting populations of birds, insects, plants and mammals. The site operates within the flood storage reservoir system that protects Gainsborough from serious high water events along the River Trent, and has key design considerations to manage the hydrological impacts of this scheme.

This landscape now contains over 100 scrapes and a 4km network of wet ditches engineered with a flood neutral status - a fantastic demonstration of managing floodplain risks and biodiversity. Dealing with soil types that range from highly permeable peat to alluvial clays with low hydraulic conductivity, a variety of design principles were used including high ditch levels maintained via windmill water pumps from Aquatic Control Engineering, and perched water through natural precipitation events.

This presentation aims to highlight the decision making behind the final scheme design, the hydrological considerations posed, and the implementation of this project throughout construction phases. The core focus for the workshop will be to use a 'hands-on' model to demonstrate various topographical and engineering features delivered on the ground.

Keywords: RSBP; biodiversity; wetland creation; windmill pump

RESTORATION AND RECONNECTION OF A WATER MEADOW TO THE RIVER ISE FLOODPLAIN

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Abstract

The project involved the complete restoration of a site unmanaged in living memory to a working water meadow. It was a partnership project managed by Dr Robin Field from the River Nene Regional Park and Jane Pearman, Reserves Manager of the Wildlife Trust. The site was virtually impassable during most of the year due to thick head high coarse vegetation, with unseen remains of ditches and very wet conditions underfoot. It was shown on the first edition OS maps with some of the sluice positions identified on the river. The water meadow was a very unusual type of habitat within the Midlands let alone Northamptonshire and this may be the only site which can be restored to working condition. Most went out of use over 100 years ago and the only reason this site has survived is that the Wicksteed Trust never used the site save for very occasional grazing.

The restoration of the water meadow started in November 2010 when funding for five community events was agreed by The Big Lottery. On the 1st of April 2011 Natural England agreed to fund the restoration with a Higher Level Scheme agreement under Environmental Stewardship. The Wildlife Trust then agreed a 25 year memorandum of understanding with Wicksteed Trust to manage the water meadow as one of their nature reserves. The main water channels (500m) were excavated and four sluices were built to allow the water from the river on to the site. Large areas of scrub were found mainly around the drier edges of the site and needed to be removed to allow the site to be fenced so that cattle grazing could be re-introduced. To assist with the restoration the drier part of the meadow was cut for hay in early August 2011 and the rest was cut in late September. At the same stage the soil excavated during ditch digging was spread. The reserve was then ready to have the side channels re-cut (900m). This was completed using a tractor and single furrow potato ridger. The final areas of scrub were removed and the reserve was totally fenced to allow grazing to start. The water system was tested in May 2012 as the river level had risen sufficiently. The reserve was multi-use with a strong biodiversity element but it also has an ability to store water in times of flood and filter water through the meadow and return it to the Boating Lake thus providing it with cleaner water. This should reduce the chances of algal blooms within the Boating Lake once it has been restored.

Keywords: Water meadow; biodiversity; restoration; water channels

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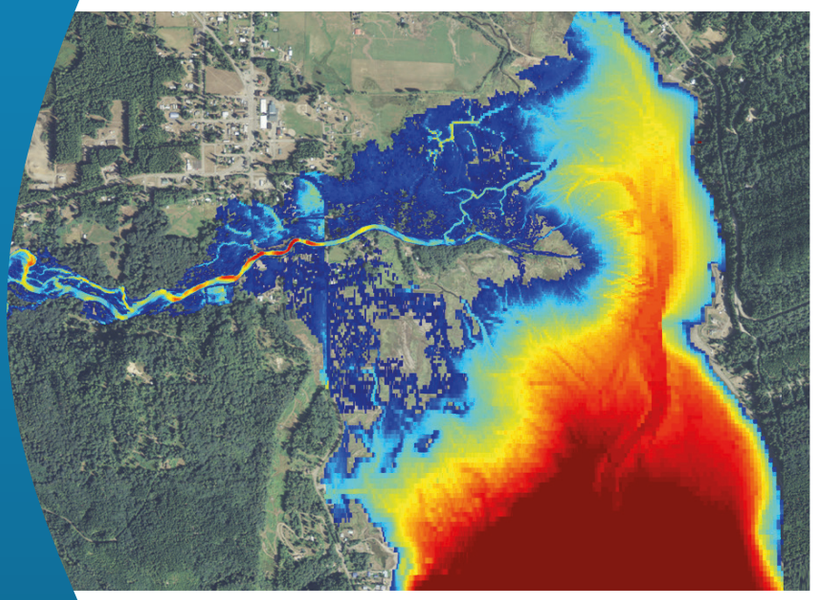

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SESSION 6:

CATCHMENT-SCALE & MORPHOLOGICAL PROCESS LED RESTORATION

BROOKLANDS SUITE

Development of a catchment-scale river restoration prioritisation strategy for the River Till, Northumberland

CAROLYN MILLS *et al.*
Geomorphologist – cbec eco-engineering UK Ltd

An Application of the Process Restoration Philosophy on a Scottish Upland River

HAMISH MOIR
[1] Director – cbec eco-engineering UK Ltd

Catchment scale river restoration and WFD implementation: Restoring wildlife and floodplain on the Sussex Ouse (MORPH)

IAN DENNIS[1] & SALLY CHADWICK[2]
[1] Principal Geomorphologist - Royal Haskoning
[2] Biodiversity Technical Specialist – Environment Agency

NOTES…

DEVELOPMENT OF A CATCHMENT-SCALE RIVER RESTORATION STRATEGY FOR THE RIVER TILL, NORTHUMBERLAND

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Abstract

cbec eco-engineering UK has developed a catchment-scale river restoration prioritisation methodology and we present an example of its application to the River Till, Northumberland. The methodology is underpinned by the philosophy of 'process river restoration', whereby optimal, sustainable benefits are attained by addressing human interventions on basic river process and by working at the largest practicable spatial scale. The approach requires understanding of physical process throughout the system, allowing the degree and nature of human impacts to be determined. This information is used to prioritise where restoration measures would be best implemented to provide optimal cumulative physical benefit.

Geomorphic data from various sources for the River Till were compiled into a GIS to create a catchment-scale dataset. This was augmented with targeted field surveys. Reach-by-reach analysis produced quantitative indices of geomorphic process including specific stream power and sediment budget descriptors. Historic map analysis was used to quantify rates of channel change over the last 150 years. Using this information, a catchment-scale conceptual process model was developed, showing spatial variability in dominant geomorphic process and degree of channel dynamic behaviour. This was crucial for understanding potential channel sensitivity and response to human pressures, as well as for determining suitable restoration interventions.

Human pressures on physical process were identified from the dataset. These were weighted according to severity to give each reach an index of pressure. For each reach the level of human pressure, and its degree of geomorphic sensitivity, was used to determine the overall level of impact, allowing the most severely impacted reaches to be identified. Restoration options were put forward for each reach, based on understanding of the pressures and impacts. These were assessed in terms of their likely benefit to geomorphic process, as well as site-specific constraints to implementation, to produce a prioritised restoration strategy.

The methodology demonstrates how building up a strong process-based understanding allows the development of a restoration strategy based on geomorphic principles. This represents a robust approach which will allow effective targeting of measures and ensure that individual interventions constitute components of a long-term, sustainable, system-scale recovery.

Keywords: Fluvial audit; catchment management; process-based restoration; restoration prioritisation

AN APPLICATION OF THE PROCESS RESTORATION PHILOSOPHY ON A SCOTTISH UPLAND RIVER

H. J. MOIR[1] AND E. GILLIES[2]

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Abstract

We present a project that presented the near unique opportunity to apply the 'process river restoration' philosophy almost without limitations. The philosophy promotes river restoration through the reinstatement of natural fluvial process, providing a long-term sustainable alternative to traditional intrusive approaches that are often more accurately termed 'river re-engineering'. In practice, the process restoration approach involves the reduction of artificial constraints that are inhibiting natural dynamic river/floodplain processes. The approach therefore aims to treat the cause rather than the symptom of river degradation, and allows 'the river to do the work' of adjusting to a new, quasi-stable equilibrium form. The study stream was the Allt Lorgy, a high energy gravel-bed tributary of the River Dulnain on the Spey system. Historically the site had exhibited a 'wandering' morphology but engineering works ~20 years ago simplified the drainage through realignment, dredging and flood embankments, producing a single thread channel largely disconnected from its floodplain. An initial detailed quantitative assessment of existing site conditions (channel and floodplain) guided the restoration design, specific elements of which were the removal/reduction of flood embankments, removal of boulder rip-rap and weir structures, filling of artificial floodplain drains, the addition of large wood features and gravel augmentation. Construction was undertaken in mid-September 2012 immediately after which a significant flow event occurred. Post-flood re-assessment determined that the implemented design had functioned as intended, initiating a trajectory towards the site's 'reference condition'. The project highlights the potential benefits of applying the 'process restoration' approach if it is implemented appropriately and after careful assessment of imposed geomorphic regime, site constraints and some idea of 'reference conditions'. Under these conditions the approach involves a lower risk of physical failure and a lower cost of implementation than standard intrusive river engineering approaches. However, it is acknowledged that the site presented a near unique set of circumstances for application of the approach; other sites might not provide sufficient dynamic process in order for the river to develop a natural equilibrium state or considerable practical constraints may inhibit implementation.

Keywords: Process river restoration; gravel-bed river; geomorphic process; site monitoring, large wood, gravel augmentation

CATCHMENT SCALE RIVER RESTORATION AND WFD IMPLEMENTATION: RESTORING WILDLIFE AND FLOODPLAINS ON THE SUSSEX OUSE

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Abstract

The Middle Ouse Restoration of Physical Habitats (MORPH) project is a partnership between the Environment Agency, the Ouse and Adur Rivers Trust (OART) and Royal HaskoningDHV to implement the WFD and CFMP in the Ouse and Adur Pilot Catchment. The project has developed strategic restoration actions to achieve Good Ecological Status through structure removal or modification, fish passage improvements and associated river restoration measures, and has highlighted several key challenges:

- Rationalising an initial list of WFD failures to produce a more manageable, prioritised list which could be assessed in greater detail.
- Obtaining support from key stakeholders. The project team includes a dedicated project officer from OART who worked closely with stakeholders to secure their support at an early stage.
- Identification of 'quick wins' from the shortlisted sites (based on the level of constraints associated with technical implementation, stakeholder support and budgetary constraints) and developing detailed designs that can deliver multiple objectives (including fish passage improvements, hydromorphological improvements and flood risk management objectives) within a limited budget and on a tight programme.

This presentation will outline some of the challenges that were overcome for these ambitious projects, discuss the lessons learned, and discuss how these lessons were shared across projects to ensure they were delivered successfully. The focus will be on the key aspects of delivery of flood risk management and WFD ambitions through effective partnership working and consultation. Outcomes of the project will be outlined, in particular the added value of partnership working which has widened the WFD/FRM scope and produced several daughter projects.

Keywords: Catchment restoration; WFD implementation; strategic restoration planning; design, construction

NOTES…

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SESSION 6:

TOOLS OF THE TRADE: HELPING YOU UNDERSTAND YOUR RIVER

MONZA ROOM

Restoration Techniques, Mitigation Measures and Channel Management

LYDIA BURGESS-GAMBLE *et al.*
Research Scientist – Environment Agency

Use of Space-for-time substitution (or the ergodic hypothesis) in river restoration: Examples from South East England

ANDREW BROOKES
Head of Geomorphology and River Restoration - Jacobs

RRC Manual of River Restoration Techniques Update

JENNY MANT *et al.*
Science and Technical Manger - RRC

NOTES…

RESTORATION TECHNIQUES, MITIGATION MEASURES AND CHANNEL MANAGEMENT

L. BURGESS-GAMBLE[1], L. MERRINGTON[2]& J. COTTON[3]

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Abstract

Whether you are planning a large scale river restoration project, a small scale enhancement project or just looking for greener engineering techniques – there are a wide range of resources available to help you.

We would like to introduce you to three resources which can help you decide on the most sustainable techniques to use when planning river restoration, implementing Water Framework Directive measures and undertaking river maintenance works.

1. The RRC Manual of River Restoration Techniques is an on-line resource which provides case study examples of different river restoration techniques. The manual is currently being updated by the RRC and the Environment Agency. It will include new case studies, and older case studies will be updated to indicate how they may have contributed to the achievement of Water Framework Directive (WFD) mitigation measures. The updated version of this manual will be available in August 2013 and will be a detailed technical design guide show casing a wide range of techniques.

2. River Basin Management Plans (RBMPs) describe how the WFD will be achieved in your region. They also tell you, at a local level, which actions and measures you need to implement to achieve WFD objectives. An on-line mitigation measures manual (found on the Environment Agency webpage) explains what WFD mitigation measures are, and gives you practical examples of what implementing a mitigation measure may look like. This manual is being updated to make it more user friendly and to turn it into a resource that you can use to irmpove the water environment to meet the requirements of the WFD.

3. A channel management handbook is being developed to help those who maintain river channels decide the best form of river maintenance for a specific location. The manual will be an online resource available on the Environment Agency webpage. It will ask you a series of questions to help you select a maintenance activity which is most appropriate for your location based on requirements such as the level of flood risk and achieving the requirements of environmental legislation (e.g. WFD, Eel Regulations and Habitats Directive).

Keywords: river restoration, channel management, mitigation measure, Water Framework Directive, river basin management plan, techniques

USE OF SPACE-FOR-TIME SUBSTITUTION (OR THE ERGODIC HYPOTHESIS) IN RIVER RESTORATION: EXAMPLES FROM SOUTH EAST ENGLAND

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[3] Project officer (Fisheries and Biodiversity), [4] Conservation Technical Specialist – Environment Agency ,
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Abstract

The space-for-time substitution technique has been used extensively in geomorphic studies to document alterations in river systems, including changes in channel form and sediment yield below dams and urban areas. It has been used less so in the field of river restoration or evaluation. Reconstructing natural channel dimensions (such as bed width) is important in attempting to recreate more sustainable ecological habitats in channels that have been subject to past modifications such as widening and deepening. Ideally historical channel cross-sections, taken pre-modification, should be used as a guide. Unfortunately there is a paucity of data, particularly for schemes constructed in the last century when channel modification was at its peak. Space-for-time substitution can afford an effective means of estimating the potential magnitude of changes involved, the degree to which a channel may have recovered following disturbance, and 'reference dimensions' where river restoration intervention is deemed necessary. This involves collection of channel dimension information for part or all of the catchment area. It is demonstrated in this presentation that as long as the limitations and assumptions of the technique are borne in mind this is potentially a powerful tool for river restoration.

Using examples from South East England, including a recent Fluvial Audit conducted on the River Ray in Buckinghamshire/Oxfordshire, this presentation illustrates how to assemble information on the spatial variation in expected channel dimensions associated with factors such as drainage area, and to use these dimensions to assess the likely magnitude of changes in channel dimensions as a result of modification and subsequent recovery. For the River Ray this information is of use in relation to WFD mitigation actions such as local bed raising, channel narrowing, removal or modification of channel structures and major restoration work such as re-meandering.

This presentation also describes examples of successful re-creation of more natural channel dimensions for projects constructed up to 25 years ago using reference reaches, as well as examples of projects that incurred unexpected channel change. Qualitative assessment of these sites through time suggests that channel type and sediment loadings are key factors in determining the rate and nature of adjustment. Based on this information a series of guiding principles are developed for wider application.

Keywords: River restoration, re-creation of channel dimensions, WFD mitigation measures

THE RIVER RESTORATION CENTRE'S MANUAL OF TECHNIQUES UPDATE

N. ELBOURNE, A. GEE, D. HAMMOND, M. JANES, J. MANT & V. WEST

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Abstract

The River Restoration Centre's Manual of River Restoration Techniques was first published in 1999, with a much welcomed update in 2002. A significant increase in knowledge about river restoration techniques has been gained during this period and the Centre recognised the benefit of providing a further update of this guidance document. Funding from many of the Centre's core funders and support from the RESTORE LIFE + project has enabled the Centre to both increase the range of techniques and also review the existing ones. This will allow the user to understand which elements of the existing projects have been successful and review the lessons learnt.

The new look web-based Manual of Techniques will include examples of projects that require detailed engineering design such as the new cascade fish pass at Lodge Burn, in Northern Ireland; projects that are low cost and focus on 'kick starting' natural process such as the Bure in Norfolk; through to those that rely on local community ownership to support future maintenance as exemplified by the River Somer that flows through the small town of Midsomer Norton in Somerset. Each project will provide information on the river category to help the user understand under which conditions the technique has been implemented, together with links for WFD measures, river designation and a statement of the monitoring protocol with any available results.

Critical to the success of guidance documents such as this is the intention to provide clear signposts to complimentary information already in existence. This allows knowledge and expertise to be pooled and distributed to practitioners.

This presentation will review some of the key lessons learnt since 1999, outline the range of the new projects to be included in the Manual and discuss the rationale and benefits of this new document that will be finalised by mid-summer 2013.

Keywords: Manual of River Restoration Techniques; 2013 update; river restoration

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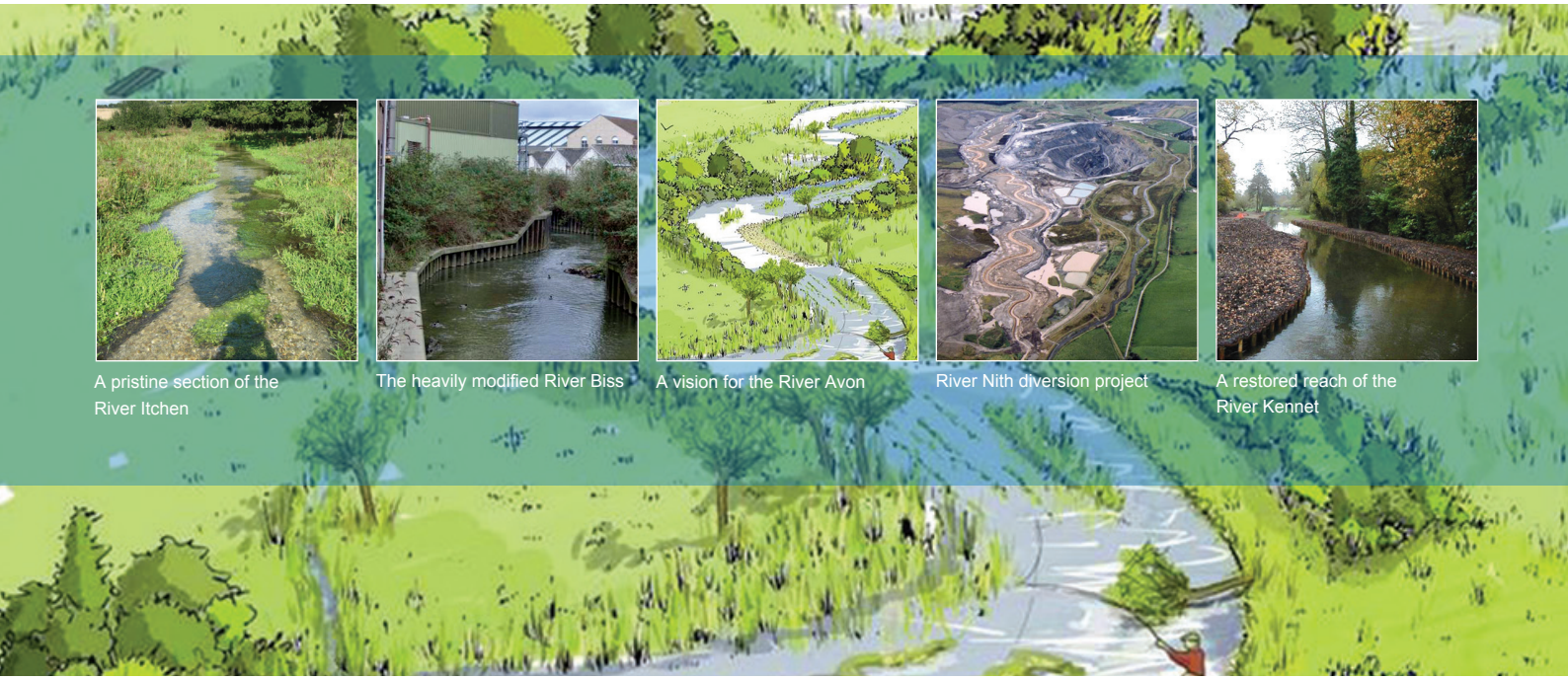

A pristine section of the River Itchen

The heavily modified River Biss

A vision for the River Avon

River Nith diversion project

A restored reach of the River Kennet

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SESSION 6:

COMMUNITY ENGAGEMENT AND DELIVERY

INDIANAPOLIS ROOM

Evaluating the Catchment-Based Approach – Transferrable lessons for national implementation

CLARE BLACK *et al.*
Environmental Scientist – Cascade Consulting

Pontbren Project – a farmer led approach to catchment restoration

MIKE TOWNSEND
Senior Advisor – The Woodland Trust

Farming For Food and Cleaner Rivers: The Catchment Sensitive Farming Approach and Outcomes – 6 Years On

JAMES GRISCHEFF *et al.*
Senior Adviser – Natural England

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EVALUATING THE CATCHMENT-BASED APPROACH – TRANSFERRABLE LESSONS FOR NATIONAL IMPLEMENTATION

C.L. BLACK[1]& D. CORBELLI[2]

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Abstract

To develop an understanding of how Defra's new catchment-based approach could work in practice, a series of 25 catchment-level partnerships were developed through a pilot phase (May 2011 – December 2012). The evaluation team, led by Cascade Consulting, were commissioned by Defra to undertake an independent review of the catchment pilots to identify and share transferrable lessons regarding how best to develop effective, partnership-based approaches required for wider adoption from 2013. This seminar sets out the process for the evaluation and presents the key findings and recommendations for implementation.

This research has involved working closely with pilot hosts and participants from a wide range of stakeholders - including Water Companies, Rivers Trusts, Groundworks, Local Authorities, Wildlife Trusts and members of the public. The evaluation assessed a range of activities over the pilot phase, to determine what worked best and assess barriers to delivery in different socio-geographical contexts (e.g. urban / rural, different levels of historical stakeholder collaboration). Many of the pilots are tackling hydromorphological pressures, with several exploring wider integration with flood risk management and other initiatives that may benefit or enable delivery of river restoration measures e.g. green infrastructure and urban regeneration, local enterprise partnerships and payments for ecosystem services. Feedback was also gathered through discussion at a series of regional and national learning events, designed to encourage knowledge sharing between pilots and to tackle issues experienced by pilot hosts.

Outputs of the evaluation will include a "how to" guide for catchment management (April 2013) which will translate the learning coming out of the pilot phase into useful guidance and reference materials for others looking to set up and run catchment-based initiatives, and a knowledge exchange hub (http://ccmhub.net/) which provides a discussion forum and signposting to a wide range of case studies and supporting guidance.

The key messages emerging from this evaluation suggest that pilots are already realising significant benefits as a result of collaboration at the catchment scale, including better engagement with and commitment from stakeholders from different backgrounds, enhanced understanding of the catchments themselves, improved access to data held by different groups and more efficient use of resources to begin delivering improvements on the ground.

Keywords: Catchment; approach; defra; WFD; pilot; evaluation; learning; engagement; stakeholder; benefit

PONTBREN PROJECT- A FARMER LED APPROACH TO CATCHEMENT RESTORATION

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Abstract

The Pontbren Project takes its name from the stream which drains a small headwater catchment of the River Severn. In 1997 a group of neighbouring farmers came together to make their farms businesses more sustainable. Key to the success has been the farmers - collaborating as a group, cooperating with the scientists, but each remaining in control of the management decisions on their own land.

Planting shelter belts, restoring hedgerows and creating ponds has had a dramatic and sometimes unexpected impact on water quality, runoff, stream morphology and biodiversity. Over the past 15 years Pontbren has been the focus of detailed research on the environmental benefits of farm woodland. This research, and the stories of the farmers, has been written up in a report for the Woodland Trust and Coed Cymru in order to capture the lessons from this long running and well studied project.

Key messages are;

- Broadleaved woodlands and shelterbelts can make the management of upland farms more efficient, and better places to live and work.

- Woodland and hedgerows on improved upland grassland can have wider hydrological and environmental benefits than was previously understood.

- Field based experiments and observations are critical to understanding complex hydrological and biological processes and calibratinge computer models

- Conventional agri-environment and woodland grant schemes lack sufficient flexibility to support targeted, site-specific, collaborative environmental initiatives

- Farmer-led groups need access to the services of skilled facilitators and technical advisers who understand the objectives of the farm business on the one hand, and environmental needs and opportunities on the other.

Keywords: Water quality; runoff; upland; farmer collaboration; woodland, hedgrows

FARMING FOR FOOD AND CLEANER RIVERS: THE CATCHMENT SENSITIVE FARMING APPROACH AND OUTCOMES - 6 YEARS ON

J.M. GRISCHEFF[1] & P. SMITH[2]

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Abstract

In late 2006 Catchment Sensitive Farming (CSF) was launched to help farmers tackle Diffuse Water Pollution from Agriculture (DWPA) in 40 (now over 74) priority catchments across England using training and incentives on a voluntary basis. Once a priority catchment has been identified through the Water Framework Directive planning process it then becomes the job of a local Catchment Sensitive Farming Officer (CSFO) and their steering group to target sub-catchments and finally a list of farmers in a sector/ geography who are (on balance) those most likely to influence the water quality issues.

The local steering group, led by the CSFO, then develop a campaign, whereby farmers are encouraged to take up the range of DWPA mitigation measures relevant to their individual farm and the pollutant(s) to be minimised. The measures are largely derived from the DWP mitigation inventory (Newell Price 2011). The locally relevant delivery campaign needs to balance between the relevance of the measures implemented for water quality and the likely popularity of the measures on offer to farmers and their businesses. At all stages of engagement the DWPA measures recommended become more tailored and specific to the catchment and farmer needs. One of the more specific training products available to CSF farmers is a Water Management Plan, where specialist engineers will consider all water moving on a farm, where it goes, how pollution might travel and suggest sustainable drainage measures to mitigate the issue without compromising productivity. Environmental Stewardship and the CSF Capital Grant Scheme have been important tools for the CSFO to encourage implementation.

Over 11,000 farm holdings (1.7M Ha) receiving advice by July 2012. This represents a range of uptake from over 75% in more established catchments to 10% in new catchments (by area) within target areas. Over 50% of the 125,000 individual recommendations to mitigate water pollution have been implemented. It is the implementation of DWPA mitigation measures that is modelled within a Catchment Change Matrix to measure environmental benefits. Enhanced water quality monitoring (undertaken across 9 representative catchments) has demonstrated reductions in pollutant loads and concentrations resulting from CSF and effectively tests the above model. Although evident across all pollutants, reductions are particularly clear for pesticides because they are predominantly of agricultural origin.

Keywords: Diffuse water pollution from agriculture; Water Framework Directive; local; DWPA mitigating measures; drainage; environmental stewardship; monitoring; reductions

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SITE VISIT INFORMATION: SITE 1A

CHANNEL IMPROVEMENTS TO THE RIVER NENE, DUSTON MILL, NORTHAMPTON

(WEDNESDAY 1ST MAY 2013)

The River Nene is part of the Nene Valley Nature Improvement Area. We will visit a short section of the river that has been suffering from low discharges, to some extent due to partial diversion to a flood relief channel and also because of abstraction to a reservoir. As a consequence, the channel's cross-section is too large for the "normal" flows exhibited, a situation that is worsened by two weirs that make the river "pond back". All these factors contribute to siltation on the riverbed and deterioration in ecological quality.

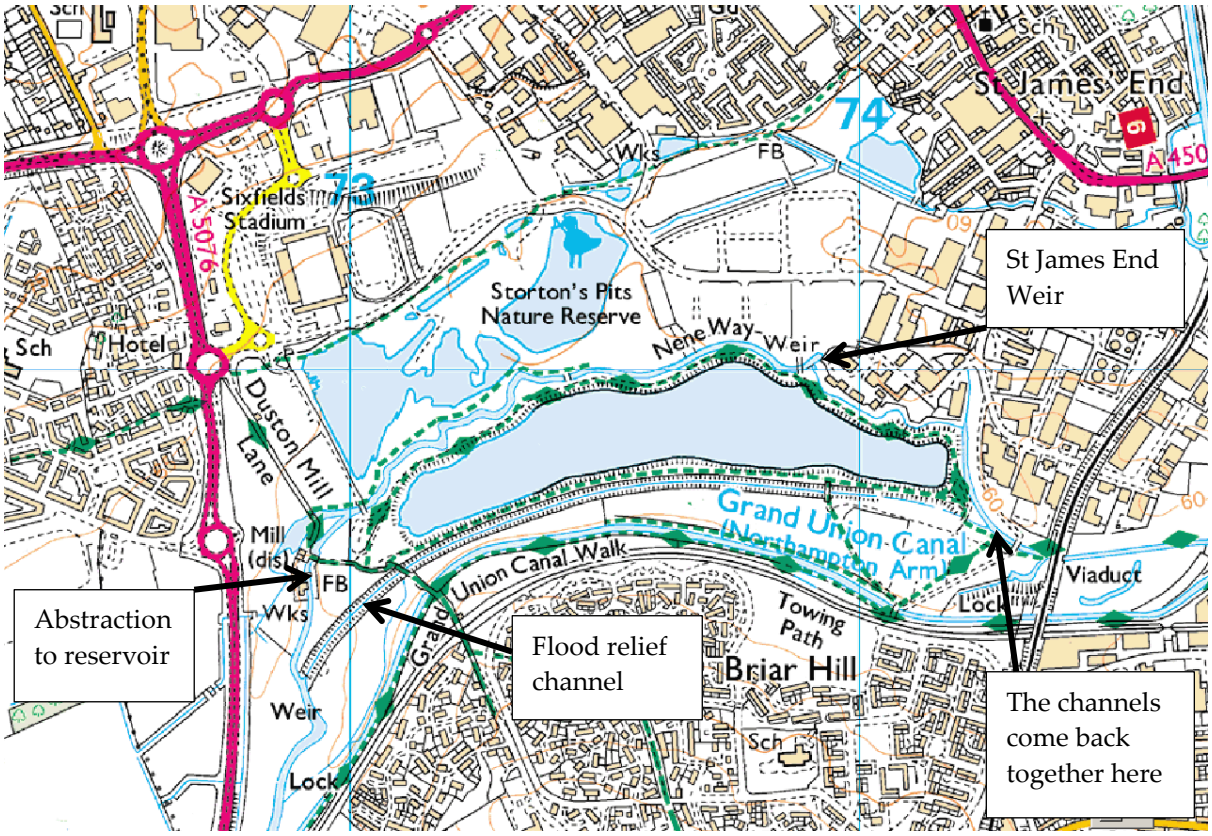


Figure 1: Duston Mill site map (Map copyright of Ordnance Survey)

One weir cannot be removed as it provides the head for water abstraction, but there is a proposal to either remove, lower, bypass or put a notch in the downstream weir, at St James End. This will bring about a faster flowing habitat to the 1.2km of river immediately upstream of the weir. It is estimated that approximately 2000m^3 of silt lies on the riverbed in that stretch. This silt will have to be managed in some way before any works take place on the weir: the silt could be mechanically removed and either taken to a tip as waste or, once water levels in the river have been lowered, be used to create habitat features within the channel. Alternatively, however, the silt could be left alone and simply allowed to be transported downstream through normal river processes. As the weir currently impounds a large volume of water, any works to reduce or remove its impact will have an additional benefit to flood risk, as channel conveyance and capacity will be increased.

If St James End Weir cannot be removed or lowered, an alternative option for habitat improvement will be adopted. The impounded channel will be narrowed by between a third and a half, by excavating much of the right bank down to just above the water level and placing the spoil into the river. Hazel spiling with a geotextile lining will be used to retain the spoil and, as the features will lie just below the water level, they will form wetland berms, therefore further diversifying the habitats on site. On occasion, the berms will lie in sequence on alternate sides of the river, adding sinuosity to the channel. The underwater berms will not reduce channel capacity as the spaces they will occupy are where the water is currently effectively static. However, the excavated banks will increase flood storage and protection for the urban areas downstream.

Figure 2: St James End Weir on the River Nene

Unusually, even during "normal" flows the flood relief channel takes more water than the main river. Whichever of the above improvement options is taken, it is also hoped that the weir that controls the apportionment of flows will be altered to allow more to remain in the river, although that could have implications for the effectiveness of a third (normally dry) channel that takes flood flows to a retention lake.

Participants will have the opportunity to give their views and opinions on the enhancement options to remove the weir to reinstate normal river processes or to narrow the watercourse and introduce more morphological diversity.

SITE VISIT INFORMATION: SITE 1B

SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

UPTON MEADOWS

(WEDNESDAY 1ST MAY 2013)

Phase I of Upton Sustainable Urban Extension commenced 2003 and when completed it will contain over 1,600 homes, a primary school and an area for new business along the A4500 (Figure 1). Upton Meadows was one of the first developments in the UK to masterplan an integrated 'roof to river' surface water management strategy. A variety of measures were installed including green roofs, porous paving, rainwater harvesting, swales and a series of retention ponds. Dr Janet Jackson at the University of Northampton has been monitoring and collaboratively researching the development since 2003. Both Undergraduate and Postgraduate students use the site for their projects and dissertation. Current research projects include:

- biodiversity values, ecosystem health and ecosystem services of SUDS
- SUDS performance - sediment transport - heavy metals
- SUDS Management
- Bio/phytoremediation and entrapment/phytofiltration
- Community Health and Well Being
- Community education and enterprise

Partners include: Homes and Communities Agency, The Prince's Foundation for Building Communities, Halcrow, Aviva Insurance, Sustainable Construction INet, Universities of Nottingham, Loughborough and Leicester, Zedfactory, Microdrainage and Pell Frischmann.

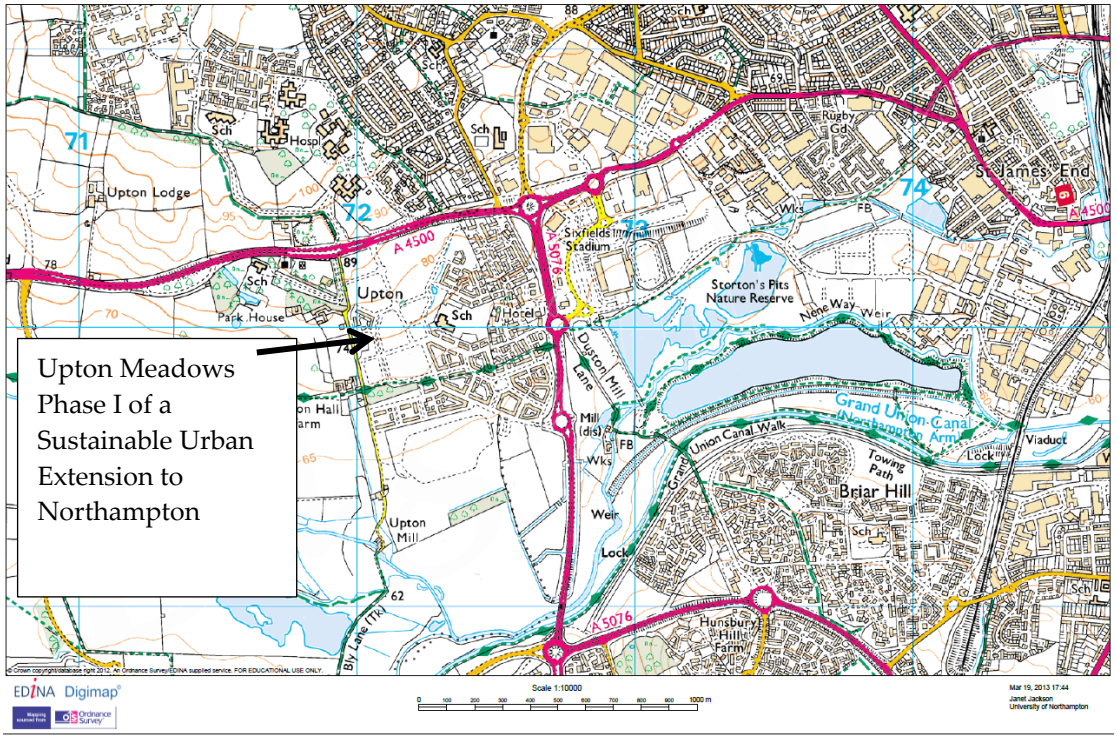
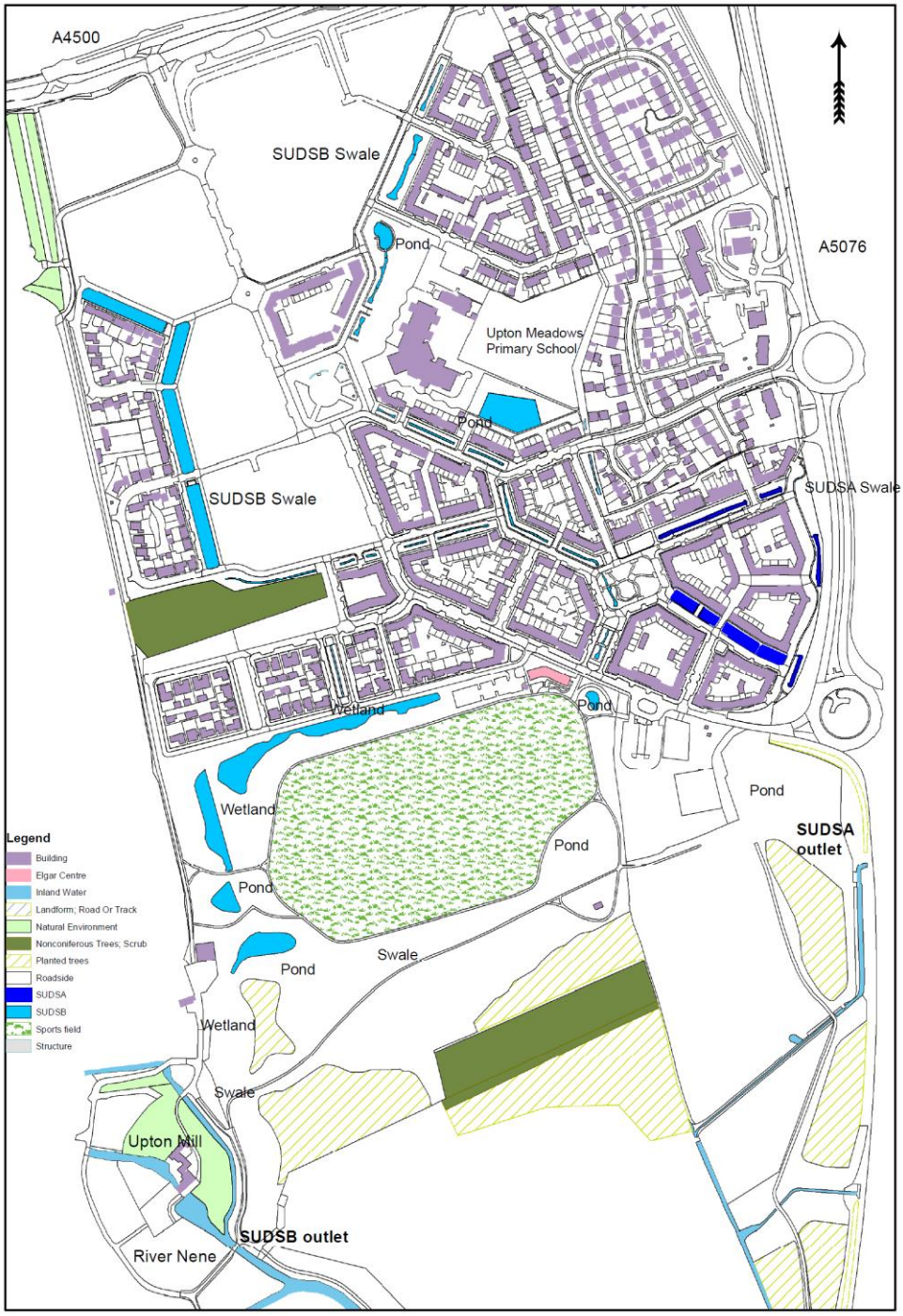


Figure 1: Upton Meadows site map (Crown Copyright Ordnance Survey; supplied by Edina 2013)

The development contains two hydrological catchment units. SUDSA drains to the River Nene towards the south-east of the site and SUDSB drains down toward Upton Mill to the south of the site (Figure 2).



Research thus far has revealed a biodiversity gain through development on this ex-arable site.

Man-made SUDS have been colonised naturally and rapidly. The ecology of SUDS is dynamic and natural succession does occur.

From a recent survey in December 2012 we found that 89% residents felt that SUDS added value; improved their Quality of Life and made the development a healthier place to be. 91% used the green space regularly with 57% using it every day or every week.

During the tour we will have opportunities to discuss and debate the use new urban habitats to control of surface water run off, pollutants and urban sediment.

For further information please contact:
Dr. Janet Jackson
University of Northampton
School of Science and Technology
Newton
Northampton, NN2 6DJ

Email:
janet.jackson@northampton.ac.uk

Figure 2: Map of the Upton Meadow SUDS schemes A & B

NOTES…

SITE VISIT INFORMATION: SITE 2

RIVER BURE DIVERSION

BICESTER TOWN CENTRE

(WEDNESDAY 1ST MAY 2013)

The River Bure, or Bure Brook as it is otherwise known, is classified as an Environment Agency Main River and flows through Bicester town centre. In the 1970s the river was diverted and canalised at this location as part of the Manorsfield Road construction. In 2004 Cherwell District Council formed a partnership with Stockdale Land and Sainsbury's to regenerate a 3.9 hectare car park site in the centre of Bicester. In order to enable this development at Bure Place, it was originally proposed to culvert a concrete section of the main river. However, concerns were raised that this would increase flood risk and the maintenance requirements at the site, as well as inhibit biodiversity. As such the development partnership sought a solution which allowed them to maximise the land available for development whilst offering flood risk benefits and significant environmental improvements.

The decision was taken to realign a section of the river as illustrated in Figure 1.

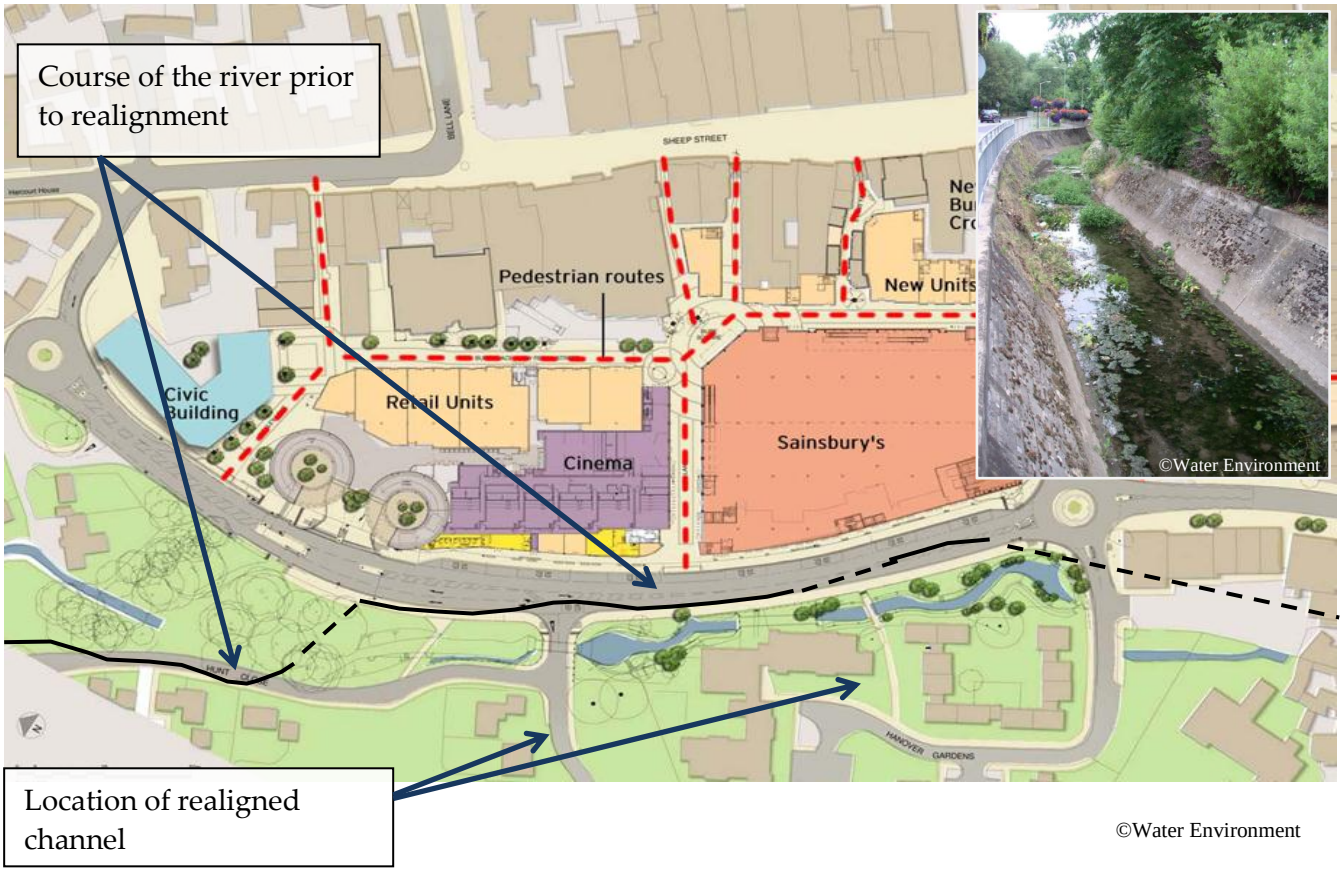


Figure 1: Outline of the proposed development at Bure Place, including location of the realigned channel. Inset: Pre works, canalised channel.

Following the initial concept of the diversion, two years were spent planning and developing the scheme and undertaking feasibility investigations. A Flood Risk Assessment (FRA) was carried out, including a ground investigation and hydraulic analysis. A hydraulic model was created to test the impact of the proposals and the new channel alignment was designed based on the outcome of this modelling. The channel design aimed to create a pseudo-natural environment, creating new habitats whilst working within the tight physical constraints of the site area. Following consent, the designs were developed further and construction started in 2010. The project was completed in April 2011.

Figure 2: The channel diversion during construction (top) and 2 years on.

Key features of the channel design will be discussed during this visit including; the combination of reinforced banks used, the removal and creation of outfalls, the diversion and construction of the new channel and culverts and the creation of in-channel features to create new habitat and varied flow regimes.

NOTES…

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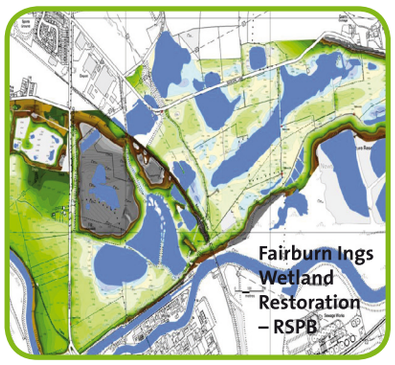
Orford Ness Water Level Management Plan – National Trust


Fairburn Ings Wetland Restoration – RSPB


Rymes Reedbed Wetland Restoration – Wildlife Trust for BCNP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SESSION 7:

MAKING THE MOST OF EUROPEAN FUNDS

BROOKLANDS SUITE

Integrated management of river catchments – the 'TRAP' project

ROB COLLINS *et al.*
Head of Policy – The Rivers Trust

European River Corridor Improvement Plans (ERCIP)

CLAIRE GRAY[1], TABITHA LYTHE, [2], DAVE WEBB[3] & TOM WILD[4]
[1]*Senior Planning Policy Officer – London Borough of Lewisham*
[2]*Development Management Planning Officer – London Borough of Lewisham*
[3]*Biodiversity Technical Specialist – Environment Agency*
[4]*Director – South Yorkshire Forest Partnership*

Sharing best practice across Europe and the European Riverprize

ALASDAIR DRIVER[1] & MARTIN JANES[2]
[1]*National Conservation Manager – Environment Agency*
[2]*Managing Director - RRC*

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INTEGRATED MANAGEMENT OF RIVER CATCHMENTS – THE 'TRAP' PROJECT

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Abstract

The Rivers Trust, together with nine partners from Finland, Latvia, Ireland, Netherlands, Slovenia, Greece and Romania, is involved in a 3-year project funded under the INTERREG IVC programme. TRAP – Territories of Rivers Action Plans – deals with the challenge of integrated management of rivers and their territories (or catchments). It aims to develop regional policies and tools that not only promote sustainable economic growth but also ensure protection of our freshwaters, thereby supporting the aims of the Water Framework Directive. The project also encompasses the European Landscape Convention, addressing the protection of our landscapes including their natural and cultural heritage. TRAP is, therefore, a cross-cutting and ambitious project and one that attempts to address the real-world challenges that arise between economic growth and environmental protection.

Each TRAP partner has identified various 'good practices' across these policy areas with the aim of exporting them elsewhere to improve regional policies and tools. A number of the good practices focus upon catchment restoration and management often with multiple benefits arising. In the Netherlands, for example, Waterboard Noorderzijlvest has engaged in negotiations within a 'land use development board' whereby they, together with the regional and national Government, have provided funds to support farmers to cease agricultural activity on poor quality unproductive land. The adoption of an ecosystem services approach has fulfilled multiple goals, with the subsequent return to nature of the land, leading to an enhancement of biodiversity and of its recreational value. In addition, downstream flood risk has decreased as water is now retained and slowed within the catchment, rather than the rapid runoff characteristic of the former agricultural land. In the UK, the Westcountry Rivers Trust has been involved in the development of a market-based catchment restoration scheme, which aims to identify both delivery and funding mechanisms to lever private investment for multi-functional wetland restoration across whole river catchments. Aside from these examples, TRAP partners are addressing a range of other issues ranging from river restoration in Ireland, to sewage from unconnected dwellings in Latvia, and to the establishment of a methodology for determining ecological flows in Slovenia.

Collectively, the practices identified within the TRAP project are helping to identify optimum outcomes and trade-offs where conflicts arise in the catchment, for example, between a particular economic activity and water protection.

Keywords: TRAP project; catchment management; ecosystem services; Water Framework Directive; aquatic biodiversity; water management

EUROPEAN RIVER CORRIDOR IMRPROVEMENT PLANS

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[3] Biodiversity Technical Specialist – Environment Agency, Goldcrest House, Alice Holt Lodge, Farnham, Surrey, GU10 4LH, david.webb@environment-agency.gov.uk

[4] Director – South Yorkshire Forest Partnership, 5th Floor Howden House, 1 Union Street, Sheffield S1 2SH

Abstract

The presentation will provide an overview of the European River Corridor Improvement Plans project (ERCIP) - a transferable model of effective joint agency river management. ERCIP is part funded by the EU European Regional Development fund through INTERREG IVC and involves partners from England, Germany, Greece, Italy and Romania.

The objective of the ERCIP project is to promote the exchange and improvement of current experience regarding jointly produced River Corridor Improvement Plans (RCIP). This will be achieved by improving the integration between regional environment agencies, water boards and local government authorities when carrying out river corridor management processes related to the protection of, and future development along, sensitive river corridors.

The presentation provides best practice examples on how to manage a range of activities along river corridors in urban, semi-urban and rural settings and covers the following matters.

1. How to establish, manage and maintain a co-ordinated approach, and develop formal processes between the relevant authorities in order to work together on strategic issues.

2. How to identify and agree short, medium and long term priorities by developing environmental risk prevention and planning guidance that is jointly owned and implemented.

This approach allows three levels of embedded policy results;
- A commitment to joint working
- Preparation of, or improvement to, a local RCIP and
- Adoption or publication of a RCIP.

The presentation will show how to address issues arising from the EU Water Framework Directive and Floods Directive and how local communities can be encouraged and motivated to actively participate in the processes involved in enjoying, owning and maintaining river corridors to deliver maximum environmental, social and economic outcomes.

Keywords: River corridor; transferrable model; partnership working; land management; catchment; co-ordination; Water Framework Directive

SHARING BEST PRACTICE ACROSS EUROPE AND THE EUROPEAN RIVERPRIZE

A. DRIVER[1] & M. JANES[2]

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[2] *Managing Director – River Restoration Centre, Building 53, Cranfield University, Cranfield, Bedfordshire, MK 43 0AL*

Abstract

Restoring Europe's rivers through the sharing of best practice has been the key aim of the RESTORE project, the core work of which will be completed by the end of 2013. This presentation will provide an update on some of the key findings from the project and outline the new resources available. The presentation will include an outline of the 'Rivers by Design' handbook developed specifically to help planners, architects and developers appreciate the crucial role that they can play in river restoration success together with details about the distribution of river restoration projects that have been uploaded across Europe on to the RESTORE wiki.

The final opportunity to engage with river restoration specialists across Europe through RESTORE will be during the joint RESTORE and ECRR conference to be held in Vienna on 11th-13th September 2013.

The inaugural European Riverprize will be presented during this event. This prestigious award will be given to organisations engaged in the sustainable management of waterways in Europe, in recognition of their integrated approach to catchment management, long-term vision and demonstrated outstanding achievements in river restoration and protection. The expected value of the European Riverprize is 100,000 Euro and the winner will automatically qualify for the International Riverprize which has been awarded in Australia since 1999. Although it is now too late for new applications for this year's prize, RRC conference delegates and their contacts are encouraged to consider applying in the future, as this will be an annual award.

Keywords: RESTORE; Rivers by Design; European Riverprize; European River Restoration Conference

NOTES…

POSTER PRESENTATIONS

LOUNGE

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1 **It's All About the Gravel**

ALASDAIR MAXWELL
WFD project Manager – Environment Agency

2 **Bypass Channels on the River Thames**

DARRYL CLIFTON-DEY[1] & LIZZIE RHYMES[2]
[1]*Environment Agency*
[2]*Projects Officer (Fisheries & Biodiversity) – Environment Agency*

3 **Fobney Island Wetland Creation and River Restoration Project**

GRAHAM SCHOLEY[1] & LIZZIE RHYMES[2]
[1]*Conservation Technical Specialist – Environment Agency*
[2]*Projects Officer (Fisheries & Biodiversity) – Environment Agency*

4 **Hydromorphological Appraisal of the Use of Large Woody Debris in the Restoration of the River Lathkill, Derbyshire**

JOHN COWX[1] & IAN DREW[2]
[1]*Caulmert*
[2]*Senior Lecturer – Manchester Metropolitan University*

5 **River Ingrebourne Enhancement**

JANE HORNSBY *et al.*
Business Development Manager – Land and Water Services Ltd

6 **Classification of Secondary Channels on the River Nene**

KATY KEMBLE
Graduate Geomorphologist – Jacobs

7 **Cinderella Scores a Hat-Trick! Winterbourne Restoration Projects**

SARAH WILLIAMS[1] & SARAH GUEST[2]
[1]*Dorset Wild Rivers Coordinator – Dorset Wildlife Trust*
[2] *Biodiversity Officer – Environment Agency*

8 **Detecting Streamflow Response to Land Management Change at Holnicote**

GENE HAMMOND[1] & CARL ISHEMO[2] & STEVE ROSE[3]
[1]*Principal GIS Consultant – Penny Anderson Associates*
[2]*Penny Anderson Associates*
[3]*Technical Director (Land Management) – JBA Consulting*

9

Understand Your River – An On-Line River Categorisation Tool

SEBASTIAN BENTLEY[1] & GEORGE HERITAGE[2]
[1]Senior Hydromorphologist – JBA Consulting
[2]Head of Hydromorphology – JBA Consulting

10

The Morphological Response of the River Ribble to Naturalisation: Data from the 2011 Restoration Works

NEIL ENTWISTLE[1] & GEORGE HERITAGE[2]
[2]Lecturer – University of Salford
[2]Head of Hydromorphology – JBA Consulting

11

Extraneous Clean Water and "lost" urban streams

ADAM BROADHEAD[1] & RACHEL HORN[2] & DAVID LERNER[3]
[1]PhD Student – The University of Sheffield
[2] Senior University Teacher – The University of Sheffield

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Connectivity at Barriers: A Case study for technical fish pass solutions, Norfolk. Wissey Siphon Fish Pass

ZEBRINA HANLEY
Marketing Manager – Aquatic Control Engineering Ltd

Restoration of the Mayes brook in Mayesbrook Park, London

NICK ELBOURNE
the River Restoration Centre

River Restoration Centre Activities 2012/2013

LAURA MUÑOZ-PUELLES *et al.*
the River Restoration Centre

The Catchment Restoration Fund

VICKY WEST *et al.*
the River Restoration Centre

Replacing Gauging Weirs to Improve Ecology

ULRIKA ÅBERG *et al.*
the River Restoration Centre

RRC Manual of River Restoration Techniques

ANNA GEE *et al.*
the River Restoration Centre

RESTORE Successes So Far

RESTORE PARTNERSHIP
Environment Agency (England), Wetlands International, SYKE (FI), Dienst Landelijk Gebied (NL), RRC (UK), CIRF (IT)

Environment Agency
Wessex Area – Alasdair Maxwell
River Frome Rehabilitation Plan

"It's All About The Gravel"

Martins River Island, River Frome Dorset 2012

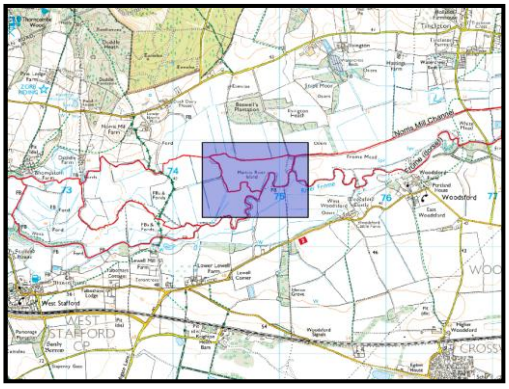

'Degraded Reach'


'Embankment Removal'


'Gravel Extraction'


'Borrow Pit'

Environment Agency Cost: £90,000
River Length: 0.8 kilometres



Sourcing gravel to maximise river and floodplain enhancements while minimising environmental and financial costs:

The Martins River Island enhancement is part of the River Frome Rehabilitation Plan; aiming to bring the River Frome Site of Special Scientific Interest (SSSI) into favourable condition and working towards Good Ecological Status under the Water Framework Directive (WFD). The reach had been significantly degraded during land drainage activities in the 1970's such as river dredging. These works removed significant quantities of river gravels affecting the salmonid spawning potential and created an over deep slow flowing canalised channel. The dredged material was predominantly placed on the north bank creating a raised embankment. These works reduced field flooding and improved land drainage allowing agricultural intensification through arable production.

A change in landownership, an uptake of Natural England's Higher Level Stewardship (HLS) scheme and a return to livestock grazing has enabled the concept ideas within the rehabilitation plan to be delivered as part of this project. To improve this reach it was estimated that several thousand tonnes of gravel would be required to create the bed profiles and in channel features desired. The high cost of importing these gravels, fuel use and local traffic impact led to a novel approach being taken: to 'win' the gravels from existing seams below field level by digging a borrow pit adjacent to the river.

The gravels extracted proved to be pure and required only one screening in preparation for being placed in the river. The embankments on the north bank were removed with all the material being placed in the borrow pit. This resulted in zero waste being taken off site and allowed river and floodplain connection. The size of borrow pit and amount of material infilled meant a shallow scrape was created. This will become wet during high river flows potentially creating suitable habitat for wintering and wading birds.

Project Aims and Objectives:

- Remove raised embankments – improve river and floodplain connection
- Reintroduce river gravels – increase spawning habitat and return to a more 'natural' bed gradient
- Improve flow variation and increase river bed morphological diversity
- Create new and improve existing wetland habitats and increase Large Woody Debris (LWD) presence
- Zero waste from site and minimise carbon cost and impact locally during construction (approximately 150 lorry loads avoided)

Project Outcomes:	Further Work Required:
• 400 metres embankment removed	• Large Woody Debris locations proposed throughout reach
• 2500-3000 tonnes gravel added to the river	• New gravel bed profiles to be fine tuned (if required)
• 250 metres bed raised (0.5 – 1.5m's deep)	• Reseeding field with wetland species / grass mix
• 4 new riffles and deep pools	• Riparian tree planting (providing shade, cover and habitat)
• Pond / scrape created (2500m2)	• Localised scour protection (if required)


'Adding Gravel'


'Riffle Creation'


'Bed Raising'


'Floodplain Reconnection'

Hydromorphological Appraisal of the Use of Large Woody Debris in the Restoration of the River Lathkill, Derbyshire

John M. E. Cowx [1] & Ian B. Drew [2]

[1] Now with Caulmert [2] Manchester Metropolitan University

1. INTRODUCTION

Natural In-stream large woody debris (LWD) was once viewed as problem inhibiting the passage of water and commonly removed. Now the benefits of LWD to river health are well documented (Gurnell et al, 2005; Diez et al., 2001; and Chen et al., 2008) to the extent that LWD is purposely placed in channels as a river restoration measure (figure 1). LWD contributes to channel hydraulic, morphological and biological diversity. This study presents an in depth survey of the hydromorphological impact of introduced LWD.

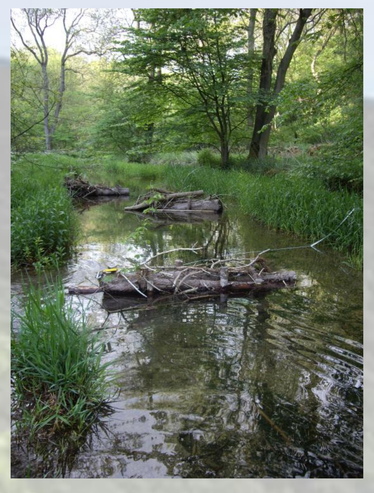


Figure 1. In-stream engineered LWD in the River Lathkill .

Hydromorphological objectives of LWD installation are typically to:
(1) Promote scour and deposition to create variations in channel depth (e.g. pool and riffle habitats)
(2) Divert flows across channel to promote plain form change
(3) Promote bar formation through induced sediment deposition
(4) Increase in-stream cover and refugia (Fischenich and Morrow, 1999)

2. LOCATION

Lathkill Dale, located in the Peak District National Park, is managed by Natural England as part of the Derbyshire Dales National Nature Reserve. The position of the study reach is shown by the red box on figure 2.

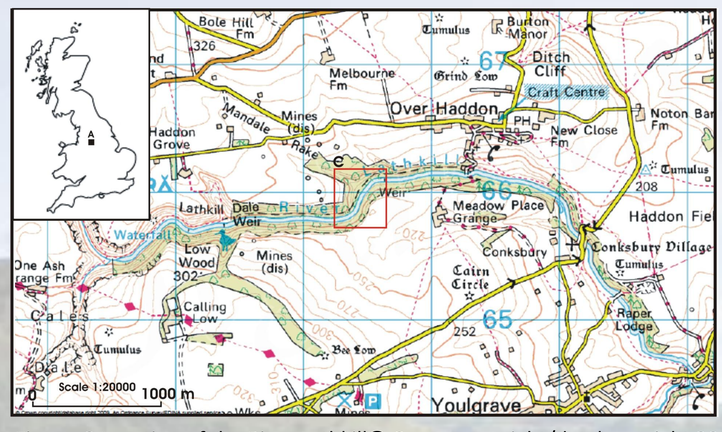


Figure 2 Location of the River Lathkill© Crown copyright/database right 2012. Ordnance Survey/EDINA supplied service.

3. LATHKILL HISTORY & RESTORATION

Hydromorphology in the Lathkill has a history of modification by human intervention. 18th and 19th century lead mining was associated with channelisation and the excavation of drainage soughs. The latter, combined with the permeable limestone geology has caused surface flow to dry up in summer months. This seasonal characteristic, illustrated by Figure 3c, actually allowed more detailed mapping and sampling of bed materials for this investigation, making this an excellent opportunity to evaluate LWD.

The river was also further modified in the Victorian era when it was straightened, clay lined and controlled by weirs in order to establish good conditions for trout fishing.

The relatively basic hydromorphology of the modified river channel with uniform flow and bed sedimentology (fig 3a) was cited as the core reason for Natural England's recent restoration (Pers. Comm. Phil Bowler 2010). Restoration began in 2003 when a new narrower channel was dug. The 5 LWD structures of various design, stabilised with timber stakes and wire, were subsequently installed in 2008 (figure 3b & c)

Figure 3 LWD in the River Lathkill
a (Left) Channel reach before installation of LWD (2003) Photo courtesy of Philip Bowler (Natural England)
B (Middle) - LWD at time of flow conditions (spring 2010)
C (Right)- LWD and dry river bed (summer 2010)

4. Research Project The effectiveness of in-stream structures used in restoration have been questioned (Palmer et al., 2009 and Miller et al., 2010) and there is consequently an incentive for conducting post-project evaluation research into the success of river restoration projects which utilise LWD. The aim of this research was to evaluate the success of LWD in creating a hydromorphologically diverse river channel with a view to identifying its potential impact on the ecology of the stream. To identify the hydromorpholoical characteristics of the river, a programme of detailed field mapping was undertaken.

During spring 2010 a flow meter was used to record velocity in the direction of flow at up to 14 points across 41 cross-sections in the 30m reach. Readings were all taken at a height above the bed equivalent to 0.6 of the water depth.

After the river ceased flowing in summer 2010 the river bed elevation was determined along the 14 cross sections to produce a topographic map of the river bed and bed material around the woody debris was mapped. In total 30 bed units were identified and samples taken from each, for dry sieving sediment size analysis. Unfortunately plans to undertake further study during winter 2011 were not possible due to a delay in flow becoming re-established.

Figure 4. Flow patterns measured around LWD

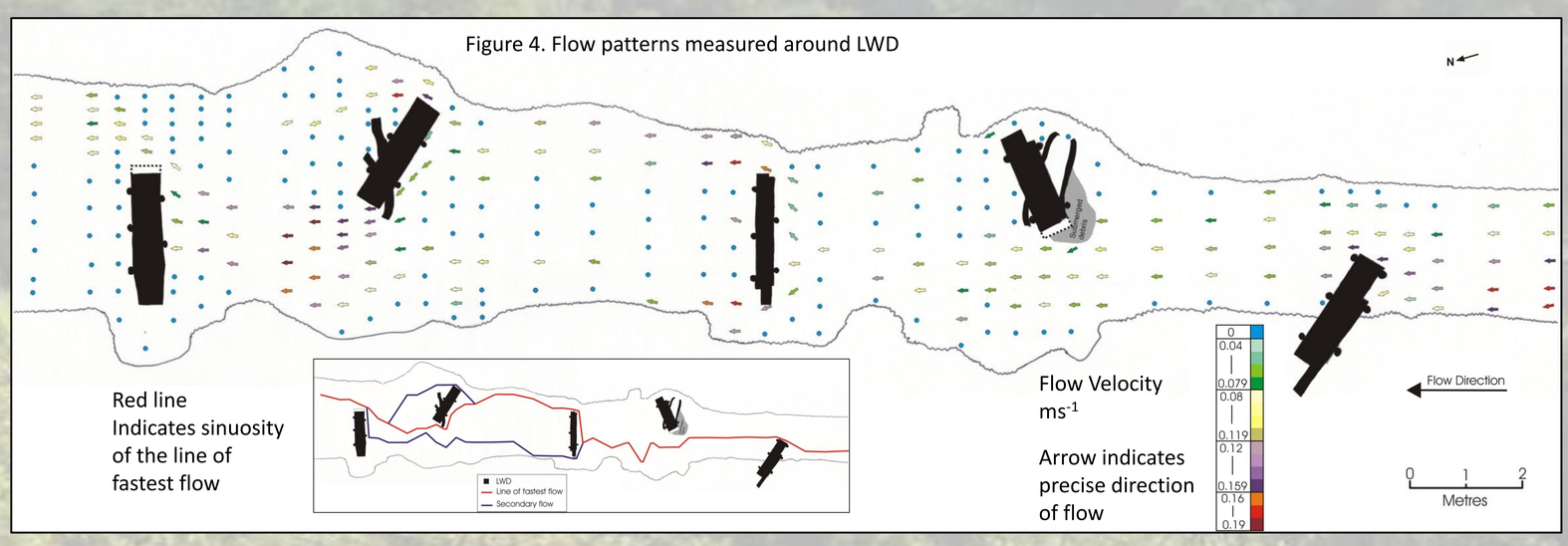


Figure 4 confirms that the LWD structures are having an impact on flow patterns and shows precisely how direction and magnitude are modified. At the entrance to the reach the channel plan form and flow is relatively uniform in direction but with the line of fastest flow towards the left hand bank. Subsequently the first LWD structure seems to have a minor influence in deflecting flow, while further downstream the effects are more marked demonstrating how the course of the thalweg can be manipulated. This will consequently influence the plan form of the channel which has been made less uniform in the LWD reach with bank erosion has occurring where water flow velocity is increased and deflected towards the channel side. Flow has also forced its way round stream side structures resulting in additional areas of bank erosion – only the first side structure built well into the bank has avoided this. Flow is generally slowed down behind the LWD where in some case areas of still water have been created.

Figures 5 and 6 identify areas of deeper channel which indicates scouring is taking place, particularly beside channel side LWD structures and in front of the mid channel structure and generally reflecting the new line of fastest flow (as indicated in figure 4). In future the scour could result in undercutting of the structures which could produce greater uncertainty in regards to the nature of longer term channel changes. Bed elevation is generally higher downstream of the structures as a consequence of the lower flow velocities.

The patterns of bed topography seem to increase in asymmetry when associated with LWD set at an angle to the flow rather than perpendicular to it – the middle structure showing the most symmetrical pattern.

Figure 6 Two photos taken summer 2010 showing evidence of scouring either side of the fifth LWD structure in the reach.

Figure 5. Bed topography (figures indicate depth below the water surface)

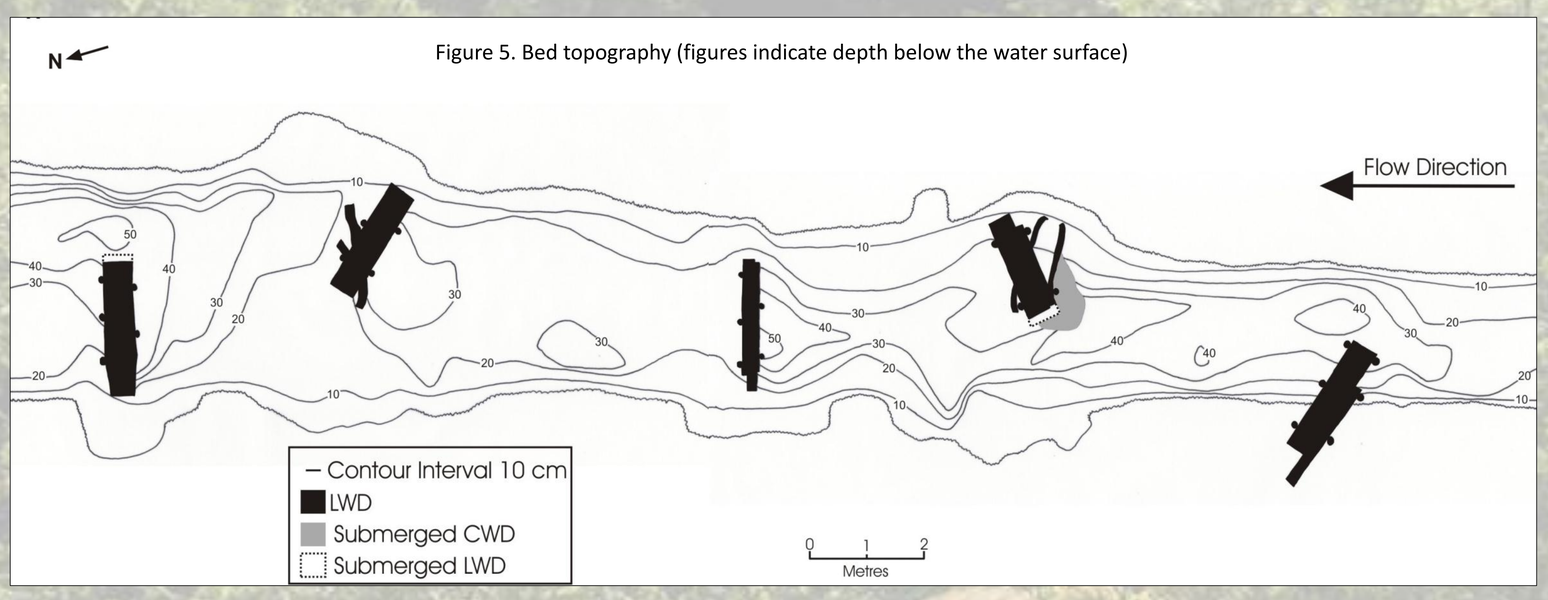
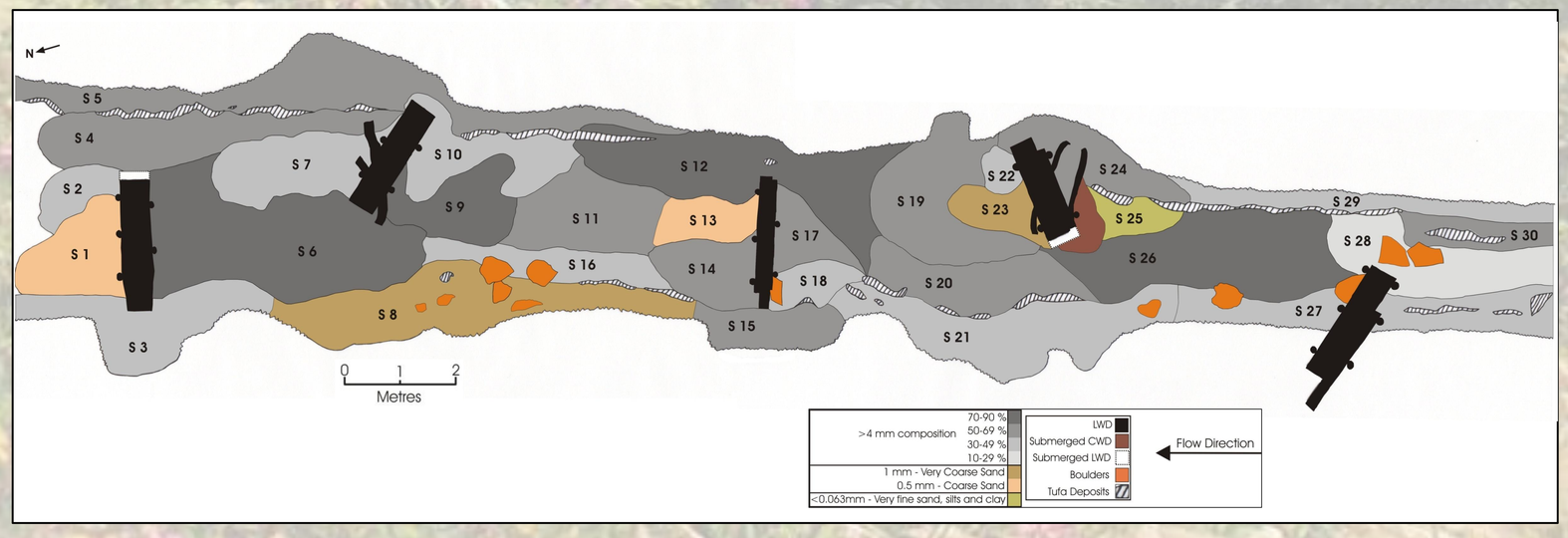


Figure 7 suggests that the bed material size distribution reflects the increased complexity of flow once the LWD reach is entered. Before the first structure the pattern of bed material distribution is more uniform. Once the reach is entered finer sediments are generally located downstream of LWD structures which also correspond with shallower areas of river channel in figure 5 and areas of low/no flow in figure 4. Bed units over 4 mm in composition share general patterns being generally located in the areas of fastest velocity seen in figure 4 associated with deeper sections of the river.

Samples 25 and 28 contained high levels of clay in the scour zones around the faster flows shown in Figure 4, these could represent the Victorian channel lining efforts and therefore responsible for its anomalous position.

The tufa deposits are calcareous deposits which can bind material which has been in place for a long period, their position could indicate incision of the channel into a older bed.



5. Summary The three maps figures 4, 5 & 7 show interlinking trends between depth, bed composition and flow speed around the LWD. The introduction of LWD in the River Lathkill has created a more hydraulically diverse and geomorphologically complex river channel.

The success of the restoration is complicated by the unique conditions in the River Lathkill such as tufa formation and intermittent flow. Despite this, the results are favourable for the continued use of LWD as a cost effective strategy for prompted recovery in river restoration projects.

The study further illustrates the need for post project monitoring to be planned as an integral part of restoration projects. This study would have benefited from the chance to establish baseline conditions prior to establishment of the LWD rather than rely on the start of the reach to represent the unchanged state.

6. Implications for habitat It is hoped that the diversity in hydromorphic conditions will establish a suite of diverse habitats which benefit fish, invertebrates and plant species.

The largest potential ecological impact of the LWD is on fish populations in the river. According to Cowx (1998) criteria for successful restoration of fish habitats the newly created habitat in the Lathkill is extremely favourable for fish reproduction.

Another major potential ecological impact of the LWD installation is on Invertebrate communities. Stream invertebrates are well adapted to exploit changes in structural heterogeneity in habitats such as substrate, substrate roughness, current velocity and food availability (Gabriel et al., 2009).

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Acknowledgement: Many thanks to Phil Bowler (Natural England) for permission to undertake the study and background information.

River Ingrebourne Enhancement

Project Introduction:

During early 2011 a one Kilometer stretch of the River Ingrebourne was dredged removing spoil from the main river and depositing the soil on the banks. The dredging works removed some of the natural features of the river and deposited soil within the flood plain. The London Borough of Havering consulted with the Environment Agency and decided to remove the dredged material to a more suitable site, and improve the characteristics of the river over a 1.8 kilometer stretch both up and down stream of the original dredge site to improve habitat for the local water vole colony and other aquatic species.
The River Ingrebourne runs through the London Borough of Havering entering the borough in the north near to Maylands Golf course from Brentwood and meanders through the borough until it joins Rainham creek and then the tidal Thames. The river has a section just downstream of the project work site which is designated Site Special Scientific Interest (SSSI) status and the area to be improved is a designated local nature reserve.

Project Objectives:

1. To re-profile the banks to create a more natural river corridor to improve species habitat and to ensure the river drains better under flood conditions.
2. To remove any spoil away from the designated flood plain.
3. To further enhance species habitat by constructing berms in the channel over certain areas.
4. To construct groyne flow deflectors in some areas to improve summer flow and position silt strategically.
5. To protect the local water vole population while the work is being carried out.
6. To treat Japanese knotweed in accordance with current legislation and guidance.
7. To control Indian balsam found on the site .

River Ingrebourne corridor before the project began….

Excess material left on river margins

Choking to river channel

Choked margins

Project picture diary showing restoration elements

Lowered existing slumped bank material to summer water level

Steps constructed to ease and encourage community access for pond dipping

Berm created using faggots

Close up of structural elements

Groyne flow defectors constructed using chestnut stakes

Shelf created at summer water levels, underwater at high flows

Island created by creating shallow shelf (depth of shelf just visible). Reeds placed back in channel to encourage growth

Soft engineering erosion control using wooden stakes

Silt removed from old pond revitalizing it and encouraging lost diversity and extra flood capacity.

More island creation close to summer water level

Further backwater constructed off main river channel

Steps completed

Construction of new attenuation pond

Berm created for flood protection to public footpath

Images taken March 2013 showing how the river is adapting and benefitting from the project

Improved channel flow

Deflectors showing bed distribution

River edge showing new capacity available

Graded banks showing winter root growth

Again… improved flow

Backwater plant regeneration

Conclusion:

The project was very successful with the works being completed within timescale and budget **and** exceeding the expectation of the client.
Land and water Services Ltd carried out the contract under full CDM conditions, utilising its own specialist equipment conforming to the Water Framework Directive.

Close liaison with the assigned ecologist was required throughout the works, ensuring existing habitat was not disturbed.
The challenges on this project came mainly from its location within an urban environment and open community space. There were several vested parties namely : The London borough of Havering (Client), The Environment Agency, Essex Wildlife Trust and the local conservation society requiring in-depth liaison and attention to detail to deliver the scheme in an environmentally aware manner. With no waste streams leaving the site.

Construction Phase value: £59,000 Duration of the works 4.5 weeks

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A Classification of Secondary Channels on a Lowland River Based on Ecogeomorphology, and an Assessment of their Morphological Contribution Towards Reaching 'Good Ecological Potential' Status

By Katy Kemble MSc BSc Hons

Introduction

Despite their ecological and morphological functions are viewed as highly important, secondary channels have received very little study worldwide to date. This study attempted to gain an understanding of the morphological quality of these channels in comparison to their primary channel counterparts, as well as generating a classification to enhance the understanding of these channels and the controls on them.

Aims and Objectives

1. Assess the morphological quality of the secondary channels of the River Nene compared to the adjacent reach of the primary channel.
2. Create a classification for the secondary channels based on data collected and generate recommendations for potential future management.
3. Assess the contribution of the secondary channels towards the overall ecological value of the river, by virtue of the increased morphological diversity.

Objective (i): Generate a Habitat Quality Assessment (HQA) score and a Habitat Modification Score (HMS) for all reaches based on the River Habitat Survey guidelines.

Objective (ii): Generate a score based on the vegetation and their features in order to enhance the contribution of vegetation to the scoring system for the secondary channels

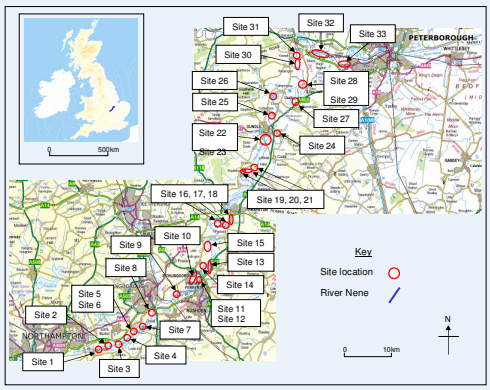


Figure 1: Location of the 33 study sites between Northampton and Peterborough.

Method

A geomorphological survey was used to assess both the secondary and primary channels for the 33 identified sites along the River Nene (Figure 1). The survey has been created for this study and is based on both the River Habitat Survey (RHS) and surveys suggested in the River Reconnaissance Handbook.

Literature Review

Background information

• Prior to anthropogenic intervention, evidence suggests that abundant areas of Europe were covered by large multi-channel rivers.

• The multi-channel river systems (braided or anabranching) had morphologically complex channels and extensive riparian woodlands (Figure 2).

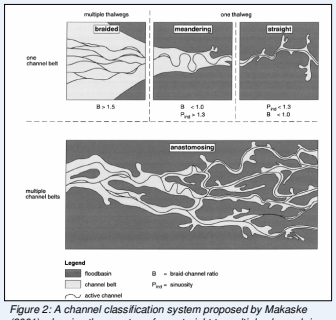


Figure 2: A channel classification system proposed by Makaske (2001), showing the spectrum from straight to multiple-channel rivers, depicted by the number of channel belts and thalwegs.

Secondary channels

• Play a key role in providing an alternative environment to that of the primary channels and in sustaining endangered lotic environments.

• Provide variations in the ecotopes available for biota, refugia in high flows and rearing habitat in low flows and supplying non-existent habitats for rheophilic fish.

• Reinstatement has become an option for sustainable restoration of river environments.

• Geormophology of secondary channels includes:

– Variations in the width, depth and substrate.

– Accretionary macroforms - such as bars and riffles.

– The angle at which the secondary channels branch from the primary channel.

– Vegetation which acts to stabilise the accretionary macroforms.

Studies of secondary channels

Very few studies have been conducted on secondary channels, due to both their rarity and the lack of understanding of their Importance. Two key studies are as follows:

• Fraser River in south-western British Columbia (Ellis et all. 2004; Ellis and Church, 2005)

• Western Germany (Jahnig et al. 2008)

The River Nene

In the UK, 'natural' secondary channels rarely remain, but instead are derived from disused mill streams and riverside gravel pits, with others being the old primary channels that have been replaced by new, straight navigable channels. One example of where this occurs is on the River Nene, in south-east England. The photos below are some examples of the secondary channels found.




Results

Aim 1: Morphological Quality

From the data analysed for this aim it is possible to see that the secondary channels do indicate a higher morphological quality than the primary channels, with greater numbers of geomorphological features (Figure 3) and in-channel vegetation and the associated features these promote.

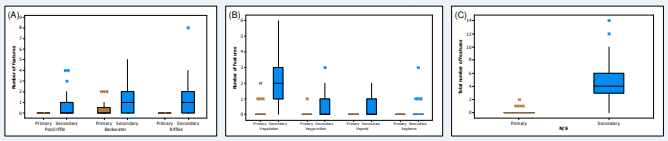


Figure 3: Box and whisker plots of the geomorphological features found in the reaches studied. (A) Pool/riffle sequences, backwaters and riffles; (B) vegetated side bars (Vegsidebar), vegetated point bars (Vegpointbar), vegetated mid bars (Vegmid) and vegetated berms (Vegberm); (C) the total of the geomorphological features (the above listed features) found at each site. The '' shows any outliers from the interquartile range dictated by the boxed area.*

Aim 2: Classification of Secondary Channels

The cluster analysis resulted in the assignment of five groupings, with Group 1 containing the most sites and Group 4 only containing one site. The groups were then tested to highlight which variables were statistically different, hence showing the controls on the groupings created (Figure 4).

Group 1 – Modification levels vary from low – high, but there is a distinct lack of riparian woodland corridor.

Group 2 – Modification levels of medium – high, however 'natural' bank protection has been implemented as a form of restoration.

Group 3 – More 'natural' reaches with low – medium modification levels, with surrounding land-use and bank-top vegetation being the least affected by anthropogenic activity.

Group 4 – A single reach that was heavily modified and affected by urban land-use. The site had no riparian woodland corridor and little significant in-channel vegetation or geomorphological features.

Group 5 – Land-use was affected by anthropogenic activities, with fragmented – no riparian woodland corridor. There was a lower percentage cover of emergent reeds and on average less than 3 geomorphological features in total.

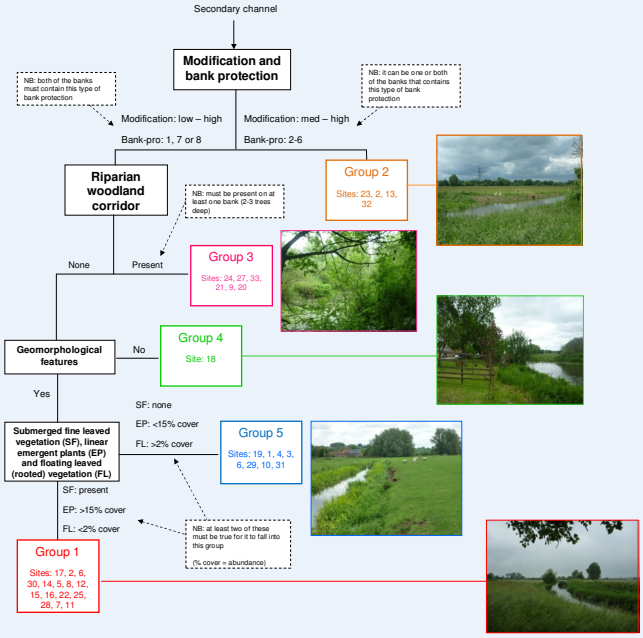


Figure 4: A generated decision tree to allow the assignment of secondary channels to each of these groups.

Aim 3: Contribution to 'Good Ecological Potential'

Objective (i)

Overall, the conclusion is that in terms of the RHS scoring systems, the secondary channels do show lower modification scores (HMS) and higher habitat quality scores (HQA) (Figure 5) compared to the primary channels surveyed. This will mean that the secondary channels of the River Nene have a greater potential in aiding to achieve a 'good ecological potential' than the primary channels, and as a consequence may benefit from more focused management attention to aid in furthering this potential.

Objective (ii)

In order to rectify the lack of inclusion of in-channel vegetation in the HQA scores, it is to be suggested within this study that a more relevant scoring system may be needed to allow for a more valid and accurate comparison of the secondary channels to the primary channels. The scoring system provides a more detailed scoring for the in-channel vegetation and considers the more controlling role that vegetation plays in these low energy, lowland systems where accretionary macroforms (e.g. bars) will be less likely to be present without the stabilising presence of vegetation.

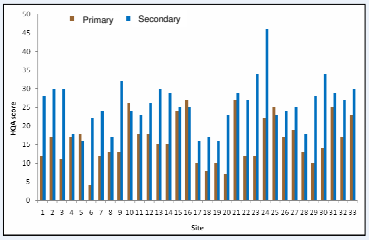


Figure 5: Habitat Quality Assessment scores for the primary and secondary reaches of the River Nene..

Conclusion

• The **secondary channels were shown to have higher morphological qualities.**

• The secondary channels add a degree of complexity to the system, increasing morphological and ecological diversity over the river as a whole.

• The classification that has been generated based on the secondary channels has provided five separate groups with rather distinctive characteristics.

• The segregation of these channels has shown to begin with the level of channel modification and bank protection, to then be assessed by the presence of a riparian woodland corridor and finally be distinguished by the presence of both the geomorphological features and in-channel vegetation.

• The higher morphological quality shown by the secondary channels can also potentially be a means of working towards achieving a 'good ecological potential' status for the River Nene, which is required under the WFD.

• This study has also aimed to increase the understanding of the ecogeomorphology, with respects to the morphological quality of these channels, leading to the development of a new vegetation index.

CINDERELLA SCORES A HAT-TRICK!

3 years, 3 projects, 3km of winterbourne chalkstream restored

Introduction

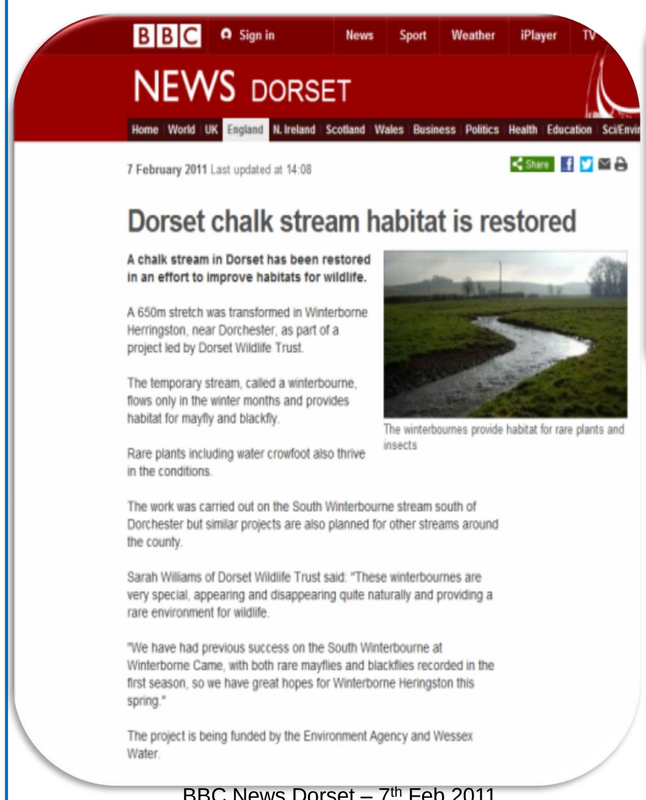
- The **Dorset Wild Rivers** project and the **Environment Agency** have created three successful **winterbourne restoration** projects that have delivered a number of outcomes including **Biodiversity Action Plan (BAP)** targets, working towards **Good Ecological Status** (**GES** under the **Water Framework Directive (WFD)** and building **resilience to climate change**.

- **Winterbournes** are rare chalk streams which are groundwater fed and only flow at certain times of the year as groundwater levels in the aquifer fluctuate. They support a range of **specialist wildlife** adapted to this unusual flow regime, including a number of rare or scarce invertebrates.

- So called "**Cinderella**" chalkstreams because they are so often overlooked. Their ecological value is often degraded as a result of pressures from agricultural practices, land drainage, urban and infrastructure development, abstraction and flood defences.

- Over centuries, the spring-fed South Winterbourne in Dorset has been degraded. This has resulted in very **straight**, **steep-sided** and **over-deepened** channels with little resemblance to a Winterbourne.

- The South Winterbourne is a tributary of the Dorset Frome which is currently **failing** under **WFD** for fish, macrophytes and diatoms. The Winterbourne is an important juvenile fish habitat and feeder reach to the Lower Frome.



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Dorset chalk stream habitat is restored

A chalk stream in Dorset has been restored in an effort to improve habitats for wildlife.

A 650m stretch was transformed in Winterborne Herringston, near Dorchester, as part of a project led by Dorset Wildlife Trust.

The temporary stream, called a winterbourne, flows only in the winter months and provides habitat for mayfly and blackfly.

Rare plants including water crowfoot also thrive in the conditions.

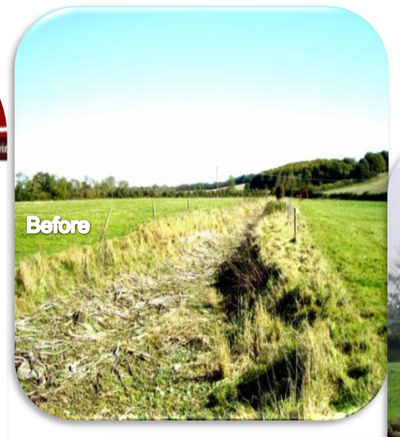
The winterbournes provide habitat for rare plants and insects

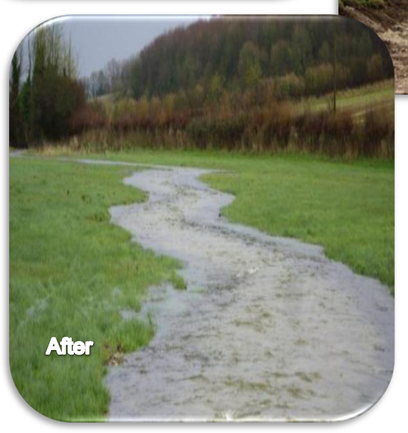
The work was carried out on the South Winterbourne stream south of Dorchester but similar projects are also planned for other streams around the county.

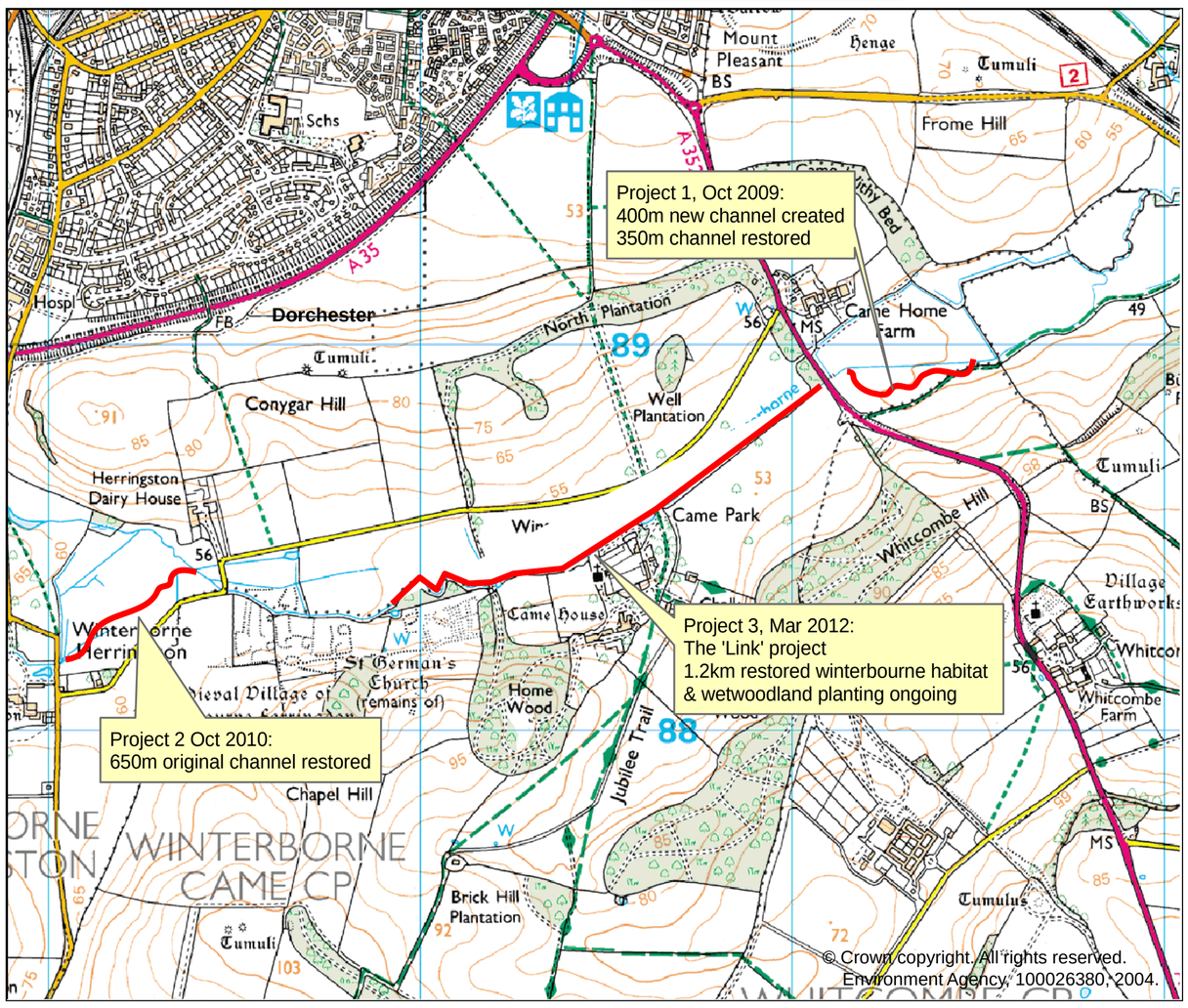
Sarah Williams of Dorset Wildlife Trust said: "These winterbournes are very special, appearing and disappearing quite naturally and providing a rare environment for wildlife.

"We have had previous success on the South Winterbourne at Winterborne Came, with both rare mayflies and blackflies recorded in the first season, so we have great hopes for Winterborne Herringston this spring."

The project is being funded by the Environment Agency and Wessex Water.







Monitoring & Results

- In order to measure the impacts of our work, pre and post work macroinvertebrate and fish monitoring is being carried out as part of the project.

- A more diverse habitat supporting diverse wildlife has been created. The bankside vegetation has been manipulated to provide a mixture of both shaded and more open sections of channel and a more species rich margin.

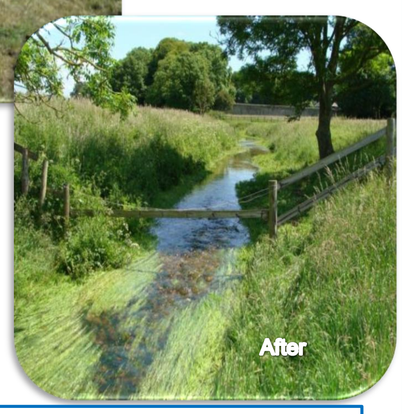
- Our macro invertebrate sampling indicates that the work has been a great success: the rare mayfly larva ***Paraleptophlebia werneri*** (Red Data Book 3), and the notable blackfly larva ***Metacnephia amphora***, were found in the stream only 6 months after the work was completed.

- The Conservation value of the new channel was reassessed using the scientific Community Conservation Index (CCI). While the old channel before restoration had a **moderate conservation** value, the new channel has a **very high** value.

- Brown trout spawned throughout this stretch this winter.

- Winterbourne specialist, *Paraleptophlebia werneri* is a genus of mayflies in the family *Leptophlebiidae*.

- It is particularly adapted to living in winterbourne streams which run during the winter but dry up in the summer. It lays drought resistant eggs in the river gravels which can survive the dry season and then hatch when the winterbourne starts flowing again.



How did we do it?

- The ground works where undertaken when the Winterbourne was dry. The works recreated the original route where it could be found, by excavating new channels and re-profiling the existing one.

- This was a joint project between **Dorset Wildlife Trust** and the **EA's Biodiversity & Fisheries** team in Blandford, where expertise was used from both organisations in order to create a successful project.

- Funding was secured from the **Environment Agency**, **Dorset Wild Rivers Project** and from the Weymouth Relief Road environmental enhancement section 106 grant, totalling just £35,500.

- **Dorset Wild Rivers** is a **partnership** project led by **Dorset Wildlife Trust** and **FWAGSW** and is funded by **Wessex Water** and **Dorset AONB.** It also includes the **Environment Agency, Natural England, Wild Trout Trust, Frome, Piddle and W.Dorset Fisheries Association.**

What did we do?

In total, approximately 3km of the South Winterbourne was enhanced over 3 projects in 3 years. The length of the stream has been increased by 1km.

- 2009 – 400m of **meandering winterbourne channel created** and a further 350m was **enhanced**.
- 2010 – 650m of the winterbourne **was moved to its original route** of across the middle field of the field, and it was **reconnect to its floodplain**.
- 2012 – A further 1.2 km of winterbourne was **enhanced**.
- All of the work was undertaken via low cost earthworks and by working with in-situ features and materials.

The winterbourne was restored to a more natural course and profile: the route **meanders** and the banks have been **re-profiled** so that the sides are more varied and some are now **gently sloping**; **riffles**, **pools**, **glides**, wet **berms** and **gravel bars** have been created and lots of **large woody debris** has been incorporated into the channel; most of the channel has been **re-connected to the floodplain;** 1ha of adjacent **wet woodland** has been planted and **pond creation** and **stock management** has taken place.

The diverse habitats created should see the return of wildlife, such as **water voles**, **amphibians**, **brown trout**

Legacy and future...

- This project will be used as a **demonstration site** for similar partnership projects on other winterbourne chalkstreams across Dorset where enhancement opportunities have been identified and where GES is less than good. **Workshops** will allow **landowners** to see how their channel could look.

- The Partnership project continues to work with landowners and scope other sections of Dorset Winterbournes for enhancement work. A number of restoration plans have been drawn up for further degraded **priority winterbourne sites** and with funding can go ahead in 2013/14.

Aim

- The overall aim of this work was to restore, enhance and create UK **Biodiversity Action Plan (BAP) Priority Habitat** and work towards achieving **GES**.

- Also to **reconnect the floodplain**, kick-start and recreate a range of **geomorphological processes** and **features** and incorporate **large woody debris (LWD)** back into the channel.

Part of a nationwide network of Wildlife Trusts

For more information contact;
Sarah Williams, Dorset Wild Rivers Coordinator at swilliams@dorsetwildlifetrust.org.uk Tel: 01305 264620 or
Sarah Guest, Environment Agency Biodiversity Officer at sarah.guest@environment-agency.gov.uk
Tel: 01258 483441

Protecting **Wildlife** for the Future

Detecting Streamflow Response to Land Management Change at Holnicote

Gene Hammond[1], Carl Ishemo[1] and Steve Rose[2]

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Rural land management is known to affect both the generation and propagation of flooding at the local scale. However, there is a general lack of good evidence that this impact is still significant at the larger catchment scale given the complexity of physical interactions and climatic variability taking place at this level.

The Holnicote Project was commissioned by Defra following the Pitt Review into the summer 2007 floods in England which recommended exploring an alternative approach to complement engineered defences, including land management and working with nature to mitigate flood risk, whilst providing multiple benefits to the environment and local communities.

The Holnicote Estate, owned by the National Trust, comprises about 5,000 hectares of land, from the uplands of Exmoor to the sea. It incorporates most of the catchments of Horner Water and the River Aller. A range of rural land uses are present in the study area, including – moorland, woodland, grassland and arable.

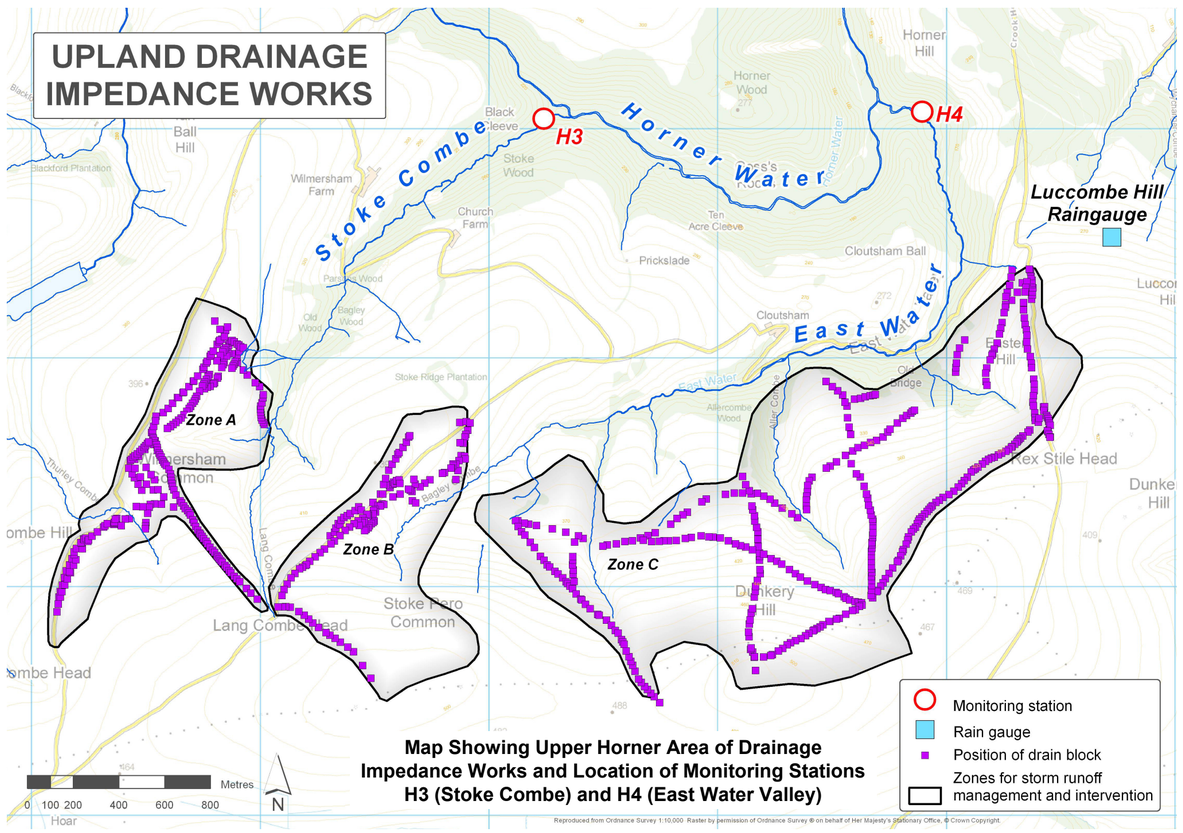
About 100 houses across three villages are at risk from flooding which could potentially benefit from changes in land management practices in the surrounding catchment providing a more sustainable flood attenuation function. However, the various interest groups and stakeholders involved in catchment change can have diverse and often conflicting needs and agendas, making the process of engagement, acceptance, compromise and delivery of change a complex management requirement. The current project is scheduled to run until 2015.

Objectives

The upper catchments feeding the streams in Stoke Combe and East Water Valley have been subject to land drainage impedance works and this study attempts to detect any changes in flow regime between the pre and post land management works monitoring periods. The key objective is to attempt to detect, and if possible quantify, changes in flow variability and hydrograph response for these two tributaries of the Horner Water.

The aim is to determine whether any differences identified are statistically significant and therefore due to differences in catchment hydrological response, rather than rainfall and climatic variation.

The analysis is designed to compliment the flood modelling and analysis work already undertaken by JBA Consulting.



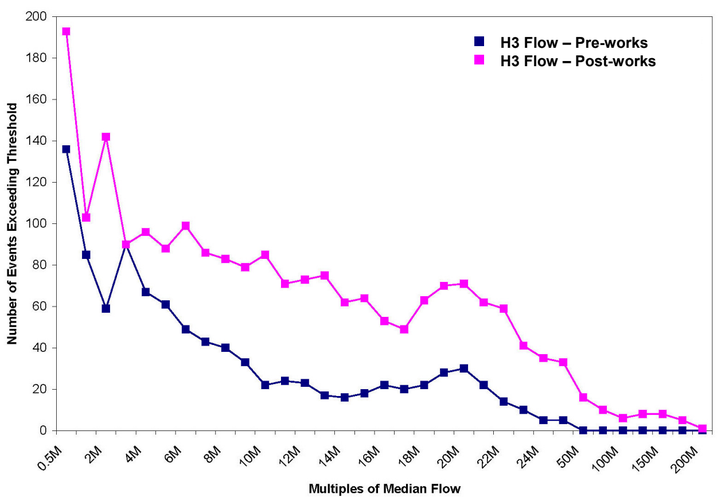
Map Showing Upper Horner Area of Drainage Impedance Works and Location of Monitoring Stations H3 (Stoke Combe) and H4 (East Water Valley)

Approach to Data Analysis

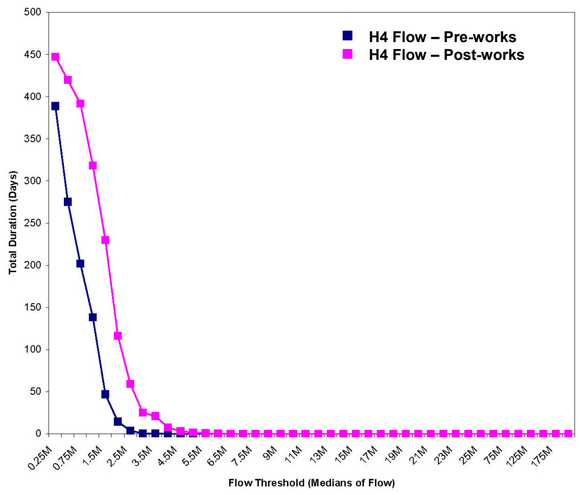
15 minute time series flow data derived from stage-discharge rating has been analysed, together with time-synchronised 15 minute rainfall data. The data collected at station H3 (Stoke Combe), H4 (East Water Valley) and raingauge RG4 (Wilmersham Farm) comprise the target datasets for analysis. The datasets have been analysed in three main ways. These include:

- Descriptive statistical summaries and time series plots;
- Flow variability analyses, base on the Archer and Newson (2002) method of median flow threshold analysis using a purpose-written series of Visual Basic software tools (as produced by Archer (2002, 2009) and further developed by Climent-Soler, (2007, 2009), in order to quantify flow variability characteristics for each monitored watercourse, in both pre and post land management time periods and to identity any statistically significant differences in variability.
- Hydrograph response analyses, involving the repeat analyses of single event hydrograph response characteristics, using a custom written modelling tool (MS Excel spreadsheet, developed by Gene Hammond and Carl Ishemo) and based on the method developed by Grayson *et al*. (2010).

Flow Variability Analysis - Stoke Combe (H3): Number of Events Exceeding Multiple Thresholds of Median Flow (Pre and Post Land Management Works)



Flow Variability Analysis: East Water Valley (H4) Total Duration (days) Above Threshold Median Flows



Flow Variability Analysis

Data were analysed for station H3, on Stoke Combe, immediately upstream of the tributary with Horner Water, and H4, on East Water Valley stream, immediately upstream of its confluence with Horner Water. Both sites are in the Dunkery and Horner Woods National Nature Reserve. For both sites, flow and rainfall data were available for both pre and post works monitoring periods, with the data partitioned as follows:

- Pre works monitoring period: 18/05/2010 to 08/09/2011
- Period of catchment works: 08/09/2011 to 12/10/2011
- Post works monitoring period: 12/10/2011 to present

The flow variability analysis involves a spectral analysis of flow variability (peaks and troughs of flow) over fixed thresholds, based on multiples of median flow. The objective is to demonstrate changes in flow patterns and behaviour in terms of the number of hydrograph events which exceed a range of median flow thresholds, together with the total and mean duration.

Pre and post land management flow regimes are illustrated in the graphs opposite. Here it can be seen that flow variability differs in each monitoring phase.

Hydrograph Analysis

Hydrograph analyses will be applied to groups of single-peak stormflow events in order to build up a dataset of descriptive parameters, which aim to statistically characterise (describe) the hydrograph response under varying land management conditions. The theory behind the procedure is described by Grayson *et al.* (2010) and is based on the idea that the shape of the 'average' hydrograph response will change as a consequence of changes in flow routing and timing due to land management works across the target catchment. Key hydrograph descriptive parameters calculated include the following:

- Peak flow for event
- Time to peak flow
- Lag time
- Total time of event
- Total rainfall for event
- Time from baseflow to peak flow (rising limb)
- Time from peak flow back to post event baseflow (receeding limb)
- Total storm event flow (area under hydrograph curve)

For each time series flow record, single peak events were extracted, together with the corresponding rainfall data and analysed individually using the spreadsheet tool. This leads to the production of a dataset of pre and post treatment events, which comprised the sample for statistical analysis. Comparative statistical tests will then be performed on the sample data for selected key variables try to determine change between treatment periods; i.e. pre works versus post works monitoring periods.

Anticipated Results

The techniques presented are based on the idea that the shape of the 'average' hydrograph response will change as a consequence of changes in flow routing and timing due to land management works across the target catchment. Coupled with this, over time we would subsequently expect to see a changes in flow variability. For example, if artificial drains (grips) are blocked and gullies blocked or re-vegetated, it might be anticipated that the storm hydrograph may show an attenuation in peak flow and increased lag times, time to peak and total time of event. Another key change in the flow response characteristics would be a change in the rate of hydrograph rise and fall. Equally, all of these key characteristics may affect the delivery and timing of flood flows in the lower catchment, where the primary flood risk receptors (people and property) are located

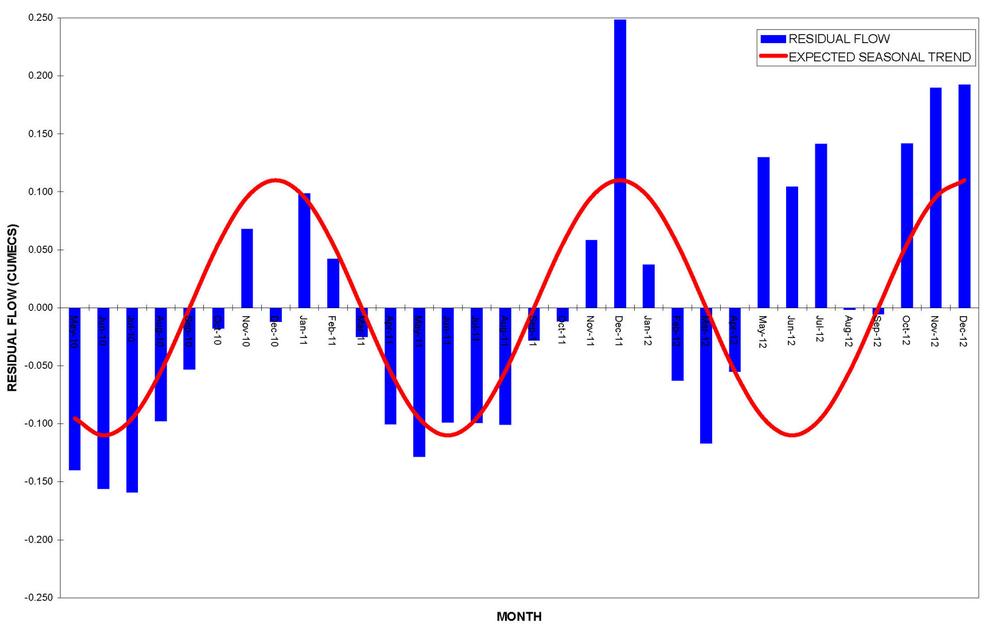
The challenge remains to discriminate hydrological change due to land management works, rather than change due to climatic (rainfall) variability.

Importantly, a methodology and toolkit has been developed and enhanced, which allows the repeat analyses of flow at these critical sites, as more data become available. For this type of analysis to succeed, a critical requirement is the availability of a suitable flow event dataset, from which we can gain confidence in statistical test outputs.

Understanding and De-Coupling the Effects of Climate on Flow

The analysis also attempts to de-couple the effects of climate (principally rainfall) variability, as otherwise, the results will be dominated by variability in this primary driving variable. Here, a variety of analyses and methods will be used to assess whether changes in flow response are solely caused by rainfall variability coupled with antecedent moisture conditions, or whether the observed changes are due to land management changes on the

TIME SERIES PLOT OF RESIDUAL FLOW - EAST WATER VALLEY (H4)



Analysis of Residual Mean Monthly Flow at H4, Highlighting the Role of Rainfall Variability (i.e. extremely wet 2012)

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Summary

The Holnicote project provides the opportunity to potentially demonstrate and quantify the effects of catchment land management change on streamflow response. If successful, the analysis techniques presented here represent a powerful toolkit for quantifying hydrological change and can be applied to any catchment.

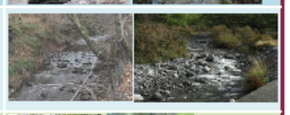
Understand Your River – An On-Line River Categorisation Tool

The successful River Restoration workshop that JBA ran in May 2012 brought to sharp relief that there is a vast gap in data, information and material availability relating to our understanding of natural processes in rivers and on floodplains. This means that many attempts at river restoration and naturalisation remain based around a limited overall understanding utilising a narrow set of approaches developed largely for un-reactive low gradient heavily modified river channels.
JBA are developing a website detailing the findings of the workshop and providing information and guidance on the character and functioning of rivers in the UK synthesised from academic research (Figure 1) and field experience (Figure 2).

Figure 1.

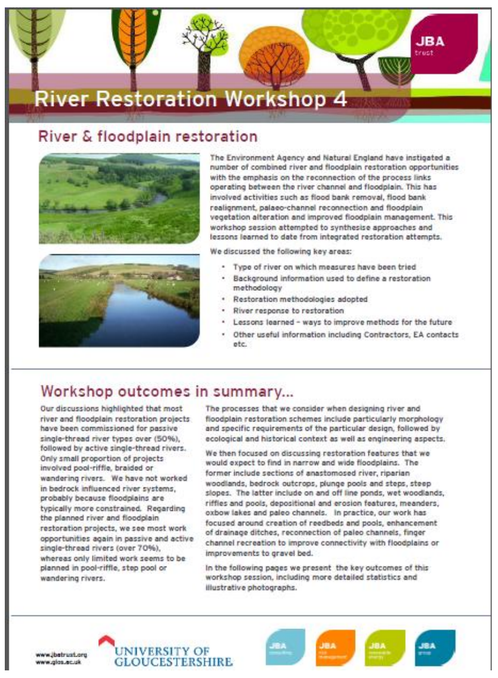
River reach characterisation guide

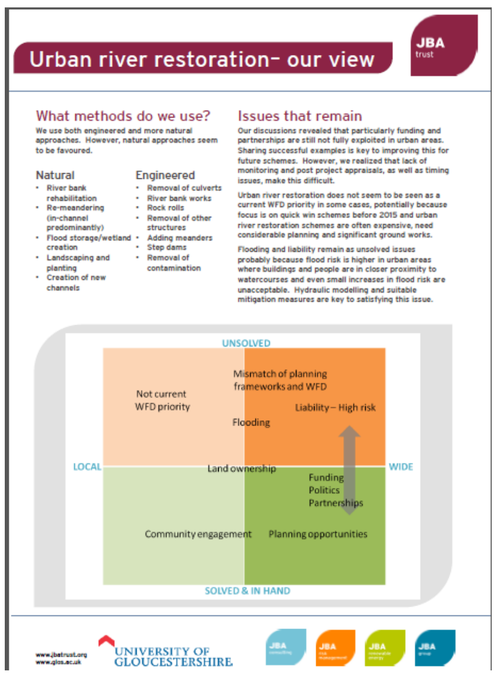
In river restoration it is important to understand what morphological features, flow types and ecology ocurr in our rivers. Introducing the wrong morphological features in the wrong river types could lead to destabilisation, degradation and overall reduction in the ecological status of a watercourse from the current level. Collated in this single page, this guide provides information on morphological features, flow regime and ecological diversity would be common within various types of rive reaches from upland reaches to lowland reaches downstream. The guide draws on outputs of the collaborative workat the JBA Trust's River restoration workshop in May 2012.

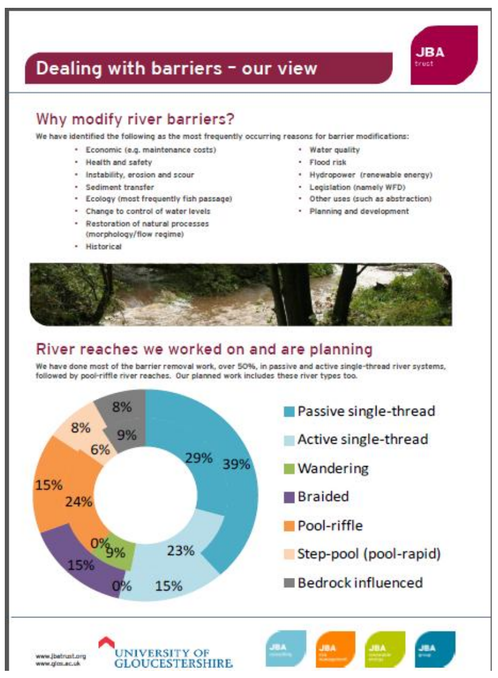
River reach type	Location along river	General description	Gradient	Stability	Typical morphological characteristics				Illustrative images
					Morphological features	Flow regime	Ecology	Floodplain	
Bedrock influenced	Upstream/ Upland	Channel dominated by boulders and cobbles, bedrock outcrops. No features such as channel pools, riffles. Very little or no bed sediment.	Steep (> 10-15%)	Stable	Boulder steps, exposed rock, waterfalls, pools, chutes, coarse bedload. Undercutting, bedding planks. Often large woody debris (LWD) dams in wooded areas.	Flashy, fast flowing, variable high energy system. Low baseflow. Chutes and cascades. Shallow depths. Highly turbulent.	Nutritiously low, clean water. Dominated by invertebrates, crayfish, birds. Abundant riparian habitats, often wooded. Mosses and lichens, algae. Low in-channel life.	Limited, narrow floodplain.	
Step-Pool	Upstream/Upland	Channel-spanning pools and boulder steps, often also rapids. Some fine sediment.	Steep (5-20%)	Stable	Presence of boulders, waterfalls, migrating pools and riffles with regular spacing of in-channel features. Broad channel with differences in gradient. Varied sediment (coarse). Frequent undercutting and erosion.	Flashy, variable high energy system. Low baseflow. Chutes, turbulent flow. Supercritical flow on steps and subcritical in pools.	Nutritiously low. Dominated by (macro)invertebrates, fish (salmonids) and birds. Abundant riparian habitats, often wooded. High habitat variety, often in moorlands or mines. Low in-channel life.	Limited floodplain.	
Pool-Riffle	Middle reaches	Characteristics of both wandering and active single-thread channels. Sand and fine gravel. Less dynamic than wandering channels.	Medium (1-5%)	Stable	Pools, bars and riffles, meanders. Frequent undercutting and erosion, variable sediment supply. Shallow banks, armouring. Coarse sediment and presence of soft material.	Relatively dynamic with riffles, pools and runs. Variable energy (high to low), variable depth. Less flashy.	Dominated by fish (spawning areas), (macro)invertebrates, crayfish, bullhead, otters. Birds. High habitat variety, aquatic and marginal vegetation. Organic matter.	Wider floodplain.	
Braided	Downsteam/ Lowland	Channel with a number of threads separated by small and often temporary islands (braid bars). A highly dynamic system particularly during floods, which causes high mobility of the channel. The threads often form within a relatively stable river banks.	Medium	Unstable	Dynamic, multi-channel high energy system with soft bed material as well as coarse sediment. High sediment load and movement. Wide channel with rapids, bars, riffles, pools and cut-off channels. Varied sediment (coarse), often unconsolidated. Shallow and steep banks, palaochannels.	Chutes. Variable high energy flow. Shallow and flashy, ephemeral. Typical of environments where channel depth is dramatically decreased and so channel velocity drops (e.g. in river delats).	Dominated by invertebrates, fish (provision of spawning areas), birds, otters and other mammals. Riparian vegetation often includes woodland, marshland and other marginal vegetation. Relatively low in-channel life, aquatic vegetation governed by the gravel based habitat.	High floodplain connectivity.	
Wandering	Downsteam/ Lowland	Gravel bed with smaller bed material size than braided or active single-thread. Characteristics similar to braided and active single-thread systems. Wide valley floor.	Medium, but shallower than braided.	Relatively stable.	Variable gradient, sequences of bars, pools, riffles, rapids and runs. Meanders, oxbow lakes and undercutting/erosion features. Coarse sediment. Sandy banks. Paleochannels.	Dynamic flow with riffles and ripples, pools and runs. Flashy and fast flowing with high, variable energy. Variable depth and large volumes, moderate flow.	Dominated by invertebrates, fish (provision of spawning areas), otters, water voles. Marginal vegetation, marshlands, reedbeds and riparian woodland. Floodplain grazing.	Wider dynamic floodplain with islands, shrubs and riparian vegetation. High floodplain connectivity.	
Active Single-Thread	Middle reaches	Low sediment supply for point bars. Often sand and gravel dominated dynamic channels.	Low	Stable	Bars (with sediment deposition), pools, riffles. Varied gradient and sediment supply. Meandering channel with oxbow lakes, often incised and asymetric. Channel is often wide, constraint and with undercutting/erosion.	Less dynamic than wandering channels, variable energy system (high and low). Riffles, pools and runs. Large volumes, moderate flow.	Dominated by fish (less salmonids), invertebrates, otters, birds, water vole, amphibians and algae. High habitat variety including woodland, riparian vegetation, marshlands, marginal vegetation. Floodplain grazing.	Well connected with river channel. Riparian vegetation, frequently flooded.	
Passive Single-Thread	Middle reaches	Less dynamic channels with resistant bed and banks (often clay soils). Often sinuous incised planform. Poor in-channel morphology with low level of activity.	Low	Stable	Very few features, poor activity. Occassional pools and riffles in isolated locations. Meandering incised channel, low sediment movement, often wide channel.	Low energy system, less flashy. Glides and pools. Large volume, prolonged hydrographs.	Low in nutrients. Reedbeds (including tree species such as willow or alder), marshland, often also invasive species (e.g. Himalayan Balsam). Low in-channel life includes fish, otters, water vole.	Often artrificially disconnected from floodplain by embankments.	

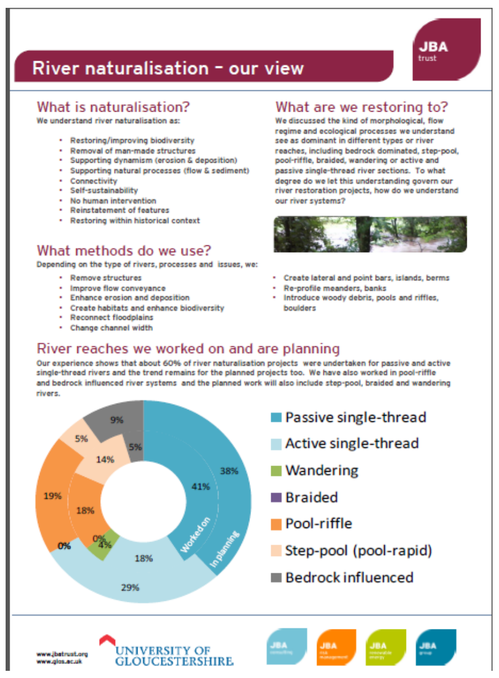
www.jbatrust.org Version W12-2110/v1 (23 July 2012)

Figure 2.



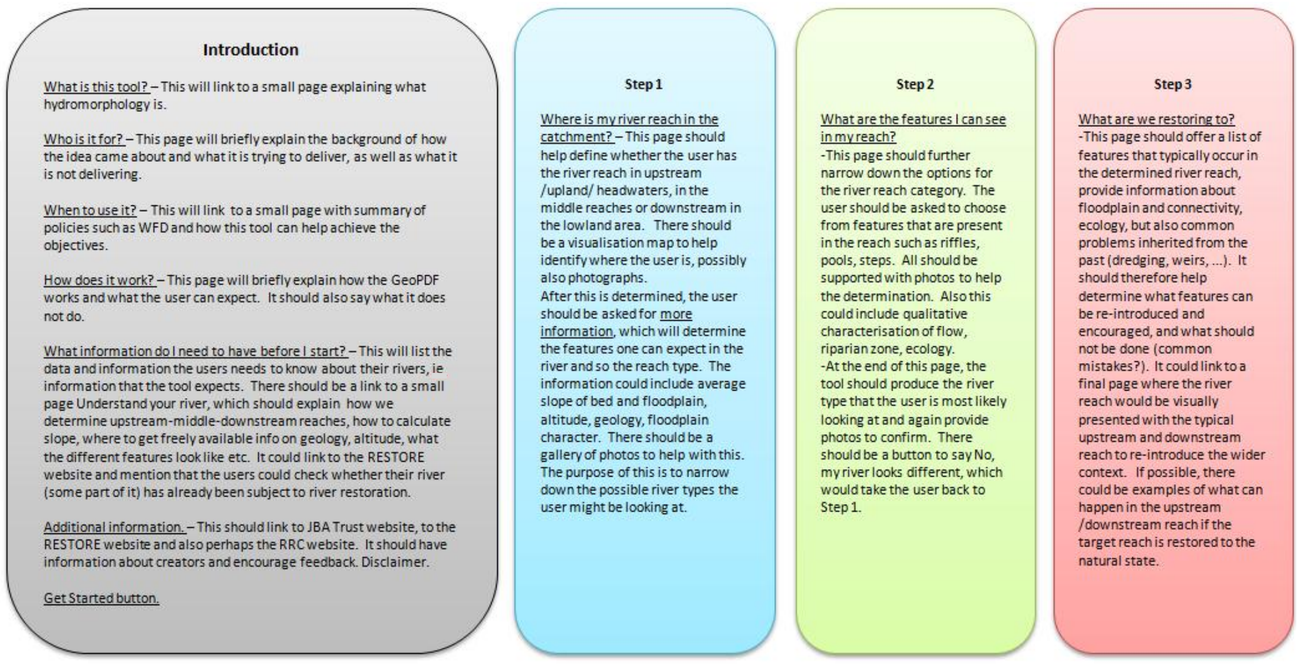






Discussion during the workshop sessions suggest restoration successes are poorly reported and so fail to inspire other projects. Many mistakes could also have been avoided or learnt from, if more was known about previous restoration attempts. The attendees at the workshop came from across a wide spectrum of river restoration practitioners with various levels of experience and knowledge. However, they all agreed that appreciation and understanding of the hyromorphological, ecological and hydrological processes that are typical for a particular river reach is crucial, but not sufficiently understood (Figure 3).

Figure 4.



The JBA Trust are developing further web based material linked to river restoration (Figure 4). All material can be found at www.jbatrust,org. Please contact the poster authors by email with any requests or suggestions to improve the site.

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The Morphological Response of the River Ribble to Naturalisation: Data from the 2011 Restoration Works

In 2010 the status of Long Preston Deeps Site of Special Scientific Interest (SSSI) was confirmed overall to be in 'unfavourable condition'. A Government target for SSSIs has required a river restoration plan for Long Preston Deeps SSSI to be adopted by December 2010, contributing to moving the SSSI towards 'unfavourable recovering condition'. The works reconnected a number of floodplain features improving hydraulic diversity and restoring functional habitats.

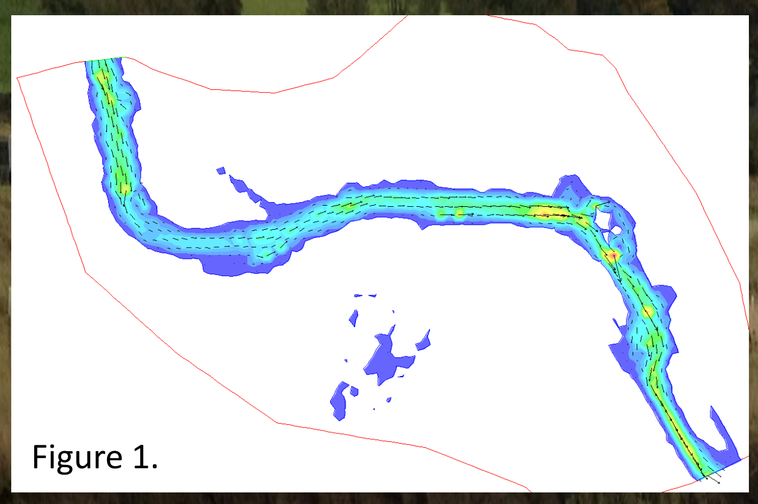


Figure 1.

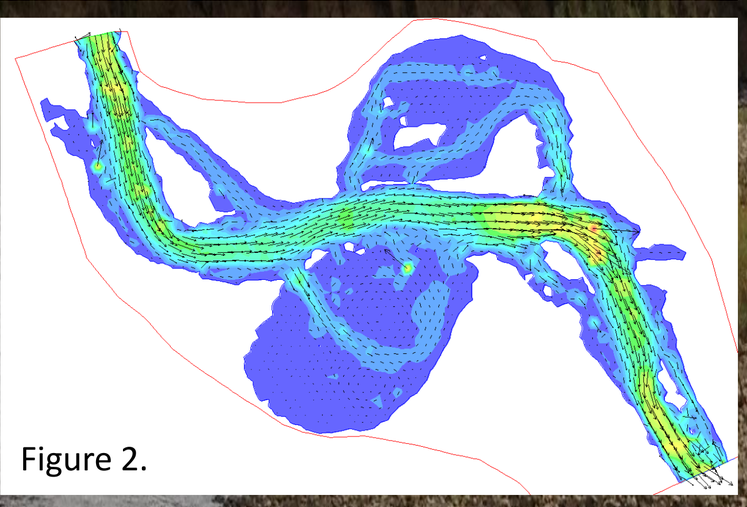


Figure 2.

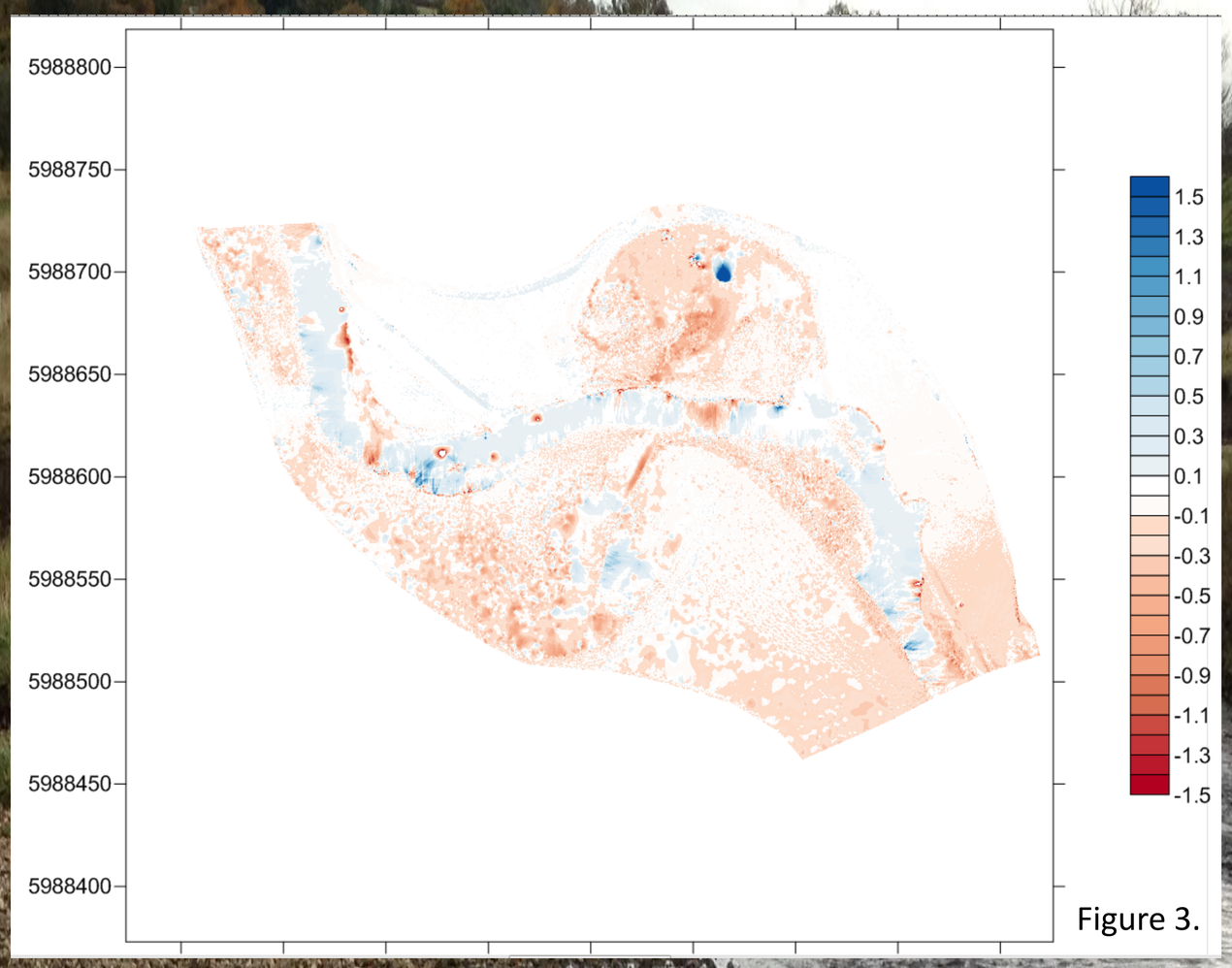
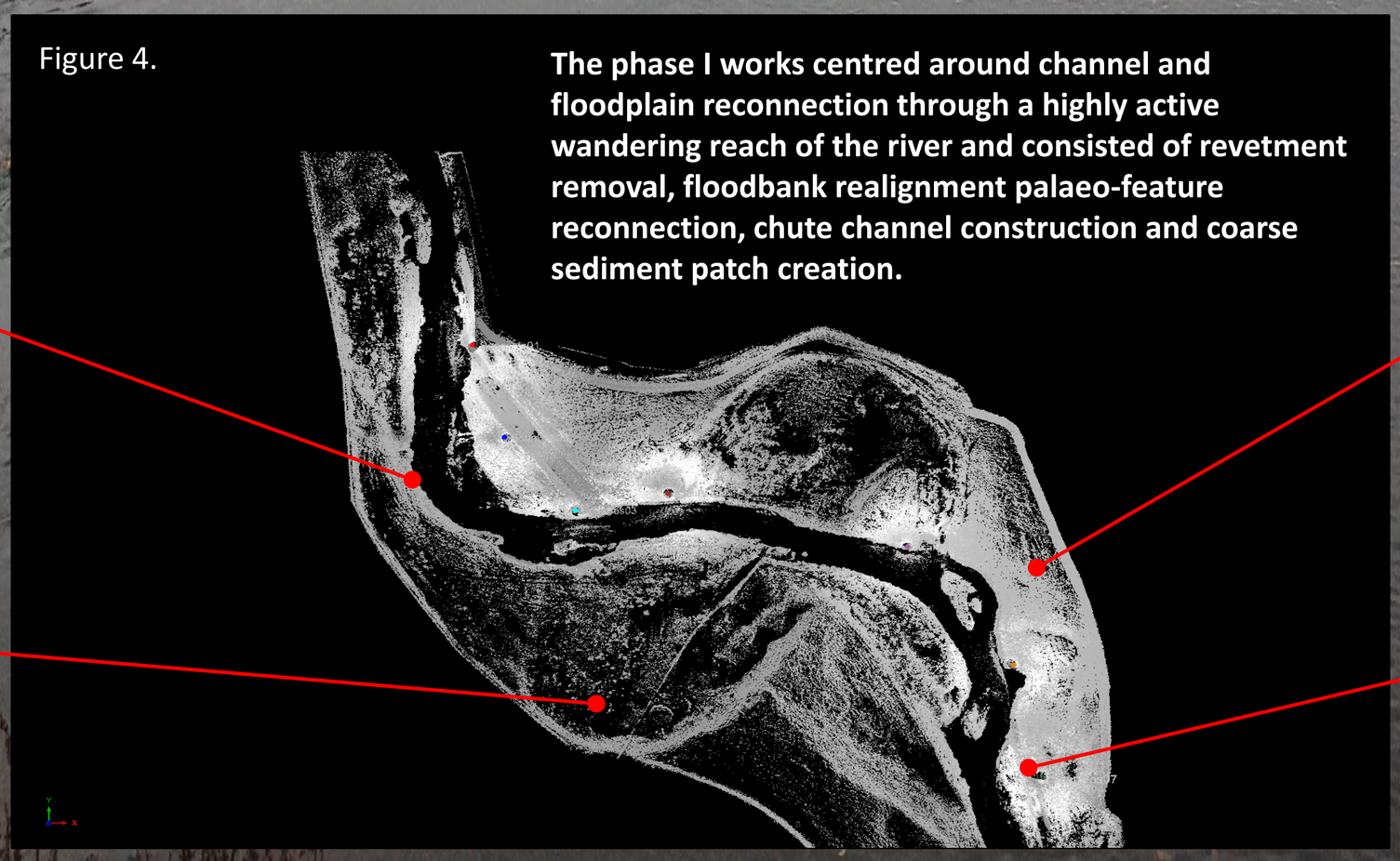


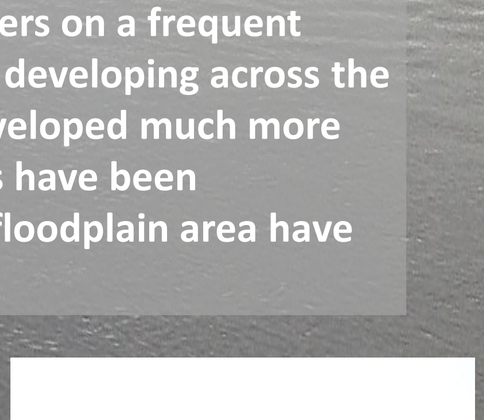
Figure 3.

Monitoring of the site began immediately after construction and consisted of terrestrial LiDAR and bathymetric resurvey and flow modelling (Figures1 & 2) and sediment sampling. The results reveal significant changes to the in-channel morphology (Figure 3) following several geomorphologically effective floods, resulting in sediment shoaling, riffle development and minor bank erosion. Chute development has been most rapid in better connected features with entrance and headcut erosion and chute exit gravel splay formation. Reconnected palaeo features have been rejuvenated receiving flood waters on a frequent basis and reducing overall erosive forces in the previously confined main channel. Wetter habitats are also developing across the floodplain, improving the overall hydromorphology of the reach (Figure 4). Higher chute channels have developed much more slowly and whilst they have served to divide flood flows the forces exerted on the bed and bank sediments have been insufficient to instigate significant morphological change. Improved floodplain connectivity and increased floodplain area have led to more frequent inundation and the deposition of significant quantities of overbank fines.

Figure 4.



The phase I works centred around channel and floodplain reconnection through a highly active wandering reach of the river and consisted of revetment removal, floodbank realignment palaeo-feature reconnection, chute channel construction and coarse sediment patch creation.



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The University Of Sheffield.

URSULA

With acknowledgements to Yorkshire Water for data and support

Catchment Science Centre

Extraneous Clean Water and "lost" urban streams

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1. Extraneous Clean Water in combined sewers

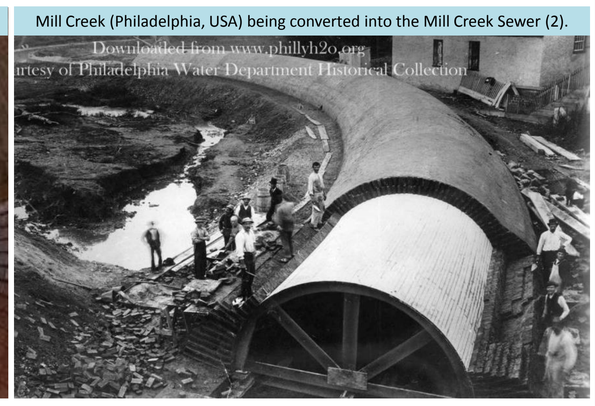
Historic streams and springs have been lost beneath the urban surface, buried into culverts, and forming part of the early combined sewer system. "Extraneous clean water" (ECW) from culverted streams and springs adds to combined sewer baseflow to wastewater treatment works (WWTWs).

There may be substantial economic, social and environmental benefits to be gained from separating streams from the sewers.

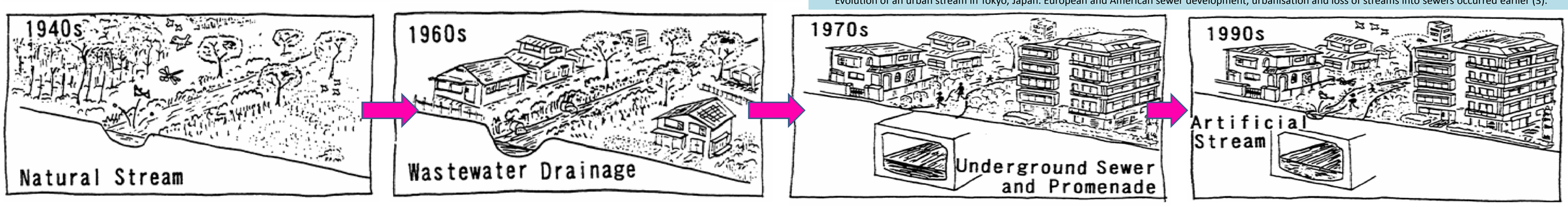
Despite limited experience in Switzerland, ECW is poorly understood and further research is required.

Garrison Creek Sewer (Toronto, Canada) intercepting a culverted stream (1).

Mill Creek (Philadelphia, USA) being converted into the Mill Creek Sewer (2).



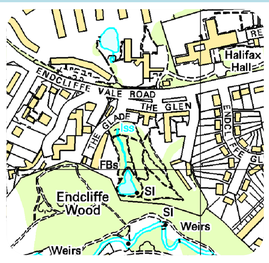
Evolution of an urban stream in Tokyo, Japan. European and American sewer development, urbanisation and loss of streams into sewers occurred earlier (3).



2. Current research: Integrating multiple lines of evidence to locate and quantify ECW in UK combined sewers

1. Locating "lost" culverted streams and springs

Locate current surface water network from maps (4)



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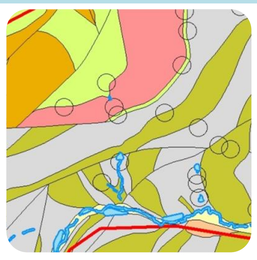
Locate historically culverted streams and springs from historical maps and accounts, street and place names (4)

+

Correlate stream/spring location from geology maps and groundwater records (4)



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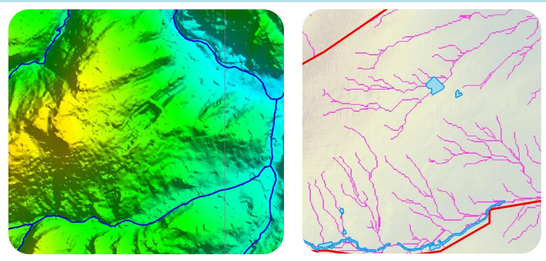
Predict hidden stream flow paths from topography using digital terrain model and Arc HydroTools to support historic map searches (4)



2. Indicating ECW risk areas

ECW is likely where historically culverted streams and springs flow along current combined sewers

Two modes of ECW entry

Interception: historically culverted streams and springs drain into intercepting combined sewer

Conversion: combined sewer built on course of historically culverted streams and springs

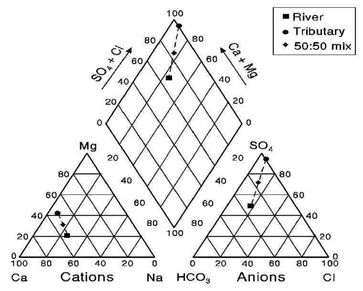
Direct and indirect validation

Discrete ECW entry – determine connectivity between culverted stream and sewer by tracers

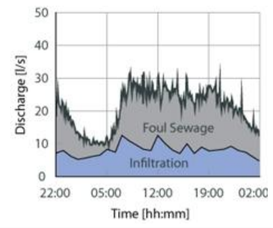
ECW at source – hydrochemical "typing" of sewer samples – identify ECW by mixing effects on chemical markers

ECW at source – water balance comparison of modelled against measured sewer flow – baseflow separation of sewer hydrograph

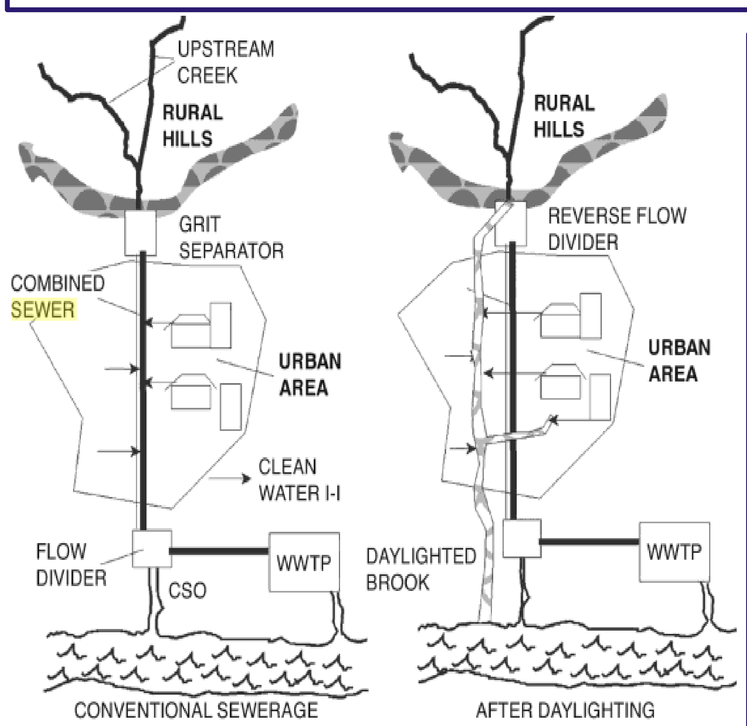
3. Further validation by identifying sewer ECW for validation



Two water "types" are distinguished by different major ion chemistry (left) (5). This established approach will be applied innovatively to distinguish between sewer end members – wastewater, groundwater (ECW), drinking water, surface water – in collaboration with Yorkshire Water.



Sewer baseflow has been used to indicate general groundwater infiltration to sewers (left) (6). During dry weather flow and in areas where the water table is not uniformly high, the approach will be used to indirectly identify and quantify ECW in sewers where night time minimum wastewater may reveal a residual ECW flow.



Before (left) and after (right) deculverting for ECW separation in Zurich (7). Street streams now convey clean stream, spring and surface waters, reducing dry weather sewer baseflow to WWTW by up to 40%. During storm events, street streams discharge to the sewers to safely prevent surface flooding.

3. Solutions: Deculverting and the Swiss "Stream Concept"

Zurich's innovative stream separation project has deculverted and restored 16 km of lost urban streams since 1985.

ECW separation reduced WWTW costs from c. £2.2 M to £0.66 M per annum, and justified the investment in deculverting and street streams.

Numerous additional environmental and social benefits have been cited, including improved land value, recreation and amenity space, flood risk management, habitat improvement, urban-heat-island cooling, public health and wellbeing.

Scenes of Zurich's Stream Concept. Above left to right (8, 9): deculverted streams convey ECW away from the WWTW, using innovative designs to maximise aesthetic, environmental and land value benefits. The priorities change depending on practicality – some remain confined to engineered channels, while others are more naturalistic. Below: before (left) and after (right) (9) deculverting a culverted stream through a Zurich residential area. Could this be applicable in the UK given the differences in urban design?

There may be substantial economic, social and environmental benefits of separating clean water from combined sewers by deculverting "lost" streams and springs

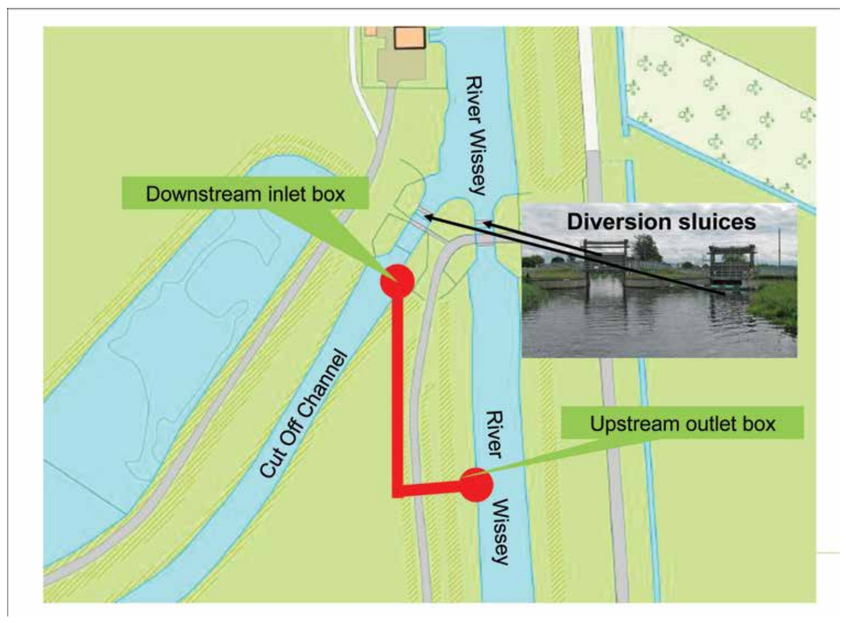
References **(1)** Cook, M. (2011) *Exploring Toronto's Sewers and Drains (*WWW*)*, Toronto: Vanishing Point. *(http://www.vanishingpoint.ca/about; 20/08/2011).* **(2)** Levine, A. (2008) *The History of Philadelphia's Watersheds and Sewers (*WWW*)*, Philadelphia: Philly H2O. *(http://www.phillyh2o.org/index.htm; 20/08/2011).* **(3)** Novotny, V., J. Ahearn, P. Brown and J. Ahern (2010) *Water Centric Sustainable Communities: Planning, retrofitting and building the next urban environment*, London: Wiley. **(4)** Map data from Edina Digimap / Ordnance Survey. **(5)** http://faculty.uml.edu/nelson_eby/89.315/IMAGES/Figure%209-78.jpg. **(6)** http://www.eawag.ch/forschung/sww/schwerpunkte/urbane_einzugsgebiete/apuss/index_EN. **(7)** Conradin, F. and R. Buchli (2005) 'The Zurich Stream Day-Lighting Program', in Marsalek, J., D. Sztruhar, M. Giulianelli and B. Urbonas (*ed) Enhancing Urban Environment by Environmental Upgrading and Restoration*, Netherlands: Springer, 277-88. **(8)** author's own photograph. **(9)** ERZ (2000) *Bäche in der Stadt Zürich (Translation: Streams in the City of Zurich)* (WWW), Zürich: Entsorgung und Recycling Zürich. (http://www.thomas-goettin.ch/fileadmin/goettin/pdf/Fliessgewaesser_Zuerich.pdf; 20/08/2011).

Connectivity at Barriers:
A Case study for technical fish pass solutions, Norfolk

Wissey Siphon Fish Pass

The Barriers...

Heavily modified water bodies dominate the Anglian region. Whilst some can be removed and restored many serve an important flood risk purpose, preventing flooding to local communities and some of the most productive arable land in the UK. Fisheries and biodiversity officers have not had it easy balancing EU water framework objectives with flood risk and water resource needs.
In this region a robust network of sluices form a fish un-friendly maze towards the sea. At Denver sluice it is possible for fish to enter the cut-off channel and effectivley landlock themselves with no access to suitable habitats or waterbody links. This is seen as a major contributing factor of WFD failure in this watercourse and a solution was needed.



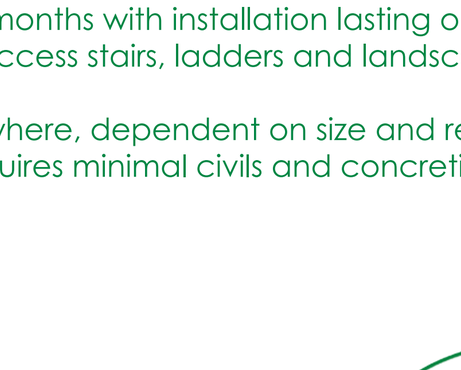
WHAT SOLUTION WAS REQUIRED?

Wissey diversion sluice required a solution which aided fish migration without compromising the current structure. it needed to:

- Maintain flood defence integrity
- **Suit multiple species (perch, roach, gudgeon, pike)**
- Work with 2.5m head difference
- Have cut-off isolation features
- Adhere to the current legislation
- be installed quickly beneath a public footway
- Operate well at low flows

Other options considered included a larnier fish pass, full bypass channel and fish flap valves, but due to flood risk and cost implications the siphon was considered the ideal solution for this site.


llowering siphon section into floodbank


entrance box in cut-off channel with access

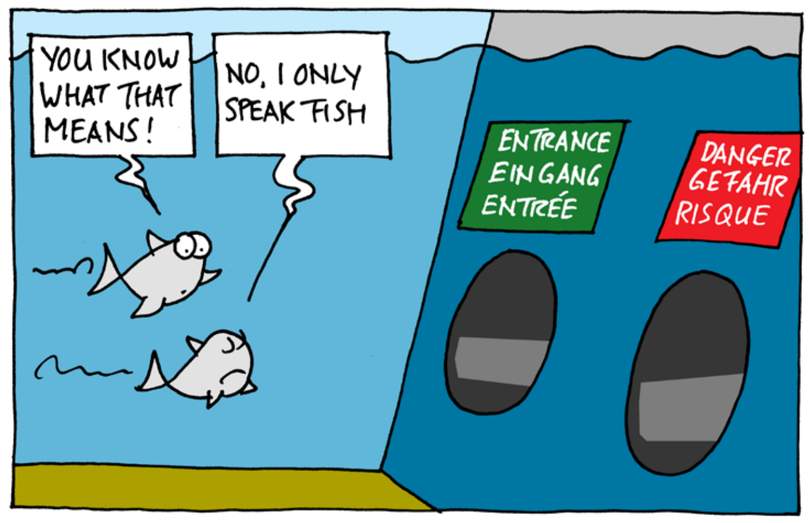
connecting the channels with siphon pipe

buried section complete

WORK ON THE GROUND.

The full project spanned nine months with installation lasting only 4 days. Total project cost including a monitoring suite, access stairs, ladders and landscaping finished within budget at £407k.

However siphon projects elsewhere, dependent on size and requirements start from £40k.
Installation is effortless and requires minimal civils and concreting due to the modular siphon design.



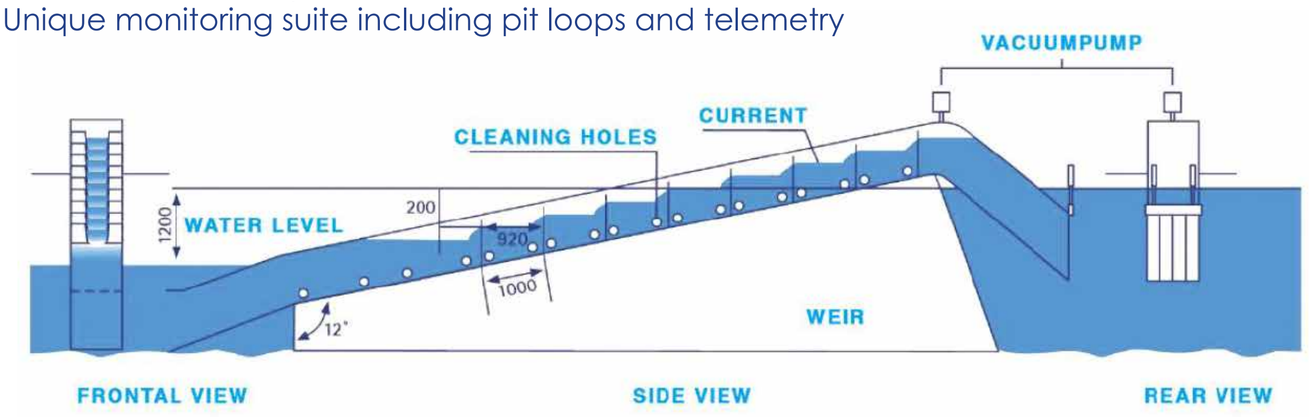
SUMMARY OF PROJECT DRIVERS

- Upper Wissey waterbody was failing its WFD classification based on fish.
- Improve fish classification from moderate to good.
- Additional positive impacts by adjoining tributaries such as Watton Brook.
- Ensure the sluice structure was compliant to the 2009 Eel regulations.
- Designate the structure as compliant to fish regulations.
- Help to improve the Norfolk sea trout fishery.

The Siphon Technology...

A Siphon Fish Pass is a pool and weir type pass contained within a composite pipe siphon. This means the flow rate is not subject to that of the watercourse but can be fully adjusted and changed by an alternating air bubble size within the vacuum. Each baffle section within the pipe is suitably spaced for the species watercourse requirements. The standard design, a concept used and developed in holland, was altered to better suit the UK environment which included:

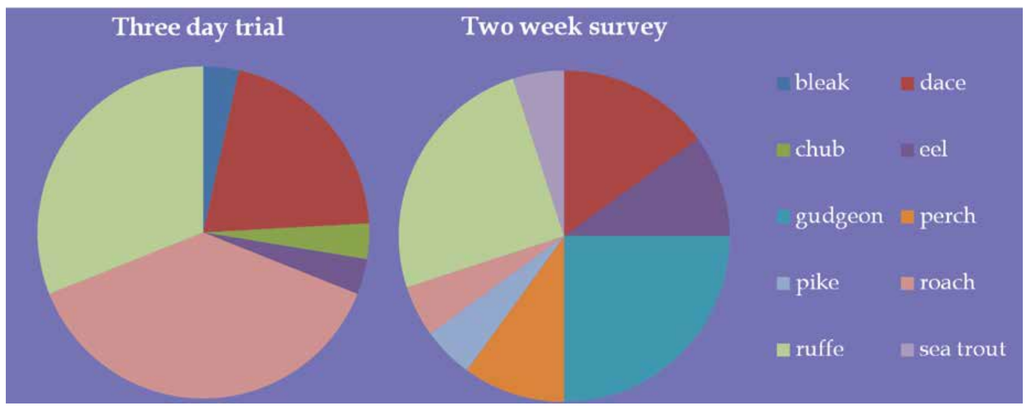
- Integrated eel pass
- Adherent knapp on each baffle
- Cut Off Valves for siphon isolation
- Unique monitoring suite including pit loops and telemetry



Monitoring...

Initial monitoring of the Siphon has already taken place by the Environment Agency in conjunction with Hull International Fisheries Institute. Fish tagging and fyke net surveys were conducted and provided evidence of use by a range of species including sea trout and eel. A full five year monitoring plan is currently in design by the Environment Agency in conjunction with Cranfield University. The key objectives are to catch around 3200 fish during the study period and tag at critical times such as sea trout spawning runs and downstream migration of the silver eel. This on-going study will involve:

- Fyke Netting
- PIT tagging
- Acoustic Tagging
- Video and DIDSON cameras
- Acoustic Doppler Current Profilers




Fish caught for siphon testing


Appearance of sea trout in Norfolk


Fyke net assembly

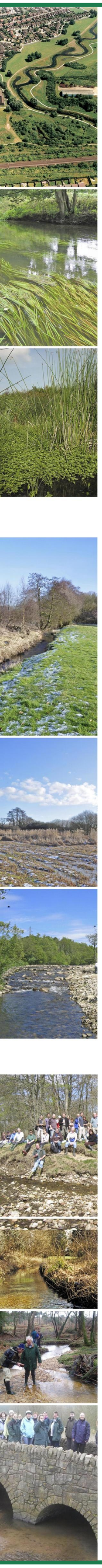
in partnership with Environment Agency

Cranfield UNIVERSITY

ACE

Poster Produced By:
Zebrina Hanly: Aquatic Control Engineering Ltd
www.aquaticcontrol.co.uk

A big thank you to the Environment Agency and partners for their continued support and partnership.



River Restoration Centre

Restoration of the Mayes brook in Mayesbrook Park, London

Nick Elbourne

River Restoration Centre Restoration Adviser &

Cranfield University postgraduate student

1. Introduction to the Mayesbrook Park project

Background

Mayes brook had been deepened, straightened and re-aligned, hidden behind palisade fencing. Mayesbrook Park was awarded funding as part of the **Mayor of London's 'Help a London Park' project** and as a flagship scheme, this helped draw in considerable interest from a range of project partners including funding from R.C.A., an insurance company. The restoration in 2011 delivered multiple benefits.

Project aims

- Exemplar natural flood management
- UK first in adapting urban green space to the impacts of climate change
- Contribute to Water Framework Directive, London BAP and London Climate Change strategy targets
- Provide a long-term and sustainable asset in an area of social deprivation
- Outdoor recreation for local people
- Attract public and private funding to deliver catchment restoration

Public consultation event, 2008 (© LBBD)

2. Restoration design

Landscape design

- **Improvement to water quality** by identifying misconnected domestic water pipes (Thames Water), which had led to pollution flowing into the brook.
- River works to **increase flood storage** by 1ha and **increase habitats and wildlife**.
- **Improvements in landscape, social and aesthetic value**. New recreation facilities (outdoor gym and sports facilities) and better access for park users.

Mayesbrook Park restoration project landscape master plan (© Quartet Design)

3. A coordinated monitoring programme

Delivering an integrated approach

A monitoring strategy was formulated to ensure improvements could be assessed in a scientific and transparent way. Evaluation targets were thematic, focusing on riparian environment; terrestrial ecology; visitor experience; and adaption to climate change. Guidelines developed by the River Restoration Centre (RRC) were used to determine monitoring targets using SMART criteria (Specific, Measurable, Achievable, Relevant, Time-based). Data has been collected by many groups, with central coordination by RRC.

Monitoring by technical staff, volunteers and school groups (© LBBD/Nick Elbourne)

4. Early results from my MSc study

River and floodplain habitat

- **Increase** in the diversity of biotopes (habitats and flow types)
- **Improvement** in the Urban River Survey 'overall score' following restoration
- **Photographic evidence** of the restored river channel accommodating floodwaters

Aquatic invertebrates

- **Increase** in the number of aquatic invertebrate groups sampled
- **Change** in the aquatic invertebrate composition (*by functional feeding group %*).

Transformation of the lower channel from an embanked straight channel to a meandering channel, reconnected with its floodplain (© LBBD/Nick Elbourne)

Key messages

- Creation of a river corridor and a wider 'green network', such as paths, parks and gardens, to create a **dramatically improved natural infrastructure**. Hailed as the UK's first 'climate change adaption park', the restored landscape continues to mature.
- **Social benefits** have been significant - increased numbers of visitors and greater feeling of safety – demonstrated by formal monitoring. The role of the on-site ranger as a friendly face for local people, and event organisation has been a great success.
- The **importance of an integrated monitoring strategy** to coordinate all evaluation activities to involve local people, and to form evidence to support future restoration.

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River Restoration Centre

River Restoration Centre Activities 2012/2013

Site visits
Advisory visits
Technical workshops

RRC have been involved in advisory visits, site visits and technical workshops all over the UK in the past twelve months. The map below shows the location of these activities.

For information on how to arrange a site visit or a workshop in future, please speak to any member of RRC staff.

Site visits

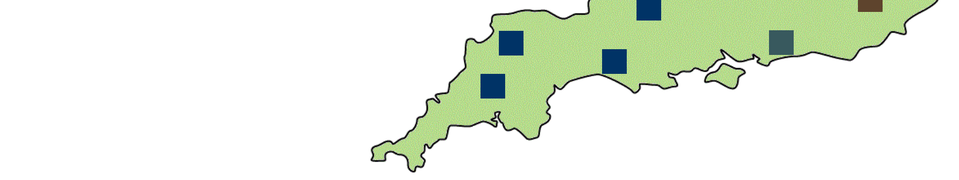
- *River Medlock, Manchester*
- *River Windrush, Oxfordshire*
- *Woodsmill stream, West Sussex*
- *Mayesbrook Park, London*

Technical workshops

- *Catchment Restoration Fund, Sheffield and London*
- *Gauging Weirs Replacement, Sheffield*
- *RRC Annual Conference, Nottingham*
- *WFD walkover survey training, Kent*
- *UKWIR workshop, Birmingham*
- *RESTORE workshop, Nottingham*
- *RESTORE workshop & site visit, Dunkeld*
- *RESTORE workshop & site visit, Dublin*

Advisory visits

- *River Cray, South London*
- *River Welland, Northampton*
- *River (Upper) Lee, Luton*
- *River Great Ouse, Buckinghamshire*
- *Lustrum Beck, Middlesbrough*
- *Burnock Water, Cumnock*
- *River Neet, Cornwall*
- *River Menanhyl, Cornwall*
- *River Roch, Rochdale*
- *River Tone, Somerset*
- *Long Brook, Plymouth*
- *River Ballymoney, Antrim*
- *River Lowther, Eden*
- *River Nene, Northampton*
- *River Colne, Surrey*
- *RSPB Skinflats, Falkirk*



Through the RESTORE project, the RRC have presented to a European audience at technical workshops in Denmark and Southern Ireland. The RRC have also coordinated field visits in the Loire valley (France) and Munich (Germany), and attended the European Conference on Ecological Restoration in Czech Republic.

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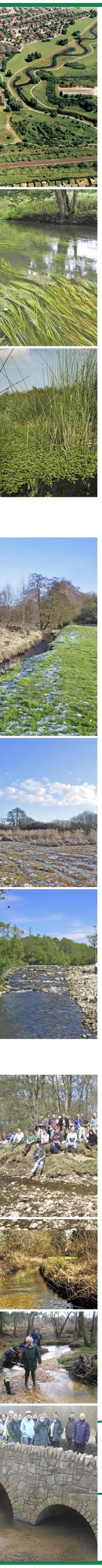
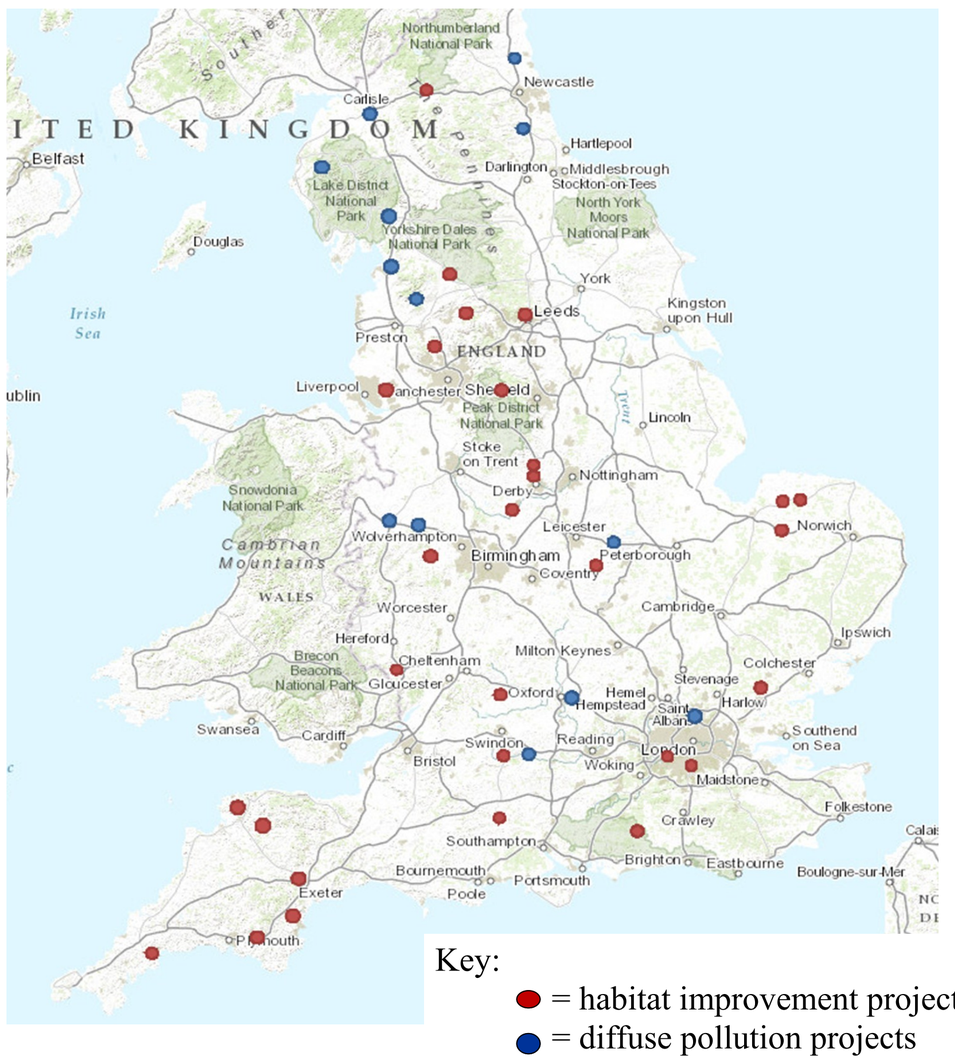


River Restoration Centre

The Catchment Restoration Fund

£24.5 million fund administered by the Environment Agency to support third sector groups carrying out river restoration

Map showing locations of the 42 projects across England:



Key:
- = habitat improvement projects
- = diffuse pollution projects

Aims of the fund:

Restore natural features
Reduce impact of man made structures
Reduce impact of diffuse pollution
...in and around watercourses

How was the funding awarded?

- A national panel including EA, Defra, Natural England and the RRC
- 42 projects approved over two rounds of bidding
- Approval given to projects of high priority within their catchment and with a high confidence of delivery

Anticipated impact of the funding

- Over 300 waterbodies to receive; habitat improvement, improved access for fish, reductions in urban and rural diffuse pollution
- Working towards an improvement in WFD status
- Encourage partnership working and empower local communities to continue projects beyond the CRF

Projects

- Led by charitable organisations e.g. rivers trusts, wildlife trusts and local action groups
- Project plans include: weir removal, gravel installation, large wood, farm visits, wetland creation, fish and eel passes, fencing, culvert removal, tree planting/coppicing, grip blocking, bed raising, channel narrowing, creation of new meandering channels

How have the RRC been involved?

- Part of national panel advising on allocation of funding
- Independent review role; appraisal of design and monitoring plans
- Technical workshops in London and Sheffield
- Project site visits

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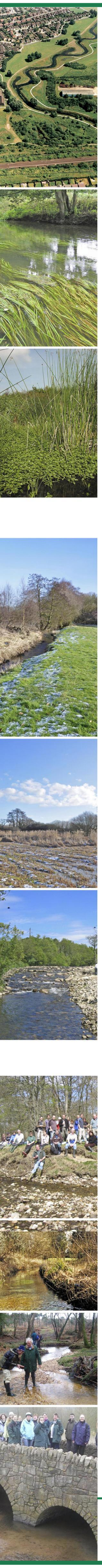


River Restoration Centre

THE RIVER RESTORATION CENTRE

Working to restore & enhance our rivers

Replacing gauging weirs to improve ecology and hydromorphology

Can we remove or replace gauging weirs but still maintain the important long-term hydrological record?

1. Issues

- The implementation of strategic river restoration is hampered by the presence of various barriers in the river systems.
- The removal of weirs can be a problem where the weir is being used for gauging purposes.
- A conflict exists between the need to collect long-term flow data and the need to enhance the state of river ecology and hydromorphology.

2. Aim and objectives

The project aimed to develop guidance for removal of gauging structures, or where not feasible, to identify alternative sustainable options that minimise impacts on sediment and flow dynamics, and connectivity. This has been done through:

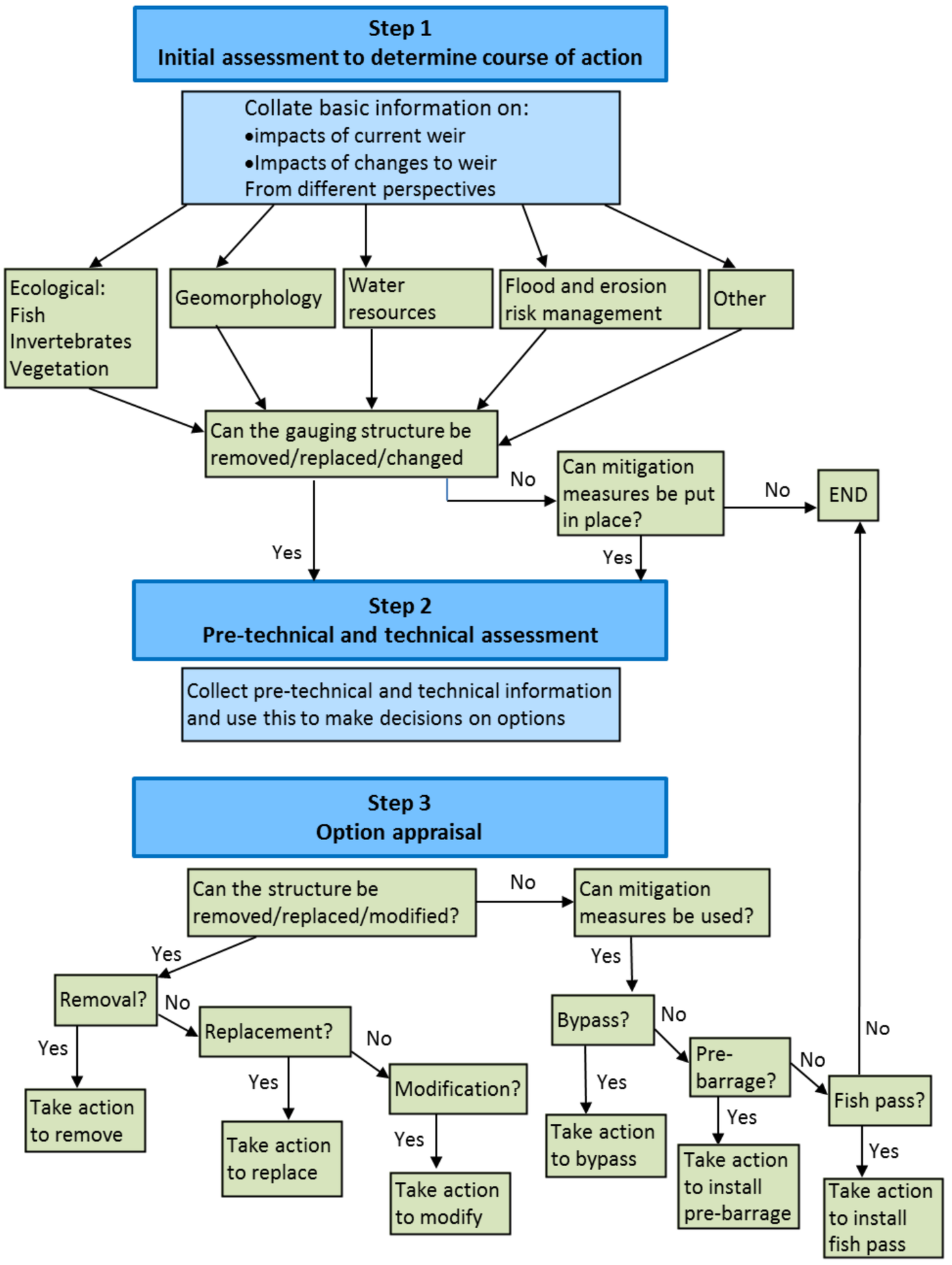
1. workshop discussions on weir removal and replacement from a hydrometric, ecological and fisheries perspective;
2. identifying gauging stations that could be removed or replaced;

Rock ramp downstream of a gauging weir on Afon Gwyrfai.

3. developing detailed case studies to demonstrate achievable best-practice;
4. developing a decision making frame-work for potential gauging weir removal or replacement.

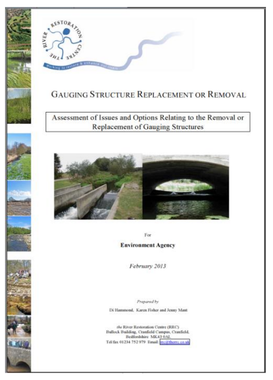
3. Assessing gauging stations

A gauging station assessment framework has been developed which outlines a set of eight key statements to guide the discussion of removal/replacement between relevant fisheries and hydrometric teams within the Environment Agency. The flow chart gives an overview of this process.



4. Results

A guidance document has been put together on how to assess the effect of gauging stations on fisheries, ecology and hydromorphology, and to explore potential alternatives. Issues and benefits of structure removal are discussed and will be available in detail in an R&D document on structure removal, lowering and modification. This document has been put together by the RRC and Karen Fisher, supported and funded by the Environment Agency and Natural England.



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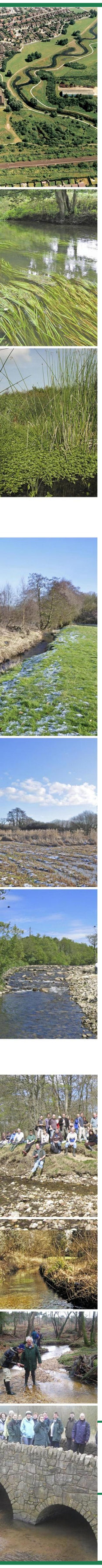
NATURAL ENGLAND



River Restoration Centre

RRC Manual of River Restoration Techniques

A guide to best practice techniques utilised in the restoration of river reaches across the United Kingdom

What is the Manual of River Restoration Techniques?

The RRC Manual of Techniques is a technical manual that aims to provide practitioners with an understanding of river restoration and habitat enhancement techniques that have been used before; so that new restoration schemes can benefit from ideas that may be incorporated and improved upon.

Originally focussed on the rivers Cole and Skerne, it was RRC's intention that the manual would be expanded to include additional techniques, featuring different river types. Following this update, the manual will contain 66 techniques across 36 projects.

Location of projects featured in the MoT

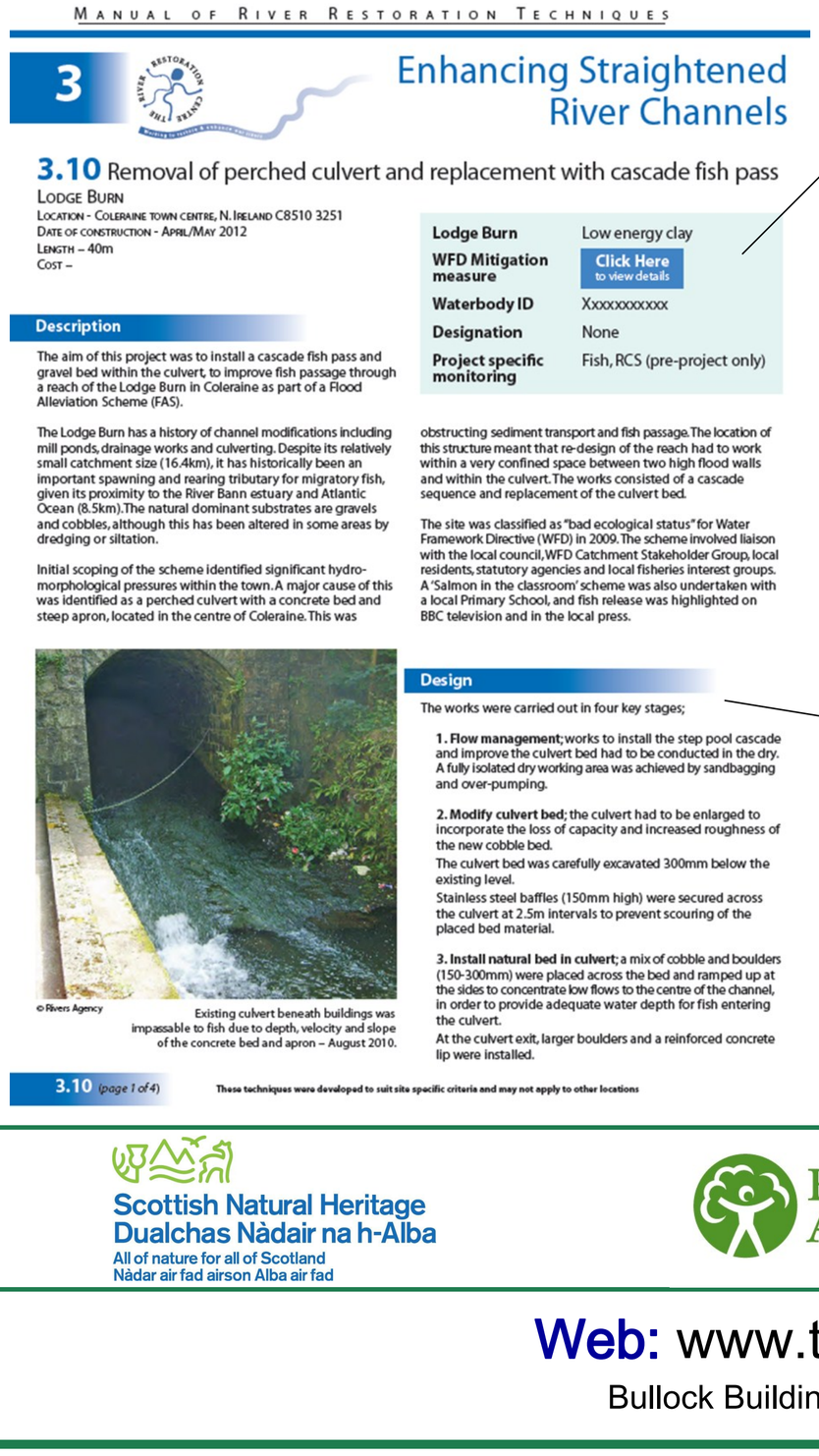
2013 Update… What is new?

Update on existing entries

- One page summary with photographs for each entry.
- Outline of the technique performance since the last update.
- Suggestions for those wishing to design and implement similar schemes in the future.

19 new projects

- A wide range of techniques, at a variety of scales, from across the UK.
- Ranging from highly technical design projects to low cost projects aimed at 'kick starting' natural processes.
- Including a site description, an outline of how to implement the technique, design drawings, the technique performance to date and before and after photographs.



MANUAL OF RIVER RESTORATION TECHNIQUES

3 Enhancing Straightened River Channels

3.10 Removal of perched culvert and replacement with cascade fish pass

LODGE BURN

LOCATION - COLERAINE TOWN CENTRE, N. IRELAND C8510 3251
DATE OF CONSTRUCTION - APRIL/MAY 2012
LENGTH – 40m
COST –

Lodge Burn	Low energy clay
WFD Mitigation measure	Click Here to view details
Waterbody ID	Xxxxxxxxxx
Designation	None
Project specific monitoring	Fish, RCS (pre-project only)

Description

The aim of this project was to install a cascade fish pass and gravel bed within the culvert, to improve fish passage through a reach of the Lodge Burn in Coleraine as part of a Flood Alleviation Scheme (FAS).

The Lodge Burn has a history of channel modifications including mill ponds, drainage works and culverting. Despite its relatively small catchment size (16.4km), it has historically been an important spawning and rearing tributary for migratory fish, given its proximity to the River Bann estuary and Atlantic Ocean (8.5km). The natural dominant substrates are gravels and cobbles, although this has been altered in some areas by dredging or siltation.

Initial scoping of the scheme identified significant hydro-morphological pressures within the town. A major cause of this was identified as a perched culvert with a concrete bed and steep apron, located in the centre of Coleraine. This was obstructing sediment transport and fish passage. The location of this structure meant that re-design of the reach had to work within a very confined space between two high flood walls and within the culvert. The works consisted of a cascade sequence and replacement of the culvert bed.

The site was classified as "bad ecological status" for Water Framework Directive (WFD) in 2009. The scheme involved liaison with the local council, WFD Catchment Stakeholder Group, local residents, statutory agencies and local fisheries interest groups. A 'Salmon in the classroom' scheme was also undertaken with a local Primary School, and fish release was highlighted on BBC television and in the local press.

© Rivers Agency

Existing culvert beneath buildings was impassable to fish due to depth, velocity and slope of the concrete bed and apron – August 2010.

Design

The works were carried out in four key stages;

1. Flow management; works to install the step pool cascade and improve the culvert bed had to be conducted in the dry. A fully isolated dry working area was achieved by sandbagging and over-pumping.

2. Modify culvert bed; the culvert had to be enlarged to incorporate the loss of capacity and increased roughness of the new cobble bed.

The culvert bed was carefully excavated 300mm below the existing level.

Stainless steel baffles (150mm high) were secured across the culvert at 2.5m intervals to prevent scouring of the placed bed material.

3. Install natural bed in culvert; a mix of cobble and boulders (150-300mm) were placed across the bed and ramped up at the sides to concentrate low flows to the centre of the channel, in order to provide adequate water depth for fish entering the culvert.

At the culvert exit, larger boulders and a reinforced concrete lip were installed.

3.10 (page 1 of 4) These techniques were developed to suit site specific criteria and may not apply to other locations

Information box to outline river type and WFD measures the technique mitigates

This is to help the user understand the conditions under which the technique has been implemented and to identify WFD pressures that this technique could be used to tackle at other sites.

Detailed design diagrams

To help practitioners and design engineers understand how to implement the technique on the ground.

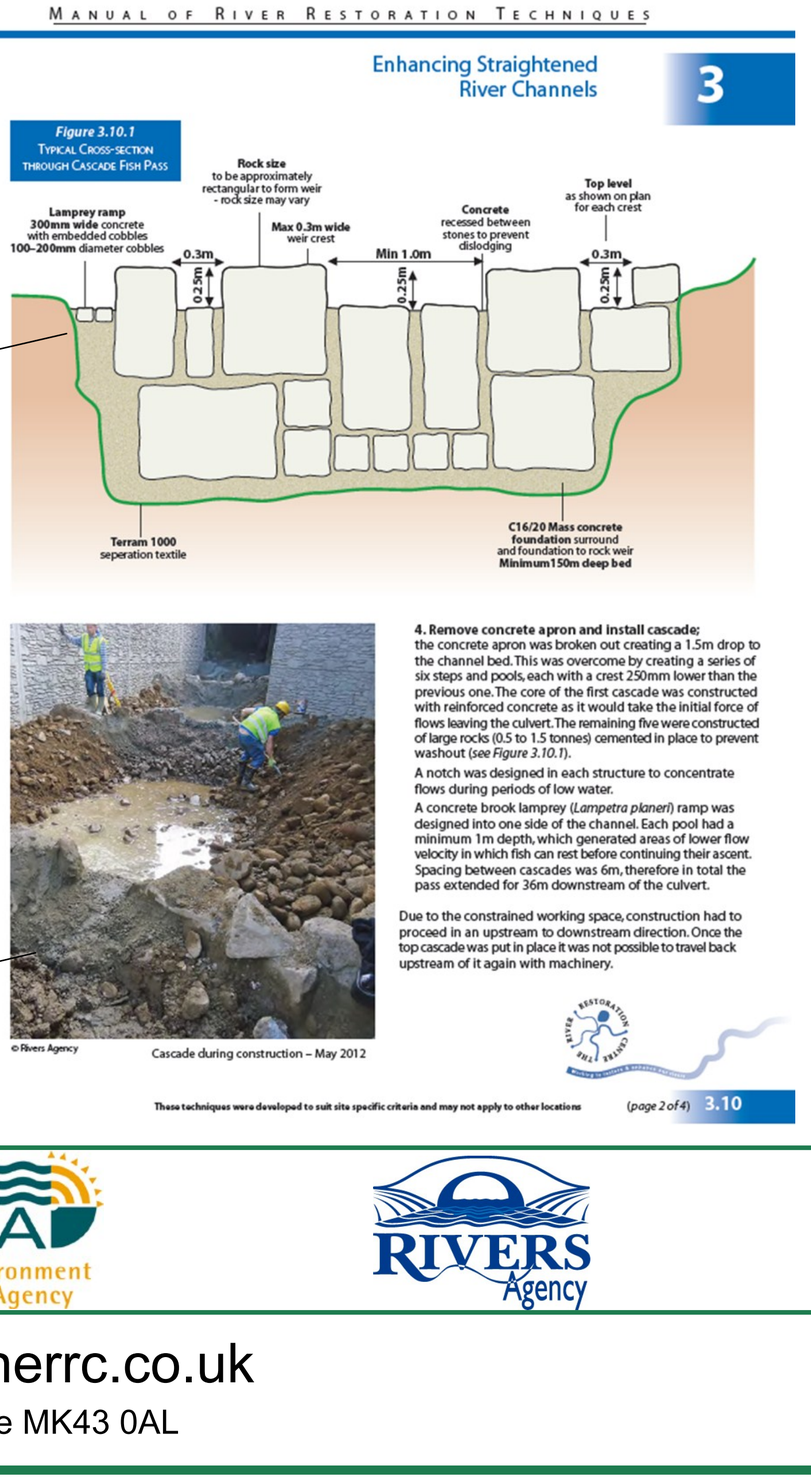
*NB: The MoT is **not** an engineering design manual and should not be used as such. Technical drawings are site specific and may not apply to other locations.*

Step by step approach

An outline of how to implement the technique is given, along with details of the subsequent performance to date and suggestions for those considering similar projects in the future.

Photographs

To illustrate the site before, during and after works were carried out



MANUAL OF RIVER RESTORATION TECHNIQUES

Enhancing Straightened River Channels 3

Figure 3.10.1 TYPICAL CROSS-SECTION THROUGH CASCADE FISH PASS

© Rivers Agency

Cascade during construction – May 2012

4. Remove concrete apron and install cascade; the concrete apron was broken out creating a 1.5m drop to the channel bed. This was overcome by creating a series of six steps and pools, each with a crest 250mm lower than the previous one. The core of the first cascade was constructed with reinforced concrete as it would take the initial force of flows leaving the culvert. The remaining five were constructed of large rocks (0.5 to 1.5 tonnes) cemented in place to prevent washout (*see Figure 3.10.1*).

A notch was designed in each structure to concentrate flows during periods of low water.

A concrete brook lamprey (*Lampetra planeri*) ramp was designed into one side of the channel. Each pool had a minimum 1m depth, which generated areas of lower flow velocity in which fish can rest before continuing their ascent. Spacing between cascades was 6m, therefore in total the pass extended for 36m downstream of the culvert.

Due to the constrained working space, construction had to proceed in an upstream to downstream direction. Once the top cascade was put in place it was not possible to travel back upstream of it again with machinery.

These techniques were developed to suit site specific criteria and may not apply to other locations (page 2 of 4) 3.10

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Environment Agency

SEPA Scottish Environment Protection Agency

RIVERS Agency

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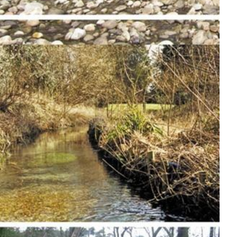


Restoring Europe's Rivers

RESTORE

SUCCESSES SO FAR

RESTORE is a partnership for sharing knowledge and promoting best practice on river restoration in Europe. It is supported by LIFE+ funding from the European Commission and works closely with the European Centre for River Restoration (ECRR).

Winning recognition and promoting the benefits of river restoration to different audiences

Funding over the right timescales…

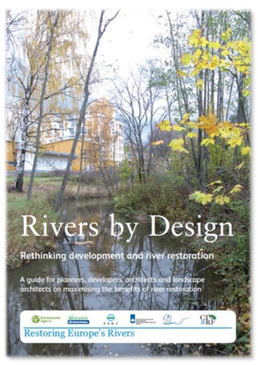
RESTORE have lobbied to support mechanisms providing financial support over multiple years. The Catchment Restoration Fund (England) is an example of this.

Inspiring a new international accolade for rivers…

CEO of the International RiverFoundation, Matthew Reddy, launched the new **European River*prize*** at our workshop in Lille, addressing concerns that there little recognition for river restoration and sustainable management.

A guide for planners and landscape architects…

Rivers by Design provides practical advice and information to maximise the ecological, social and economic benefits that can be delivered by incorporating river restoration and habitat enhancement into spatial planning and development.



Building the evidence base to reduce risk and uncertainty

The most comprehensive case study resource ever…

Our online RiverWiki knowledge management tool, holds information on past restoration experiences from over twenty countries. The resource continues to be populated by users. Register for free to upload your own projects.

http://riverwiki.restorerivers.eu/

Promoting and enabling monitoring and evaluation…

RESTORE has been highlighting the importance of post-project evaluation at many third party events.

Lessons learnt…

RESTORE will revisit case studies that have featured in the past to gather tales of all the unforeseen issues which only surface years after the works are finished.

Improving ways of working for project designers, managers and deliverers

Workshops and site visits have…

Promoted the early benefits of early contractor involvement with consultants internationally and with relevant government agencies.

Engaged *with EU water policy makers.*

Demonstrated new practical tools.

Brought spatial planners and river restorers together, to highlight the importance of integrated land and water management to the planning sector.

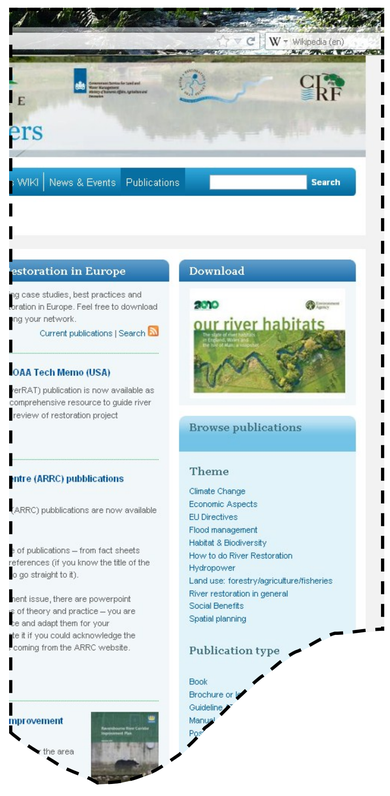
Look out for upcoming site visits and engagement workshops

Producing and collating guidance & information

On www.RestoreRivers.EU…

There's a wealth of information on the many **multiple benefits** of more naturally functioning rivers. We have brought together all freely available guidance from all 21 partnership countries, across Europe and the whole world.

*Downloadable information on a range of themes such as **flood risk management**, **hydropower**, **economic** aspects, meeting **EU directives** and '**how to do river restoration**'.*



To aid learning from accumulated experience…

We have taken steps towards the reformation of the Danish River Restoration Centre.

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DELEGATE LISTS

AS COMPILED ON 12TH APRIL 2013

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Fiona Bowles	Wessex Water
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Kevin Skinner	Atkins

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Sir Sebastian Anstruther	Arun + Rother Rivers Trust
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Chris Coode	Thames21
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Chris Farmer	Environment Agency
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Sarah Galsworthy	Environment Agency
Jonathan Garland	Environment Agency
Paul Gaskell	Wild Trout Trust
Sally German	ARUP
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Robin Green	BWB Consulting Ltd

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Stephen Haley	Natural England
Steve Hancke	Willowbank Services
Matt Hardwick	Royal HaskoningDHV
Darren Harvey	BWB Consulting Ltd
Lucy Hawker	Warwickshire Wildlife Trust
Gerard Hawley	Penny Anderson Associates
James Hector	Willowbank Services
Paul Henderson	Environment Agency
George Heritage	JBA Consulting
Jack Herriot	Environment Agency
David Hetherington	Arup
Craig Higson	Environment Agency
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Paul Hodgkiss	Waterco
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James Holloway	Queen Mary University of London
James Holt	Environment Agency
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Jayne Hornsby	Land & Waters Services Ltd
Melissa Hoskings	Severn Rivers Trust
Toby Hull	Wandle Trust
Alex Humphreys	Atkins
Kathryn Hunter	Yorkshire Water
Tim Jacklin	Wild Trout Trust
Mike Jenkins	Environment Agency Wales
Kye Jerrom	Environment Agency
Jim Jones	Surrey Wildlife Trust
Gareth Jones	Ribble Rivers Trust
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Pinja Kasvio	Finnish Environment Institute (SYKE)
Katy Kemble	Jacobs
Stephen Kennedy	Environment Agency
Peter King	Ouse & Adur Rivers Trust
Jimmy King	Inland Fisheries Ireland
Charlotte Kinnear	RSPB

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Guy Laister	Water Environment Ltd
Chris Lally	Isle of Man Water & Sewerage
Mark Lang	Hyder Consulting
James Latham	Water Environment Ltd
Heb Leman	Environment Agency
Shaun Leonard	Wild Trout Trust
David Lerner	University of Sheffield
Anne Lewis	Environment Agency
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Andy Loble	Environment Agency
Emily Long	Environment Agency
Tim Longstaff	Wandle Trust
Oliver Lowe	Environment Agency
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Suzie Maas	Atkins
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Nathalie Marten	Pond Conservation
Andy Martin	Environment Agency
Julia Massey	Environment Agency
Alasdair Maxwell	Environment Agency
Alex McDonald	Environment Agency
Rachael McFarlane	Environment Agency
Jonathan McKee	DARD Rivers Agency
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Diane Millis	Environment Agency
Carolyn Mills	cbec eco-engineering UK
Hamish Moir	cbec eco-engineering UK
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Francesca Moore	Black & Veatch
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Patrick Murphy	NI Environment Agency

Name	Organisation
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Pam Nolan	Environment Agency
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Leela O'Dea	Canal and River Trust
Jo Old	Environment Agency
Diane O'Leary	West Cumbria Rivers Trust
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Robert Orford	Miles Waterscapes Ltd
Simon Palmer	APEM Ltd
Timur Pavlyuk	FGUP RosNIIVH (Russian Research Institute for Integrated Water Management and Protection)
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Gareth Pedley	Eden Rivers Trust/Wild Trout Trust
Francesca Pert	Environment Agency
Alix Pitcher	OHES Environmental
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Rosie Pyper	Environment Agency
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Ben Rayner	Environment Agency
Abigail Rees	Birmingham University
Nick Reid	Environment Agency
Jack Rhodes	RSPB
Lizzie Rhymes	Environment Agency
Vic Richardson	Thames21
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Gary Roberts	Atkins
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Rory Sanderson	Environment Agency
Leanne Sargeant	Environment Agency
Toni Scarr	Environment Agency
Graham Scholey	Environment Agency

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Andrea Shaftoe	Environment Agency
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Oliver Southgate	Environment Agency
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Fiona Steele	Environment Agency
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Mike Streetly	ESI Ltd
Lee Swift	Environment Agency
Elizabeth Taeed	cbec eco-engineering UK
Lucy Taylor	Environment Agency
Julie Templeton	Atkins Ltd
Lauren Tewson	Environment Agency
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Murray Thompson	Natural History Museum
Emma Thompson	Environment Agency
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Julia Toone	Environment Agency
Mike Townsend	The Woodland Trust
Alice Tree	SEPA
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Rebecca Westlake	Environment Agency
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Greg Whitfield	Environment Agency
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Gareth Williams	Environment Agency
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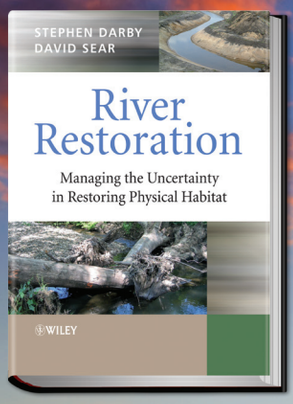

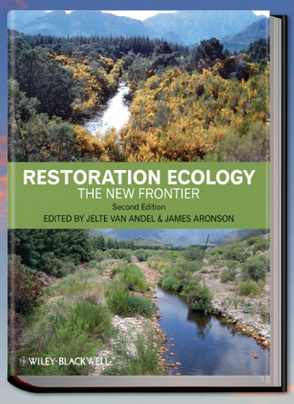

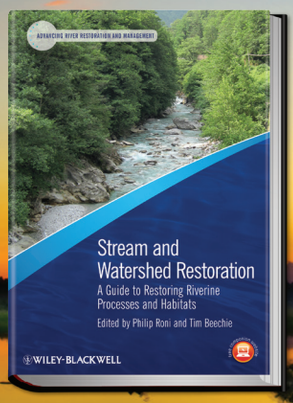

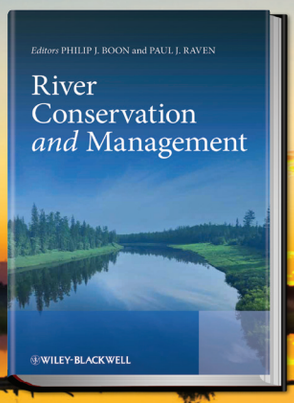

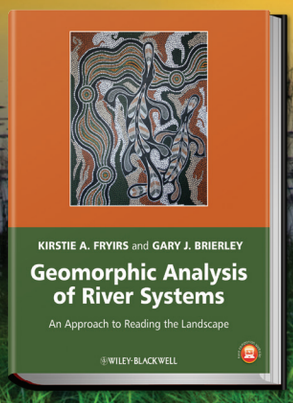

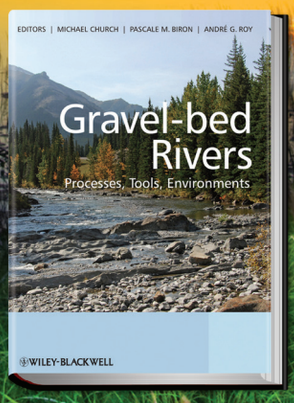

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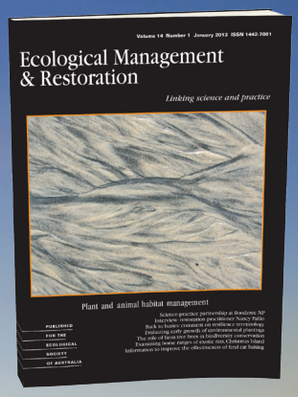

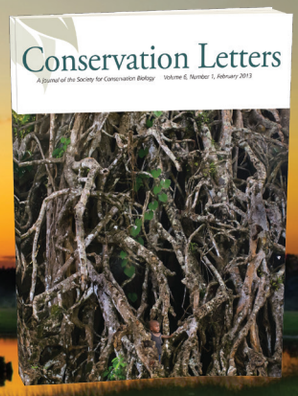

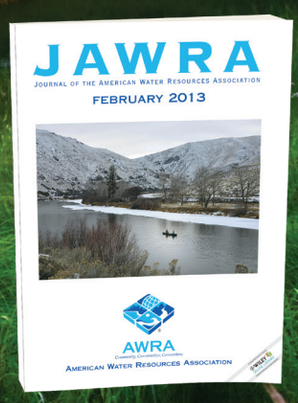

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