River Restoration Centre
13th Annual Network Conference

Delivering River Restoration:
Recipes for Success

In association with the EU LIFE+ RESTORE project

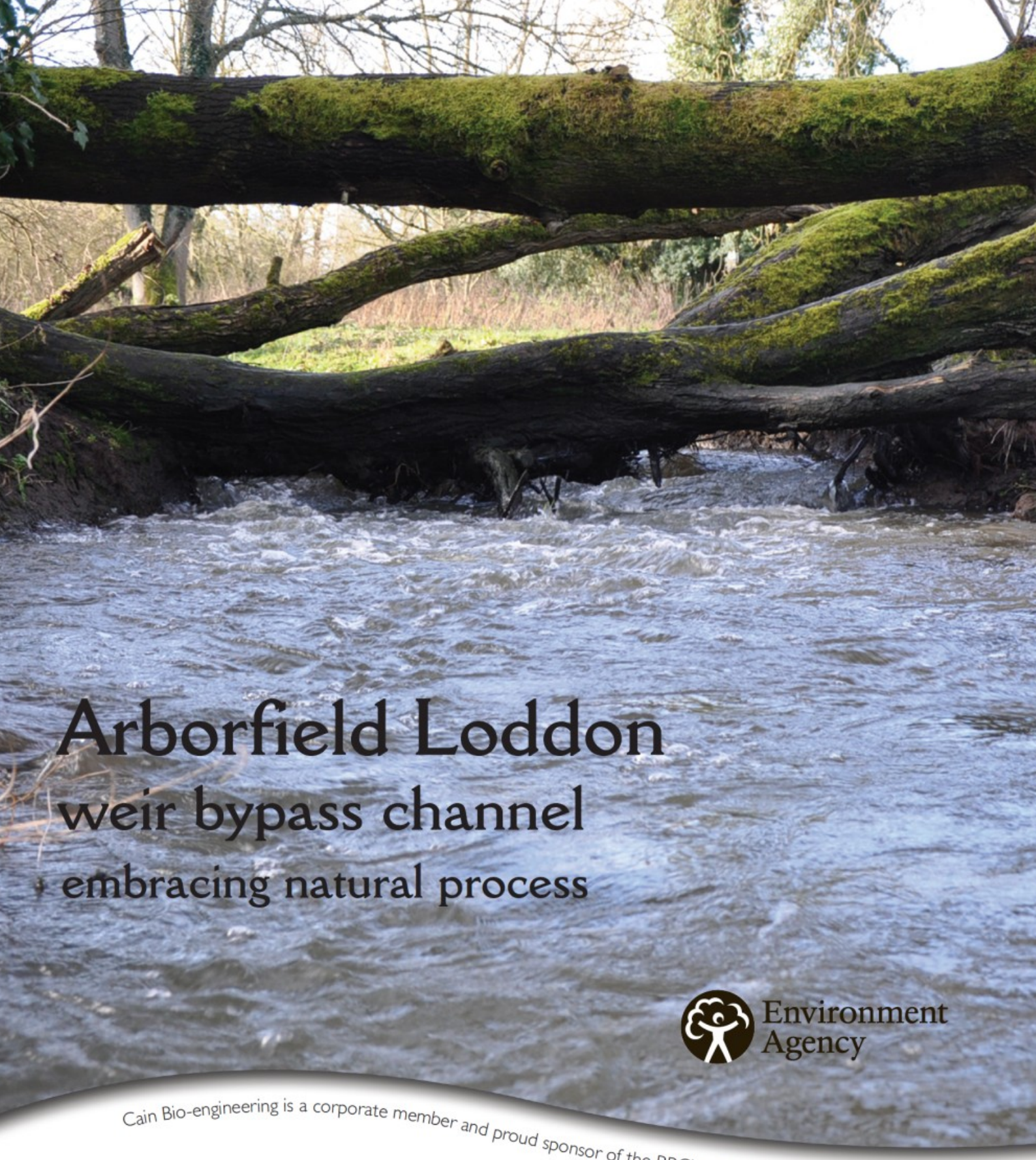
Restoring Europe's Rivers

Delegate Pack

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

19th—20th April 2012

Jubilee Campus, University of Nottingham, England



Arborfield Loddon

weir bypass channel

embracing natural process

Environment Agency

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THE RIVER RESTORATION CENTRE
Working to restore & enhance our rivers

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the River Restoration Centre

Working to restore and enhance our rivers

13th Annual Network Conference

Delivering River Restoration: Recipes for Success

Kindly sponsored by:

Delegate handbook 2011 & 2012 designed and produced by James Holloway and Nick Elbourne

Welcome!

…from the Director

May I wish you a warm welcome to this year's River Restoration Centre Annual Network Conference. Now in its 13th year, the continued success of this event owes much to the contributions of presenters past and present, as well as all of the attendees. Without your participation by speaking, listening and sharing, we wouldn't be able to organise and run this conference.

2011/12 was a fantastic year for river restoration and for RRC. The Government's investment of £92M to help deliver the work required to improve the natural process functioning of our watercourses was a welcome announcement at the time of the last RRC conference. Much of the early angst of building processes for assigning these funds has past, allowing the true work to begin in earnest.

At RRC we have been working hard to support new proposals through advisory work, a programme of site visits, guidance documents and workshops to disseminate best practice. Our Western Europe lead role in the EU LIFE+ *RESTORE* project has allowed us to communicate to a wider European audience, working in partnership with the Environment Agency, our other RESTORE partners and the European Centre for River Restoration (ECRR). Through the ongoing suite of events and exchange of experiences, I know we will add considerably to the information resource available to UK river managers.

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.

The new Catchment Restoration Fund will provide funding to deliver many partnership restoration projects over the next few years, and I am delighted that RRC has been asked to provide our independent expertise to help make sure that this mechanism results in success. We continue to grow as an organisation and the future looks extremely positive. We will continue to work collaboratively with our members and others in order 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 return to the University of Nottingham for a third time, following the excellent feedback from last year's extended one-day conference. We were delighted with the quality and breadth of presentations and posters presented, and we are equally excited about this year's programme.

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

CONTENTS

PROGRAMME OF EVENTS

- - - THURSDAY 19TH APRIL - - -

Business School South

09:00	REGISTRATION & REFRESHMENTS	60 mins
	Lecture Theatre B52, 1st Floor **CHAIR: Andrew Gill** (RRC Board)	
10:00	**Announcements, Welcome & Introduction** Geraldene Wharton *(Chair of the River Restoration Centre Board)*	20 mins
10:20	**KEYNOTE ADDRESS:** **Approaches to River Restoration Across Europe** Bart Fokkens *(Chairman of the European Centre for River Restoration)*	30 mins
10:50	***Discussion***	10 mins
11:00	BREAK With tea and coffee	30 mins

Session 1:
THE PROCESSES OF MANAGING PARTNERSHIPS AND PROJECTS

	Lecture Theatre B52, 1st Floor	Lecture Theatre A25, Ground Floor	
	CHAIR: Kevin Skinner (Atkins & RRC Board)	**CHAIR: Fiona Bowles** (Wessex Water & RRC Board)	
11:30	**Partnership at the Muddy End.** Will Bond *(Alaska Environmental Contracting)*	**The Electricity Supply Board and habitat development in the River Shannon catchment, Ireland.** Denis Doherty *(Electricity Supply Board)* et al.	15 mins
11:45	**River restoration strategies in Wessex: How partnership development promotes project delivery.** Alasdair Maxwell *(Environment Agency)* et al.	**SSSI Restoration in the New Forest: Trying To Keep Most of the People Happy, Most of the Time.** Sarah Oakley *(Forestry Commission)*	15 mins
12:00	**Re-connecting the blue ribbons and green grids: Adding value through urban river restoration.** Lucy Shuker *(Queen Mary, University of London)*	**Holnicote – Catchment Change Challenge!** Peter Worrall *(Penny Anderson Associates)* et al.	15 mins
12:15	***Discussion***	***Discussion***	15 mins

12:30	LUNCH		60 mins

Session 2:

GETTING YOUR FEET WET – WHAT GOES ON IN THE CHANNEL

	Lecture Theatre B52, 1st Floor	Lecture Theatre A25, Ground Floor	
	CHAIR: Angela Gurnell (Queen Mary, University of London)	**CHAIR: Mervyn Bramley** (Independent Engineer and Environmentalist & RRC Board)	
13:30	**Re-Naturalising Whicham Beck, Cumbria – Innovative Processes in Project Delivery and Environmental Management, with Sustainable, Cost-effective Reservoir Discontinuance.** Paul Bradley *(PBA Applied Ecology)*, Evan Dollar *(MWH)* et al.	**Arborfield weirs and nature like bypass – reconnecting people with nature after twenty years of thought.** Dominic Martyn *(Environment Agency)*	15 mins
13:45	**Bringing LIFE to the Irfon.** Simon Evans *(Wye & Usk Foundation)*	**Rewilding the River Adur.** Ian Dennis *(Royal Haskoning)*	15 mins
14:00	**The Logie Burn Restoration Project.** *(- TBC -)* Estelle Gill *(Scottish Natural Heritage)* et al.	**Restoration in tight spaces! Legacy engineering and river naturalisation.** George Heritage *(JBA Consulting)* et al.	15 mins
14:15	***Discussion***	***Discussion***	15 mins
14:30	**Simple is best.** Nigel Holmes *(Alconbury Environmental Consultants)*	**The Removal of Kentchurch Weir on the River Monnow.** Alexander Humphreys *(Atkins)* & Peter Gough *(Environment Agency)*	15 mins
14:45	**Day-lighting of a culverted channel in Aberdeenshire: Constraints, challenges and opportunities.** Hamish Moir *(cbec eco engineering)* et al.	**A case study on the design, construction and effectiveness of a new nature-like fish pass at Byron's pool on the River Cam, highlighting the need for a 'hands on' approach.** Ellis Selway *(Bodhi Ecology)*	
15:00	***Discussion***	***Discussion***	10 mins
15:10	POSTER SESSION With tea and coffee Rooms A24 & A26, Ground Floor		50 mins

Session 3:
VALUING THE BENEFITS OF RIVER RESTORATION

	Lecture Theatre B52, 1st Floor	Lecture Theatre A25, Ground Floor	
	CHAIR: Jenny Wheeldon (Natural England / Environment Agency)	**CHAIR: Geraldene Wharton** (Queen Mary, University of London & RRC Board)	
16:00	**Environmental and Economic Growth Strategies – The River Avon Restoration Initiative.** Nikki Wood *(Environmental Gain)*	**Most bang for your buck. Optimising value for money from catchment restoration schemes.** Tommy McDermott & David Bradley *(APEM)*	15 mins
16:15	**The Water Environment Restoration Fund.** Joanne Gilvear *(Scottish Environment Protection Agency)*	**Prioritising culverts for removal: Breaking banks without breaking the bank!** Diana Hammond *(River Restoration Centre)* et al.	15 mins
16:30	***Discussion***	***Discussion***	10 mins
16:40	Short break to move to final joint session		10 mins

Lecture Theatre B52, 1st Floor

CHAIR: Shaun Leonard (The Wild Trout Trust)

16:50	**Catchment Restoration Fund for England.** Roland Moore *(Defra)*	15 mins
17:05	**Funding Catchment Restoration through Payments for Ecosystem Services.** Laurence Couldrick *(Westcountry Rivers Trust)*	15 mins
17:20	**It ain't all about 'the environment'!** Mark Everard *(Environment Agency)*	15 mins
17:35	***Discussion***	20 mins
17:55	**Closing remarks**	5 mins
18:00	**RESTORE – *Restoring Europe's rivers*** **INFORMAL INFORMATION EXCHANGE SESSION** *Featuring demonstration of RESTORE good practice knowledge exchange tool*	60 mins

- - - FRIDAY 20TH APRIL - - -

IN ASSOCIATION WITH RESTORE

09:00	**Workshop 1:** **PROJECT MONITORING AND ASSESSMENT**		
	Introduction to the session		20 mins
09:20	**DATA COLLECTION & ANALYSIS**	**MONITORING DESIGN & JUSTIFICATION**	
	Presentation of experiences (15 min), each followed by questions and discussion (5 min), in two parallel sessions		1 hour 20 mins
	Lecture Theatre B52, 1st Floor	Lecture Theatre A25, Ground Floor	
	The effect of large woody debris on stream community structure across an enrichment gradient. Murray Thompson *(Natural History Museum)* et al.	**How French river restoration projects are evaluated? Discussing the notion of success.** Bertrand Morandi *(University of Lyon)* et al.	
	Pilot project WALPHY: Walloon experimentation of river restoration. Alexandre Peeters *(Université de Liège)* et al.	**Ecological evaluation of recently completed restoration schemes on the River Wensum.** Ian Morrissey *(Atkins)*	
	Anastomosing on the River Trent: An update on river response. Neil Entwistle *(University of Saltford)* et al.	**Coordinated monitoring at Mayesbrook Climate Change Adaptation Park.** Nicholas Elbourne *(RRC)* et al.	
	A hydraulic and fisheries based post-project appraisal of the Inchewan Burn restoration project. David Gilvear & Colin Bull *(University of Stirling)*	**Assessing London's Rivers.** Angela Gurnell *(Queen Mary, University of London)* et al.	
11:10	BREAK With tea and coffee		30 mins
10:50	**Guided discussion on issues emerging and potential solutions**	**Guided discussion on issues emerging and potential solutions**	30 mins
11:20	**Feedback of issues and solutions from split sessions** (Lecture Theatre B52)		20 mins
11:40	**Concluding remarks** *Including where to find advice in PRAGMO (RRC's monitoring guidance)*		20 mins

12:00	LUNCH	60 mins

Workshop 2:
SHARING GOOD PRACTICE IN RIVER RESTORATION

The Exchange Building

Participants from across Europe will present and discuss their experiences in two 1 hour 15mins workshops (parallel sessions).

Delegates will swap sessions after a coffee break.

13:00	**Session A: Demonstration of the RESTORE wiki tool** Room B4, 1st Floor Tutorial and exploration of the RESTORE's wiki case study tool How can we effectively capture the state of the art and does this meet the needs of the river restoration community? How to do river restoration – what needs to be considered? By what mechanisms can we develop further resources?	1 hour 15 mins
13:00	**Session B: Best Practice Knowledge Exchange – RESTORE themes** Room C33, 2nd Floor Introduction of best practice thematic examples What information is currently available? Does this meet our needs? How do opportunities compare across Europe? What are the constraints and pitfalls?	1 hour 15 mins
14:15	BREAK With tea and coffee	30 mins
14:45	***Session A participants switch to Session B, and vice versa***	(1 hour 15 mins)
16:00	END	

NOTES…

Fluvial Geomorphology

Our services include:

- River restoration design;
- Habitat enhancement;
- Low flow studies;
- Historical assessments of channel change;
- Geomorphological field surveys;
- Strategic river management plans;
- Catchment and fluvial audits;
- Water Framework Directive studies and mitigation design;
- Identification of river restoration opportunities;
- Options appraisal;
- Integrated GIS production;
- Fish passage assessment;
- Fish pass design;
- River-sensitive structure design.

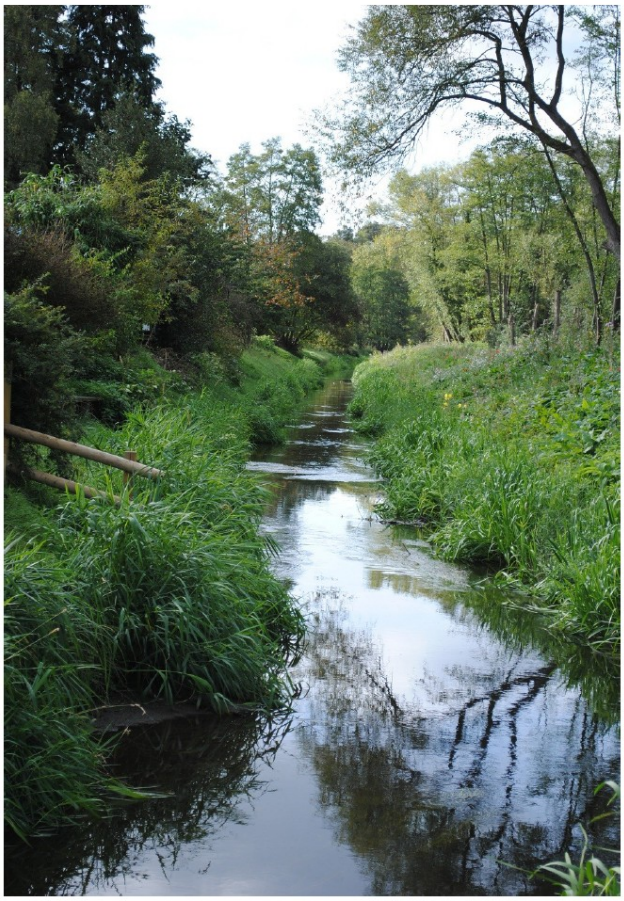
The principles of fluvial geomorphology drive our approach to river management. This ensures sustainability, the promotion of natural processes and ecological and societal benefit.

Proper river management uses the principles of fluvial geomorphology in order to promote healthy interactions between sediment, water, ecology and artificial pressures. Fluvial geomorphology is an integral component of ecologically driven river restoration and Arup has a proven track record of undertaking work of this nature. Arup has extensive expertise in undertaking a range of work that utilises fluvial geomorphology in order to develop sustainable solutions by working with natural processes, repair environmental damage and leave a lasting legacy.

Arup has a number of fluvial geomorphologists and related specialist professionals throughout the UK, and our team is ready to support you in delivering your environmental objectives.

For more information, please contact: david.hetherington@arup.com

River Restoration
Project Consultancy and Design



Over the last 20 years Willowbank has developed expertise in engineering design and specialist construction techniques, this experience combined with our knowledge of aquatic and emergent vegetation means that we are able to offer the client sustainable innovative cost effective solutions for, repair and regeneration of riverbanks, fisheries, wetlands and associated habitat enhancement.

Please visit our stand to discuss restoration techniques.

Willowbank
info@willowbankservices.co.uk
www.willowbankservices.co.uk
01823 690113

WILLOWBANK
NATURAL ENGINEERING SOLUTIONS

Communicating & disseminating best practice

National River Restoration Inventory (NRRI)

This is one of the RRC's most valued resources – and its data are available to all RRC members. The NRRI is the largest inventory of best practice river, watercourse and floodplain restoration, enhancement and management efforts in the UK and further afield. Information includes project details and location (where recorded), objectives and techniques applied and comments on their success/failure alongside other useful evidence. Documentation on monitoring and appraisal, catchment and cost (where available) is also recorded and projects are linked to our directory of contacts.

Through the LIFE+ RESTORE project (RRC are the 'West Europe' lead organisation), an online 'Wiki' inventory of case studies, which is being launched at this year's RRC conference, will allow users to view European projects.

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

River Restoration News

The River Restoration Centre's bi-annual newsletter is available online six months after it is distributed to RRC members. Containing news articles and features on projects around the UK (and abroad) to illustrate developments in the field.

River Restoration Centre Bulletin

The River Restoration Centre's monthly e-newsletter provides updates and short features, focused on day-to-day activities of the RRC and others keen to promote 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 News - September 2011

RESTORE Partnership

EU LIFE+ Information and Communication Project

www.restorerivers.eu

Restoring Europe's Rivers

in association with ECRR

PROJECT DESCRIPTION:

River ecosystems throughout Europe have been severely degraded by engineering projects for flood protection, navigation, water supply and hydroelectricity. It is estimated that less than 20% of Europe's rivers and floodplains are in their natural state and many species have been lost. The role of river restoration, often promoting 'soft' engineering solutions, as a tool to reserve some of the problems associated with damage to these ecosystems has grown considerably in recent decades. Applying sustainable river restoration serves both the Habitats Directive and the Water Framework Directive at several levels; at regional level, supporting the Natura 2000 network; and across Europe these can improve the ecological status of river basins.
River restoration can also assist with adaptation to climate change by strengthening ecological network resilience. River restoration activities also play a crucial role in developing best practice approaches for flood risk management. River restoration is hindered, however, not by a lack of expertise but by a lack of opportunities for sharing best practice and knowledge. Addressing this gap in knowledge transfer is the main aim of the 'RESTORE' project.

OBJECTIVES:

To develop a network linking policymakers, river basin planners, practitioners and experts across Europe to share information and good practice on river restoration to:

1. Support river restoration practices across Europe.
2. Build up existing river restoration network capacity.
3. Promote effective river restoration knowledge transfer.

OUTCOMES:

The project is now in its 2nd year. The project partners have identified issues at the national, regional and European scale; and a series of focused workshops have helped to discuss these in more depth. Identifying how to address these is a key outcome of the project and the RESTORE poster on display highlights developments.

CONTACT DETAILS:

Environment Agency: Antonia Scarr antonia.scarr@environment-agency.gov.uk
River Restoration Centre: Nick Elbourne nick@therrc.co.uk

An article in the European Centre for River Restoration newsletter from SFW, developers of the RESTORE river restoration 'wiki' repository

RESTORE – the case study repository is coming

What is this about?

– This article intends to provide readers with an update on the RESTORE river restoration case study repository. Our aim is to create something like a Wikipedia for river restoration projects. By sharing and being able to comment on information about the experiences of river restoration in Europe, ideas for best practice will quickly emerge. This will be achieved by the creation of public website hosting restoration shared knowledge in the form of reference documents, best practice guidance and a repository of case studies.

Background –

My personal involvement began last year in my role as a consultant for UK based IT Services Company SFW that is working closely with the RESTORE partnership to develop the case study aspects of the website. With my knowledge of riverine environments limited to canoeing it was with some trepidation that I attended the Ljubljana seminar to meet RESTORE stakeholders and potential end users. Much to my relief everyone was friendly, the sessions were interesting and webbed feet were not mandatory. Hopefully I will get to meet some of you again at the RRC event in Nottingham. Subsequently we have refined the system requirements to take into account findings, feedback and ideas from the conference and are currently proceeding with design.

Why is this of interest? –

We are hoping to create a focal point for pooling information and sharing experience within the European river restoration community. Specifically the case studies will be presented in the form of interactive web pages that include thematic and geographic information. You will therefore be able to:

- Search case studies by theme, location or other attributes
- Visualise cases on integrated Google Maps
- Contribute by adding new cases
- Edit cases with supplemental information
- Discuss cases with community members
- Contact other contributors

Do I have to be an IT expert? –

No, we are designing the system to be as friendly as possible with the inclusion of simple pages and forms to allow all users to participate. A partial screen extract for a draft sample query page is illustrated below:

What is happening next? –

A working prototype has been produced by SFW and work will progress to fully define the data model and user interface aspects. Some key milestones include:

- 20th April 2012 – demonstration of the case study repository at the River Restoration Centre Network conference in Nottingham.
- June 2012 – system deployment complete

Keep up to date with news and events at the RESTORE website www.restorerivers.eu

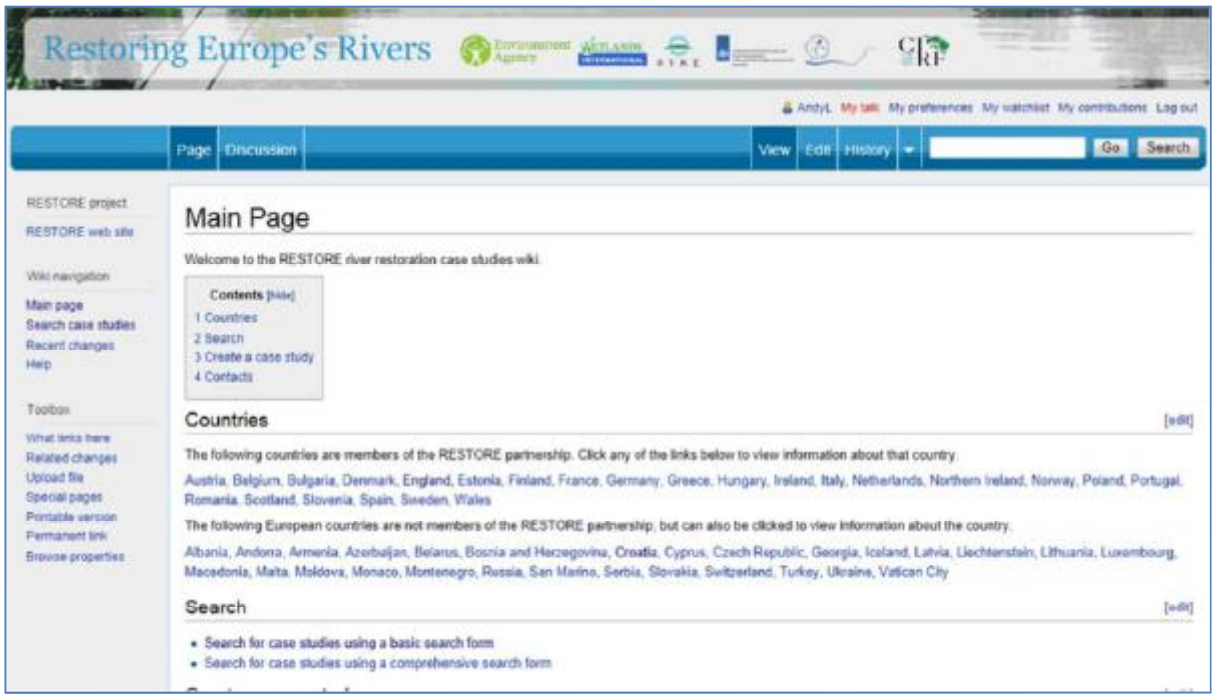
Restoring Europe's Rivers

How can I get involved? –

We are encouraging as many people as possible to become involved and contribute to building an online community. We would love to see people and receive comments at the Nottingham demonstration and during subsequent usage. Once the system is operational, please help by including your existing and planned restoration works within the repository. Feedback is always welcome at restore@environment-agency.gov.uk

Pete Jeans, SFW

www.sfwltd.co.uk



A screenshot of the RESTORE Wiki case study repository at an advanced stage in development

Meet the RRC Staff

Many of you may have seen this feature in our monthly Bulletins. Its purpose has been for us to introduce ourselves to you as our audience, and for you to get to know what we all do. Please come and find us over the next few days – we are a friendly and engaging bunch even if we do say so ourselves!

Ian Brown, Centre Administrator

"I have been with the RRC since 2007, joining a week before the Conference which is our busiest time. I am the Membership Officer, responsible for looking after current RRC members as well as dealing with enquiries from potential new members. I organise the summer site visit programme and I run the booking process for the Conference as well as approaching sponsors. The sponsorship is used to finance attendees who wish to come to the conference but are unable to find the money themselves. I will have met the majority of you already by the time you read this, as I help at conference check-in handing out the delegate handbook and badges".

Nick Elbourne, Information and Communications Officer

"I manage and update the National River Restoration Inventory, a large resource of river restoration project data in the UK; and I administer the RRC website and social media. I support project staff in delivering advisory reports and I have been heavily involved in the EU LIFE+ project RESTORE in developing tools, and sharing best practice. I'm always pleased to hear from anyone who has information about river restoration in the UK (or Europe) and as editor of the RRC Bulletin and Newsletter, I am happy to include articles on anything that you have been involved in".

Di Hammond, Senior Projects Adviser

"I have over 20 years' experience in catchment hydrology and in more recent years, hydroecology, working for the Environment Agency and its predecessors and then at an environment consultancy, joining the River Restoration Centre in 009. My first degree was in Geology (BSc), I then did a part-time MSc in Earth Sciences and the Environment at Kingston Polytechnic (as it was then), then a part time PhD in Hydro-ecology at the University of Middlesex. A key part of my role is advising on potential options for river restoration. This has taken me to rivers all over the UK. I co-hosted a spatial planning workshop in Arnhem as part of the RESTORE project that the RRC is working on. Outside of work I am a keen gardener and am trying to teach myself to play keyboard".

James Holloway, Projects Adviser

"The Centre initially roped me in to analyse and evaluate a monitoring programme, but after that, wouldn't let me leave! Now as Projects Adviser, most of my time goes to site-specific 'options scoping' reports, and other tailor-made projects which exploit our unique over-arching and independent position. One such current project is the development of a methodology to prioritise >50,000 culverts for removal. We want to end up with 30! Aside from this, I run the programme for our Conference, answer technical enquiries and help RRC disseminate good practice through newsletters and other media. However, given the chance to fight through Himalayan Balsam on a cold wet morning, I can't get out of the office fast enough!!"

Martin Janes, Managing Director

"My role combines technical advice on river restoration implementation, representing practitioners and the wider restoration community at policy and strategy steering groups and managing a not-for-profit organisation. I work with our core funder representatives from the Environment Agency, the Scottish Environmental Protection Agency, Natural England, Scottish Natural Heritage, Rivers Agency and the Northern Ireland Environment Agency to ensure that RRC is providing the expertise they need. Over the past year I have been managing RRC‟s input to RESTORE. This is the first Information and Communication strand of LIFE+ projects for rivers and it fits precisely with the aim of RRC to communicate best practice river restoration, albeit at the European scale. Through the ongoing suite of RESTORE events and exchanges, I know we can add a lot to the information available to river managers".

Jenny Mant, Science and Technical Manager

"I joined RRC nearly ten years ago having previously worked and completed a PhD on fluvial geomorphology at Portsmouth University. I manage the advisory work schedule and budgets, manage and support the technical team and support business development activities. I am involved in developing links with academic institutions which is fundamental to ensuring that river restoration-related research can help to inform practitioners. I provide technical advice to practitioners, policy makers and community groups and to date no two projects have ever been the same. I have been a judge for the Wild Trout Trust Awards where every year it is a real challenge to decide who the worthiest winner is! Visiting these projects serves as a reminder of the unending enthusiasm from people who undertake projects at grass roots. Furthermore, I'm involved in the organisation of the RRC conference and RESTORE events. I oversee development of the RESTORE West region communications plan".

Jo Evason (Accounts Technician) has recently left the Centre to start her own business, but from April 2012, the Centre will have two new members of staff – so look out for new 'Meet the Staff' features in the months to come!

ABSTRACTS

PRESENTATION SESSIONS,

POSTERS (pg 71)

& MONITORING WORKSHOP (pg 99)

KEYNOTE ADDRESS

MAIN LECTURE THEATRE B52

Approaches to River Restoration Across Europe

BART FOKKENS

Chairman – European Centre for River Restoration

NOTES…

APPROACHES TO RIVER RESTORATION ACROSS EUROPE

BART FOKKENS

Chairman – European Centre for River Restoration, P.O.Box 20021, 3502 LA Utrecht, The Netherlands
info@ecrr.org

Abstract

River restoration is being completed across Europe at different scales and for a range of benefits. As a result, the EU LIFE+ project RESTORE is exploring river restoration in the context of economic, social, flood risk management and habitat and biodiversity benefits. In addition the highly topical hydro-power discussion is evaluated in terms of how river restoration can help to mitigate some of the potential environmental conflicts associated with this activity whilst the importance of incorporating spatial planning into river restoration is also explored.

However, the RESTORE project has also recognised that what is understood as river restoration may differ between countries depending on their perceived priorities. As such the World Water Forum has recognised the need to raise awareness with decision makers and wider stakeholders for a variety of water issues and workshops themes have included how to implement river restoration in the context of spatial planning.

This paper, will explore river restoration approaches from across Europe that exemplify linkages with these topics and how they are being developed in terms of good practice based on knowledge gained from the European Centre of River Restoration, RESTORE and participation in the World Water Forum.

The aim of this presentation is to invoke discussion around these themes and help to disseminate information about best practice to the audience.

Keywords: Hydropower; Planning; Partnership funding; Water management policy; World Water Forum

SESSION 1A:

THE PROCESSES OF MANAGING PARTNERSHIPS AND PROJECTS

MAIN LECTURE THEATRE B52

Partnership at the Muddy End

WILL BOND[1] & ANDY HILL[2]

[1] *Managing Director – AlaskA Environmental Contracting Ltd*

[2] *Contract Manager – AlaskA Environmental Contracting Ltd*

River Restoration Strategies in Wessex and How Partnership Development Promotes Project Delivery

ALASDAIR MAXWELL *et al.*

Water Framework Directive Delivery Project Officer – Environment Agency

Re-Connecting the Blue Ribbons and Green Grids: Adding Value Through Urban River Restoration

LUCY SHUKER

Post-Doctoral Research Assistant – Queen Mary, University of London

NOTES…

PARTNERSHIP AT THE MUDDY END

WILL BOND[1] & ANDY HILL[2]

[1] *Managing Director – AlaskA Environmental Contracting Ltd, Stokeford Farm, East Stoke, Dorset. BH20 6AL.*
will@alaska.ltd.uk
[2] *Contract Manager – AlaskA Environmental Contracting Ltd, East Stoke, Dorset*

Abstract

From the contractor's perspective 'partnerships' in many ecological projects mean that the client has managed to secure funding from a number of other bodies with similar objectives. Sometimes it seems little more than an opportunity to build a collection of logos! All too often it doesn't seem to make getting timely consents from partner organisations any easier.

At a recent RRC workshop looking at ways of improving river restoration the most consistent message of all, emerging from all sides (consultants and clients as well as contractors) was the need for early contractor involvement. This is a relationship seldom labelled 'partnership' yet what the workshop was reporting was that this is the most fundamental and arguably the most fertile partnership for any project.

It is evident from the workshop results that many practitioners greatly value having the contractor's involvement as a partner. This presentation looks at a number of projects which have benefitted from extending the partnership to early contractor involvement, and a few that have not, highlighting the gains and shortfalls. However, this more informal and intimate approach is not always appropriate and it is equally important to highlight situations where contractor partnership may not be suitable, and examples will be shown.

Keywords: River restoration; Contractor; Partnership funding

RIVER RESTORATION STRATEGIES IN WESSEX AND HOW PARTNERSHIP DEVELOPMENT PROMOTES PROJECT DELIVERY

A. MAXWELL[1], M. PORTER[2], A. FRASER[2] & S. GALSWORTHY[2]

[1] *Water Framework Directive Delivery Project Officer – Environment Agency, Rivers House, Sunrise Business Park, Blandford* alasdair.maxwell@environment-agency.gov.uk

[2] *Water Framework Directive Delivery Project Officers – Environment Agency, Rivers House, Blandford*

Abstract

The Environment Agency's (EA) Water Framework Directive Delivery Team in Wessex Area Blandford has produced programmes of work for catchment scale river restoration on the Dorset River Frome SSSI (River Frome Rehabilitation Plan) and Hampshire River Avon SSSI system (River Avon Restoration Project). Both plans suggest river restoration proposals that could potentially improve river condition currently limiting the rivers in meeting SSSI favourable condition assessment and Good Ecological Status under the Water Framework Directive.

Both restoration plans aim to deliver actions through collaborations with a range of different stakeholders including landowners, fishing clubs, wildlife trusts and community groups.

Benefits of collaborative working:
- co-ordination of available funds to ensure most effective use of limited resources.
- develop common objectives to share best practice and lessons learned in both catchments.
- more opportunities for cost effective and efficient delivery use of local labour or skills and improved community awareness.

The River Frome Plan is being delivered by the EA using already established or newly developed partnerships, e.g. the Frome, Piddle and West Dorset Fishery Association. Building upon experience from previous restoration projects including innovative techniques and local collaborations for effective delivery such as those completed for the Moreton Channel 2010 and Upper Bockhampton 2011 projects.

The River Avon Project in contrast is led by a Project Board whose members include the EA, Wessex Water, Natural England, Hampshire Wildlife Trust and others. The EA has been allocated a programme of reaches based on the types of work involved, generally the more complicated or techical such as structure removal or remeandering. All other actions will be delivered through the Board by groups such as Wessex Chalk Streams Project or the Wessex Chalk Streams and Rivers Trust.

The WFD Delivery team have developed a number of tools to promote successful delivery projects and to share lessons learned e.g. Project Records. A 'Directory of Actions' (River Avon) and Reach Based Newsletters (River Frome) now available online providing for each reach greater information on issues and solutions to existing and potential partners. Case studies, use of reach references to explain a 'vision', photowork and landscape artwork will help to develop existing partnerships; but also educate, inform and promote the creation of new and long lasting collaborations to deliver shared river restoration and projects.

Keywords: Collaboration; Delivery; Water Framework Directive; Objectives.

NOTES…

RE-CONNECTING THE BLUE RIBBONS AND GREEN GRIDS: ADDING VALUE THROUGH URBAN RIVER RESTORATION

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Abstract

To successfully restore ecological functioning to urban river corridors and enhance the levels of ecosystem services they provide, local authorities and river practitioners face a wide range of challenges to assimilate, integrate and disseminate complex information that needs to encompass river sciences, geomorphology, hydro-ecology, hydraulic engineering plus diverse stakeholder and community interests.

By linking the 'blue ribbon' with 'green grid' networks, a number of London case studies delivered by multi-disciplinary and cross-sector partnerships are demonstrating how integrating green and blue objectives can lead to more sustainable outcomes that benefit both the river-floodplain-parkland environments and local communities.

This paper presents the findings of recent PhD research (jointly funded by NERC and ESRC) to investigate the extent to which ecologically successful and cost-effective river environment improvements are being achieved by multi-disciplinary partnerships with mosaic funding packages through combined socio-environmental approaches to urban river restoration within Greater London.

The results illustrate how case study examples in Barking (Mayesbrook Park Restoration Project: Adapting to Climate Change) and Lewisham (R. Ravensbourne, Ladywell Fields) are combining good ecological outcomes for inner city rivers with increased ecosystem services and a revitalisation of their adjoining green spaces. At the same time: reducing flood risk, increasing ecological potential, building bio-diverse resilience to climate change and attracting increased park visitors to enjoy new opportunities for recreation, natural play and learning about nature and wildlife.

Keywords: Ecosystem services; Integrated catchment management; Green infrastructure; Urban greening.

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SESSION 1B:

THE PROCESSES OF MANAGING PARTNERSHIPS AND PROJECTS

SECOND LECTURE THEATRE A25

The Electricity Supply Board and Habitat Development in the River Shannon Catchment, Ireland

DENNIS DOHERTY *et al.*
ESB Fisheries Biologist – Electricity Supply Board

SSSI Restoration in the New Forest: Trying to Keep Most of the People Happy, Most of the Time

SARAH OAKLEY
Ecologist – Forestry Commission

Holnicote - Catchment Change Challenge!

PETER WORRALL *et al.*
Technical Director – Penny Anderson Associates Ltd (Consultant Ecologists)

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THE ELECTRICITY SUPPLY BOARD AND HABITAT DEVELOPMENT IN THE RIVER SHANNON CATCHMENT, IRELAND

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Abstract

The Electricity Supply Board (ESB) as part of the hydroelectric development of the R. Shannon in 1929, owns the R. Shannon fishery and therefore has a legislative responsibility to 'manage, conduct and preserve' the Shannon fisheries (Shannon fisheries Act 1935).

Large areas of the R. Shannon have been negatively impacted upon due to incremental habitat degradation. This habitat degradation process is due to the impact of several arterial drainage schemes, declining water quality, peat extraction, the intensification of agriculture and forestry. Since 2006 ESB Fisheries Conservation has been involved in a partnership approach to begin a process of habitat re-development works on the mid-Shannon catchment. The agencies involved in this partnership are; Inland Fisheries Ireland, The Shannon Fisheries Preservation & Development Company, The National Parks and Wildlife Service and The Office of Public Works. Also of primary importance are the local landowners and the recreational angling clubs. There has been a strong interaction at this local level, i.e. between ESB, IFI and these local stakeholders. Much emphasis has been placed on the initial contacts as part of the work schedule and planning process.

The habitat works include both in-stream and riparian works such as vortex weirs and alternating deflectors, placement of random boulders, bankside rock armour, provision of cattle drinking areas, placement of stone and spawning gravel. The bankside works include the provision of public access (walkways, styles, bridges and footpaths), selective tree/shrub pruning and fencing. All catchments are electrically fished both pre and post works.

Examples of the work sites both pre and post work will be given from the Woodford, Cross, Kilteevan, Bow, Nenagh and Camcor river catchments.

Keywords: Partnership; Riverine Habitat Development; Riparian; ESB; IFI.

SSSI RESTORATION IN THE NEW FOREST: TRYING TO KEEP MOST OF THE PEOPLE HAPPY, MOST OF THE TIME

SARAH OAKLEY

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Abstract

SSSI stream restoration works have been carried out in the New Forest over the last 15 years, and are set to continue until 2020. During this time the sites tackled have increased in size and complexity, from 200m stretches of stream restoration in the early years, to over 3.5km of re-meandering plus the restoration of associated mire catchments in 2010.

There is a long list of consultees and stakeholders who show an active interest in ANY proposed restoration works in the New Forest. Some of these have unique and strongly held views, and are innately suspicious of government-led 'condition assessment' targets - in addition to the usual statutory agency suspects, the Verderers, Commoners Defence Association and New Forest Association are all involved in the formal consultation process. Furthermore, the New Forest's designation in 2005 as a National Park and the geographic progression from upstream catchments to larger watercourses at the Forest edge has resulted in an increased requirement for community engagement.

So….how do you keep most of the people happy, most of the time? This talk looks at the processes used to engage consultees, identifies issues and shares successes and solutions.

Processes: Development of a protocol for consultation and approval of SSSI restoration works - to ensure clarity, understanding and efficient use of resources.

Issues: Large-scale restoration sites look scary! Local communities - informing versus consulting. Rumour mills, and the vociferous local resident. Rates of delivery - what if it all goes wrong? Do we know what we're doing? Recognition of the Forestry Commission's capability in the field of habitat restoration. The Springwatch brigade.

Successes and Solutions: Horsetrading/compromises. Rapid rate of delivery generates evidence. Local champions. Communicative contractors - courtesy and flexibility increase understanding and cooperation.

CASE STUDIES:

Fletchers Thorns (Blackwater River): 1.2km of artificial channel was replaced by 2.3km of restored meanders in 2011. Central location, close to one of the main 'honeypot' visitor car parks and a major cycle route. Only 1 letter of complaint.

Latchmore Brook: 770m of restored meander will replace 595m of artificial drain, plus adjacent mire restoration, due to be worked in 2012. Close to the edge of the Forest, popular with local dogwalkers; 2 car parks and a cycle route nearby. Initial clearance of scrub and trees featured in local papers, numerous letters and emails from outraged local residents - and we haven't even started the work yet…

Keywords: Consultation; Stakeholders; Processes; Issues; Solutions.

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HOLNICOTE - CATCHMENT CHANGE CHALLENGE!

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Abstract

This seminar attempts to illustrate some of the realities of implementing flood risk management through a process of catchment change. Although there is a broad acceptance 'in principle' that changing land management within whole catchments has a potentially significant role to play in flood risk management, there is neither sufficient scientific support to the notion nor the structures, policies and processes in place to affect the necessary changes. Our core case study focuses on the Holnicote Project which is one of three part Defra funded Multi-Objective Flood Management Demonstration projects, the other being Pickering and Derwent.

At Holnicote two adjacent catchments lie within the National Trust ownership which gives the project a head start on this key constraint to catchment scale land management change. From the summer of 2009 the project has seen the design and deployment of hydrometric monitoring systems within the Horner Water and River Aller catchments, combined with baseline hydrological modelling and the determination of the physical and environmental characteristics of the two river systems.

Running in parallel to the establishment of the hydrological baseline has been the development of land management change proposals of a sufficient scale to be detected by the catchment monitoring system. It is at this point where the real issues of delivery come to play. The interest groups and stakeholders that are involved in catchment change within any catchment can have significantly diverse and often conflicting agendas. This makes the process of engagement, acceptance, compromise and delivery of change a complex management requirement particularly given the differing time frames within which these groups operate.

At Holnicote, extensive land management alterations targeted at changes to the hydrographs of each river system, have been developed and these have undergone radical modifications as other competing interests, such as ecology, landscape and economic viability of agricultural units have come to the fore.

Keywords: Catchment change; Ecosystem services; Hydrological monitoring; Flood risk management.

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SESSION 2A:

GETTING YOUR FEET WET – WHAT GOES ON IN THE CHANNEL

MAIN LECTURE THEATRE B52

Sustainable, Cost-Effective Reservoir Discontinuance - Re-Naturalising Whicham Beck, Cumbria

EVAN DOLLAR[1], PAUL BRADLEY[2] *et al.*
[1] *Water Resource Technical Discipline Lead – MWH*
[2] *Director – PBA Applied Ecology Ltd*

Bringing LIFE to the Irfon

SIMON EVANS
Deputy Director – Wye and Usk Foundation

The Logie Burn Restoration Project

ESTELLE GILL *et al.*
Area Officer – Scottish Natural Heritage

Simple Is Best

NIGEL HOLMES
Principal – Alconbury Environmental Consultants

Day-Lighting of a Culverted Channel in Aberdeenshire: Constraints, Challenges and Opportunities

HAMISH MOIR *et al.*
Managing Director – cbec eco-engineering UK Ltd

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SUSTAINABLE, COST-EFFECTIVE RESERVOIR DISCONTINUANCE - RE-NATURALISING WHICHAM BECK, CUMBRIA

EVAN DOLLAR[1], PAUL BRADLEY[2], CARL SANDERS[3], DALE GIBBONS[4] & GAVIN HULME[5]

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Abstract

Baystone Bank Impounding Reservoir (IR) was constructed in 1877, with a capacity of 125 Ml. Following a detailed options appraisal, United Utilities (UU) took the decision to fully remove the IR and to restore Whicham Beck, an upland gravel-bed river, through the relict reservoir basin. This decision was supported by the Environment Agency (EA).

A pre-impoundment (1867) map was used together with topographical information to design the channel planform and pattern. Upstream channel and floodplain dimensions and bed form architecture were measured and used to design the re-instated channel and floodplain. Resistance equations were used together with calculated bed load discharges to confirm appropriate channel geometries and gradients. The channel dimensions were 'burnt' into a 3D ground model using ArcGIS 3D Analyst which also allowed for the estimation of cut / fill volumes and the generation of a slope contour plan. Finally, a sediment transport model was used to identify potential areas of erosion and deposition and to contribute to the riparian planting plan.

The project team faced significant technical and environmental challenges to delivering this innovative restoration project, on schedule and within budget. The project required a multi-disciplinary team and involved a range of stakeholders and regulators. An open and inclusive approach to project management was developed, which enabled a creative approach to problem-solving, and a more flexible approach to delivering approved plans.

Silt accumulation and earthworks posed significant risk of downstream pollution. This was effectively contained by an innovative approach to silt management. A three-stage fish rescue was conducted, removing indigenous fish from the reservoir, its bywash channel and a constructed reach of watercourse above the reservoir. Samples of a scarce aquatic plant were translocated, and opportunities for foraging bats, otter etc. were maximised within the overall scheme.

This innovative project was completed ahead of schedule and on budget. Discontinuance was a cost-effective solution - Capex and Opex costs were reduced by designing the re-instated channel and still water pond to operate in sympathy with natural processes, and there is no future cost / liability for the client.

The project has effectively re-naturalised a large component of this river catchment, whilst minimising the ecological impact in delivering these works. Migratory fish have access to a further 3 km upstream, the valley has been re-instated to fit with the surrounding landscape and the view down the valley to the Duddon estuary has been restored.

Keywords: Baystone Bank; Environmental management; Silt; Fish.

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BRINGING LIFE TO THE IRFON

SIMON 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, 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 to recover the Wye and Usk on a catchment scale.

The Irfon drain a lowly populated section of Powys in mid wales and is a major tributary of the Wye. It is in better condition that most of the rest of the Wye catchment. The presentation covers the previous limited work in the Irfon sub-catchment that opened the river for fish access. It will explain the seemingly insurmountable problems with acid waters that led to the Foundation submitting an application to LIFE+. It moves on to describe the project, the methods that are being employed to bring the features of the SAC into favourable conservation status. The project aims to correct the problems of acid waters, elevated levels of fine sediment, degraded riparian habitat and fragmented populations and mitigate for the appreciable climate change that has already being recorded in the headwaters of the catchment (1.7 °C increase in mean stream water temp). It will explain how the methods employed have evolved over the past 15 years as the Foundation has collected ever increasing amounts of data on the efficacy and improve their robustness.

Finally it will detail the work that has been completed so far, and the results of it which will hopefully 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 by taking in the whole catchment and explains how LIFE+ have recognised this fact in awarding funds to this ground breaking project.

Keywords: Special Area of Conservation; LIFE+; Catchment scale restoration; Acidification; Fish passage; Fine sediment; Stream temperature.

THE LOGIE BURN RESTORATION PROJECT

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Abstract

We describe the practicalities of carrying out a small scale river restoration project on the Muir of Dinnet National Nature Reserve (NNR) in Aberdeenshire. The project has restored the morphology and habitats of a section of the Logie burn by diverting the water from a canalised river back through historical meanders. We describe the preparation for the project and the methods used, including the way in which these were adapted as the project progressed. The project was implemented by the Dee Catchment Partnership, led by Scottish Natural Heritage (SNH) and funded by the Scottish Environment Protection Agency and SNH.

The Logie burn had been heavily modified by canalisation and dredging over much of its length. It also received run-off from agriculture and forestry operations. This run-off was also damaging Loch Davan, a freshwater Special Area of Conservation, which the burn drains into. The restoration of the Logie had three complementary aims: 1) to improve water quality in the Logie burn and Loch Davan by reducing sediment and phosphate inputs; 2) to improve riparian habitat in the Muir of Dinnet NNR; 3) to create a re-meandering demonstration site. The restoration project was the first in the Dee Catchment and complemented other work upstream, aimed at reducing pollution from run-off and improving riparian habitats.

The meanders had been left intact by the canalisation works, with earth plugs separating them from the straight channel. These plugs were removed to allow the river to flow back along its old course. At the same time, the straight channel was blocked off to create two backwaters, which were enhanced with emergent plants and woody debris. The burn was fenced off to create a wide riparian buffer strip and wader scrapes were added to enhance the floodplain habitat.

The Logie project provides an opportunity to contribute to the evidence base for the multiple benefits of morphological restoration. With this aim, the James Hutton Institute is monitoring changes to water quality, hydrology and hydromorphology, and this is complemented by fish monitoring in the catchment by the River Dee Trust. The meander restoration is part of a suite of linked projects that aim to improve riparian habitats and water quality across the River Dee catchment.

Keywords: Re-meandering; Partnership; Small scale; Protected species.

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SIMPLE IS BEST

N. T. H. HOLMES

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Abstract

Just being simple does not mean a river restoration project cannot be amazingly effective, innovative and ambitious. Have digger will travel has become a motto. Being 'cheap' does not result in a job being 'nasty'!

In the last six years I have worked with many different river types with various organisations such as local councils, wildlife trusts, angling bodies and the Environment Agency to carry out simple as well as extensive, river restoration works. In most examples all that is done is utilize materials from within the channel and re-distribute them to re-create long and cross-sectional variations. Where possible materials that have been removed from the river in the past, and especially if reed/sedge is still growing adjacent, they are put back to their birthplace. Only when material that should be there has been lost, such as gravel, is anything imported.

The key to this effective approach is to import nothing, and use the re-distribution of existing materials to create the conditions whereby the river can develop and re-establish self-sustaining habitat. Work carried out 'energises' rivers almost for free, establishing habitat-creating natural forces barely comprehensible given the extent of degradations treated. Like a chiropractor, minimal manipulations stimulate self-recovery, a sure way of enabling rehabilitation to good health to be sustained and improved over time.

Effective schemes have been carried out on chalk streams, clay rivers and fen drains, as well as SSSIs and SACs. Ecological post-project appraisal confirms what the eye can see - huge improvements for minimal expenditure. Examples to illustrate the methods include the Darent, Kent Stour, Meon, Itchen and Nar.

Keywords: Low cost; No/minimal imports; Effective; Natural.

DAY-LIGHTING OF A CULVERTED CHANNEL IN ABERDEENSHIRE: CONSTRAINTS, CHALLENGES AND OPPORTUNITIES

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Abstract

We present the stages of a complete restoration project through identification of the problem/ requirements, field assessment, modelling, design, implementation and monitoring.

cbec were employed to re-design a channel that had been inappropriately realigned following the day-lighting of a culvert at a housing development. An initial site visit and topographic survey identified that the constructed channel was at high risk of failure due to too high a bed slope, a confined trapezoidal cross-sectional shape and banks/ bed comprising of unconsolidated fine sediments. However, before any remedial measures could be proposed, two high magnitude flood events occurred within five days of one another. This resulted in massive incision of the channel bed (and associated bank collapse) through a dramatic head-cut process.

A second topographic survey revealed a net loss of 539 cubic metres of sediment (over a ~70 m long section of channel, ~2 m wide). Hydrodynamic modelling of this resultant channel form determined the spatial pattern of shear stress for the design flow (100-year event), identifying that a 'step-pool' morphology was necessary to produce a stable channel.

Using established theory on natural step-pool geometry, we conducted an iterative process of model runs and design modifications to produce a final stable channel configuration. This incorporated a sequence of boulder steps with associated plunge pools and a widened channel corridor through the addition of 'bench' features. The designs were constrained by the space available for the channel (given the development site plans) and the high surface elevation of the development site (therefore necessitating a relatively low elevation and confined channel).

The channel was constructed in Sept-Oct 2010 and resurveyed again to ensure design fitting. Subsequent to implementation, the channel has experienced several large flow events without significant modification to morphology. A recent re-survey has revealed that small alluvial bar features have developed downstream of the steps and have become stabilised through vegetation colonisation. The channel corridor banks have also become more stable through natural vegetation colonisation.

The presentation demonstrates how considerable practical constraints at a site can be managed to permit an appropriate and sustainable design to be produced that mimics natural fluvial form/process.

Keywords: Channel realignment; Step-pool; Stable design.

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SESSION 2B:

GETTING YOUR FEET WET – WHAT GOES ON IN THE CHANNEL

SECOND LECTURE THEATRE A25

Arborfield Weirs and Nature-like Bypass – Reconnecting People with Nature After Twenty Years of Thought

DOMINIC MARTYN
Technical Officer (Fisheries) – Environment Agency

Rewilding the River Adur

IAN DENNIS *et al.*
SeniorRiver Restoration Specialist – Royal Haskoning

Restoration in Tight Spaces! Legacy Engineering and River Naturalisation

GEORGE HERITAGE *et al.*
Technical Director – JBA Consulting

The Removal of Kentchurch Weir on the River Monnow

ALEXANDER HUMPHREYS[1] & PETER GOUGH[2]
[1] *Senior Engineer – Atkins*
[2] *Senior Technical Specialist – Environment Agency Wales*

A Case Study on the Design, Construction and Effectiveness of a New Nature-like Fish Pass at Byron's Pool on the River Cam, Highlighting the Need for a 'Hands On' Approach

ELLIS SELWAY
Ecologist – Bodhi Ecology

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ARBORFIELD WEIRS AND NATURE-LIKE BYPASS – RECONNECTING PEOPLE WITH NATURE AFTER TWENTY YEARS OF THOUGHT

DOMINIC MARTYN

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Abstract

For twenty years, Arborfield weirs were seen as an important issue for the Environment Agency and its predecessors. Impassable flow control structures impounded the Loddon for over 4km upstream. This, along with past dredging, limited availability and distribution of natural habitat types in part causing a Water Framework Directive (WFD) failure. Inclusion of important local objectives (access, reduced maintenance, local flooding, BAP habitat) gave a secure platform to achieve partnership buy-in to develop a solution. WFD provided a key driver and funding mechanism alongside partnership contributions to deliver a nature like bypass channel, two wet woodland feeds and weir lowering. A paucity of case studies with pre and post project appraisal offered an opportunity to fund a data set including geomorphological, habitat, fisheries, invertebrates, plant and aerial evidence.

Difficulties in negotiation, communication, the planning process and expectation management are highlighted while lessons learnt during the project management phases are covered. This paper identifies the opportunities taken during construction to deliver a bypass that mimics the nature of local 'near reference' riverine conditions working with natural processes.

Keywords: Water Framework Directive; Partnership project management; Communication; Negotiation; Buy-in and funding; Options appraisal; Outline and detailed design; Construction; Site supervision.

REWILDING THE RIVER ADUR

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Abstract

The River Adur Floodplain Restoration Project was established by the Environment Agency, Natural England, Sussex Wildlife Trust and the Knepp Castle Estate with the aim of 'rewilding the river' by enhancing channel and floodplain habitats with a particular emphasis on reconnecting the floodplain to the river channel.

Following initial options scoping and technical feasibility by RRC, Royal Haskoning's designers produced an innovative design which incorporated the use of a series of floodplain palaeochannels to recreate an approximation of the former course of the river. Additional features such as backwaters, floodplain scrapes and large woody debris were also included in order to maximise environmental benefits. Opportunities to remove existing in-channel structures, which impede fish passage, impound flows, and contribute towards the failure to reach Good Ecological Status, were also identified and incorporated into the designs.

Detailed two-dimensional modelling of the scheme was undertaken using a combined ISIS and Tuflow model to identify floodplain inundation patterns and ensure that the new channel was closely connected to the floodplain. One of the key challenges of the design was the balancing the key project aim of increasing floodplain wetness with the major constraint of ensuring that flood risk to adjacent properties and infrastructure was not increased. Particular attention was required to ensure that the modifications to the river channel (specifically the decrease in capacity and bed raising required to increase floodplain wetness) did not result in increased inundation frequency for a minor road bridge adjacent to the site.

This presentation will outline some of the challenges that were overcome for this ambitious project and discuss the lessons learned in turning a restoration vision into reality. Construction of the first phase of the scheme commenced in September 2011, with construction of further phases scheduled for subsequent years.

Keywords: Floodplain enhancement; ISIS; Tuflow.

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RESTORATION IN TIGHT SPACES! LEGACY ENGINEERING AND RIVER NATURALISATION

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Abstract

Kirklees Brook is a tributary of the River Irwell flowing through the Kirklees Valley to the north east of Bury. The valley is a Site of Biological Importance (SBI) and was designated as a Local Nature Reserve in October 2010. The stream is characterised by moderate to steep gradients and a generally narrow valley becoming highly confined along several reaches. The river has an industrial legacy and two old weirs are presently preventing fish movement along the watercourse. It is estimated that easement of these obstructions would open up 6 km of river to migratory fish.

The Irwell Rivers Trust in partnership with the Environment Agency and Bury Council have instigated works (as part of an overall catchment wide initiative under the Water Framework Directive) to enhance the local hydromorphology, improve ecological connectivity and restore fish passage. This must be undertaken whilst maintaining the structural integrity of the masonry retaining walls protecting old water storage areas associated with the historically important former Calico print works at the site. The high energy brook exhibits boulder and cobble sized bed sediment forming coarse step-pool or rapid areas in the channel that are acting as natural grade controls, dissipating energy and creating plane bed areas upstream.

A number of restoration approaches were considered. Complete removal of the weirs would be too risky on the grounds of maintaining the structural integrity of the revetted banks and preventing dramatic channel response (such as a bed knickpoint migrating upstream). Weir notching would help retain integrity but would leave an unnatural sedimented reach upstream. Bed raising would act to improve the hydromorphology of the reach between the weirs but would leave the upstream reach un-restored.

Infilling the bed between the upstream and downstream weirs combined with lowering of the upstream weir was chosen as the optimal approach creating a naturalised boulder/cobble rapid between the weirs and exposing the original cobble plane bed upstream through natural erosion processes. The works, carried out in autumn 2011, restored the reach to a state similar to other rapid areas seen elsewhere along the river and maintained the integrity of the historic channel works associated with the mill site. The response of the river has been generally favourable and this presentation reports on the short-term changes observed at the site and the probable long-term evolution of the reach.

Keywords: Step-pool restoration; Urban restoration.

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THE REMOVAL OF KENTCHURCH WEIR ON THE RIVER MONNOW

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Abstract

In August 2011 the Environment Agency Wales completed the removal of Kentchurch Weir, on the River Monnow, which is a major tributary of the River Wye. The weir was approximately 2 metres in height and over 30 metres wide, making it the largest weir removal completed in Wales to date, and one of the largest undertaken in the UK. This presentation details the project process from the very earliest site inspections and assessments through to the completion of the weir removal. Those stages and innovations that led to the success of the project, and the lessons learned that will inform future major weir removals are discussed.

The initial site survey was carried out by a team of fisheries, engineering and geomorphology experts. The aim of the initial survey was to prepare a strategic-level report on the potential impacts of removing the weir. This included appraisals of: fisheries benefit, engineering feasibility, geomorphological impacts, flood risk and potential impacts on third-party assets. The initial report was supplemented by an appraisal of the flood risk impacts. We adopted a broad scale modelling approach that compared flood risk in the pre- and post-removal scenarios.

We then progressed to the preparation of the detailed business case upon which the justification of the project would be based. For this stage we identified the project risks and put in place the measures that were necessary to manage and reduce them where possible. This included the commissioning of a bathymetric survey of the river bed, along with sediment sampling upstream in order to ascertain the composition of the stored materials that were likely to be mobilised upon removal.

We put together the works information for the procurement of a contractor to demolish the weir. The expertise of the team ensured that the works were procured in a way that minimised the potential risks that can be associated with pioneering projects of this type. We also commissioned time-lapse photography footage of the demolition works in order to capture the process for the benefit of future schemes.

The removal of the structure was completed to budget and ahead of schedule in August 2011. The work has opened up 160km of the River Monnow to the free passage of fish and re-naturalised the impounded reach. Monitoring the river's response is an ongoing research project led by Cardiff University.

Keywords: Weir Removal; Fish Passage; Geomorphology; River Restoration.

A CASE STUDY ON THE DESIGN, CONSTRUCTION AND EFFECTIVENESS OF A NEW NATURE-LIKE FISH PASS AT BYRON'S POOL ON THE RIVER CAM, HIGHLIGHTING THE NEED FOR A 'HANDS ON' APPROACH

ELLIS J. SELWAY

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Abstract

Riverine fish depend highly upon the physical characteristics of their habitat, utilising different niches during their life cycle for growth, survival and reproduction. Anthropogenic in-channel structures such as weirs can impede these movements, contributing to the decline of fish populations. Fortunately, as a result of legislative and climate change targets, the restoration of riverine habitats has gained momentum in recent years and fish passes of varying design, including ecologically minded nature-like passes, are widely accepted as a method of helping to restore connectivity. Despite this there only a few nature-like fish passes in the UK and limited information available on their effectiveness.

An ambitious project, spanning 5 years from concept to construction, the Byron's Pool nature-like fish pass was installed on the River Cam to bypass a fixed crest weir and sluice representing a complete barrier to fish migration. Specialist contractors were appointed to engineer the design and construct the pass, with construction carried out between 16th December 2010 and 30th March 2011. Several modifications to the design, needed to make the pass fully operational, were carried out both during construction and immediately after the opening of the pass. These included the import of additional gravels, retention of a turreted stop log and installation of additional rocks and boulders.

The effectiveness of the pass was measured using a combination of visual surveys, electrofishing and use of remote video cameras. Environmental conditions were also measured to indicate if these were within the range of physical and biological parameters required by fish.

The pass has proven to be effective and valuable lessons have been learned about the importance of a 'hands on' approach, using manual alterations and adaptations to enhance an otherwise formulaic process.

Keywords: Anthropogenic in-channel structures; Complete barrier; Migration; Fish pass; Effectiveness; Electrofishing; Remote video cameras.

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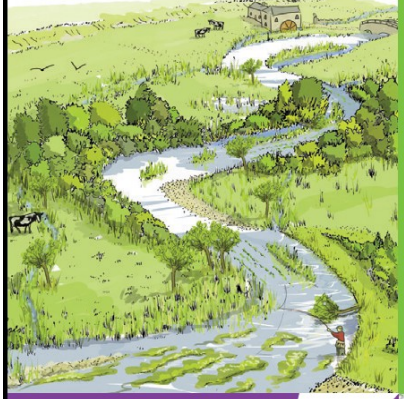

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SESSION 3A:

VALUING THE BENEFITS OF RIVER RESTORATION

MAIN LECTURE THEATRE B52

Environmental and Economic Growth Strategies –
The River Avon Restoration Initiative

NIKKI WOOD[1] & BOB SARGENT[2]
[1] *Managing Director – Environmental Gain Ltd*
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The Water Environment Restoration Fund

JULIE TUCK
Restoration Specialist – Scottish Environmental Protection Agency

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ENVIRONMENTAL AND ECONOMIC GROWTH STRATEGIES – THE RIVER AVON RESTORATION INITIATIVE

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Abstract

Despite its status as a World Heritage City, Bath has long turned its back on the River Avon, which largely flows ignored through the now decayed industrial part of the City. For decades, the River has been viewed as a drainage and navigation feature, with hard engineered flood defences and only a brief celebration at the photogenic Pulteney Weir. Otherwise it has become an under-appreciated aspect of our environment, largely hidden behind floodwalls and old industrial areas.

Bath and North East Somerset Council, reflecting increased public concerns that strategies to regenerate the City are lacking, recently convened a voluntary Group with expertise in watercourse regeneration, ecology, and development, to advise on how the River can become the focus of wide ranging and sustained economic regeneration in the City. This independent Group has set out a conceptual basis from which a River Corridor Economic Regeneration Model can be structured and is now being launched for general public consideration and comment.

Sensitive restoration of the river is crucial to the strategy, since improvement of the channel and associated habitats and amenity is central to the creation of a revived city environment, a generator of economic life, and a part of Bath's cultural identity for social engagement.

Regeneration on an urban landscape scale comes about because needs are allied to opportunities and over time attitudes and understanding of a wide range of stakeholders pull in the same direction to achieve transformation change. Current drivers for the Avon are:

- The need for new economic regeneration in the City
- Adoption of a less engineered approach to flood management
- Low carbon living
- Bio-diversity and amenity enhancement
- Localism and public engagement in the regulatory regime

This presentation takes us through how a voluntary group of independent interests and professionals are developing the early stages of a river regeneration strategy based on the relevance, opportunity and health that the River Avon can bring to City regeneration. It will touch on how frictions and constraints have pushed us forward to developing a realistic opportunity for sustained environmental and economic regeneration along one of England's ignored aquatic arteries.

Keywords: Regeneration; Habitat Enhancement; Public Engagement.

THE WATER ENVIRONMENT RESTORATION FUND

JOANNE GILVEAR[1] & JULIE TUCK[2]

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[2] *Restoration Specialist – SEPA, Inverdee House* julie.tuck@sepa.org.uk (corresponding author)

Abstract

The Water Environment Restoration Fund managed by SEPA is in its fourth year of funding and this presentation will provide an overview of this new fund. It will detail the fund drivers / history and principals for funding, along with the types of projects funded and spend.

The presentation will also touch on the issues and problems we have encountered with funding (looking at a number of case study projects) and has additional relevance to 'managing partnerships and projects'. This will cover issues with other funding sources, timescales, licensing, project management and generally managing expectations of partnership work.

It will conclude with what we have learned to date regarding restoration work in Scotland and what the future direction will be for the Fund.

Keywords: Restoration; Scotland; Funding.

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SESSION 3B:

VALUING THE BENEFITS OF RIVER RESTORATION

SECOND LECTURE THEATRE A25

Most Bang for your Buck –
Optimising Value for Money from Catchment Restoration Schemes

T. MCDERMOTT[1] & D. C. BRADLEY[2]
[1] *Senior Aquatic Ecologist – APEM Ltd.*
[2] *Principal Aquatic Ecologist – APEM Ltd.*

Prioritising Culverts for Removal –
Breaking Banks Without Breaking the Bank!

DIANA HAMMOND *et al.*
Senior Projects Adviser – The River Restoration Centre

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MOST BANG FOR YOUR BUCK – OPTIMISING VALUE FOR MONEY FROM CATCHMENT RESTORATION SCHEMES

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Abstract

As catchment management moves away from investigating solely chemical pressures on freshwater systems, the role of historic hydromorphological degradation has become increasingly obvious. Hydromorphological pressure can occur at almost any point along river gradient and often involve large scale changes to the geomorphological template through which the river channel runs. As part of a general trend towards re-establishing natural within-catchment connections, catchment managers and scientists have struggled to quantify the level of ecological change attributable to the restoration programmes, and in many cases have failed to exhibit any demonstrable benefits resulting in wasted capital. This study aims to investigate the true value of restoration using a categorisation approach, and to identify those post-restoration monitoring schemes which provide value for money while remaining powerful enough to detect change.

Cost benefit analysis of three restoration and post restoration monitoring types are investigated. Firstly we will investigate those projects which are low-key, non-invasive methods that encourage the rivers processes to naturally restore themselves over the long term. These projects tend to cost little per mile of river restored, but time scales are often large and year on year increases in ecological quality difficult to measure.

The second restoration category are those projects which use active restoration methods, including in-river enhancement and active reconnection through engineering of rivers with their historic linkages, and are often well funded. However in many cases the restoration takes much of the budget and as such little is left for post restoration monitoring. This is often due to provisions in funding, such as in the LIFE+ funding awards which stipulate monitoring cannot cost more that capital costs of enhancement and restoration.

The third category are those restoration projects which are similar to category two projects but involve thorough and statistically robust monitoring packages with which to quantify change attributable to the restoration works. These are often the most expensive per mile of restored channel.

Through a search of various sources of own post-restoration monitoring projects we will present a scoring matrix of the ecological success, value for money and repeatability of each category and the methods used. We will place special emphasis on monitoring design and the identification of those designs which will optimise ability to quantify positive change while providing value for money and most favourable use of limited budgets.

Keywords: Cost/benefit analysis; Monitoring; Quantifiable change.

PRIORITISING CULVERTS FOR REMOVAL – BREAKING BANKS WITHOUT BREAKING THE BANK!

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Abstract

There are some 40,000 culverts in the north of England – watercourses which have been covered, buried and all but forgotten …and that is only counting those culverts more than 50 m long and properly mapped. Obviously this has major implications for ecology, flood risk and social amenity, but has also been identified as a key limitation to the achievement of Good Ecological Status or Potential under the WFD. There are many examples of the successful transformation of such streams and rivers to restored open channels, but the process of de-culverting is more often than not significantly more expensive than continuing to patch up and repair such assets as they deteriorate with age.

However, this is not always the case, and RRC were tasked by the Environment Agency to produce a strategy for identifying priority culverts in their two northern Regions where maximum ecological, flood risk management and/or social gain could be achieved for the least relative cost. This presentation will introduce the key factors identified for use in our assessment and explain how we obtained and used all the required data to produce a shortlist of potential de-culverting projects to be taken forward.

We will describe how we first filtered the records spatially to identify those in open areas, then analysed the results for various network characteristics to produce measures of habitat connectivity regained. These were finally ranked in a matrix alongside scores capturing other criteria such as the condition of the asset and WFD waterbody status. The final stage of the process was to 'reality check' and actually visit some of the highest-ranking sites, and we will present some fascinating examples of culverts encountered in this phase, which illustrate the range of issues encountered both in such a prioritisation exercise and in assessing feasibility for de-culverting on the ground. We are keen that findings, achievements and lessons learnt on this ambitious project may be applied to other such strategies, in the interests of successfully adopting similar approaches to much wider spatial coverage.

Keywords: De-culverting; Daylighting; Restoration strategy; Habitat connectivity; Multi-criteria analysis; Network analysis.

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SESSION 3C:

VALUING THE BENEFITS OF RIVER RESTORATION

MAIN LECTURE THEATRE B52

Catchment Restoration Fund for England

ROLAND MOORE[1] & DAMIAN CRILLY[2]

[1]*Policy Adviser – WFD & Daughter Directives Team, Defra*

[2] *Program Manager, Integrated Catchment Management – Environment Agency*

Funding Catchment Restoration through Payments for Ecosystem Services

LAURENCE COULDRICK

Head of Catchment Management – Westcountry Rivers Trust

It Ain't All About 'The Environment'!

MARK EVERARD

Principal Scientist – Environment Agency

NOTES…

THE CATCHMENT RESTORATION FUND FOR ENGLAND

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[2] *Program Manager, Integrated Catchment Management – Environment Agency (Environment & Business), Horizon House, Deanery Road, Bristol BS1 5AH*

Abstract

The Department for Environment, Food and Rural Affairs (Defra) have established the Catchment Restoration Fund (CRF) for England, providing up to £10m of funding each year for projects to facilitate delivery of the Water Framework Directive. This presentation will introduce the Fund and its objectives, and elaborate on how it is perceived that the programme will be managed over the next few years.

The lead applicant for CRF grants must be a charity or an organisation with charitable, benevolent or philanthropic purpose however other organisations that do not meet this criteria, such as local authorities or private sector companies, can still be involved in delivering a project, as partners. Funding is not available to fulfil a legal obligation or to fund commitments of action already made in River Basin Management Plans, or to fund an existing project unless there is a significant extension in scope which will result in greater progress towards good status water.

CRF aims to encourage smaller organisations to join together with a lead applicant to develop and foster greater partnership working. This in turn, will promote an integrated approach to catchment management. Funding will be allocated for projects to be delivered in 2012/13, 2013/14 and 2014/15, and there are several rounds for applicants to submit. Projects can be funded for multiple years, but these will need to be structured for phased completion, and have specific delivery milestones within each financial year.

The fund will support work that aims to:
restore more natural features in and around waters;
reduce the impact of man-made structures on wildlife in waters;
reduce the impact of small, spread-out (diffuse) sources of pollution that arise from rural and urban land use.

Keywords: Catchment management; Pollution mitigation;

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FUNDING CATCHMENT RESTORATION THROUGH PAYMENTS FOR ECOSYSTEM SERVICES

L. B. COULDRICK

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Abstract

The Westcountry Rivers Trust has been delivering river restoration at a catchment scale over the past 15 years predominantly through win-win advice that saves farmers money and improves ecosystem function. Although these historic projects have usually been funded by discrete one-off pots of money, the Trust has more recently been paving the way for more long term catchment restoration funding through establishing 'on the ground' Payments for Ecosystem Services (PES) schemes.

The Trust has worked with its local water company, South West Water, to set up an advice and grants programme on several Westcountry rivers with the aim of improving raw water quality. Details of the estimated 1:65 cost/benefit ratio for elements of this scheme, as well as the intricacies and limitations of the dynamic between private companies and third sector not-for-profit groups, is explored here. The presentation also highlights the fact that this scheme is one of the first in the country that allows capital asset funding from water companies to be spend on land it does not own through the use of contracts and covenants.

Further potential for PES schemes is also evaluated through catchment scale mapping of ecosystem services, especially water regulation (flood and drought), water purification, greenhouse gas regulation and habitat provision as well as how this may effect food provision.

This work shows that PES has a huge potential to deliver catchment scale restoration as well as highlighting the recipe of potential buyers within any catchment.

Keywords: Water Company; Ecosystem Service Mapping; South West Water.

IT AIN'T ALL ABOUT 'THE ENVIRONMENT'!

MARK EVERARD

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Abstract

When rivers function well, they deliver real benefits to real people. From health to access and amenity, economic resources and healthier food, natural fertilisation of floodplains and recruitment to fisheries, to better air quality and climate regulation. Reciprocally, degraded river functioning represents real losses to various stakeholder groups across society, often impacting disproportionately on the poor. These losses or gains range from less tangible 'nice to have' and 'quality of life' outcomes to far more material health and economic benefits.

Undoubtedly, plants, animals and our access and enjoyment of them are all net winners of river restoration. However, as case studies on urban and rural rivers, both here and overseas, demonstrate to us in robustly scientific and economic terms, it's not all about net gains for 'the environment'.

Health professionals are increasing realising the tangible health and indeed economic benefits of encouraging access to nature and 'green exercise', and the contribution of enhanced habitat to removal of problematic air pollutants and the breakdown of urban 'heat islands'. The role of restored wetlands and riparian zones, and the SuDS and 'Green Infrastructure' systems that emulate natural wetland processes, are also manifestly delivering value to society through improved hydrology, groundwater recharge, pollutant abatement, access to green space and further benefits besides.

There are whole new markets to explore and exploit for those interested in the restoration of rivers. Altruism, the sense of doing 'the right thing', may have been a substantial driver in the past, and will remain so for many of us. But we are now accruing the evidence to demonstrate how a better river can have beneficial outcomes for adjacent property values, improved flood risk management, recovering fisheries, social inclusion and a host of other public benefits. So let's help those we work with break out of siloed 'environmental', or indeed other narrow disciplinary, thinking. If we can connect with those tasked with advancing the interests of the diverse and real beneficiaries who benefit from river and wetland restoration, often for lower investment relative to more traditional management approaches, then recognition of the contribution of protected and restored rivers to a sustainable future will come closer to reality. PES, or 'paying for ecosystem services', approaches offer ways to bring these benefits into the mainstream, as does the harnessing of ecosystem-based approaches address concerns ranging from flood management to air and water pollution abatement, provision of amenity and places for education and healthy exercise, and habita for wildife including fish recruitment. Importantly, they do so in ways that better account for wider impacts on other services, the unintended consequences from traditional narrow engineered solutions coming into sharper focus. Mainstreaming of an ecosystem approach ultimately means recognition that all ecosystem uses and interventions affect whole social-ecological systems, including all species, habitats, natural processes and the many dimensions of human benefit that they inevitably influence.

Keywords: Ecosystem services; Stakeholders; Markets; Ecosystem functioning; SuDS; Green infrastructure; Social inclusion; Economic valuation.

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POSTER PRESENTATIONS

ROOMS A24/A26, GROUND FLOOR

Relocating A Sewage Outfall:
Utilising Hydromorphic Audit and Dynamic Channel Modelling to Good Effect

CAROLINE ANDERTON[1] & GEORGE HERITAGE[2]
[1] Principal Analyst – JBA Consulting
[2] Technical Director – JBA Consulting

Environmental Improvements to an Urban Watercourse:
Restoring The Pent Stream, Folkstone

SEBASTIAN BENTLEY *et al.*
Analyst – JBA Consulting

Understanding Sediment Transport in a Modified Chalk Stream Environment

GRANVILLE DAVIES *et al.*
Principal Engineer – Royal Haskoning

Urban River Restoration: Implications on Channel Sedimentation Patterns and Associated Ecosystem and Human Health

HELEN GIBBS *et al.*
PhD Student – Queen Mary, University of London

River Basin Planning Stakeholder Engagement and Integration in Scotland

ANNA GRIFFIN *et al.*
River Basin Planning Unit – SEPA

Conflict & Compromise: Implementing Channel Naturalisation Against a Background of Engineered Stability

GEORGE HERITAGE *et al.*
Technical Director – JBA Consulting

The Resilience of River Restoration Schemes to Climate Change – Operation, Stability And Maintenance Considerations

DAVID HETHERINGTON*et al.*
Senior Scientist – Ove Arup and Partners

Bridging the Gap – The Benefits to Fish and Eel Populations Generated by Sharing Engineering and Fisheries Knowledge

ANTHONY HOWARTH
Senior Project Engineer – Aquatic Control Engineering Ltd

Cuckmere Estuary Options Analysis

GAVIN JOHNSON[1] & BRYONY SMITH[2]
[1] Associate – Capita Symonds
[2] Senior Graduate – Capita Symonds

Evaluating River Health Pre and Post-Restoration in the Kamisaigo River

RITA LOPA & YUKIHIRO SHIMATANI
Department of Urban and Environmental Engineering, Kyushu University, Japan

Realigning The River Cherwell - A Practical Perspective

JANE MOON
Senior Geomorphologist – Black & Veatch

Restoration Along The Itchen Navigation: A Man-Made SAC Chalk River

ALI MORSE[1] & JON MILLIKEN[2]
[1]Itchen Navigation Project Manager – Hampshire & IoW Wildlife Trust
[2]Director – WLW Ltd.

The Great Eau, One of Lincolnshire's Best Examples of a Chalk Stream Habitat

RUTH SNELSON
Project Officer – Lincolnshire Chalk Streams Project

River Windrush Restoration Scheme

CHRIS SPENCER *et al.*
Senior Site Manager – Land and water Services Ltd

Fish siphon on the River Wissey, Norfolk

MARJON VAN NIEUWENHUYZEN[1] & GERARD MANSHANDEN[2]
[1]Product Design and Development / Northern Sales – Aquatic Control Engineering
[2]Managing Director – Fish Flow Innovations

The Use of Individual-Based Models as Tools to Inform River Catchment Mgmt

KEVIN WOOD *et al.*
Postgraduate Researcher – Centre for Ecology & Hydrology

The Nature of Success: Considering the Ecological and Social Success of Restoration

KIRSTEN WRIGHT
Senior Aquatic Scientist – APEM Ltd.

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RELOCATING A SEWAGE OUTFALL: UTILISING HYDROMORPHIC AUDIT AND DYNAMIC CHANNEL MODELLING TO GOOD EFFECT

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Abstract

A sewage outfall located on the southern bank of the river Clyde at Ferniegair opposite Baron's Haugh nature reserve sits on a gravel bar. Submerged gravel accumulation associated with the bar at the site is presently blocking the sewer outlet causing regulatory failure. A combined hydromorphological audit and hydrodynamic modelling study was commissioned by Scottish Water Solutions to consider the optimal site for relocating the outfall, investigating the local dynamics of the River Clyde in relation to wider influences on sediment transport and channel change. The work included prediction of the future movement of the gravel bar using dynamic bed modelling (CAESAR) following the collection of detailed channel geometry data using an Acoustic Doppler Velocity Profiler.

The hydromorphic assessment concluded that the outfall location would be subject to continued sedimentation as a result of slow channel migration and bar growth and a new site was required for the outfall. Sediment supply to the river reach is largely from widespread uncontrollable sources across the middle and upper catchment valley floor, as such gravels are entering the reach periodically resulting in fluctuating shoal and bar sedimentation. However, the pattern of sedimentation is spatially stable over recent time with well defined areas susceptible to change. These have been identified in the historic and contemporary components of the geomorphic audit and confirmed using the CAESAR model. Modelling of geomorphologically effective flows suggests that much of the reach becomes active with severe erosion downstream on the left bank after the upstream island and across the channel in the middle of the reach. Conditions immediately downstream of the outfall bar are changeable, experiencing both erosion and deposition. Two areas of relative stability are notable, the long pool between the island and outfall bar and the shallower run at the downstream limit of the study reach and these were further investigated for their engineering potential with regard to outfall relocation.

Works are currently under consideration to relocate the outfall to one of these more stable location based on the audit and modelling findings.

Keywords: Dynamic river modelling; Stable channel evaluation

ENVIRONMENTAL IMPROVEMENTS TO AN URBAN WATERCOURSE: RESTORING THE PENT STREAM, FOLKSTONE

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Abstract

The Pent Stream is a moderate gradient single-thread channel that flows through the town of Folkstone in Kent. It presently suffers from a poor hydromorphology principally due to extensive engineering modifications and fine sedimentation issues. The Environment Agency Southern Region in association with JBA Consulting have undertaken a series of channel improvement works to deliver ecological and visual improvements, without affecting the existing flood risk through heavily urbanised areas.

A hydromorphological audit of the Pent Stream catchment was undertaken and the results helped to identify and inform the potential options for the channel improvement works. The audit focused on the sediment sources and the sediment dynamics through the Pent Stream network. It found high levels of sediment in the main channel transport system linked to legacy inputs from the Channel Tunnel Rail Link (CTRL) construction works in the upper catchment. This sediment was being stored where weirs and over-widening cause flow energy reduction. Flow regulation, again associated with the CTRL works has resulted in a loss of high energy flows in the Pent Stream meaning that deposited fines were able to consolidate and become vegetated making them very difficult to erode.

Suitable options to reverse the trend of fine sediment stabilisation were then appraised using a Multi-Criteria Analysis, these included weir removal, re-profiling, 2 stage channel design and bridge redesign. The confined nature of much of the stream restricted extensive re-naturalisation, however, a number of sites were chosen for morphologic improvement. The findings of the study were also conveyed to the public for consultation and the sediment management measures proposed have been taken forward by Environment Agency Asset Systems Management teams with groundworks now completed on the Ashley Avenue reach. Maintenance and monitoring protocols will operate on the new scheme providing valuable information for the response of the stream to the varied enhancement works.

Keywords: Lowland channel restoration; Urban channels; Fine sediment; River naturalisation.

UNDERSTANDING SEDIMENT TRANSPORT IN A MODIFIED CHALK STREAM ENVIRONMENT

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Abstract

The River Hull Headwaters is the most northerly chalk stream in the country and is classified as a Site of Special Scientific Interest. However, the SSSI is considered to be in unfavourable condition in part due to the impounding effect of structures, which encourage slow flows and sedimentation. Further, the Hull Headwaters do not meet Good Ecological Status under WFD.

This paper will review the Hull Headwaters Sediment Modelling project. The project used an innovative combination of modelling techniques to appraise the impact of six structures on the river and SSSI, and in particular their effect on sediment transport. Options for modifying or removing weirs as part of a wider river restoration project were assessed and management options recommended. The study also supports an ongoing Restoring Sustainable Abstraction project in the catchment.

The paper will describe the new approach modelling techniques used to assess the impact of structures, and the wider impacts of sediment transport on the river's morphology, habitat and ecology. The paper will examine the potential risks and opportunities that weir removal presents to SSSI interest features. It will go on to consider how lessons learned from this project can be applied elsewhere.

Keywords: Modelling; Weir and sluice removal; SSSI.

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URBAN RIVER RESTORATION: IMPLICATIONS ON CHANNEL SEDIMENTATION PATTERNS AND ASSOCIATED ECOSYSTEM AND HUMAN HEALTH

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Abstract

Urban river restoration often creates rivers that are favourable to sedimentation and in-channel vegetation growth as a result of greater sediment availability, increased channel width and consequently heterogeneous flow pattern development. Sediments, particularly finer-grained, store contaminants including metals and so could have detrimental impacts upon aquatic ecosystems and human health. This research reports on the effect of urban river restoration upon sedimentation patterns and associated changes in sediment metal storage at four sites on London rivers.

Contrasts in the extent of bed sediment types were found between the restored and unrestored stretches at two sites. The majority of the concrete-lined unrestored stretch at Chinbrook Meadows had no sediment deposition, whereas the restored stretch had over half of the channel occupied by finer sediment. At Sutcliffe Park the dominant bed sediment type in the restored stretch was finer sediment, whereas in the unrestored stretch it was gravel.

Analysis of sediment samples showed significant differences in sediment properties and metal concentrations between bed sediment types. Metal concentrations, organic matter content and % <63µm were generally higher in the exposed finer and in-channel vegetation sediment. At both sites, total loadings of all metals were greater in the restored as opposed to the unrestored stretch, and this difference persisted after standardisation to loading/m2 of channel to account for differing channel dimensions.

The observed metal concentrations were analysed in terms of sediment quality guidelines. In terms of ecological sediment quality Cu, Ni, Pb and Zn were of greatest concern at Sutcliffe Park and Pb and Zn at Chinbrook Meadows. Exceedances of human health sediment guidelines only occurred for Cu and Zn at Sutcliffe Park.

This research has implications for the design, management and maintenance of restored urban rivers in terms of the assessment of fine sediment accumulation and its associated quality.

Keywords: River restoration; Metals; Sediment quality; Fine sediment; Sedimentation.

RIVER BASIN PLANNING STAKEHOLDER ENGAGEMENT AND INTEGRATION IN SCOTLAND

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On behalf of the River Basin Planning Unit – Scottish Environment Protection Agency, Rivers House, Irongray Industrial Estate, Dumfries DG2 0JE Anna.Griffin@sepa.org.uk

Abstract

SEPA established a flexible, yet consistent, stakeholder engagement network nearly 5 years ago to advise on and implement the river basin management plans required in Scotland. In the Scotland river basin district, and in Solway Tweed in partnership with the Environment Agency, the river basin planning team have worked with over 200 organisations; resulting in the development and discussion of measures to protect and improve the water environment and the subsequent production and implementation of the Scotland and Solway Tweed river basin plans in 2009.

It is widely recognised that integrating river basin planning objectives with other planning systems will deliver implementation that is both efficient and effective. We can report on the advances we have made, specifically with regard to the integration with development plans, biosecurity plans, catchment management planning processes; with case studies to illustrate our approach.

As our stakeholder networks have gained in strength and confidence there has been a move towards adopting a multiple benefit approach and we are able to contrast and compare the similarities and differences between data-led or stakeholder-led approaches to measure development and report on the issues and opportunities this brings. We are also developing a national strategy on restoration, which will set out a framework for delivering morphological restoration and improvement. This will clarify priorities and the role of stakeholder networks in delivering restoration.

Keywords: Local authorities; Catchment management planning.

CONFLICT & COMPROMISE: IMPLEMENTING CHANNEL NATURALISATION AGAINST A BACKGROUND OF ENGINEERED STABILITY

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Abstract

The River Ribble at Long Preston Deeps is a Site of Special Scientific Interest (SSSI) currently in unfavourable condition. A restoration plan developed by Natural England and the Environment Agency aims to re-naturalise the river and floodplain bringing the area into favourable condition. The SSSI is characterised by an active gravel-bed river with a number of large gravel bars (incipient wandering) to the north grading into a uniform low energy over-deepened silt-bed river (inactive sinuous single thread) further south. Both river types presently exhibit an unnatural morphology and ecology due to past and present engineering, floodplain management activities and flood disconnection. The restoration plan outlined a number of options to restore in-channel and floodplain morphology and dynamics linked to floodbank removal, palaeo-feature reconnection, livestock management and vegetation establishment with the overall vision of establishing a wooded anastomosed / single thread system for the SSSI which would ultimately control the local erosion and gravel instability issues present along the reach. An initial meeting with interested local parties revealed widespread opposition to the plans and a feeling that decisions were being made without proper consultation, few were convinced that the plan would address the stability issues on the river. Winter flooding saw predicted breaching of the flood banks occurring at the northern end of the SSSI and triggered an opportunity to carry out part of the restoration plan with the agreement of affected landowners who saw some merit to entering into a High Level Stewardship (HLS) agreement associated with the floodplain and palaeo-channel reconnection. Meetings held on site with farmers, anglers and conservation trust members proved far more successful at gaining a mutual understanding of the issues and options available for restoration and an agreed approach has been followed on site, realigning flood banks, removing revetment and reconnecting channel and floodplain features. The works have been successfully implemented and a number of lessons have been learned concerning the piecemeal enactment of the restoration plan, complete buy in by affected landowners, acceptance of probable channel change following removal of restraints to channel movement and understanding of likely river response to incomplete restoration up and downstream. Perceptions of 'natural' river behaviour among communities associated with rivers is generally one of stability drawn from generations of river training and flood prevention, re-naturalisation will undoubtedly challenge those perceptions and could well lead to negative reactions to the effects of naturalisation works along some of our more reactive rivers.

Keywords: Upland restoration; River naturalisation; Floodplain connectivity; Gravel stabilisation

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THE RESILIENCE OF RIVER RESTORATION SCHEMES TO CLIMATE CHANGE – OPERATION, STABILITY AND MAINTENANCE CONSIDERATIONS

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Abstract

Complete renaturalisation of river systems is the only way to induce a state of complete freedom to adapt to the potential impacts of climate change on hydrology and ecology. Under truly natural conditions river systems are free to flood and be morphologically dynamic without adverse consequences to society. In reality, such conditions are very rare and instead river restoration is conducted in an attempt to mimic natural processes for the benefit of ecology, amenity and water level management within the constraints that have resulted from human development.

There is much uncertainty surrounding future climate scenarios and the impacts that these scenarios could have on the hydrological and sedimentological regimes, and ecological controls of river systems. These changes could put increasing pressure on restored rivers and the soft or green infrastructure that they rely on to function as quasi-dynamic geomorphological and ecological systems. Additionally, any fixed features may encounter changing stresses from flows, different types of geomorphological processes, as sedimentological regimes change, and encounter stability issues as vegetation adapts to a new climate.

This paper reports on some preliminary research focused on understanding potential climate change induced pressures on river systems, their potential impacts on restoration features and how this can be accounted for in design.

A secondary purpose of this research is to consider the joint climate change mitigation (through low carbon use in construction, enhanced carbon sequestration and holding) and adaptation (through in-build adaptability of schemes) benefits of environmentally sensitive approaches to river restoration. General recommendations will be made with regards to best practice in order to achieve the best results with regards to maximising climate change mitigation and adaptation benefits when restoring rivers.

Keywords: Mitigation; Adaptation; Climate scenarios.

BRIDGING THE GAP – THE BENEFITS TO FISH AND EEL POPULATIONS GENERATED BY SHARING ENGINEERING AND FISHERIES KNOWLEDGE

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Abstract

Many companies are involved in the installation of water control structures which may prevent the migration of various aquatic species. With the introduction of European legislation, EC Council Regulation (1100/2007) for the recovery of the European eel stock and Water Framework Directive (2000/60/EC), it has become necessary for companies to assess how they deliver scheme specifications to ensure eel and fish passage whilst still maintaining the primary role of any equipment provided.

The primary functions of all water flow control equipment are either flood protection or level management and this primary role cannot be neglected when considering the requirements of the Eel Regulation and Water Framework Directive.

The implementation of the Eel Regulation and provision of fish passage has left many people asking one simple question 'How do we deliver what is required?' It could be a fisheries expert struggling to turn an idea into reality or an engineer with an idea that he needs to confirm is suitable for a particular watercourse. Either way, without the sharing of their combined knowledge they may never reach the desired end result.

To ensure the desired end result for each specific site, it must be understood that getting as many opinions from relevant experts as early on in the project is key. From initial site meetings to email/telephone conversations, by using the technology available we can very quickly get to a short list of the most cost effective working solutions.

Our paper gives specific examples of projects and installations that have only been possible through the sharing of knowledge from both fisheries and engineering disciplines. We will show that through working in partnership that it is possible to offer innovative solutions that meet all of the requirements for a specific site and also comply with all relevant regulations and guidance it is our belief that the pooling of knowledge will usually offer the most effective result for a specific site.

The paper focuses on the following key points and highlights the benefits of partnership working that includes knowledge from all related disciplines.
Examples of partnerships between engineers and fisheries experts with an outline of the overall project, the end result and the positives and negatives that occurred.
Sharing of knowledge at the conception stage and how it can save time and money.
Possible ways to formalise a more structured way for this knowledge sharing to happen.

Keywords: Fish passage; Eel passage; Flood protection; Eel Regulation; Partnership working.

CUCKMERE ESTUARY OPTIONS ANALYSIS

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Abstract

In April 2011 the Environment Agency ceased maintaining the existing flood defences along the tidal River Cuckmere, south of Exceat Bridge (referred to as the Cuckmere Estuary).

Prior to the withdrawal, Defra provided East Sussex County Council with a Pathfinder grant to assist in exploring different options for managing this change. The Project was interested in understanding how each of these options might affect the estuary, in the near future and in the longer term.

The option impact study quantified the changes to the estuary by means of a detailed hydraulic study of the estuary. In addition a number of visual aids including animations were produced so that stakeholders could interpret the predicted short, medium and long-term consequences of each option.

The findings of the study were presented to the local community at interactive workshops and the short term future of the Cuckmere Estuary was determined by the local community at meeting at the end of June 2011.

The use of computer animations/visualisations was key to informing stakeholders. These tools can be used to and manage stakeholder expectations, which have created issues prior to, during and following the delivery of many river restoration projects in the past.

Keywords: Meanders; Saltmarsh; Visualisation; Engagement.

NOTES…

EVALUATING RIVER HEALTH PRE AND POST-RESTORATION IN THE KAMISAIGO RIVER

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Abstract

Since 2009 the Kamisaigo River has been restored by the Fukutsu City Government to improve the environmental quality of the river. River restoration measures must be properly installed, monitored, and maintained to be successful.

To assess the health of the Kamisaigo River post-restoration successfully or not, an ecological indicator is needed to detect the changing environmental condition. The Fish Biological Health Index (FBHI) scores adequately represent characteristics of river health and used to determine which rivers (or segments of rivers) successful post-restoration. We calculated 14 regionally developed indices using the ecological features of fish towards several river sites, which included restored sites and control condition in control sites (un-restored sites) in nearby river.

The results from several sampling stations indicated that the environmental quality of this river health post-restoration were range in moderate to good conditions in generally. This study shows how FBHI can be used to monitor and assess river restoration projects to improve future efforts.

Keywords: Fish biological health index; River health; Restored site; Control site.

REALIGNING THE RIVER CHERWELL - A PRACTICAL PERSPECTIVE

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Abstract

As part of the Banbury Flood Alleviation Scheme three sections of the River Cherwell, located near Banbury, Oxfordshire, were realigned to make room for the construction of a new flood embankment. This included two sections of the River Cherwell, referred to as the upper and middle realignments. Black & Veatch were responsible for developing the detailed design of the new realigned channel and taking them through to construction. Key objectives for the design included increasing the connectivity between the river and the floodplain; and provision of changes to the channel form that would be in line with high status morphological objectives under the Water Framework Directive.

A number of challenges were faced during the development of the design and during construction. The presence of an impounding structure downstream of the upper realignment posed a challenge for the design team, particularly in regards to the potential for the future removal of this structure, as a result a number of modifications to the cross-sectional planform of the upper realignment were made during construction. Buildability was another issue faced, particularly in regards to contractors experience and managing their perception of what was required during the contruction of the new river channel.

Further enhancements to the biodiversity and hydromorphology of the channel design were carried out during construction. Works on site included, 'roughening' the channel planform, localised channel narrowing and bed raising, and the translocation of aquatic vegetation. On site, supervision of enhancement works ensured that local resources were fully utilized, for instance, coarse woody debris was identified and retained on site and reused within the channel to provide a more variable flow regime and to speed up the establishment of riparian habitat.

Keywords: Channel enhancement; Floodplain connectivity; Geomorphology; Coarse woody debris; Channel narrowing; Water Framework Directive.

RESTORATION ALONG THE ITCHEN NAVIGATION: A MAN-MADE SAC CHALK RIVER

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Abstract

On one of Hampshire's chalk rivers, a 5 year partnership project to restore the Itchen Navigation is nearing its end. The 300 year old perched channel fell into disrepair when commercial use ceased, and an EA report highlighted the likely loss of the Navigation if no action was taken. A £2.4M lottery funded project was developed to tackle the issues faced. A major aim was to stabilise the crumbling banks - since maintaining continuity of the channel ensures that the wildlife, heritage and recreational use prevalent today can persist.

Engineering works began at priority reaches; designed to ensure the integrity of the banks, enhance in-channel and marginal habitats, and limit ongoing maintenance requirements.

Impact avoidance / mitigation and habitat enhancements formed a key part of all engineering works, not just maintaining but enhancing the Navigation. Use of bioengineering methods created marginal berms of local provenance wetland vegetation which protect repaired banks from erosion, and provide, extend and link habitat for key species including southern damselfly, otter and water vole. A lack of maintenance had led to excessive tree growth, shading out vegetation and breaking apart banks, contributing to erosion and sediment input. The flow through over-widened reaches was insufficient to remove sediment, causing choking of gravels and loss of macrophytes. Tree works and channel narrowing rectify this, improving in-channel conditions for fish and other aquatic species. These enhancements benefit SAC and SSSI interest features, and help to deliver WFD objectives. To date, over 2km of bank and channel enhancements and 3km of footpath repairs have been completed.

Movement of materials was a major logistical consideration in terms of both environmental impact and H&S. At Brambridge, boats and mobile gantries were used to import chalk to widen the embankment. At Hockley, a monorail transported chalk and path gravels for the embankment, and locally excavated ditch clearance arisings for the marginal berm. These novel methods made works possible in sensitive, difficult-to-access locations.

As the project progressed, experience gained allowed design changes, enabling additional works to be incorporated within existing budgets. For example, several 'Dog Dips' have been installed, channelling dog access to less vulnerable locations, and educating owners. On completion, landowners sign up to maintain the works into the future; another key sustainability consideration.

Complementing engineering works are education, interpretation and community engagement designed to foster an understanding of the river amongst landowners and the local community, contributing to longer-term sustainability.

Keywords: Multi-objective; Funding; Partnership; Bioengineering; Materials transport

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THE GREAT EAU, ONE OF LINCOLNSHIRE'S BEST EXAMPLES OF A CHALK STREAM HABITAT

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Abstract

The history of Lincolnshire's chalk rivers differs greatly to southern chalk rivers. Those in Lincolnshire have undergone little of the traditional development of water mills and water meadows. They have not been subject to the extensive management that comes with high quality trout fisheries, for this reason it can be said that Lincolnshire's chalk rivers differ in ecological status to other chalk rivers that have undergone traditional management.

Following 'pilot' projects on the Waithe Beck carried out by the Environment Agency, the Lincolnshire Chalk Streams Project partnership started in 2006 with the appointment of a project officer.

The Great Eau was identified as a mixed chalk geology river with a siltation problem that would greatly benefit from restoration and enhancement works. The concern is the level of silt settling along the river bed upstream of Claythorpe mill, Aby. The impoundment of the mill and low flows cause the build-up of sediment upstream. Contact was made by the then project officer with the riparian landowners along the 1km stretch of river including the owner of an established fishing syndicate. They were all of the same thinking that the silt level upstream of the mill was contributing to flooding and building up further up the channel year on year causing a noticeable change to the trout population.

The work needed to this section of river was done in stages when the funding was made available from a SITA Enriching Nature Grant. Designs were drawn up to;

- Install a cattle gate with an additional gate to allow public access,
- Install fencing along the bank top to keep the cattle from poaching the banks,
- Install groups of flow deflectors to trap sediment and encourage channel narrowing whilst creating flow diversity to scour and expose the gravel bed and create sinuosity to a straightened channel,
- Hedgerow maintenance,
- Install a hard standing cattle drink,
- De-silt the channel upstream of the mill.

To avoid upsetting the landowners and due to funding pressures an immediate solution to this silt removal now looks unlikely in the short-term. However, funding has been diverted to explore alternative enhancement options whilst longer term solutions to the silt removal are considered. The current enhancements are already making a positive change to the local stream dynamics and biodiversity of the channel as reported by landowners, anglers and to the satisfaction of all funding partners.

Keywords: Silt; Enhancements; Fine sediment

RIVER WINDRUSH RESTORATION SCHEME

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Abstract

Objective: The river has historically been impounded for use by the mills at the head of the town. The habitat and aquatic life were both diverse and abundant downstream of the impoundment, but upstream passage was impeded by a sluice and two weirs. The redevelopment of the area provided the opportunity to restore some of the river's more natural elements and thus enhance both water quality and biodiversity.

As part of an ongoing housing development, Land and Water Services Ltd were engaged as part of the initial consultation team for design buildability and later as Principal Contractor. All parties (including the Environment Agency, Peter Brett Associates, West Oxfordshire District Council and Taylor Wimpey and local interest groups) worked together to produce a design which would break the impoundment and allow fish passage.

Scope of Works: The scope of the works were centred around the construction of a natural fish pass but also included the construction of a weir, restoration of a bathing area, construction of two habitat/balancing ponds and installation of two bridges.

The fish pass comprises a hard engineered structure at the upstream junction with the River Windrush. A notch weir with stop log groves allows for fish passage and flow control. The new river channel meanders across the flood plain to join an existing back water channel, the meanders have been designed to mimic a natural channel but will be left for the river to shape its own route. Riffles, stone weirs, flow deflectors and shallow scrapes have all been incorporated into the design. These will similarly be left for the river to redistribute over time.

Methodology: Enabling Works: Temporary access to the works was achieved by the installation of a bailey bridge and a culvert. The level of water in the main river was controlled by an upstream temporary river bypass system. A cofferdam was installed at the fish pass intake area.

Methodology: Construction: The excavation work took place under an EA consent, using in-house plant and equipment. The intake structure was formed with a reinforced concrete notch weir placed to driven steel piles. Excavation of the fish pass channel took 3 weeks, with all materials being landscaped within the scope of the works, reducing cost and environmental impact. Riffles and boulder dams were constructed using locally sourced stone materials. A planting scheme was carried out to the new river channel using some 5,500 local native species.

Keywords: Fish Pass; Contractor; Site works

FISH SIPHON ON THE RIVER WISSEY, NORFOLK

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Abstract

The Siphon Fish Ladder is an innovative fishway from the Netherlands, which can be applied to facilitate fish passage at any watercourse obstruction and structures including weirs, penstocks and flap valves. The Siphon fish ladder allows passage of most types of fish including eels and even frogs and tadpoles have been observed using the system.

A Siphon Fish Ladder is, in essence, a pool and weir fish pass contained within a siphon. This offers benefits as the flow rate is not subject to that of the watercourse, but can be fully adjusted and changed by alternating the size of an air bubble within the siphon using a vacuum pump.

Siphons Fish Ladders are already a much tested concept in the Netherlands, where nine are currently operational with test results confirming the effectiveness of the concept for fish species found in Dutch inland waters.

The UK, however, poses new challenges for the Siphon Fish Ladder. In the Netherlands, salmon and trout have not been present in the waters where fish siphons are installed. The criteria for a fish siphon have therefore been changed for the UK and the design has been adapted to allow passage for these species. Specialists from the Environment Agency have been involved in fine tuning the design and the Siphon Fish Ladder is undergoing trials on the River Wissey (Norfolk) to ensure the Siphon Fish Ladder is also suitable for salmonids.

The River Wissey (Norfolk) has two large counterbalance gates, one of which is permanently shut and is only opened during emergencies. This shut gate prevents fish from entering the river Wissey from the Cut Off channel and is a barrier to fish migration.

To determine the success of the siphon, rigorous monitoring methods have been planned by Chris Bell from the Environment Agency and his team for the Wissey Siphon installation. The data collected from these sites will be assessed against criteria written for each specific site to determine whether objectives have been met.

This research will determine whether a Siphon Fish Ladder is suitable for fish passage in the UK where salmonids require passage. Data from the experiments is expected to show a successful and high rate of salmonid passage, which will open up new possibilities for methods of passage for all species of fish in the UK.

Keywords: Fish passage; Salmonid; Fish pass; Monitoring; Fish migration.

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THE USE OF INDIVIDUAL-BASED MODELS AS TOOLS TO INFORM RIVER CATCHMENT MANAGEMENT

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Abstract

Ecological models can be useful tools for predicting the effects of environmental change, either natural or anthropogenic, on organisms and their habitats, making models valuable tools in conservation planning. In chalk rivers grazing conflicts have been reported between mute swan (Cygnus olor) flocks and submerged macrophytes, which are legally protected for their high conservation and economic value. Additionally some chalk rivers have Special Area for Conservation (SAC) or Site of Special Scientific Interest (SSSI) status; 'favourable condition' of these sites may be threatened by overgrazing.

We use an individual-based model (IBM) of a swan population in a chalk river catchment to predict the effects of different habitat management scenarios. The IBM is based on field data collected over two years in the River Frome (Dorset, UK). The model predicts the effects of a) greater riparian shading, and b) the creation of alternative feeding habitat adjacent to the river, on swan habitat use, feeding behaviour, and macrophyte biomass depletion. Based on the IBM predictions, we recommend field trials of altered habitat management in chalk river catchments that could alleviate swan conflicts.

Keywords: Conservation conflict; Waterfowl; Macrophytes; Habitat management; Chalk rivers.

THE NATURE OF SUCCESS: CONSIDERING THE ECOLOGICAL AND SOCIAL SUCCESS OF RESTORATION

K.A.L.WRIGHT

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Abstract

A successful wetland restoration scheme is generally thought of as the demonstration of an ecologically viable and sustainable ecosystem, or improvement of ecological status. If measured at all, the success of such schemes are normally measured in terms of its attracting a particular species or its contribution to the area of a particular habitat type. However, wetlands in urban areas also take on a range of specific societal values, as they provide people with contact with nature and opportunities for recreation that are otherwise rare in the urban landscape.

There are very few examples of post-restoration monitoring which consider the social success of a site, such as how much people are engaged with wetland design and management, or how people perceive it. The WFD renders use of interdisciplinary techniques within a participatory framework a statutory requirement, however, this requirement is not being met. These monitoring schemes are therefore of limited use in evaluating urban wetlands since they do not consider the importance of the interaction between people and nature.

This presentation describes an interdisciplinary project designed to discover whether any common factors influence ecological and social success, and to establish whether a wetland restoration or creation scheme can possess both.

Important ecological factors identified in determining success include the position of the site within the landscape, size, location and interconnectivity. Hydrologically, the availability of a sufficient volume of water, the ability to control flows, and good water quality were all shown to be important. Climatic conditions exerted a clear influence in determining hydrological stress. Socially, the aesthetic perception of wetlands was found to be strongly linked to their success, along with accessibility for people and the provision of visitor facilities and information. Finally, the involvement of the local community from an early stage could greatly promote the future of the wetland as a sustainable, multifunctional place of interest.

Both best practice guidelines and a simple assessment procedure were developed to assist in future creation, restoration and assessment of wetlands. These principles are currently being applied by APEM in undertaking a pre-restoration condition assessment, feasibility study, outline design and public consultation for a proposed project aimed at restoring a disused backwater channel and associated wetland of the River Brain at Witham, Essex.

Such is the interconnected nature of physical, chemical, ecological and social processes that it is only an interdisciplinary style of approach to restoration that is truly likely to succeed.

Keywords: Wetland restoration; Social success; Monitoring; Interdisciplinary.

NOTES…

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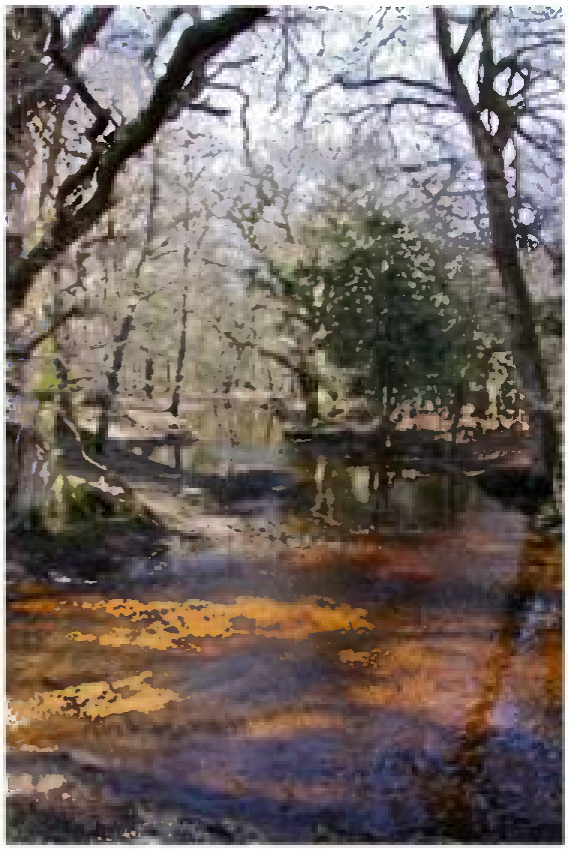

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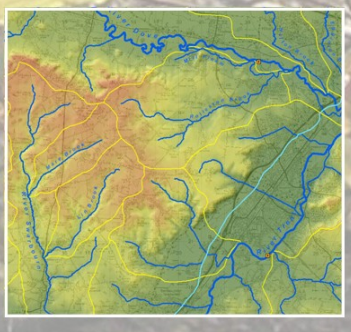

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--- WORKSHOP ---

PROJECT MONITORING AND ASSESSMENT

SESSION A

DATA COLLECTION AND ANALYSIS

MAIN LECTURE THEATRE B52

The Effect of Large Woody Debris on Stream Community Structure Across an Enrichment Gradient

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

Pilot Project « WALPHY »
Walloon Experimentation of River Restoration

ALEXANDRE PEETERS *et al.*
Geographer – University of Liège, Belgium

Anastomosing on the River Trent: An Update on River Response

NEIL ENTWISTLE *et al.*
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A Hydraulic and Fisheries Based Post-Project Appraisal of the Inchewan Burn Restoration Project, Birnam Perthshire

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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 are being altered increasingly by long-term exploitation and habitat modification, successful river restoration is therefore critical for mitigating impacts on biodiversity ecosystem functioning.

Restorations are typically constrained to small patches within individual rivers and often lack adequate monitoring and assessment. This has led to poor diagnosis of both the "problem" and the effectiveness of the "solution" as useful data are rare.

Most river rehabilitation studies have focused on target species (e.g. brown trout) or assemblages (e.g. macroinvertebrates), but little is known of the potential effects at the more complex organisational levels that bind these components together (i.e. food webs, communities, ecosystems).

Our principal aim is to evaluate the impact of "large woody debris" restoration on community structure, in a study across five chalk streams, including the Bure and Test in Norfolk and Hampshire respectively, using a Before-After-Control-Impact (BACI) style design. To test whether macroinvertebrate response is constrained in systems with high nutrient concentrations, a further 14 calcareous rivers along a nutrient gradient were also sampled.

Results revealed no consistent relationship between macroinvertebrate assemblages and either nutrient concentrations or habitat structure in these streams, suggesting other methods may be required to gauge the success of restoration. These include assessments of biomass stocks, food webs, and body-size distributions. Preliminary results indicate that total fish biomass is typically higher in the presence of woody debris. Macroinvertebrate biomass and their contribution to fish diet will also be discussed in the presentation.

Keywords: Biomass; Food web; Macroinvertebrate; Nutrients.

PILOT PROJECT « WALPHY »
WALLOON EXPERIMENTATION OF RIVER RESTORATION

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Abstract

According to the Water Framework Directive (WFD 2000/60), our rivers and water bodies are required to achieve the "good ecological status" by 2015. This requirement is related to the physico-chemical, biological water quality as well as the hydromorphological quality. In this context, a LIFE Environment project, co-founded by the European Union and the Service Publique de Wallonie, was launched in 2009 for a period of five years. It aims to realize the experimental and demonstrative river restoration works on three "at risk" water bodies, based on two axes: longitudinal continuity and transversal continuity.

The first two selected water bodies (Bocq, eastern tributary of the Meuse) are suitable for the restoration works which concern the longitudinal continuity due to the presence of dams and other obstacles between 1 and 3 m high. These works consist in dam management (weir removal or fish ladders) taking into account hydromorphological (sediment transport) and biological (invertebrate or fish species free movement) impacts.

The third water body (Eau Blanche, western tributary of the Meuse) presents straightened rivers with artificial banks, which consequently lead to poor connections between the stream and its floodplain. This water body is therefore appropriated for the works based on the transversal continuity recovery. These works consist in enhancing straightened river channel and restoring meanders or banks. Until now, these works have been realized on more than 5 km.

These works are being monitored on the basis of geomorphological and ecological analysis.

The geomorphological monitoring is based on surveys conducted before and after the works. It also concerns the bedload transport, the clogging of the gravel layer and the morphological changes of the river following the works.

The ecological monitoring is based on two indicators: macroinvertebrates and fishes. Standardized and repeatable methods were developed to compare the situation before and after the works, especially through the analysis of microhabitats. In addition, we use another two complementary indexes of physical quality for this monitoring. Developed by the consulting office Teleos, these indexes have a fish orientation and have been implemented in many of our stations.

Keywords: Water Framework Directive; Habitat enhancement; Dam management; Geomorphological monitoring; Ecological monitoring.

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ANASTOMOSING ON THE RIVER TRENT: AN UPDATE ON RIVER RESPONSE

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Abstract

The River Trent drains around 10,500 km^2 of central England including 2272 km^2 under tidal influence. The tendency of the River Trent and its principal tributaries to split creating gravel shoals and islands has been noted by a number of previous studies and the resultant geomorphic variability is seen as very important from a biodiversity perspective. This is particularly the case as long sections of the river are now stable, morphologically uninteresting and unconnected with their floodplain.

Staffordshire Wildlife Trust recognised the value of this channel type, attempting to recreate it by widening the channel downstream of the confluence with the River Tame removing 45,000 m^3 of floodplain deposits to create a series of interconnecting channels and islands. Gravel shoaling and island development was further encouraged through the creation of large woody debris deposits and the retention of vegetated floodplain areas within the main channel and across the widened section.

Morphologic development of the reach has been slow following construction in 2010. Visual inspection reveals that many of the channels remain infrequently inundated whilst the scraped floodplain areas receiving seasonal flow remain largely uniform, although some morphologic development and sediment differentiation is occurring in the upstream reach.

2D hydraulic modelling of the constructed channels indicates that the primary inflows display limited flow concentration causing increased flow velocities and some coarsening of the bed and this is seen on site. Flows nearer the main channel have also been sufficient to keep the emplaced gravels free from excessive fine sediments.

Elsewhere, however, hydraulic uniformity linked to over-wide channels and a near constant flow direction has failed to encourage a dynamic system. Increased inundation frequency combined with gradual morphologic development and vegetative community differentiation will see an increase in hydromorphic diversity over time improving the overall value of the anabranched reach, this could be further encouraged by additional island construction to create a smaller and more convoluted set of sub-channels.

Keywords: Lowland channel; Anabranched channels; River naturalisation.

A HYDRAULIC AND FISHERIES BASED POST-PROJECT APPRAISAL OF THE INCHEWAN BURN RESTORATION PROJECT, BIRNAM PERTHSHIRE

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Abstract

The Inchewan burn river restoration project replaced a 100 metre length of stream bed composed of gabion baskets with a natural boulder bed river. RRC acted as advisors to the restoration project. The original engineered reach has been constructed as part of bridge construction when the A9 road near Dunkeld in Scotland was built. Unfortunately the gabion lined channel blocked the passage of fish to the upstream river. As part of the restoration initiative, improvements in riparian habitat have also been undertaken.

The success of the project is appraised here by assessing the values and pattern of water depth and velocity in the restored reach in comparison to control reaches up and downstream. Electrofishing data will also evaluate the extent to which opening up the burn to fish passage has resulted in the presence of salmonids in the restored and upstream reaches.

The post-project appraisal was undertaken by 3rd and 4th year undergraduates of Stirling University in relation to a mini-project and research dissertation under the supervision of Prof. Gilvear and Dr. Bull.

Keywords: Fish; Boulder bed; In-channel restoration; Gabions; Hydraulic habitat.

--- WORKSHOP ---

PROJECT MONITORING AND ASSESSMENT

SESSION B

MONITORING DESIGN AND JUSTIFICATION

SECOND LECTURE THEATRE A25

How Are French River Restoration Projects Evaluated? Discussing the Notion of Success

BERTRAND MORANDI *et al.*
PhD Student – University of Lyon, France

Ecological Evaluation of Recently Completed Restoration Schemes on the River Wensum

IAN MORRISSEY
Senior Environmental Scientist – Atkins Ltd

Mayesbrook Park Restoration Project - A Coordinated Monitoring Strategy

NICK ELBOURNE
Information and Communications Officer – River Restoration Centre

Assessing London's Rivers

DAVID GILVEAR[1] & COLIN BULL[2]
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HOW ARE FRENCH RIVER RESTORATION PROJECTS EVALUATED? DISCUSSING THE NOTION OF SUCCESS

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Abstract

Since the 1990's, French operators and scientists are engaged in river restoration policies application and implement many projects. The WFD, with "good ecological status" target, is promoting this restoration effort but also highlights the need of feedbacks from pilot projects and evidences of success. However project assessments and audits are still rare.

Our work is focused on some case-studies (e.g. Rhone, Rhine, Ain) considered as pilot cases with a monitoring program and potentially providing feedbacks. The study is based on interviews of French scientists and operators, and on different kind of documents related to the projects (scientific report, technical documents, etc.). The main issue of this contribution is to analyse the bridge from monitoring to evaluation.

We study monitoring tools and methods: what are temporal and spatial frameworks? What are metrics and indexes used? Answering these questions is a first step to analysing evaluation results, for which a set of questions is also asked. How can operators go from monitoring results to evaluation of effects or status quality? How can they affirm "yes, it is a success", or "yes, there is a positive effect"?

Behind these questionings we explore the human values which support river restoration policy. We give a special attention to the use of reference concept and relationship between reference and indexes structure. The aim of this contribution is to confront theoretical thinking with French practices.

We'd like insist about three main conclusions: 1. There is a weakness of monitoring framework, especially integrated and planned over a period enough long to catch expected changes; 2. Assessment approach is influenced by socio-cultural, institutional and practical context; 3. There is a gap between theoretical schemes and practical use of references in evaluation process. Throughout these conclusions we can propose some elements in order to rethink assessment approaches in an operational way.

Keywords: France; Monitoring; Human values.

ECOLOGICAL EVALUATION OF RECENTLY COMPLETED RESTORATION SCHEMES ON THE RIVER WENSUM

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Abstract

The inherent uncertainty in assessing the "success" of river restoration schemes can in part be reduced through the inclusion of a set of measurable hypotheses to underpin monitoring protocols. This paper details the approach undertaken in the assessment of ecological and physical habitat response to three recent river restoration schemes undertaken on the River Wensum Special Area of Conservation (SAC) chalkstream in Norfolk.

Pre and post-restoration monitoring survey protocols were developed to include both restoration reach and more detailed 10m plot scale data pertaining to geomorphological and ecological response to a range of instream works implemented to improve the river condition for a range of target river species. Importantly these protocols were developed to provide an easily repeatable field based and cost-effective assessment procedure (2 day survey programme) that was not site specific and could therefore be used across all schemes implemented in the Wensum catchment. The schemes discussed here include restoration measures to improve existing channel form and function through re-sectioning works (e.g. berm creation and bed raising through gravel placement) as well as large scale full channel realignment and the reinstatement the flow through old meander cut-offs.

Measuring the response of macroinvertebrate, macrophyte and fish communities to the hydro-morphological change arising from restoration measures has identified where the works have acted positively to increase the extent of target species and assemblages. The use of standard biotic indices obtained from aquatic macrophyte and macroinvertebrate community data in determining the ecological response to instream works is discussed, together with lessons learned from the monitoring programme and follow-up measures implemented in light of the current assessments.

Keywords: Ecological; Monitoring; Evaluation; Restoration; Macroinvertebrates; Hydro-morphology; Chalkstream.

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MAYESBROOK PARK RESTORATION PROJECT - A COORDINATED MONITORING STRATEGY

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Abstract

The Mayesbrook Park restoration project near Barking in East London aims to restore terrestrial and aquatic habitat, and provide an amenity and recreational area for the local community. Restoration on the Mayes Brook took place in 2011 to restore a severely degraded section which flows along the western side of the park and to reconnect the watercourse with its floodplain. Prior to works, this offered very little habitat or refuge for aquatic species. Water quality in the catchment was a significant constraint on river restoration potential beforehand; however Thames Water believe that misconnection issues have now been addressed.

Mayesbrook Park has been recognised as the UK's first 'climate adaptation' park given the focus towards climate resilience in its actions. Due to this it has received a lot of interest from a range of organisations from different sectors; a few of whom came forward to financially support the project while others offered in-kind support. With this in mind, a steering group including the Environment Agency, Natural England and the London Borough of Barking and Dagenham with guidance from the Thames River Restoration Trust and the River Restoration Centre was established to ensure that the project aimed to deliver on its ambitious plans.

It was decided early on that a budget should be set aside to monitor the scheme, and it was realised that given the range and sheer volume of data that would be collected, it would also make sense to finance a monitoring coordinator role for the project. This presentation outlines the approach taken to determine the makeup of the project objectives and its associated monitoring objectives, and steps taken to ensure coordinated delivery of these tasks by multiple partners in the first year of the project.

The River Restoration Centre's applied guidance methodology, Practical River Restoration Appraisal Guidance for Monitoring Options (PRAGMO) has been used to guide the process. An update on monitoring actions (as stated in the formalised strategy) is sent to all partners every few months to ensure that data collection activities are undertaken in an appropriate manner. 'S.M.A.R.T.' principles have been used to frame Specific, Measurable, Achievable, Realistic and Time-bound objectives.

Eight months on, the monitoring strategy has improved partnership working between the organisations involved and the aim to coordinate physical and non-physical (social) activities has so far been successful. Adaptive management is a keen part of this process and changes can been made to the strategy with justification if and when required.

Keywords: Strategic monitoring; Biological targets; Social targets; PRAGMO.

ASSESSING LONDON'S RIVERS

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Abstract

In order to improve understanding of associations among fluvial processes, vegetation, engineering modification and the form of urban rivers, survey or assessment methodologies are needed to record information on the detailed physical properties of urban rivers and their margins in a consistent way that is susceptible to statistical analysis. A number of river habitat surveys have been developed to characterise rivers and their corridors but few have been developed specifically for application to urban water courses. The Urban River Survey is one such survey. It is a modification of the Environment Agency's River Habitat Survey that gives greater detail on key properties of the urban river environment and provides information from which a range of environmental indicators can be calculated.

Recently, the survey has been applied to rivers across London, mainly by researchers from QMUL, but increasingly by researchers and practitioners in other organisations. Practitioner interest in the survey and the environmental indicators that are derived from it has prompted the development of a user-friendly interactive website designed for river practitioners and researchers through which URS survey data for London can be submitted, interrogated and displayed.

This paper describes the URS, the indicators that are derived from it and the web tool that handles the data. It is hoped that by offering training and support to interested groups and individuals across London, it will be possible to develop detailed information across space and through time to track the changing habitat characteristics of London's rivers, including their response to restoration interventions.

Keywords: Habitat survey; Urban river; River engineering; Assessment; Website.

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— — — *New Guidance Document* — — —

River Restoration Centre is pleased to publish (online)

Practical River Restoration Appraisal Guidance for Monitoring Options (PRAGMO)

PRAGMO is the first guidance document that aims to assist all practitioners involved in the process of setting monitoring protocols as part of a river restoration project.

PRAGMO sets out a range of practical monitoring techniques at varying scales and costs, which can be tailored to the needs of any river restoration project. PRAGMO will enable scientifically rigorous monitoring of any project to produce data to demonstrate that it has achieved its stated objectives. That data can also be used to compare one project with another to identify the most effective techniques and those which are best value for money.

"This is a culmination of many years of hard work by the RRC in pulling together monitoring practices from a wide range of groups. The guidance document will be a significant contribution to promoting best practice in river restoration" (Dr. Judy England, Environmental Monitoring Team Leader, Environment Agency).

PRAGMO is aimed at a wide audience ranging from small interest groups seeking to carry out localised river restoration projects to government agencies tasked with complying with UK and European law with respect to restoring, enhancing and protecting rivers.

"PRAGMO will for the first time give us a means of comparing the results and the value for money of different river and wetland restoration projects. That information is priceless in the current economic climate" (Robert Oates, Executive Director, TRRT).

Funded by the Environment Agency, Scottish Environment Agency (SEPA) and the Thames Rivers Restoration Trust (TRRT), the document is supported by The Riverfly Partnership, The Rivers Trust, Freshwater Biological Association, On Trent, The Wild Trout Trust, Scottish Natural Heritage and Natural England.

It will be officially launched at the RRC Annual Conference on Friday the 20th of April 2012 at the University of Nottingham

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Further RESTORE workshops are planned in Scotland, the Republic of Ireland and Belgium; in addition to an International Conference to present the findings of the EU LIFE+ project in 2013.

Field excursions to projects in the Loire Valley, France and to the River Isar Project, Germany are also proposed.

To be informed about these and other RESTORE related news, email the RRC to be added to the project mailing list. The RESTORE website will be updated when details of the engagement events are confirmed. Reports and other outputs from past events are available on the RRC website: http://www.therrc.co.uk/rrc_restore.php

For more information contact:

Environment Agency: Antonia Scarr antonia.scarr@environment-agency.gov.uk

River Restoration Centre: Jenny Mant jenny@therrc.co.uk

SITE VISIT INFORMATION

CHANNEL WIDENING ON THE RIVER TRENT

(SATURDAY 21ST APRIL)

Background

The main aim was to recreate some of the habitats which were once common features along our main rivers prior to their modification in the 19th and 20th centuries. The river has been heavily engineered in the past and was once much shallower and wider. The project aims at allowing natural river processes to occur by widening the channel (to over 90m in some places) encouraging it to become active in terms of deposition and bed-scouring. The scheme cost £161,000 of which £144,000 was capital works. Partners include Staffordshire Wildlife Trust in partnership with Lafarge Aggregates, Landfill Communities Fund, Natural England, The National Forest Company, the Environment Agency, Network Rail and May Gurney.

Baselines survey information has been collated for a number of invertebrate, bird, amphibian, fish, mammal and plant species at Croxall. UK and Staffordshire BAP wetland species recorded within two kilometres and within the last ten years include: white-clawed crayfish, harvest mouse, otter, water vole, common toad, eel, barn owl, snipe, lapwing, reed bunting and native black poplar. The UK BAP species, depressed (or compressed) river mussel has been recorded within three kilometres of the site. This is a species which is being targeted for specific survey work at Croxall to ascertain whether the habitats created during the scheme prove suitable for colonisation. Staffordshire Wildlife Trust will be carrying out repeat surveys for BAP and other indicator species at the site. Links with universities are in place to ensure that ongoing research and monitoring is carried out.

Lessons Learnt

It became clear that the restoration works could have been even bolder by lowering the whole of the bend down to lake/river level. This experimental work on the Tame at Croxall gave confidence that widening, combined with allowing river processes to work was an answer to the problems of poor channel structure in gravel rivers. This was part of the background to the much larger scheme carried out by the Wildlife Trust on the Tame/Trent at Croxall.

Earlier work at the site

Stage 1 (1997) Along 400m of the Tame an underwater shelf about 4m wide was excavated to just below water level and the bank sloped back to an angle of 1:20 to a maximum of 30m at the point of the bend. The river in this reach had a very even width of about 25m before the works.

Stage 2 (2002) It became clear that a larger increase in cross section at high flows would have been desirable. In 2002, the 400m of land between the river and the lake (an area of about 2.7ha) was lowered by 750mm. The highest point was lowered from 1.6 to about 0.85m above normal water level. The river height at bank full level was thus similarly lowered thus reducing velocity and thus increasing deposition on the bend. The soil was again put into the lake to create shallows.

Stage 3 (2008) A 300mm pipe linking the pool at Croxall to the river was put in when gravel working on the site ceased. It allowed water to enter and drain from the lake slowly, kept lake levels generally higher than the river and prevented fish movement. Poor in-channel habitat on the River Tame, combined with intermittent poor water quality, has retarded the development of sustainable fish stocks. To counter this, the EA created a series of "fish refuges/spawning areas" by linking pools to the river. In 2002 the pipe was replaced by a lower level open channel. This allows fish to enter and leave the pool and also lowered the lake level thus creating better shallows for waders.

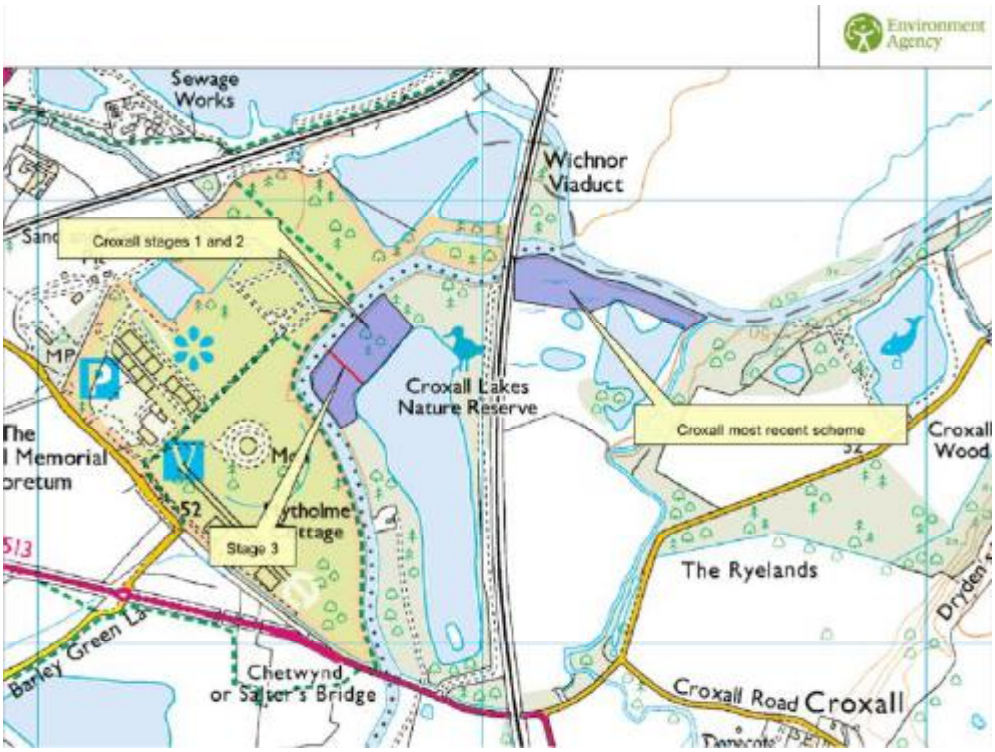

Figure 1 Croxall Lakes site map

Figure 2 Annotated aerial photograph © *Environment Agency*.

Figure 3 Widened channel with bars and islands

Figure 4 Islands being created


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