The RIVER RESTORATION CENTRE'S 10th ANNUAL NETWORK CONFERENCE

River Restoration Benefits – Past, Present and Future

Wednesday 1st April – Thursday 2nd April 2009
Plus site visit on Friday 3rd April 2009

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Contents

PROGRAMME

The River Restoration Centre 10th Annual Network Conference 2009
University of Nottingham

Day 1: Wednesday 1st April 2009

9.00 – 10.20	REGISTRATION & TEA/COFFEE	

Lecture Theatre 3

10.30	**Announcements:** Martin Janes (*River Restoration Centre*)	5 mins
10.35	**Introduction:** Karen Fisher (*River Restoration Centre Chairman*)	20 mins
10.55	**Keynote Speaker:** Alastair Driver (*Environment Agency*). River Restoration – Quo Vadis?	25 mins
11.20	**Discussion**	10 mins

Lecture Theatre 3

Session 1 Policy and Project Frameworks

CHAIR **Alastair Driver** (*Environment Agency*)

11.30	Jonathan Gibson (*Environment Agency*). Progress toward provision of new or amended powers to deliver the hydromorphology requirements of the Water Framework Directive.	20 mins
11.50	Richard Sharp & Wendy Brooks (*Environment Agency*). Greater working with natural processes to reduce flood risk.	20 mins
12.10	Colin Thorne (*Nottingham University*). Science base and tools for evaluating stream restoration project proposals.	20 mins
12.30	**Discussion**	20 mins
12.50	LUNCH	1 hr 10 mins

Session 2	**Hydromorphology** **Lecture Theatre 3**	**Social and Community Benefits** **Lecture Theatre 2**	
CHAIR	**Geraldene Wharton** (*Queen Mary, University of London*)	**Malcolm Newson** (*Tyne Rivers Trust*)	
14.00	Lucy Bolton (*Environment Agency*). River restoration measures to reduce hydromorphological pressures and achieve good ecological potential for the Water Framework Directive.	Alison Holt (*Sheffield University*). The importance of social networks for urban river regeneration.	15 mins
14.15	Jean-René Malavoi (*Office National de l'Eau et des Milieux Aquatiques*). Restoring river hydromorphology: concepts and examples in France	Martin Gilchrist (*Living River*). Restoring an urban river in Salisbury with volunteers: contributing to community cohesion.	15 mins
14.30	Nick Haycock (*Haycocks Associates*). Renaturalisation of Lingmell Beck, Wastwater: a case study of gravel river restoration.	Hester Kapur (*OnTrent*). Trent Vale Landscape Partnership - engaging communities with river restoration.	15 mins
14.45	**Discussion**	**Discussion**	20 mins
Session 3 15.05	POSTERS & TEA/COFFEE		45 mins

Session 4	**A – Flood Risk Management and Ecological Gain**	**B – Future Scenarios**	
	Lecture Theatre 3	**Lecture Theatre 2**	
CHAIR	**Mervyn Bramley** *(Independent Engineer and Environmentalist)*	**Karen Fisher** (*KR Fisher Consultancy Ltd*)	
15.50	George Harley (*Faber Maunsell*). Maximising environmental opportunities in reality.	Chris Conroy (*Cascade Consulting*). Exploration of emerging technologies with applications in river restoration.	15 mins
16.05	Andrew Cooper & Jamie Farnell (*Nicholas Pearson Associates*). Flood resilience and environmental gain in Boscastle.	Peter Brunner (*Royal Haskoning*). Climate change proofing North East England: benefits for river and sediment management.	15 mins
16.20	George Gerring (*Environment Agency*). Assessing the ecological value of a recently created flood alleviation scheme – the Jubilee River.	Tim Hess (*Cranfield University*). Changing land use and hydrological status of some lowland flood plains in England.	15 mins
16.35	**Discussion**	**Discussion**	20 mins

Session 5	**Improving Spatial Connectivity**	
	Lecture Theatre 3	
CHAIR	**Andrew Gill** (*Cranfield University*)	
17.05	Graeme Peirson (*Environment Agency*) Get connected – fish and floodplains in UK rivers.	15 mins
17.20	Josee Peress (*Office National de l'Eau et des Milieux Aquatiques*). Weir and dam removal and river channel reinstatement	15 mins
17:35	Karen Potter (*Liverpool University*). Spatial planning and floodplain restoration – in the "Pitts"?	15 mins
17.50	**Discussion**	20 mins
18.10	**Open Discussion**	15 mins
18.25	**End of Day 1**	

18.30 **Newark Bar opens in Newark Hall of Residence**

19.30 **CONFERENCE DINNER**
Served at 20.00

PROGRAMME

The River Restoration Centre 10th Annual Network Conference 2009
University of Nottingham

Day 2: Thursday 2nd April 2009

8.30 – 8.50	REGISTRATION FOR DAY DELEGATES	

Lecture Theatre 3

9.00	**Announcements**	5 mins
9.05	**Keynote Speaker:** Chris Spray (*SEPA*). From Darlington to the Dales, Skerne to the sea. Origins and objectives – where next for river restoration?	25 mins
9.30	**Discussion**	10 mins

Session 6 Living with Rivers and Floodplains

Lecture Theatre 3

CHAIR **Chris Spray** (*Director of Environmental Science, SEPA*)

9.40	John Joyce (*IPA Energy + Water Economics*). What are the trade-offs when aiming for a quantitative balance in the River Rother?	15 mins
9.55	Paul Chapman & Alison Taylor (*Lewisham Council*). Can river restoration benefit social cohesion? A case study.	15 mins
10.10	Ruth Needham (*OnTrent*). Making space for water in the Trent River basin – a collaborative approach.	15 mins
10.25	**Discussion**	15 mins
10.40	TEA & COFFEE	30 mins
(10.40)	Optional pre-booked site visit – Day Brook, Nottingham A small-scale urban river restoration project	(1 hr 50)

Day 2 - PARALLEL SESSION PROGRAMME

Session 7	**A Question of Scale**	**New Tools for Restoration**	**STREAM – Practical approaches to restoration, and integrating management of the river and floodplain**	
	Lecture Theatre 3	**Lecture Theatre 2**	**Room C33**	
CHAIR	**Kevin Skinner** (*Jacobs UK Ltd)*	**Archie Ruggles-Brise** (*Association of Rivers Trusts*)	**Jenny Mant** (*RRC*)	
11:10	Ildikó Tóth (*North-Transdanubian District Environment and Water Directorate*). Mosoni-Danube rehabilitation project.	David Higgins (*Durham University*). Using advances in modelling techniques to explore catchments with a view to identifying locations in need of restoration.	Allan Frake (*Environment Agency*). Here's one we tried earlier: a practical guide to implementing restoration on lowland rivers (25 minutes).	
11.25	Ulrika Aberg (*Leeds University*). Past, present and future approaches to river rehabilitation in Japan.	David Hetherington (*Arup*). Utilisation of terrestrial laser scanner data to rapidly map instream habitat.	Joanna Eyquem (*Royal Haskoning*). Linking river and floodplain management – a step-by-step guide to developing operating protocols for water level control structures (25 minutes).	
11.40	Pete Worrall (*Penny Anderson Associates*). Minimal impact restoration – is it worth all the effort?	Tony Green (*JBA*). Reconnecting Paleo Channels – no problem? Recent experiences and solutions.	Panel Discussion (10 minutes)	
11.55	**Discussion**	**Discussion**		20 mins
12.15		**Interval**		15 mins
12.30		LUNCH		1 hour

Session 8	'In'vertebrate Communities	Restoration Potential	
	Lecture Theatre 2	**Lecture Theatre 3**	
CHAIR	**Jenny Wheeldon** (*Natural England*)	**Judy England** (*Environment Agency*)	
13:30	Ros Kaye (*Environment Agency*). Day Brook Water Meadow Project: small-scale urban river restoration of the Day Brook, Nottingham.	David Bradley (*APEM Ltd*). Establishing the real Bourne identity – a twin track approach to assessing habitat diversity and identifying appropriate river restoration needs.	15 mins
13.45	Richard Hellier (*Environment Agency*). Dagenham Washlands: innovative approaches to floodplain restoration and integration with the wider physical and social landscape.	Ilse Steyl (*Arup*). Potential for restoration on the Hermitage Stream, Hampshire.	15 mins
14.00	Vicky Kindemba (*Buglife*). Using river restoration to re-establish invertebrate communities.	Di Hammond (*River Restoration Centre*). Upper Gade restoration Options Appraisal.	15 mins
14.15	**Discussion**	**Discussion**	15 mins

Day 2 Continued

Session 9 — Where next?

Lecture Theatre 3

CHAIR **Colin Thorne** (*University of Nottingham*)

14.35	Kevin Skinner (*Jacobs UK Ltd*) *et al.* 15 years of experience – what have we learnt and how has practice changed?	15 mins
14.50	Dave Webb (*Environment Agency*) & Rob Oates (*Thames Rivers Restoration Trust*). The London Rivers Action Plan.	15 mins
15.05	Will Bond (*AlaskA*). River restoration - entering a phase of boom and bust?	15 mins
15.20	**Discussion and closing remarks**	25 mins
15.45	********* End of Conference ******** TEA & COFFEE **[please hand in feedback forms and badges]**	30 mins

16.15	**Site Visit Introductions** Only applicable to delegates staying for site visits on the third day	30 mins
16.45	**End of Day 2 and evening arrangements**	

Allowances are made in the schedule to move between rooms, times listed are session start times.

RIVER RESTORATION – *QUO VADIS?*

Alastair Driver, Conservation Policy Manager, Environment Agency

The Environment Agency and its predecessor bodies having been carrying out river restoration and enhancement for nature conservation reasons for at least 25 years. In the 1980s, this work was almost entirely opportunistic, funded on the back of flood defence schemes and fisheries projects. Systematic ecological and geomorphological monitoring was rare and detailed post-project appraisal was just a pipedream. Then, at the oft-celebrated 1990 River Conservation and Management conference in York, a bunch of enthusiastic and alcoholically-challenged individuals from the National Rivers Authority and associated organisations, conceived the idea of the River Restoration Project, which then spawned the River Restoration Centre. This was going to change the face of river restoration in the UK forever by demonstrating that:

(i) large-scale strategic river restoration is achievable and benefits wildlife and people;
(ii) comprehensive monitoring before, during and after, on at least a selection of schemes, is essential for ensuring that future scheme designs achieve their objectives;
(iii) a suitably resourced, independent information network can play a major role in promoting best practice in river restoration.

So, nearly 20 years on from York and 10 years on from the birth of the RRC, how much have things changed? Are we more strategic with our scheme selection and delivery or are we still largely driven by opportunity for partnership working? If the answer is the latter, is there much we can do about it? And what of monitoring and post-project appraisal? Have we made significant progress? If not, why not? Who needs to do what to change that? All these questions and more will be tackled by this presentation, which will also use the author's recent informal appraisals of early river restoration and enhancement schemes with which he was involved, to illustrate how things have changed – or not!

PROGRESS TOWARD PROVISION OF NEW OR AMENDED POWERS TO DELIVER THE HYDROMORPHOLOGY REQUIREMENTS OF THE WATER FRAMEWORK DIRECTIVE

Jonty Gibson, Hydromorphology Policy & Process Advisor, Environment Agency

The Water Framework Directive (WFD) requires that a programme of measures to address all pressures that affect the status of water bodies, including hydromorphological conditions, is made operational by 22nd December 2012. In this context the term 'measures' is taken to refer to planned action on the ground as well as legal mechanisms to ensure that appropriate action can be taken.

In February 2007 Defra and the Welsh Assembly Government published a consultation on mechanisms to deliver WFD requirements on hydromorphology. In response to that consultation the Environment Agency noted that they and other WFD co-deliverers lack adequate powers and duties to protect or improve the hydromorphological condition of water bodies as necessary to achieve the mandatory environmental objectives of the WFD. Similar issues were raised by other consultees.

Since publication of our consultation response the Environment Agency has been working closely with Defra and the Welsh Assembly Government to identify ways in which we can close these identified gaps.

The gaps in legal mechanisms to ensure WFD compliance principally relate to our ability to prevent deterioration in water body ecological status or potential. However, there are also potentially significant issues in relation to our ability to act to improve hydromorphological conditions for the purpose of achieving the water body status objectives. The Environment Agency is pursuing legislative change to address both these policy areas.

For the 'no deterioration' aspect of WFD compliance we are looking to address the following issues:

- flood defence consenting legislation provides limited scope for placing conditions on consents to prevent, limit or mitigate damage to hydromorphological conditions
- existing pollution prevention legislation does not currently permit the application of measures solely for the purpose of preventing hydromorphological damage
- the Environment Agency has limited scope to act itself or to compel others to improve hydromorphological conditions where recent damage has been caused
- the level of duty placed on drainage authorities to secure compliance with the requirements of WFD is inconsistent among these bodies

For the 'improvement' aspect of WFD compliance we are looking at ways in which the Environment Agency can act to improve hydromorphological conditions in water bodies impacted by historic activities. Clarification is being sought on our ability to act in cases where, for example, no responsible party can be found or where the past damaging activities were legally compliant at the time.

GREATER WORKING WITH NATURAL PROCESSES TO REDUCE FLOOD RISK

Richard Sharp, Environment Agency and Wendy Brooks, Policy Manager, Flood and Coastal Risk Management Policy, Environment Agency

The Government's Making Space for Water (MSfW) programme established working with natural processes as one of the tools to reduce flood risk. Doing so can, in the right circumstances, help to reduce costs, ensure that schemes are more sustainable and provide benefits for biodiversity. The new outcome measures for Flood and Coastal Erosion (as developed by Defra) encourage the Environment Agency and other operating authorities to deliver flood and coastal risk management schemes which achieve multiple objectives.

Making Space for Water recognised the need to "make more space for water" in the environment through, for example, appropriate use of realignment to widen river corridors and areas of inter-tidal habitat, and of multi-functional wetlands that provide wildlife and recreational resource and reduce coastal squeeze on habitats like saltmarsh. The greater use of washlands and wetlands, realignment of river channels and reconnection of rivers with their floodplain can all help store and slow water to reduce flooding downstream and mitigate peak flows.

This concept is also recognised within the European Union Directive 2007/60/EC on the Assessment and Management of Flood Risks (the Floods Directive), which must be transposed into domestic legislation by November 2009. The introduction to the Directive sets out the intent and reasoning behind it and calls for the preparation of flood risk management plans, which should focus on prevention, protection and preparedness. With a view to giving rivers more space, they should consider where possible the maintenance and/or restoration of floodplains, as well as measures to prevent damage to human health, the environment, cultural heritage and economic activity.

Most recently the Pitt Review into the summer floods of 2007 made a key recommendation that Defra, the Environment Agency and Natural England should work with partners to establish a programme through Catchment Flood Management Plans and Shoreline Management Plans to achieve greater working with natural processes. Led by the Environment Agency, this group has helped to define how natural processes can manage flood risk. It is clear that natural processes can help to deliver flood and coastal risk management, but the question is how much it can contribute, what other public benefits can be delivered and how much it will cost compared with other approaches, such as using hard defences.

SCIENCE BASE AND TOOLS FOR EVALUATING STREAM RESTORATION PROJECT PROPOSALS

Brian Cluer, Peter Skidmore, Colin Thorne, Janine Castro, George Pess, Tim Beechie and Conor Shea (Nottingham University)

Stream restoration, stabilisation or enhancement projects typically employ site-specific designs, and site-scale habitat improvement projects have become the default solution to many habitat problems and constraints. Such projects are often planned and implemented without thorough consideration of the broader scale problems that may be contributing to habitat degradation, attention to project resiliency to flood events, accounting for possible changes in climate or watershed and use, or ensuring the long-term sustainability of the project.

To address these issues, NOAA Fisheries and USFWS have collaboratively commissioned research to develop a science document and accompanying tools to support more consistent and comprehensive review of stream management and restoration project proposals by Service staff responsible for permitting. The science document synthesises the body of knowledge in fluvial geomorphology and presents it in a way that is accessible to the Services staff biologists, who are not trained experts in this field. Accompanying the science document are two electronic tools: a Project Information Checklist to assist in evaluating whether a proposal includes all the information necessary to allow critical and thorough project evaluation; and a Project Evaluation Tool (in flow chart format) that guides reviewers through the steps necessary to critically evaluate the quality of the information submitted, the goals and objectives of the project, project planning and development, project design, geomorphic-habitat-species relevance, and risks to listed species. Materials for training Services staff and others in the efficient use of the science document and tools have also been developed.

The longer term goals of this effort include: enabling consistent and comprehensive reviews that are completed in a timely fashion by regulators; facilitating improved project planning and design by proponents; encouraging projects that are attuned to their watershed and geomorphic contexts; questioning perceived constraints on project design; reducing the use of hard structures and encouraging deformability; promoting designs that address both risk and uncertainty in applying engineering design standards; allowing for future climate and land use changes; and encouraging post-project monitoring, appraisal and project aftercare.

RIVER RESTORATION MEASURES TO REDUCE HYDROMORPHOLOGICAL PRESSURES AND ACHIEVE GOOD ECOLOGICAL POTENTIAL FOR THE WATER FRAMEWORK DIRECTIVE

Lucy Bolton and Amanda Veal, Environment Agency

For the protection and improvement of the ecology of river water bodies, management of hydromorphology and physical habitat is required under the Water Framework Directive. This includes sensitive and sustainable management of current operations and restoration of habitats. To this aim in England and Wales the Environment Agency and its co-deliverers have assessed the risk of impact to ecology from the physical modification of habitat in river water bodies. Where physical modification has substantially changed the character of the water body it may be designated as heavily modified.

In natural water bodies the Water Framework Directive objective is to reach and maintain Good Ecological Status. For heavily modified water bodies the objective is to reach and maintain Good Ecological Potential. In these cases the improvements required take into account the extent to which the aquatic ecosystem can be improved given the heavily modified characteristics of the water body that are necessary for its use. It is a balance between improving the ecology, whilst maintaining the use.

Interim results in England and Wales for river heavily modified water bodies show that there is a substantial requirement for river restoration to achieve some of the objectives of the Water Framework Directive. Up to 80% of the heavily modified water bodies in a river basin district require river restoration measures.

We currently assume that by implementing these restoration measures we are likely to achieve Good Ecological Potential, however our understanding of how measures will directly impact biological quality elements and consequently quality class is limited. The hydromorphological pressure/biological impact relationship is little understood, and consequently the impact of measures on this relationship is largely unquantified.

We are developing trials using catchment-scale pilots of mitigation measures to investigate the impact of measures on biological quality elements. We will be increasing the evidence base and scientific support for measures to ensure we target these in the most effective and efficient manner. Catchment trials developed will be identified and reported in the first River Basin Management Plans.

RESTORING THE RIVER'S HYDROMORPHOLOGY: CONCEPTS AND EXAMPLES IN FRANCE

Jean René Malavoi[1] and Philippe Adam[2]
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[2]BIOTEC. 65-67 cours de la Liberté. 69003 LYON, France

Since 2000, the European Water Framework Directive (WFD) has set ambitious environmental objectives for the ecological status of rivers and has put an emphasis on river continuity. However, the WFD risk assessments, carried out in 2004, showed that hydromorphological pressures and impacts are one of the most important risks of failing to achieve WFD objectives. The poor physical characteristics of many surface water bodies (channel bed and banks) prevents natural hydromorphological processes from taking place.

Good hydromorphological process can be described by the following parameters: a diversity in flow patterns, unprotected natural river banks, mobile gravel shoals, varied riparian vegetation, wooded fluvial corridor, connected side channels and in particular a free fluvial dynamic.

Following decades or even centuries of excessive river channelisation, gravel extraction, and weir and dam creation, tens of thousands of kilometres of French watercourses have been left without the conditions necessary for natural hydromorphological processes to take place. Human intervention has resulted in a large number of morphological and ecological alterations and malfunctions that varies according to the type of river, the length of the modified stretch and the age and scale of the works. In addition, many of these interventions are multiple: for example, channel straightening plus overwidening plus bank reinforcement. The restoration that is required to reinstate more natural river processes will therefore often be complex.

The first part of the presentation on hydromorphological restoration will deal with the main types of human intervention that frequently occur in rivers and their resulting hydromorphological and ecological impact. The second part will present the underlying concepts and principles of river restoration, illustrated by examples in France. These principles set different levels of restoration objectives for each type of physical alteration according to the river's capacity to adjust and the land allowance along the watercourse.

RENATURALISATION OF LINGMELL BECK, WASTWATER: A CASE STUDY OF GRAVEL RIVER RESTORATION

Dr Nick Haycock, Haycock Associates Limited

Lingmell Beck, at the head of Wasdale, flows into Wastwater. Both the beck and Wastwater are Sites of Special Scientific Interest and Wastwater is an important European Special Area of Conservation. For the last two years The National Trust has been working to find a way to naturalise Lingmell Beck as part of a long-term scheme to reverse the damage caused by the previous bridges. Haycock Associates Limited have been asked to renaturalise the beck and test new through bridge designs and channel modifications to restore the beck's geomorphology.

The beck is a rare spawning ground of the threatened Arctic Char fish. Its survival depends strongly upon the flow conditions of Lingmell Beck. Currently the bridge embankments funnel the beck into a narrow channel. This makes the river flow too fast and deep for fish migration. In addition the road embankments cross the beck's floodplain and act as a dam during high flows. This causes significant flooding of both the National Trust assets and the surrounding farmland. Issues with sediment build up behind the bridge have also been factored into the scheme. The antagonistic flood regime is resulting in distorted geomorphological processes and the new scheme aims to redress these issues.

The proposed bridge has been chosen because it works in harmony with the river's vitally important natural processes, providing multiple benefits to the environment. It fits into the natural landscape and continues to provide public access. The bridge has been designed to allow the re-establishment of a dynamic and natural river system. Lingmell Beck will be allowed to migrate naturally across its floodplain. Braided channels are to be created in the form and location the river took before its confinement over 90 years ago. Naturalisation of Lingmell Beck will lead to the redistribution of gravels across the floodplain and restore the valley geomorphology. The proposed solution aims to reduce flood risk, improve ecology, increase safety to people in the area and enhance the aesthetics of the valley.

Please see www.nt-hal.co.uk/lingmell for an overview of the scheme. Works are due to begin March 2009.

THE IMPORTANCE OF SOCIAL NETWORKS FOR URBAN RIVER REGENERATION

Alison Holt, Catchment Science Centre, University of Sheffield

Institutions and governance structures in the UK have been set up to deal with, for example, flooding, urban development and conservation, as separate issues. However, the importance of integrated water management is now being recognised. Therefore, in addition to formal governance, society now attempts to organise itself to perform integrated management of urban river corridors to enhance the environmental, social and economic benefits (ecosystem services) that they provide. The aim of this study is to understand how society may influence and enhance the benefits provided by urban waterways. This is achieved by analysing the social network of stakeholders involved in the regeneration of urban waterways in Sheffield. The study will demonstrate how understanding the structure of such social networks and what drives them, may be used to enhance the future governance of waterways regeneration.

RESTORING AN URBAN RIVER IN SALISBURY WITH VOLUNTEERS CONTRIBUTING TO COMMUNITY COHESION

Martin Gilchrist, Living River Project, Natural England

The Living River is a £1 million project that aims to increase awareness and appreciation of the River Avon and its tributaries with a focus on how the special wildlife of the river has developed alongside the history of the area. Working with local communities from the river's headwaters in the Wiltshire Downs to the sea at Christchurch, the project will involve people who live and work in the River Avon catchment in the conservation of its natural heritage. The four year project (2006-2010) is supported by the Heritage Lottery Fund and works closely with the STREAM project.

The restoration work in Salisbury has the aims of:

- Providing some naturalness to a heavily engineered section of river;
- Engaging local people in the work.

All the work is with a 500m radius in the centre of the city. It includes the repair and upgrading of some existing restoration, the creation of some very high profile marginal shelves in both the main river channel and the flood relief channel. The majority of this work has been done through working with volunteers with some sections done by contractor.

We have involved Wildlife Trust Volunteers, BTCV, employees from major local firms, youth groups and organisations, local secondary schools and socially disadvantaged groups such as young people permanently excluded from school.

The work that has been done is not cutting edge from an enhancement point of view and we are using established techniques where there is evidence available on the ecological success. From a community cohesion point of view we did not set out with the creation of this as an aim, but realised that our work did contribute. As a result much of our evidence to date is anecdotal.

There is the possibility of river restoration creating cohesion through delivering well designed public green space. Additionally cohesion could be created through involving people in the process of making a difference to their patch and creating a sense of ownership. It could be measured better however, and we will look at some of these possibilities and the implications of this for projects including cost and possibilities of new funding.

TRENT VALE LANDSCAPE PARTNERSHIP- ENGAGING COMMUNITIES WITH RIVER RESTORATION

Hester Kapur[1], Rob Fitzsimons[2] and Richard Bennett[3]
[1]Trent Vale Community Development Officer
[2]Trent Vale and External Funding Officer British Waterways
[3]Trent Vale Management Group Member and British Waterways Heritage & Environment Manager

The Trent Vale area includes 55 parishes that are adjacent to the River Trent between Newark and West Stockwith, an area of approximately 388 square kilometres, within the counties of Nottinghamshire and Lincolnshire. The river valley has undergone modifications for navigation and flood defence as well as for mineral extraction, and the Trent Vale Landscape Partnership scheme aims to reconnect people with the Trent Vale landscape, making significant change through linking a series of smaller projects. The project has developed from the OnTrent Initiative, which works across the whole of the River Trent. With funding from the Heritage Lottery Fund since 2006, a Stage 2 submission has been made for the main body of implementation work.

Projects have started to improve wildlife habitats within the river valley with farmers and landowners, understanding and involving people in archaeology and oral and village history, skills training, creation of visitor destinations, and enhancing the biodiversity value of sites of gravel extraction. Projects need to improve physical access such as signage, footpaths and public transport; limit financial barriers by providing value for money local activities that can be accessed easily, involving less mobile people in audits and design, and marketing to different audiences.

In order to deliver the projects successfully, Trent Vale staff, partners and communities needs a strong set of skills:

- Trained and experienced ecologists, archaeologists, heritage and archiving staff are needed.
- A strong management team that can implement and realise a vision that can be sustained beyond the '3 year delivery stage'.
- Lateral thinking to stitch together the variety of scattered ideas and projects across The Vale into a rich tapestry that reconstructs and restores a Vale-wide sense of community feeling and ownership.
- Community workers who are skilled in consultation, negotiation and neutrality skills to weave their way through the complex dynamics that exist between the different user groups.
- Youth working skills to engage with young people who feel excluded.
- A marketing team which has the ability to draw in new users, and turn a dull brown river into an inviting and vibrant day out.
- Perseverance and patience to work with 15 organisations in 2 counties, 3 districts with 7 different user groups, 6 marginalised groups across rural and urban centres.

These skills have been sourced through the constituent partner organisations (County and District Councils, Wildlife Trusts, Natural England, English Heritage, Environment Agency and British Waterways) and using specialist consultants.

POSTERS

COMPARING SOCIAL AND ECOLOGICAL BENEFITS OF URBAN RIVER REHABILITATION: EXAMPLES FROM JAPAN AND THE UK

Ulrika Åberg, Paul Waley and Joseph Holden, School of Geography, University of Leeds, UK

The ecological benefits of river rehabilitation in urban areas can sometimes be questionable, but the social benefits have, on the other hand, been shown to be significant. This poster presents the results of a study into biological and social enhancements at two urban river rehabilitation sites, one in Japan and one in the UK. Japan and the UK might be culturally quite different, but when it comes to local people's appreciation for bringing their rivers back to life, opinions were found to be rather similar. Both these rehabilitation projects, on the River Skerne in Darlington and on the Izumi River in Yokohama, were carried out in the mid-1990s and are considered by many agencies to be successful projects.

A questionnaire survey was carried out among the local residents at the two rehabilitation sites. The survey showed that the majority of people were satisfied with the rehabilitation projects, and thought that the rehabilitated area had become more attractive. In the Japanese survey the majority of people also said that they visit the river more often now, that the wildlife, safety, and recreation opportunities have increased, and that they prefer the rehabilitated river section over nearby non-rehabilitated sections. In the English survey, the same answers occurred most frequently. Data from fish and invertebrate surveys in the two rehabilitated rivers show some changes in species richness and biomass. However, due to constraints from homogeneous sections downstream (and upstream), pollution inputs, and/or lack of species pools, the species richness was not as great as might be hoped for in the different rehabilitated habitat types.

POSTERS

BRINGING ANCIENT METHODS INTO MODERN RIVER ENGINEERING - AN EXAMPLE FROM THE RIVER STOUR IN EAST ANGLIA

Lenka Anstead, PhD Research Student, University of East Anglia

This presentation will demonstrate how a medieval method of erosion control known as willow spiling could be used more effectively in river management in East Anglia. An experimental project on the River Stour shows this method's advantages over structural engineering and serves as an example for further similar projects in the region. A 50-metre long unstable site with an erosion rate of up to 1.5 metres per year was chosen to demonstrate the effectiveness and applicability of willow spiling for a range of different situations.

The River Stour is one of the most important rivers in East Anglia and together with its valley it belongs to the network of Areas of Outstanding Natural Beauty. It is therefore a priority to leave natural processes working on the river wherever possible. However, there is often a conflict between land conservation and sustainable river management.

The project site is located in Nayland on the Essex/Suffolk border on part of the river that is a flood relief channel. The riparian land near the site is used for sheep grazing and recreation and despite past river engineering interventions, the land serves as a natural floodplain during wet periods. The river itself contains a range of different habitats with important fish spawning gravels for a number of species including barbel. However, the rapid river bank erosion (96 cm of erosion was measured during a 6 month monitoring period from December 2007 to May 2008) represents a hazard to public access and safety, and causes land loss which is of concern to the landowner. A solution was therefore needed and an experimental project has been designed and consulted with the Environment Agency, Suffolk Wildlife Trust and the landowner. The aim was to protect the land and the footpath with minimal impact on natural river processes. This may seem like a contradiction, but in fact it is not, as I will show in this presentation.

After the project is completed, further terrestrial surveying of the river geomorphology and monitoring of willow rooting performance, and its impact on fish, will be carried out. This information will be made available to other project practitioners via the River Restoration Centre.

POSTERS

EFFECTS OF WOODED RIPARIAN ZONES ON RIVER AND STREAM TEMPERATURE AND BIOTA: A SYSTEMATIC REVIEW

D.E. Bowler[1], J.A. Bussell[1], D.M. Hannah[2], H.G. Orr[3] and A.S. Pullin[1]
[1]Centre for Evidence-Based Conservation, University of Bangor, UK
[2]School of Geography, Earth and Environmental Sciences, University of Birmingham, UK
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The riparian zone has an important role in the ecology of rivers and streams affecting physical, chemical and biological processes. Riparian woodland influences river heat exchange processes, hence water column temperature, other water quality variables and stream biota. The shading effect of trees may become increasingly important in moderating river thermal regimes with climate change, which is anticipated to increase water temperature with potentially detrimental impacts on cold water species such as salmonid fish. Wooded riparian strips have been proposed as a management intervention to limit the consequences of riparian habitat degradation and bank erosion. We report on the progress of a systematic review, which employs transparent and rigorous methodology to comprehensively search for, appraise and synthesize studies that have been conducted on the impacts of woodland for stream temperature and biotic communities. This review aims to provide the best available evidence on the effectiveness of riparian buffers in adding ecological value to freshwater habitats and to buffer the extremes of temperature expected under future climate change.

POSTERS

CHANNEL HABITAT MODIFICATION INFLUENCES MACROINVERTEBRATE RESPONSE TO FLOW

Michael Dunbar (Centre for Ecology and Hydrology), Chris Extence, Mark Warren and Lucy Baker (Environment Agency)

Here we describe the results of two studies which used national Environment Agency monitoring data to describe common patterns in the response of one particular biotic index, LIFE (Lotic Invertebrate index for Flow Evaluation) to the combined effects of flow (discharge, measured in m^3/s) changes and habitat modification.

Environmental agencies tend to use biotic metrics or indices for status assessment, especially when methods are required which have broad applicability. As indices necessarily condense high dimensional data, the question remains as to whether information is lost in the quest for broad applicability and "noise" reduction.

Across both upland and lowland sites, LIFE score responded to antecedent high and low flows. More modified sites not only had lower LIFE scores but also a steeper response of the LIFE score to antecedent low flows. The results are consistent with the hypothesis that there is a greater variety of physical habitat niches in less modified channels, and that these habitats change less as flow changes. Although these results are to some extent unsurprising, this is the first time this has been demonstrated using routine monitoring data, and the first time parameters have been estimated for these effects.

This was not a specific study of river rehabilitation, so any inferences about changes in channel structure are based on a space-for-time substitution assumption. The quantitative relationships are based on relatively large datasets, so although caution is certainly warranted, this work provides some useful pointers. It is the first study to demonstrate that the LIFE index is influenced not only by river discharge but also physical habitat quality, and that there are interactions between these two factors. This reinforces the notion that river management needs to consider changes to flow regimes and channel structure together and provides a preliminary mechanism for quantification and comparison on a common scale. Second, the relationships are in the expected direction and there is considerable commonality across lowland and upland sites. Third, by examining the responses of the taxa making up the different LIFE Flow Groups, mechanisms can be explained. Finally, the results demonstrate that less modified channels are more resilient to flow changes. This finding is very important if future climate change leads to more extreme river flow patterns.

POSTERS

FIFTEEN YEARS ON – HOW WE HAVE UNDERTAKEN RESTORATION IN NE AREA OF THAMES REGION OF THE ENVIRONMENT AGENCY

Judy England, Chris Catling and Sarah Scott, Environment Agency Thames Region

In 2004 we presented the ten years of enhancement, restoration and rehabilitation work undertaken in the NE area of Thames Region of the Environment Agency. Over the last 5 years we have added extensively to the projects undertaken. A team of Engineers, Ecologists and Fisheries Officers continues to collaborate on numerous projects. This poster highlights the location, aims and extent of the work with a couple of key examples.

The advent and implementation of the North London River Restoration Plan have focused some of our efforts within North London where we are working in collaboration with various London boroughs to implement schemes.

In the more rural sections of the area we are working to improve our chalk streams with their high conservation status and biodiversity interest within the chalk stream Habitat Action Plan. Historic anthropogenic influences on these watercourses have included a series of mill structures and cress beds. Negotiation with land and mill owners to create bypass channels and reduce impoundments has often been long and protracted but has led to some very successful schemes. We are working to not only improve the habitat quality but also restore the flows.

Elsewhere we have undertaken wetland restoration, creation of backwaters and channel narrowing in both the rural and more challenging urban sections of the area.

This reflection on past schemes is an intrinsic component of a more strategic approach to restoration planned within the area. By learning from past successes and failures we can make more of a difference in the future.

POSTERS

RIVER RESTORATION AT THE CATCHMENT SCALE IN SCOTLAND: CURRENT STATUS AND OPPORTUNITIES

Prof David Gilvear[1], Roser Casas[1] & Dr Chris Spray[2]
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[2]Scottish Environment Protection Agency

The aim of the present works was to determine the nature and level of catchment-scale river restoration activity in Scotland. Catchment-scale river restoration was defined as *"any river restoration activity that singly, or in combination, restores natural catchment processes and a naturally functioning ecosystem and brings benefit or environmental services to the whole catchment and not just to the site of restoration"*. The method of data collection was principally by soliciting information and views from key stakeholders and practitioners in the field of river restoration. The following key findings were apparent:

River restoration should be underpinned by a good understanding of catchment processes taking into account longitudinal, lateral and vertical connectivity within the natural systems and also timescales of response. River restoration projects that restore processes and target more than one outcome should be the goal.

From a stakeholder's and practitioner's perspective SEPA's river basin planning process was seen as potentially providing a framework for the delivery of river restoration at the catchment scale. However a number of limitations were identified as hindering the process including lack of national strategy and coordination, and funding. Organisations within Scotland with a role to play in river restoration stressed the need for partnerships in delivering restoration, and that the role of the Scottish Government is to develop the mechanism and funding streams and for SEPA to coordinate delivery. A current limitation is that few organisations have specific and detailed knowledge on how to plan and undertake river restoration and there is a general feeling that a centralised river restoration database in Scotland and river restoration 'best practice guidelines' are absent.

Traditionally, river restoration has focused on a single driver, with fisheries being the most important followed by biodiversity. Sustainable flood management and climate change adaptation are seen as emerging drivers of river restoration. Most individuals appreciate that river restoration can bring about multiple benefits, but a lack of scientific assessment and monitoring makes this difficult to assess. This was demonstrated by the fact that few projects had specific targets and indicators of success.

Catchment-scale river restoration initiatives in Scotland are limited in number and of those that do exist few have extended beyond the planning and baseline survey stages. River restoration activity overall, however, is on the increase.

CRESS believes that river restoration operating at the catchment scale will over the next 25 years bring about substantial improvement in the environmental quality of river corridors together with linked environmental services and help the Scottish Government meet many of its obligations associated with EU Directives and climate change.

POSTERS

REVISITING SINDERLAND BROOK, ALTRINGHAM, EVALUATION AND APPRAISAL OF AN AWARD WINNING SCHEME

Dr Nick Haycock, Haycock Associates Limited

Sinderland Brook was winner of the Natural Environment category at the 2008 Water Renaissance awards. The scheme is the largest restoration in England, and was part of the Stamford Brook housing development on a piece of land the National Trust had bequeathed to them to raise money for the running of Dunham Massey Estate. The National Trust worked together with the developers (Taylor Wimpey and Redrow) to develop sustainable housing on a commercial scale. This development, which worked with its riverine and floodplain environment, will have significant repercussions across the UK in the years ahead, and has been subject to appraisal by the Pitt Review team in 2008.

Sinderland Brook was returned to a natural watercourse following its canalization between the 1960s and the 1980s. Aims of the project were to increase flood protection to both the new development and existing houses; to create new and diverse habitats for wildlife that were reduced due to the canalized nature of the brook; and to create an environment to be enjoyed by Stamford Brook residents and the local community alike. The 1.8 km river restoration has now been completed with a new wider floodplain corridor and meandering channel. Along with Haycock Associates continuing to monitor the geomorphological changes, masters students have conducted studies on Post Project Appraisals (PPAs), habitat and water quality surveys and geomorphological studies to establish the long-term success of the restoration scheme.

The increase in flooding over recent years and resultant economic losses has raised public interest in flood management in the UK, with particular attention given to the risks associated with the development of floodplains. In this groundbreaking project at Sinderland Brook, Haycock Associates have demonstrated that through river restoration and the enhancement of natural floodplains it is possible to make room for water whilst allowing sensitive development to go ahead. The results indicate that restoration of the Sinderland Brook not only reduced flood risk, but improved habitat, aesthetic and recreational benefits. The scheme has been a success in enhancing flood protection for the immediate and downstream areas. Compared to the original channel form it is clear that the new integrated floodplain-channel system is more than capable of containing 1:100 flood events. Design and planning of the scheme took account of climatic change and land use development in the catchment, and while modelling the river system we have tested the robustness of the design through geomorphological and vegetational changes over the coming decade. The design has been found to be robust in all these circumstances.

POSTERS

RIVERBANK RESTORATION – A PRACTITIONER'S GUIDE

James Hector, Director of Willowbank Services

The paper will provide a guide to the practical aspects of commissioning Riverbank Restoration work – from design to construction.

Successful restoration/conservation projects are the result of a combination of factors. The selection of suitable contractors is paramount and should be based on the supply of a Method Statement for undertaking the works. The process relies on:

- Clearly defined project objectives, taking into consideration:
  - Client's viewpoint
  - Stakeholder's viewpoint
  - Environment Agency regulations

- Thorough investigation and understanding of the site, e.g.:
  - Correct identification of the problem and its causes
  - Mode of bank failure
  - Mean water levels and flood water levels of a given return period
  - River / bank dynamics
  - Soil types of bank and river bed
  - Local climate / conditions
  - Local flora / fauna
  - Viable access routes (for engineers / materials / equipment)

- A wide breadth of knowledge of all available techniques and materials, both traditional (soft engineering) and up-to-the minute hard engineering, to ensure the most sympathetic, cost-effective design solutions are recommended.

- Skilled installation by an experienced contractor to ensure:
  - Secure 'tie-in' to the surrounding area
  - Minimal environmental disturbance
  - Optimal selection of planting regimes for bio-textiles to maximise biodiversity without compromising local, native flora / fauna

STREAM RESTORATION DESIGN FOR XIAOSHUN CREEK, ZHEJIANG PROVINCE, CHINA

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Xiaoshun creek originates from the boundaries of Jinhua, Yiwu, and Lanxi cities in Zhejiang province, China. It flows through Xiaoshun, Fucun and other small towns, and into Dongyang River. Its basin area is about 150 km^2, and the main channel is about 22 km in length, with a gradient of 2.3‰. The annual average rainfall is 1455 mm, with the flood season from April to September and the low water season from October to March. In the past, many problems have been experienced including flooding, water pollution and ecosystem degradation. The restoration design is based on the hypothesis that the biocoenose diversity has a linear relationship with the geomorphology diversity when there is no change in discharge and water quality. The project scope is from the Hangjinqu highway to the Dongyang River, covering 10.8 km in length. The goal of the project is to restore the health of the river ecosystem by restoring the geomorphology diversity, and to meet the requirements of flood discharge capacity. During the restoration, data on physical geography, hydrology, geomorphology, physical chemistry, biology, and social economy are collected. The SIMON channel evolution model is then used to assess the channel stability. The assessment result is the stream is at □ stage, and the riverbed aggradation and riverbank scour should be paid more attention during the restoration. Also, the stream is a Rosgen “B5” type. After comparison of several measures, channel reconstruction was selected. The flood recurrence interval of 1.5 years was utilized to determine the channel-forming discharge. The measures used for restoring geomorphology diversity include: (i) building diverse cross sections that contain channel and floodplain, and using ecological riverbank protection methods to create habitats; (ii) restoring the sinuosity characteristics of river channels; (iii) building the pool-riffle series in the stream; and (iv) modifying the flow regime with riprap and small weirs.

QUESTIONS AND POSSIBILITIES FOR SUBURBAN WATERCOURSE RESTORATION

Helena Kralova, Jitka Mala, Bozena Michelcikova, Petr Paril & Karel Hrich, Department of Landscape Water Management, Brno University of Technology

The contribution deals with the investigative phase of a suburban river restoration project. The subject of the research is a small water course in a flat agricultural landscape in the Brno City suburban area, Czech Republic. Most similar water courses in this area are affected by river realignment.

The brook (both water and bed sediments) was monitored for two years from a morphological, chemical, and biological point of view. For the morphological mapping, the Hydro-Ecological Monitoring (HEM) method was used. Each morphologically homogenous reach of the brook was evaluated by the given parameters of the river channel, bottom, banks, and floodplain, in order to classify its hydromorphological status. Six sampling profiles for both chemical and biological monitoring were selected. The chemical monitoring included basic physical and chemical parameters, oxygen regime, nutrients in the water, and the main organic and inorganic pollutants in the bed sediments. The results were compared with the limits set by the Czech legislation. Aquatic macroinvertebrates to indicate organic pollution and phytobenthos to indicate eutrophication were used.

The results show the present state of the water course, which is quite removed from its natural condition. The relationship between morphological, chemical and biological indicators, showing the extent of the brook impairment, is discussed. Finally, the reaches suitable for river restoration are identified and the benefits, problems and restoration possibilities (including the state to be achieved) are presented. The aims of these suburban river restoration projects are to benefit not only wildlife, but also the local population, who lack natural elements and recreation possibilities in their local environment. The basic condition of a successful river restoration is the removal of concrete banks to enable the natural development of channel structures. Together with the river channel restoration measures, floodplain regeneration including tree and shrub planting is very important in this flat and treeless landscape.

POSTERS

THE PHYSICAL RESTORATION OF SSSI RIVERS IN ENGLAND – MAKING PROGRESS

Chris Mainstone, Senior Freshwater Ecologist, Natural England

Around four years ago, English Nature (a predecessor body to Natural England) embarked on a process of developing strategic physical restoration plans for English rivers designated as Sites of Special Scientific Interest (SSSIs) in England, working in close collaboration with the Environment Agency. This work formed part of a range of initiatives and activities aimed at achieving the Favourable condition of the SSSI series as a whole.

The process of developing these plans was described in a poster presented at the 2006 River Restoration Conference in Edinburgh. This poster provides an update on the work that has been undertaken since that time, including: learning from the lessons of early pilot studies; gaining acceptance of the problem and building trust in the solution; rolling out the planning process to those SSSI rivers most in need of physical restoration measures; and the implementation of practical measures.

This story reflects the considerable difficulties involved in making the transition from small-scale, piecemeal restoration schemes to large-scale restoration working as closely as possible with geomorphological processes. The relatively limited spatial extent of the river SSSI network and the added weight of national and European (EC 'Habitats and Species' Directive) legislation on specially designated wildlife sites are helping to overcome the barriers to making this transition.

There is a long way to go, and there are still plenty of threats to the process to be managed at national and local scales, but the enthusiasm encountered within the ecological and river restoration communities gives considerable hope that the initiative will have a positive outcome. If so, the work will greatly increase confidence in a large-scale, strategic approach to river restoration, which should feed into decision-making on river restoration in the wider river network driven by the EC Water Framework Directive.

POSTERS

SEASONAL AND SPATIAL BANK HABITAT USE BY FISH IN HIGHLY ALTERED RIVERS: A COMPARISON OF FOUR DIFFERENT HABITAT RESTORATION MEASURES

Joachim Pander & Jürgen Geist, Fish Biology Unit, Department of Animal Science, Technische Universität München, Germany

River regulations have resulted in substantial modification of the characteristics and diversity of fish habitats. Fish habitat use in the context of species life histories and temporal habitat dynamics are crucial for the development of sustainable measures of habitat restoration in degraded rivers. The objective of this study was a comparison of the effects of introducing four different in-stream structures (bank rip-rap, benched bank rip-rap, successively grown riparian wood and artificial dead wood, each 9 replicates) on the fish community of a heavily modified stream ecosystem. Species richness and diversity, fish biomass and density showed strong variation (i) between habitat types (ii) among replicates of the same habitat type and (iii) in different seasons. The lack of historical widespread rheophilic and migratory fish species in the study stream suggests that technical bank habitat restoration measures are only of limited use for the restoration of highly specialised target species in conservation such as *Barbus barbus* and *Chondrostoma nasus*. However, introduction of particular artificial stream structures was found to increase the biomass and density of non-specialised fish species like *Squalius cephalus*, *Alburnus alburnus*, *Gobio gobio* or *Rutilus rutilus*.

COST-EFFECTIVENESS ANALYSIS FOR RESTORATION OF THE POLSKAVA RIVER, SLOVENIA

P. Repnik Mah, J. Dodič and A. Bizjak, Institute for Water of the Republic of Slovenia, Slovenia

Implementation of the EU Directive 2000/60/EC (Water Framework Directive, hereafter called WFD) and its environmental objectives is based on a cyclic stepwise planning approach. The technical analysis, i.e. characterization of the river basin district, review of the environmental impact of human activity, first economic analysis and publishing of significant water management issues, have already been carried out and form the starting point for setting the programme of measures as the focal point of River Basin Management Plans.

The programme of measures comprises basic and supplementary measures. The supplementary measures are, according to the provisions of the WFD, subject to economic analysis: cost-effectiveness and cost-benefit analysis. Both analyses represent economic tools for decision makers and politicians, as they provide costs of measures or combinations of measures as well as implementation of objectives and potential additional benefits.

These analyses were also applied in the process of setting the programme of hydromorphological (HM) measures in Slovenia. In the first stage, the generic catalogue of HM measures and selection of suitable measures for water bodies with HM alterations were prepared. In the later stage, the costs of measures were compared. As a case study for cost-effectiveness analysis, the Polskava River, a tributary to the Drava River in the Danube River Basin District, was chosen. In general the whole Drava River Basin is affected by significant HM pressures that are a consequence of the driving forces of agriculture, urbanization and hydropower utilisation. In the 1970s, intensive agricultural land use was in development, thus extensive drainage systems were built and rivers were straightened and re-profiled. In addition, urbanization along rivers spread rapidly and consequently flood protection was decreased. Many rivers have undergone progressive changes away from their natural state – one of the most evident of these is meander cut-offs.

Knowing the reference HM state of the Polskava River, three different combinations of measures for HM status improvement were defined. The first two are comparable in terms of achieving the same goal – one combination involves removing hard structures, increasing the adjacent floodplain zone and setting self-maintaining conditions, and the other involves setting different engineering-biological measures within the existing river profile. The third combination with minor effectiveness involves inserting sample blocks that contribute to more heterogeneous conditions within the stream channel. The last combination was prepared with the intention of applying cost-benefit analysis where combinations with different effectiveness are needed.

As a result of the cost-effectiveness analysis on the Polskava River, the first combination was the most suitable if taking into consideration realistic opportunity cost because of agricultural production forgone. The second combination would become more cost-effective if agricultural production forgone has been overestimated.

With analysis recognized, the most cost-effective approach to river restoration first requires the setting of numerous administrative measures that will enable the implementation of such restoration measures in Slovenia.

THE CHALLENGES OF IMPLEMENTING RESTORATION AT THE CATCHMENT LEVEL: THE RIVER WENSUM EXPERIENCE SO FAR…

Karen White, Robin Chase (Atkins), Rob Dryden, Guy Cooper (Environment Agency) and Richard Leishman (Natural England)

The criticism of reach-based river restoration is that it is opportunistic and does not necessarily lead to long-term improvements in river health due to the different objectives, standards and funding applied to each restoration. Catchment-based restoration has been heralded as the answer to solving the longer term issues but also represents a number of challenges.

This poster presents the River Wensum experience so far of moving restoration to the catchment level. We identify the various challenges involved in implementing catchment-based restoration on the Wensum, including:

- Creating a paradigm shift in the way the river is currently managed and maintained.
- Developing an effective communication plan for delivering the key messages to stakeholders and then delivering it.
- Informing and educating local landowners of the benefits of river restoration and how rivers should function naturally.
- Obtaining long-term funding to plan large-scale work.
- Changing the ad hoc way in which the 14 redundant mills are operated.
- Understanding the implications of the complex history of milling and channel engineering on river restoration proposals.

MAXIMISING ENVIRONMENTAL OPPORTUNITIES IN REALITY

George Harley, Faber Maunsell, Edinburgh

The Braid Burn Flood Prevention Scheme in Edinburgh is trying to incorporate river restoration techniques into a significant civil engineered project aimed at reducing flood risk to residents and businesses along the length of the Braid Burn. The aim of this paper is to look at the hard and soft construction taking place on site and how the final product will help to satisfy two key drivers; flood risk management and river restoration within an urban environment.

The Braid Burn complex (some 18.2km) has been designated as an Urban Wildlife Site as part of the Edinburgh Urban Nature Conservation Strategy. A variety of protected species live in and around the burn including European protected otters and bats along with dippers, kingfishers, trout, bullhead and heron. An Environmental Supervisor has been employed to ensure that all work is undertaken in line with national and local conservation legislation.

Much of the burn runs through highly urbanised Edinburgh. As a result the burn is a vital wildlife corridor linking several small habitats and providing a means for wildlife to travel between fragmented habitats. This is particularly important to male otters as they hunt along extensive territories.

The Braid Burn has suffered badly, over the years, from channel straightening and the loss of flood plains. The environmental improvement proposed for this scheme includes the reintroduction of meanders and the controlled flooding of key areas for small flood events. Where works have been carried out within the burn channel, various ecological improvements have been introduced including the creation of meanders, riffles and pools, creating diversity of flows/currents in order to maintain various habitats. Where trees have had to be removed to allow the works to commence an extensive planting programme has been planned. The works represent a significant investment in the future of the City's biodiversity.

Whilst a large proportion of the flood protection scheme involves the construction of hard physical barriers such as reinforced concrete flood walls and clay-filled embankments, the river restoration proposals were some of the earliest and most exciting aspects of the proposed flood prevention works. There is always a balance to be struck between managing flood risk in an urban environment and protecting or improving the water environment, and this needs to be widely considered at project inception with a high awareness level carried through the design stage. This awareness should not, however, stop at the construction stage, with any added value that can be found in an environmental sense being properly considered throughout construction.

These works will substantially benefit wildlife in the city by restoring sections of the river to a more natural state allowing them to flourish in the years to come. They will also supplement the benefits derived from mitigating flood risk with improved amenity value to the public at large.

FLOOD RESILIENCE AND ENVIRONMENTAL GAIN IN BOSCASTLE

Andy Cooper and Jamie Farnell, Landscape Architects at Nicholas Pearson Associates

This paper will describe and illustrate the influence that Landscape Architects can have on shaping engineering solutions for flood risk management, from our initial Landscape and Visual Impact Assessments to detailed analysis and design.

We would like to share the experience of developing a flood risk management scheme for the lower harbour within the village of Boscastle. Boscastle is a sensitive environment located within the Cornwall Area of Outstanding Natural Beauty. It is within a Conservation Area setting and located principally on land owned by the National Trust.

Boscastle is a place made famous by the significant flood damage it experienced in 2004. We will demonstrate how the skills of Landscape Architects have specifically influenced the flood defence scheme design and how we contributed to the teamwork that has been so important there. A key part of our involvement and contribution was the identification of which landscape/ecological and cultural characteristics of the village / lower harbour should be restored or conserved and which were the elements that could accommodate change, to deliver environmental, flood defence and community gains.

Before and after photographs will be used to demonstrate the added value that collaborative planning and design can bring to a flood defence scheme. The use of photomontage techniques will be identified as a valuable tool for community and stakeholder consultation and in achieving planning consent.

We will end the paper by identifying how sensitively responding to local context can enable distinctive and more flood resilient, contemporary design to be delivered within a sensitive historic environment. The new lower bridge will be used as a case study to illustrate this.

ASSESSING THE ECOLOGICAL VALUE OF A RECENTLY CREATED FLOOD ALLEVIATION SCHEME – THE JUBILEE RIVER

George Gerring, Fisheries Department, Environment Agency

The Maidenhead, Windsor and Eton Flood Alleviation Scheme, now known as the Jubilee River, provides relief from the threat of flooding in this part of the Thames floodplain. The river extends for 11.6km to the east of the River Thames and was constructed by the Environment Agency between 1996 and 2001, with the official opening in 2002.

The engineering aim of the scheme was to provide a standard of protection for a 1 in 65-year flood, but the scheme was designed with biodiversity, conservation, ecology and recreation in mind. The environmental aim was to create an ecologically and aesthetically sensitive flood relief scheme. The river is mainly operated during potential flood events but carries a small flow all year thereby acting as a natural river. When opened in 2002 a five-year ecological monitoring programme was established on the river. This paper will report on the results of the monitoring programme and investigate the ecological success of this unique scheme.

The monitoring programme was designed to provide information on the habitats and species present during the establishment phase of the river corridor. The results showed an improved habitat quality through the increase in good quality grassland over the five-year period. In addition to this there has been an increase in higher plant species diversity. This has in turn contributed to the rapid colonisation of habitats by a number of faunal species including over 30 species of breeding and 60 species of wintering birds, occasional otters and 22 scarce or threatened macro-invertebrates, amongst others. Inevitably, a number of undesirable species such as American mink and Canada goose have also become established.

However, since this colonisation the current status of the fish population is relatively unknown. Juvenile fish surveys are undertaken annually and the river is recognised as a valuable fishery as the fish populations continue to develop. However, these surveys only illustrate a single component of the fishery, namely recruitment and juvenile stages. There was a need to gain a better understanding of the adult fish population within the Jubilee to further our existing knowledge and help develop a Fisheries Action Plan (FAP) for the river.

A detailed multi-method fish population survey was undertaken on the Jubilee River in the spring/summer of 2008. This included a hydro-acoustic survey of the entire river which provided fish densities that could be compared with the River Thames. The success of the various methods varied considerably and significant differences in fish densities were found between reaches. Although 18 species of fish were identified the overall fish densities were much lower than those recorded on the Thames. This may be due to low habitat heterogeneity, channel shape and high winter flows. The low density of adult fish may also be attributed to the logistical difficulties of some of the survey methods and the limited amount of spatial and temporal data obtained.

Whilst this does not detract from the overall success of the scheme it does highlight the need to develop species- and habitat-specific targets for fish as well as other fauna. One of the fish-specific targets was to measure the success of the fish passes installed on all five of the weirs and as yet it has not been possible to do this. When this is undertaken it should provide further information to determine the bottlenecks for adult fish species within the Jubilee River.

EXPLORATION OF EMERGING TECHNOLOGIES WITH APPLICATIONS IN RIVER RESTORATION

Chris Conroy, Principal Environmental Scientist, Cascade Consulting

The term 'river restoration' has become synonymous with the implementation of measures to improve environmental quality through the enhancement of physical in-stream and marginal habitats. Techniques for physical restoration have advanced rapidly in recent years and river managers are increasingly using biological and physical data sets to identify problem reaches and prioritise actions on a catchment-wide basis.

Ecological status is determined by a range of key factors, including hydrology, geomorphology and water quality. It is therefore important to gain a holistic understanding of the influence of each of these factors within an aquatic system.

Poor water quality has the potential to limit the success of even the best physical habitat enhancement scheme, i.e. there is no point in providing physical habitat if the water quality cannot support the desired ecology. Point source pollutants are relatively easy to identify and monitor, whereas identification of diffuse pollution sources and the load apportionment in sub-catchments and catchments is particularly difficult. An ability to understand the extent to which point and diffuse pollution interacts and impacts upon source-pathway-receptor interactions would therefore provide a value tool in river restoration.

This paper explores the emerging techniques of microbial source tracking and DNA-based environmental tracer technologies. In particular, it considers their application as tools to identify and attribute the relative and quantitative contributions of pollutants from different sources. The paper then promotes a discussion on the potential utilisation of such approaches in river restoration and their application in targeting and prioritising enhancements.

CLIMATE CHANGE PROOFING NORTH EAST ENGLAND: BENEFITS FOR RIVER AND SEDIMENT MANAGEMENT

Peter Brunner[1], Dr Nick Cooper[1], Dr Helen Dangerfield[1] and Peter Kerr[2]
[1]*Royal Haskoning*
[2]*Environment Agency*

Global climate change affects us all. It is widely considered as one of the greatest threats affecting the environment and is currently high on both political and media agendas, although climate proofing strategies at the regional or local scale are not yet routinely undertaken despite having the potential to be widely implemented in the United Kingdom.

Royal Haskoning and the Environment Agency have jointly completed two regional climate proofing projects in Northeast England, which have particularly focused on climate change impacts and adaptation measures related to both land and water use and integrated benefits to the local community.

The projects were located in the Cheviot Hills and the River Wear Catchment and were both split into three phases:

- **Phase 1** – Predicting the **climate changes** by the 2050s. This was undertaken using a climatic model to make predictions of future rainfall, snowfall, temperature and wind patterns. Published information relating to sea level rise and changes in wave and surge frequency was also incorporated.

- **Phase 2** – Assessing the **impacts** of the predicted climate changes on various land and water habitats. Some of the key impacts anticipated were changes in rainfall with more intense winter flood events in the upland catchment areas impacting upon riverine habitats, for example increased river bank erosion, siltation of gravel beds and adverse surface flooding.

- **Phase 3** – Identifying possible **adaptation measures** to counter the predicted impacts. Adaptation examples include approaches that are now more commonplace, but also other approaches such as tree planting to enhance fisheries (having the benefits for stability on riverbanks or natural 'surface roughness' to attenuate out-of-bank flows), upland land sediment management (having the benefits of detention of peak flows and reduction of sediment entering rivers), or irrigation retention (reducing winter peaks and providing valuable water resources).

This paper will present a summary of these two projects (focusing on land and water habitat management, including rivers and peatscapes) and discuss their applicability to other areas of the UK, where the type and magnitude of changes and impacts may be different, and hence possible adaptation measures may also differ.

CHANGING LAND USE AND HYDROLOGICAL STATUS OF SOME LOWLAND FLOODPLAINS IN ENGLAND

Tim Hess[†], Helena Posthumus[†], Joe Morris[†], Jim Rouquette and David Gowing**
*[†] Cranfield University * Open University*

The agricultural land use and hydrological status of 8 lowland floodplain sites were surveyed in the 1980s. All sites had been subject to agricultural land drainage improvement schemes prior to the 1980s surveys, involving raising of flood banks, arterial drainage improvements and in some cases, installation of pumps. Information was collected on the pre- and post-scheme situation. In 2007 these floodplain sites were revisited and the land and farms re-surveyed.

In all, 112 farms (covering 5,517 ha of floodplain land) and 67 farms (covering 4,163 ha of floodplain land) were surveyed in the 1980s and 2007, respectively. Although it was not possible to match farms and fields from the two surveys, they represent a statistically valid sample of the conditions at the two dates and the aggregate values can be compared.

The results show how agriculture and land use has changed over a period of 25 years in the context of national trends and in relation to the rapid changes following the scheme completion. Many farms have moved out of dairying since the 1980s and there are more mixed (livestock and cropping) farms, although in broad terms, floodplain land use has not changed significantly.

This work was funded under the Rural Economy and Land Use (RELU) Programme by the UK Research Councils (www.relu.ac.uk). The support of Prof Philip Lowe (Director) and Dr Jeremy Phillipson (Assistant Director) of the RELU Programme is gratefully acknowledged. We are grateful for the willing participation of the farmers and landowners in the surveys.

GET CONNECTED – FISH AND FLOODPLAINS IN UK RIVERS

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The importance of lateral connectivity between main river channel and floodplain is well-known for fish species in lowland rivers of tropical and European continental rivers with seasonal flood pulsing. Restoration of lateral connectivity is being considered as one of a number of measures for achievement of good ecological status in lowland river systems both in Britain and continental Europe. However the relevance of lateral connectivity for fish communities in rivers in England and Wales, with their aseasonal flooding patterns, is less well-understood. The feasibility of restoration of lateral connectivity in the rivers of the UK, with its high human population, heavily developed landscape and predicted increased threat of flooding due to climate change, is also contentious.

This paper presents the findings from investigations undertaken by the Environment Agency into fish dispersal behaviour in floods and high flow events, describes examples of projects already undertaken to improve floodplain habitats for fish, and describes work in progress to design practical solutions for providing safe fish access to and from floodplain habitats through regulated tidal exchange structures. Other research needs to support the restoration of lateral connectivity are identified.

WEIR AND DAM REMOVAL AND RIVER CHANNEL REINSTATEMENT: EXAMPLES IN FRANCE

Josée Peress, Office National de l'Eau et des Milieux Aquatiques (The French national agency for water and aquatic ecosystems)

The removal in the 1990s of a number of dams and weirs used for electric power generation or other uses has resulted in the hydromorphology of the river channel becoming once again diversified. Flora and fauna have recolonised the previously impounded area, migratory fish and other aquatic organisms have become re-established in the reach, and in some cases economic regeneration of the local community has resulted from the removal of the obstruction.

This presentation will describe examples of dam and weir removal in France and how this has resulted in ecological and, in some cases, economic benefits. For each of these examples, the decision making process that led to the removal of the obstruction will be described and the removal operation and river channel restoration procedure will be explained, together with the ecological and other benefits observed in the following years.

SPATIAL PLANNING AND FLOODPLAIN RESTORATION – IN THE "PITTS"?

Karen Potter, PhD Research Student, Department of Civic Design, University of Liverpool

The development of floodplains for agriculture, settlements and industry, ensued by the need to engineer flood defences to protect this investment, has led to the loss of approximately 98% of "natural" rivers and their floodplains in Europe (Blackwell & Maltby, 2005). The impact of this large scale uncoupling of rivers from their functional floodplain is evident; fluvial flooding events in recent decades have become more frequent, damaging and costly (Moss & Monstadt, 2007). International research has begun to influence thinking in the UK: "floodplain restoration" being a pre-eminent emerging solution to increased flood risk. Restoring the floodplain in selected areas can reduce the flood risk to development downstream.

Despite support growing markedly in policy circles, floodplain restoration schemes for flood risk management are still few and of a small scale. In "Learning Lessons from the 2007 Floods", many of the consultation responses to the Pitt Review felt that this approach was not being translated into results on the ground and more effort was needed to encourage implementation, including finding and obtaining land use to make it a reality.

Although the limited connectivity between land use and flood protection is a vital constraint to floodplain restoration, the relationship between the UK land use planning system and flood risk management has been likened to a "fish out of water" (Howe and White, 2004). Drawing on experience in practice and academic research, this paper considers the challenges inherent to the integration of Spatial Planning with floodplain restoration; in particular exploring the potential of the Flood Risk Assessment process in finding the space to restore floodplains as a key component to decreasing flood risk and associated social and economic costs in the UK.

FROM DARLINGTON TO THE DALES, SKERNE TO THE SEA - ORIGINS AND OBJECTIVES - WHERE NEXT FOR RIVER RESTORATION?

Chris Spray, SEPA

The River Restoration Centre owes its existence, at least in part, to an international conference held in York almost 20 years ago - and more specifically to a talk given by a Swedish professor on the subject of a building block approach to stream restoration. That formed the catalyst to a discussion in the bar that evening - would it really work? The more the beer flowed, the more inhibitions retreated and imagination grew, and a cunning plan gradually emerged; one that somehow survived the scrutiny of a small bunch of enthusiasts in the harsh light of next morning, and eventually morphed into the River Restoration Project. Launched some months later in Huntingdon as the River Restoration Project Ltd by the then Prime Minister, John Major, these were heady days when we were constantly surprised by what we were attempting, and readily going cap in hand to friends and allies for their support and guidance! The practical restoration of two stretches of the rivers Cole (in rural Wiltshire) and the Skerne (in urban Darlington) became the focus of virtually all we were doing.

From these early beginnings, the River Restoration Centre has flourished and grown to be much more than just a band of enthusiastic zealots with a couple of projects to sell - the central locus for debate and action on river restoration, and the influential centre it is now. However, what has this initiative achieved 10 years on and where should we be going now? Back in the late 80's we had no Water Framework Directive to guide us, the EU Floods Directive didn't exist and climate change was only beginning to be treated as a serious issue by a few far-sighted scientists. Building in flood plains as an issue, insurance losses from catastrophic floods, losses of dissolved organic carbon from upland peats, and integrated catchment management that attempts to link uplands to the sea were still in their infancy - the internet, the credit crunch and devolution were nowhere to be seen!

With the publication in December of the first draft River Basin Management Plans across the UK, there is now a clear focus on attainment of "Good ecological status". One of the main causes for downgrading the status of individual waterbodies is the change in the morphology of river banks and beds away from their "natural" or reference condition. Amongst other priorities, the new plans attempt to address this situation - and suddenly river restoration is mainstream! In Scotland, the Government has provided finance for river restoration and SEPA has established a fund to which partner organisations can apply to deliver this.

Parallel to these initiatives, the new EU Flood Directive (2007) has stimulated greater focus on flooding and the potential role of unconstrained rivers in flow attenuation and flood risk management. In Scotland, the Flood Risk Management (Scotland) Bill, which transposes the directive into law, focuses on catchments and sustainable flood risk management as the way forward. Working with partner organisations and recognising the potential role of natural processes will need to be a key part of this new approach. Again river restoration comes to the fore - but at a much larger scale. What is clearly still lacking is information on the real effectiveness of some of the elements of restoration in terms of a measurable and sustainable effect on flood hydrographs.

A third strand to emerge has been the impacts of Climate Change - and the potential role river restoration could play both in mitigation and adaptation to observed and expected trends. Data from Scottish rivers show massive changes in winter flood flows that have major implications for the way we need to think about river management in the future.

Finally, river restoration of the future needs to play to the increasing importance of the ecosystem services agenda. The Millennium Ecosystem Assessment has led the way to a new paradigm which looks to value the various environmental services that a fully functioning ecosystem provides. In this context river restoration has much to deliver and to be valued for.

WHAT ARE THE TRADE-OFFS WHEN AIMING FOR A QUANTITATIVE BALANCE IN THE RIVER ROTHER?

John Joyce (Head of Water Economics and Policy at IPA Energy + Water Economics, London) and Benoit Grandmougin (Senior Consultant at ACTeon, Colmar, France)

The focus of this paper is to evaluate water saving scenarios in the River Rother sub-catchment with the aim of achieving a quantity balance and restoring the river to a good ecological status. The environmental, social and economic costs and benefits of achieving the quantitative balance will be analysed, highlighting trade-offs where relevant.

The sub-catchment is characterised by substantial abstraction for public water supply and the river experiences low flows. No more water is available for licensing in the Upper Rother while some licence capacity remains in the Lower Rother. Surface waters are over licensed and over abstracted (taking account of effective consumption).

CAN RIVER RESTORATION BENEFIT SOCIAL COHESION? A CASE STUDY

Paul Chapman, Lewisham Council, and Alison Taylor, QUERCUS Project Manager, Lewisham Council

In Lewisham, as part of the EU Life funded QUERCUS project, we have created a meandering river channel with a natural bed and profile through the middle of an urban park, Ladywell Fields. The former river channel flows down an artificially straight and wide course along the perimeter of the park, but is hidden from view and has no impact on the previously featureless landscape.

The aims of the river restoration project were primarily social:

- To increase use and enjoyment of the park and river corridor;
- To reduce crime and fear of crime on the site;
- To improve habitats for wildlife.

The vision was to create a place that the whole community would want to visit. The restored river is the centrepiece of the transformed open space – now a natural haven in an urban environment.

However, a restored landscape alone is unlikely to produce much greater social cohesion. It is the engagement of the community in the process of transformation, rather than the transformation itself, which results in the greatest gains in social cohesion.

Initially engagement in the QUERCUS project took the form of consultation. A total of 180 in-depth surveys were completed, asking people about their use of the park and their vision for its future. Focus groups were held with people with disabilities and older adults, and initial plans were on show at an open day. Further consultation took place through the planning process. This early engagement of the local community helped to build excitement and anticipation about the planned transformation.

In addition to consultation, however, Lewisham Council employed two Waterlink Way Rangers throughout the project, to lead environmental education, conservation volunteering, and run events which would capture local people's imagination and foster ownership of the project. In two years they delivered environmental education sessions in the park to 5000 pupils, and led events in which over 1000 hours of volunteers labour were given.

But QUERCUS was not satisfied with involving the 'mainstream' only. Sessions were also run for teenagers with challenging behaviour, older adults with mobility problems and people with mental health issues. Faith groups, community groups, staff groups, and youth groups were all targeted. And the river restoration in Ladywell Fields has provided the focus for every audience. Every individual has been able to engage, in some way, with the river.

Quality open spaces have the potential to bring people together in a way a busy street scene never can. Ladywell Fields is now well used by all kinds of people, and trust is gradually established as diverse groups of people share and value a community resource. Use has increased threefold, and 78% of people now say they feel safe in the park (compared with 48% previously). The river restoration in Ladywell Fields has brought a diverse, urban community together, to get involved in, to use and to value a new and special community resource.

MAKING SPACE FOR WATER IN THE TRENT RIVER BASIN – A COLLABORATIVE APPROACH

Ruth Needham, Project Manager, The OnTrent Initiative

Land use changes, development pressure and climate change have contributed to increasing flood risk in the majority of the UK, including the Trent. A future 1% annual probability flood event in the River Trent catchment, taking account of climate change, would cause nearly £2.3 billion worth of damage to property, with a further £32 million worth of agricultural damages (Draft Trent CFMP, Environment Agency, 2007). The current approach to flood risk management is increasingly recognised as not being cost effective in the majority of locations so changes need to be made.

So how do we work to create sufficient space for the Trent and its tributaries during a flood in the long term? The Trent Catchment Flood Management Plan that follows on from the Government's Making Space for Water programme includes an extensive list of actions for reducing flood risk. Many require a significant shift of emphasis in how we manage our river catchment, in particular how the land is farmed and how and where development takes place.

Targets set under the Water Framework Directive state that all water bodies need to be in a 'good' chemical and ecological state by 2015. Water quality of the Trent has improved significantly over recent years, but the ecological status and biodiversity value of many of the rivers in the catchment is still poor.

Sustainable river catchment management requires the action and cooperation of a great many individuals and organisations, taking place over potentially tens of thousands of hectares of land. Collaborative partnership projects such as OnTrent provide a mechanism to initiate and deliver projects with a range of benefits at both the local and river catchment scale.

This presentation will consider the rivers of the Trent catchment. It will focus on future opportunities for sustainable catchment management brought about by the Trent Catchment Flood Management Plan and the Water Framework Directive. Much of this work has the potential to provide significant water management improvements as well as broader benefits, for example: conserving archaeology; supporting rural incomes; increasing access; enhancing biodiversity; and involving communities.

The presentation will highlight the opportunities and difficulties of delivering a range of specific projects through a partnership approach that delivers:

- Upstream storage/ reduced conveyance
- Flood attenuation ponds/ wetlands
- Reduce run off via changes in land management
- River restoration
- The wider use of SUDS
- Quarry restoration that reduces flood risk
- Green river corridors
- Reduced soil erosion
- Flood bank and maintenance review

Key questions such as how to prioritise, project selection, design, funding, delivery and maintenance will be covered.

The OnTrent Initiative is a major partnership project to benefit wildlife, people and heritage in the Trent Valley. OnTrent provides a network for a wide range of organisations within the Trent Valley; by raising awareness, influencing policy and delivering projects.

Optional Workshop Site Visit: Day Brook, Nottingham

Ros Kaye, Environment Agency

Heavily engineered rivers are often synonymous with urban environments and the Day Brook in Nottingham is a typical example. Devoid of many natural features and supporting limited floral and faunal communities, the brook has little or no interaction with its natural floodplain. Flanked by housing, industrial and recreational sites along its entire length, the brook has been subject to several flood improvement schemes which have seen it straightened, deepened and intensively managed. A number of artificial flood storage areas were also constructed, one of which provided a suitable location and space for a restoration project. This project aimed to improve the conservation value of the Day Brook without detriment to the flood defence function of the storage area. A partnership between the Environment Agency and Nottingham City Council delivered the restoration scheme in Summer 2007. A key part of the project was also to enhance an urban green space for the local community as well as improving the biodiversity value.

MOSONI-DANUBE REHABILITATION PROJECT

Ferenc Dunai, Miklós Pannonhalmi and Ildikó Tóth, North-Transdanubian District Environment and Water Directorate, Hungary

The Mosoni-Danube is a large meandering branch of the Hungarian Upper Danube. The Szigetköz region is an alluvial plain located between the Hungarian Upper Danube and the Mosoni-Danube in the northwestern part of Hungary. The rivers and their associated habitat still play a very significant role for Szigetköz and its environment development concept. Consequently, every opportunity and problem concerning water has an effect on the region's economy. The state of rivers influences the following sectors in particular: tourism (water tourism), agriculture (irrigation, groundwater level), flood protection, environmental protection (water habitats), water resources protection (surface water quality). The measures which aim to reach the objectives of the WFD (good ecological status of waters) have to be supported by research that helps to analyse the state of waters and plan the rehabilitation of river habitats and development of the water environment.

Within the project "Research of the hydro-ecological activity of the river habitats" we had the opportunity to gain comprehensive knowledge on the Mosoni-Danube. The primary objective of the project was to analyse the habitats of the Mosoni-Danube and to collect basic databases for rehabilitation. Within the research of river habitats and their functions, we have examined human activity and pressure as the basis of status evaluation of the water bodies. In the course of the research, a practical methodological guideline had been developed in line with the Water Framework Directive (WFD) regulations and based on standardized research. The main activities of this project were research into the ecological continuity components of the river, current and fish behaviour, macrozoobentos and phytocoenological surveys. The project included analysis of the water quality and hydrological databases, as well as the assessment and presentation of the effects of the following measurements.

The restoration and rehabilitation of disturbed habitats is of crucial interest for residents living not only in this area. Since mid-2008 in the frame of development project we began to design the rehabilitation of Mosoni-Danube, which is largely based on the results of the former project. The Mosoni-Danube is a candidate heavily modified water body according to the previous classification of WFD. Our aim in this project is to achieve good ecological potential. The main activities of this project are to:

- re-establish the river continuum at the barrage in Mosonmagyaróvár
- improve flood protection and sediment transport
- revitalise the old arms
- rehabilitate branches
- conserve the natural character of Mosoni-Danube with landscape rehabilitation

PAST, PRESENT AND FUTURE APPROACHES TO RIVER REHABILITATION IN JAPAN

Ulrika Åberg, Paul Waley and Joseph Holden, School of Geography, University of Leeds

This paper examines the past and present state of Japanese river administration and how it differs from river administration in England. It will also provide examples of different types of Japanese river rehabilitation projects.

In England, rivers are foremost managed by the Environment Agency, but in contrast to Japan, rivers in England are not exclusively state property. In Japan, all major rivers are owned and administrated by the Ministry of Land, Infrastructure and Transport; and river management has therefore long been focused on construction.

Japan's massive dam and channelisation programme has partly served its flood protection purpose, but it has on the other hand created a vast environmental crisis. In the early 1990s a huge demand for urban recreation and green space emerged in Japan and one of the first pioneering urban river regeneration projects was carried out on the Izumi River in Yokohama. The main aim of the project was to enhance the amenity and re-connect the river with the surroundings, and much effort was put into public participation. The project has proven to be very successful among the local residents.

In 1997 the Japanese River Law was revised to include concern for the environment, and the number of river projects carried out according to the principles of 'Nature Oriented River Works' increased exponentially. However, in 2007, ten years after the revision of the River Law, a Nature Oriented River Works review committee was set up and concluded that nearly 70% of all Nature Oriented River Works were carried out in an unsatisfactory way. As a result of the review report a new guideline manual was published, and all regional river offices are obliged to use it. Yet several problems remain; among them is that Japanese river managers typically still have their background in civil engineering with little understanding of ecology, morphology or environmental science. A handful of Japanese academics and researchers toil with frequent workshops and seminars on river naturalisation for local river managers, but the dissemination need is immense and the resources small.

While the need for much more river restoration in Japan is huge, and despite the continued construction of dams and concrete river channels, there are glimmers of hope. Since the beginning of this century, 35 nature regeneration projects have been initiated. The main aim of these projects, unlike the Nature Oriented River Works, is not flood protection but to restore the physical and ecological processes within the rivers. These 35 nature regeneration projects are all ongoing large basin-scale projects, and 35 projects of this scale are not insignificant considering that Japan only has 109 major river systems.

MINIMAL IMPACT RESTORATION – IS IT WORTH ALL THE EFFORT?

Peter Worrall, Technical Director, Penny Anderson Associates Limited (Consultant Ecologists)

In January 2007, after a prolonged period of rainfall, several thousand tonnes of finely ground rock from a fluorspar mine tailings dam escaped into the Derbyshire countryside. Besides the damage to homes and property in the village of Stoney Middleton, the discharge of the heavily metal-laden sediments entered the Stoke Brook and the River Derwent. These river systems were ecologically diverse, supported an important salmonid fishery and had significant landscape and amenity values within the Peak District National Park. Once the immediate clean up of the village was complete attention focused on how to remove the material from the river systems without causing undue damage to habitat, species and functions of the rivers. The primary impact of the fine sediments was the binding and armouring of the gravel spawning areas for trout, grayling and brook lamprey. In addition, the smothering of the bed and banks with a dense and often thixotropic mass of sediment had implications for a range of wildlife groups as well as the amenity value these rivers afforded the area. With river banks riddled with water vole burrows, nearby ponds associated with great crested newt, and a rich bird, plant and invertebrate fauna, the challenge to remediate and restore these sinuous tree-lined river systems was significant.

Achieving minimal impact restoration required a coordination of contractor input, project management and stakeholder involvement. In this paper we present the approach taken to achieving remediation of these contaminated sediments and the degree of success in restoring the rivers without undue damage to the important environmental assets they provided. The paper also appraises whether the costs and efforts that have to be invested in achieving minimal impact restoration are, in the long run, the most appropriate environmental option.

USING ADVANCES IN MODELLING TECHNIQUES TO EXPLORE CATCHMENTS WITH A VIEW TO IDENTIFYING LOCATIONS IN NEED OF RESTORATION

David Higgins, Durham University

Historically rivers have been viewed as conduits to remove wastes from source and ultimately to the sea. This attitude resulted in severely diminished systems supporting shadows of their former ecology. More recently research, dissemination of knowledge, legislation and restoration efforts have broadened these so that they begin to mirror their former diversity. Yet many river systems remain degraded and reversal requires careful planning and targeting of limited resources.

To comprehend river networks careful research into the processes that connect and deliver to watercourses at the catchment scale is a must. Viewing rivers in isolation of the wider geology, topography, land cover, rainfall patterns, drainage and agriculture results in limited understanding of the system, its interactions, and the factors governing in-stream ecology. Reductionist perspectives offer little more than luck when attempting restoration measures.

Upland rivers provide several unique challenges. These systems have been pushed from their 'natural' oligotrophic status by multiple pressures, in particular intensified land use. To compound this water flows have been disrupted due to high density upland drainage. Research suggests these drains (grips) flush water through the catchment resulting in rapid spate events and reduced base flows. The ecology has responded to these shifts so that the typical communities of these rivers are diminished or lost.

Developments in modelling tools provide opportunities for identifying areas most in need of attention. In order to ensure that upland river ecosystems can be restored a primary need may be to re-instate the natural water flow. By mapping grips, and modeling the shifts in water storage and movement, it becomes possible to identify those having the greatest effect on catchment hydrology providing target locations for blocking and thus smoothing out the hydrograph.

SCIMAP (Sustainable Catchment Integrated Modeling Analysis Platform) is a second modeling tool that assists in the smart targeting of limited resources. SCIMAP allows us to identify risk within a landscape that results in fine sediment accumulation in watercourses. From land cover and rainfall maps coupled with a digital elevation model (DEM) SCIMAP displays relative information on erosion risk, connectivity and sediment accumulation across a catchment. Moreover grips can be added to the DEM to see how the resulting altered hydrology affects both connectivity and erosion risk.

With modern processing power these models can be run at fine spatial scales allowing the identification of gills that would benefit from planting, where buffer strips would be most effective and which grips should be targeted for blocking. This allows enhanced connectivity to be reversed and a reduction in the sources of both erosion and fine sediment. Such modeling advances provide powerful tools for restoration ecologists and in a world of finite resources, both natural and financial, these models provide excellent value.

UTILISATION OF TERRESTRIAL LASER SCANNER DATA TO RAPIDLY MAP INSTREAM HABITAT

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Habitat mapping (biotopes in the aquatic context) has long underpinned the conservation process in the UK, providing baseline information on environmental condition and allowing the effect of environmental and ecological change to be monitored and evaluated. Underpinning this process for riparian systems is the river habitat or corridor survey (recently developed into GeoRHS); this consists of a subjective mapping of the river and an adjacent thin linear strip of land in 500m segments. Issues exist with this approach to the development of a national database due to the labour intensive nature of the data collection, subjectivity issues between samplers, temporal changes to biotope composition, the fuzzy nature of perceived habitats and habitat boundaries and the operational difficulties associated with the mapping process. This paper classifies biotopes based upon high resolution spatial data of water surface roughness measured using a terrestrial laser scanner. Hydraulic variability is expressed here through assigning a local standard deviation value to a set of adjacent water surface values. Statistical linkage of these data with known habitat and biotope locations provides the classification matrix for complete mapping of the surveyed area, allowing definition of habitat and biotope areas down to the fine-scale resolution of the terrestrial LiDAR data. These values are then used to produce objective biotope maps. It is clear from the resultant maps that biotope distribution is more complex than previously mapped using subjective techniques and calls into question the current classification system employed by the river habitat survey. The resulting methodology will allow betterment in hydraulic diversity pre- and post-restoration scheme installation to be quantified in an objective manner.

RECONNECTING PALEO CHANNELS – NO PROBLEM? RECENT EXPERIENCES AND SOLUTIONS

Tony Green, JBA Consulting, Wallingford and Arnaud Duranel Upper Ray Project Officer, BBOWT, Oxford

Reconnecting a meandering paleo channel is not an unusual activity for river enhancement and restoration and is covered in the RRC's river restoration manual. However, with increasing weight given to ensuring that other parties are not adversely affected and seemingly more frequent flood events, an affordable and lasting solution may not be as easily implemented as first thought.

There have been several recent failures of the diversion bunds that resulted in a loss of water to the newly revived channel. Should it just be put back again and accepted that it may be too expensive to allow for extreme floods, or can we do something better?

This paper will present experience particularly from the Berkshire Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) site on the Tetchwick Brook, which is part of the ambitious RSPB and BBOWT River Ray Restoration Project. The river was straightened and massively deepened and widened in the 19th and 20th centuries. In 2005 the Brook was successfully diverted back into its former channel, which led to a noticeable improvement in the ecology of adjacent floodplain grasslands and an increase in curlew numbers. However, in July 2007 the original diversion was severely damaged and flow reverted back to the straightened channel.

In late 2007, BBOWT acquired the site with the ambition of restoring a major wetland environment. The options for replacing the diversion and making further modifications are now being planned and studied making use of models to take account of the potential adverse impacts on upstream land drainage that caused some of the original weakness. The paper will present these experiences and draw more widely applicable conclusions for other locations and lessons for future restorations.

STREAM – PRACTICAL APPROACHES TO RESTORATION, AND INTEGRATING MANAGEMENT OF THE RIVER AND FLOODPLAIN

Joanna Eyquem (Royal Haskoning), Allan Frake (Environment Agency) and Jenny Wheeldon (Natural England)

The STrategic REstoration And Management (STREAM) project has been carrying out major river restoration work, and developing approaches to integrating river and floodplain management on the Hampshire Avon. Practical aspects of the restoration work and integrating management of the river and floodplain will be presented and discussed at this workshop.

STREAM is a £1 million, four-year project centred on the River Avon and the Avon Valley in Wiltshire and Hampshire. The project is supported financially by the European Commission's LIFE-Nature programme. Natural England is working with project participants from the Environment Agency, Wiltshire Wildlife Trust, Hampshire & Isle of Wight Wildlife Trust and Wessex Water. The project will draw to completion in September 2009, and we are therefore keen to disseminate the outputs as widely as possible to maximise the benefit of this project.

Here's one we tried earlier: a practical guide to implementing restoration on lowland rivers
In lowland rivers, restoration techniques that "give nature a nudge" tend to be used rather than harder engineering approaches. Practical details and lessons learnt in relation to the techniques used by STREAM on the Hampshire Avon will be presented, including considerations such as choice of materials, cost effectiveness, installation methods and subsequent performance. The techniques under discussion are applicable to other lowland/low energy river systems and several have been included in the recently published Chalkstream Habitat Manual, which can be viewed at www.wildtrout.org/index.php?option=com_content&task=view&id=324&Itemid=315

Linking river and floodplain management – a step-by-step guide to developing operating protocols for water level control structures
STREAM has also developed specific tools to address potentially conflicting water level management requirements on high conservation value rivers and their floodplains. These tools include a step-by-step guide to developing operating protocols for water level control structures with local stakeholders, and a way of mapping fishery interests to minimise potential conflicts with floodplain management needs. The guide to developing operating protocols is particularly applicable to rivers affected by impoundment or where there is a need to balance flows between different watercourses, and will be presented in detail as part of the workshop.

How to find out more
STREAM is running a number of events in 2009 including a site open day for fishery and landowners on 14 May. We are also running a 2 day conference on 24/25 June to present the findings of the project.

To book a place at the events, and to view project outputs, visit www.streamlife.org.uk

DAY BROOK WATER MEADOW PROJECT SMALL-SCALE URBAN RIVER RESTORATION OF THE DAY BROOK, NOTTINGHAM

Ros Kaye, Environment Agency, Nottingham

Heavily engineered rivers are often synonymous with urban environments and the Day Brook in Nottingham is a typical example. Devoid of many natural features and supporting limited floral and faunal communities, the Brook has little or no interaction with its natural floodplain. Flanked by housing, industrial and recreational sites along its entire length, the Brook has been subject to several flood improvement schemes which have seen it straightened, deepened and intensively managed. A number of artificial flood storage areas were also constructed, one of which provided a suitable location and space for a restoration project.

Opportunities for river restoration along a river such as the Day Brook are unsurprisingly rare, however, the Day Brook Water Meadow Project is a good example of urban river restoration for the benefit of the local ecology and local community alike.

The project aimed to improve the conservation value of the Day Brook without detriment to the flood defence function of the storage area. A partnership between the Environment Agency and Nottingham City Council (landowner) delivered the restoration scheme in Summer 2007. A key part of the project was also to enhance an urban green space for the local community as well as improving the biodiversity value.

Prior to the project, the Day Brook ran along the northern boundary of the storage area. The channel was a man-made, over-deep, straight channel barely noticeable from the surrounding footpaths and supporting very little floral or faunal interest.

Working within the confines of the existing infrastructure, the 2007 works re-meandered the channel through the adjacent flood storage area, increasing the length of channel from approximately 250m to 320m. The channel was designed to exhibit natural features such as pools and riffles, shallow berms and an online reedbed. Permanently wet and ephemeral scrapes were created alongside the new channel and a low-lying area was seeded with an appropriate seed mix with the hope that wet grassland would establish over time.

One year on and the site is fully vegetated and functioning well as a newly created urban habitat, flood storage area and recreational facility for local people. Prior to the works, the site was utilised primarily by dog walkers who visited the site for its open space and not the presence of the Brook itself. The Brook was deemed neglected and an ‘eyesore’. Restoring the Day Brook and its floodplain has not only increased the biodiversity value of the area, but has also provided an improved recreational facility for local people. The Day Brook is now an integral part of the site and consequently the visitor experience. Although not primarily designed as a flood risk management/flood alleviation project, reconnection of the Day Brook to its natural flood plain has greatly reduced localised flooding frequencies by increasing water attenuation upstream of susceptible structures and properties.

Although there is an obvious conflict between retaining the ecological value of a site and disturbance resulting from recreation, this project has highlighted how recreation and community interest can benefit an urban river environment. As more local people use the site, they begin to take ownership of it. They appreciate the ecological interest it harbours and ultimately respect and value this and other rivers as an integral part of the urban environment.

DAGENHAM WASHLANDS: INNOVATIVE APPROACHES TO FLOODPLAIN RESTORATION AND INTEGRATION WITH THE WIDER PHYSICAL & SOCIAL LANDSCAPE

Richard Hellier, Environment Agency Landscape Architect

Strategically located in London's Thames Gateway between Ford Works and Dagenham Village, the 53 hectare Dagenham Washlands site is an exceptional largely semi-natural open space at the confluence of two watercourses and bordered by a large deprived housing area with intrusive industrial infrastructure close by. The floodplains of the Wantz Stream and the Beam River form the Agency-owned Washlands and feature significant flood defence infrastructure including over a kilometre of flood bund and a large sluice structure. The Washlands protects 600 properties, the Ford works and Barking Power Station providing a third of London's electricity. These structures have recently been refurbished and the flood storage capacity increased through excavation into a low gravel plateau between the floodplains just north of the confluence. The capital cost, completed in 2007, was £4 million.

As part of the two phases of works environmental enhancement was undertaken in the Wantz stream floodplain including the construction of 4 ponds, 1.0 hectares of wet fen and 0.5 hectares of reedbed. After careful site appraisal, natural regeneration was used as the primary technique for re-establishing vegetation in the floodplain with remarkable success. By stripping off the enriched topsoil layer and exposing the underlying alluvial and peat layers, abundant regeneration of target and historic wetland plant communities took place including the establishment of extensive swathes of species such as ragged robin. One pond was colonised by 13 species of marginal and aquatic plants and 6 species of dragonfly/damselfly in an 18-month period. A caddisfly species was collected in the pond that placed its water quality into the top 10% of UK water bodies. Reedbed creation has been undertaken by excavating new pools adjacent to existing stands allowing effective extension by rhizome rather than by planting.

A similar approach was adopted to re-vegetate areas of adjacent acid grassland within the excavated FSA where the topsoil layers were stripped and then used to re-sow re-profiled areas of gravel. This technique was successful in restoring the fine bent grass/sheep's sorrel communities that are rich in important invertebrates such as yellow meadow ant and grasshoppers. Breeding reed bunting and house sparrow from the adjacent wetland and housing areas were dependent on this dry invertebrate-rich grassland for feeding their young, demonstrating the importance of habitat mosaic in ensuring sustainable populations. Careful attention was given to the re-shaping of the FSA with gentle, undulating profiles to ensure an effective transition between wet and dry habitats that allow migration of species essential in a period of climate change.

An exciting opportunity to build on this success is now being explored in a third phase stand-alone environmental enhancement work at Washlands in a partnership between the Agency, London Borough of Barking & Dagenham and the Land Restoration Trust. This multi-functional project, with a value in the region of £2million, is at feasibility stage and will re-plan the full 53 hectare site from the floodplain and gravel plateau habitats to the 'gateway' amenity areas in a holistic way. The project team includes specialists in geomorphology, landscape architecture, ecology and also public participation to ensure the project reflects community aspirations.

USING RIVER RESTORATION TO RE-ESTABLISH INVERTEBRATE COMMUNITIES

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Natural rivers are rich in invertebrate life and they are integral to sustaining healthy river systems; invertebrates occupy a range of niches in rivers from bankside shingle to instream pools. Many rare and threatened invertebrate species are associated with rivers including 67 BAP species. In natural rivers there are a range of microhabitats needed to sustain a rich and diverse invertebrate fauna, however the modification of rivers has removed many of these microhabitats. For example, channelisation removes important instream and bankside habitats and so reduces invertebrate diversity, which has a knock-on effect on other river-dependent fauna by limiting food sources. Current restoration schemes do help to recreate some of these microhabitats, however they often focus on a single aspect of habitat recreation when a range of microhabitats could be created. In fact, some restoration techniques actually prevent the re-creation of microhabitats and create poor habitat. Outlined below is the range of microhabitats that should be included in river restoration schemes to re-establish a diverse aquatic and bankside invertebrate community.

- Maintain, and if possible create, a mosaic of habitats in the vicinity of the river. Habitats such as fens, water meadows, unimproved grassland and carr are all important for invertebrates.
- Maintain natural river bank profiles. Practices such as the embankment of river margins with woven willow hurdles or the removal of marginal irregularities maintain a fast flow of water which will remove fine marginal sediments. More natural, gently sloping margins with a soft sediment interface provide a greater range of suitable habitat niches. The creation of a berm or shelf at the predicted water level during any re-profiling operations will help to create such advantageous conditions.
- Some trampling of river margins by grazing cattle helps to maintain shallow sloping profiles, a varied sward height and areas of bare muddy ground, but care must be taken to ensure that excessive trampling does not result in over-siltation or eutrophication from faeces and urine.
- Retain and maintain aquatic, marginal and riverbank vegetation. Traditional river restoration techniques may be particularly damaging for invertebrate species that rely on the presence of marginal and riparian vegetation to provide shelter and emergence sites.
- Riverside trees are an important component of the river habitat, providing shelter for a number of rare and nationally scarce species. The White-clawed crayfish (*Austropotamobius pallipes*) also favours sites with overhanging bankside vegetation. However, if the river or stream becomes completely shaded by overhanging trees, this can have an adverse effect on aquatic invertebrates, so it is important to maintain a balance.
- Retain areas of silt beds. Traditional river habitat enhancement which relies on removal of silt beds may remove invertebrates and lead to invertebrate drift. Areas of silt naturally accumulating along river margins, especially on the inside of bends ("point bars") should be left and only short sections (20-30 metres) of gravel should be cleaned at any one time.

Retain dead wood both in and out of the water. Saturated dead wood provides habitat niches for a range of invertebrates, such as caddis flies and the White-clawed crayfish (*Austropotamobius pallipes*). Fallen trees may also help to reduce erosion of banks and slow the flow of water in some sections of the river.

ESTABLISHING THE REAL BOURNE IDENTITY – A TWIN TRACK APPROACH TO ASSESSING HABITAT DIVERSITY AND IDENTIFYING APPROPRIATE RIVER RESTORATION NEEDS

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The River Avon Special Area of Conservation (SAC) comprises the main stem of the Hampshire Avon and a number of its tributaries including the Bourne. The designated features are the chalk stream community (water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation), salmon, lamprey and bullhead populations. The European Habitats Directive places an obligation on competent authorities to determine whether licensed activities, either alone or in combination, are having a detrimental effect on the integrity of designated sites (known as the Review of Consents). To inform this process Wessex Water commissioned a number of studies to define the hydrological impact of abstraction on flow within the River Avon SAC and tributaries, to determine whether these river flow changes were affecting the ecology, and to investigate the geomorphological diversity of the watercourses against which to assess their likely sensitivity to reduced flows and to identify opportunities for mitigation.

Many chalk rivers in southern England have been artificially modified by management practices for flood defence, agricultural and fisheries interests in the past, and as a result now exhibit geomorphologically and ecologically degraded river reaches. One of the most favoured options for mitigating against any negative effects of abstraction on the river ecosystem in the future is the targeted restoration of geomorphologically degraded river channels. It is thought that ecological communities inhabiting geomorphologically degraded reaches are more sensitive to the effects of low flows as a result of abstraction. Geomorphological restoration of the river channel will promote the physical and biological functioning of the river reach, increase resilience to the effects of abstraction and protect the designated features of interest of the SAC. That's the theory – but the assumption that geomorphological diversity and patchiness = ecological habitat diversity has rarely been tested at this scale and in this setting.

Geomorphological diversity and patchiness indices are widely used to prioritise river reaches in terms of their restoration needs and to identify appropriate restoration needs. With regard to the River Avon SAC, we asked: to what extent can these indices be used to predict the diversity and patchiness of ecologically functional habitats for the designated features of interest? Establishing these links is fundamental before optimised river restoration can be identified – the success of which will ultimately be judged on ecological criteria alone.

Here we compare the outputs from walkover surveys carried out in parallel by ecologists and geomorphologists on the River Bourne, Hampshire. The similarities and differences in the outputs from the two parallel studies are presented, and the implications for targeting river restoration efforts are discussed. We suggest that a lack of robust monitoring data is the major limitation to testing these assumptions, establishing accurate 'guiding images' before restoration and assessing the actual outcomes of river restoration.

POTENTIAL FOR RESTORATION ON THE HERMITAGE STREAM, HAMPSHIRE

Ilse Steyl and Sally German, Arup, Southampton

The Hermitage Stream in Havant, Hampshire has been heavily modified from the 1950s onwards to accommodate the extensive urbanisation of housing estates after the Second World War. This includes a series of flood alleviation schemes, including initial straightening of the channel course during 1952/1953 and 1961-1967 as part of the Hermitage Stream Major Improvement Works and subsequent straightening, concreting and dropping of bed levels during 1971-1975 under the Hermitage Stream Flood Alleviation Scheme.

During 1999, the Hermitage Stream Rehabilitation Project undertook restoration work on a section of the stream, wherein the channel width was narrowed and coarse gravels were introduced to the bed, allowing for creation of bar features.

During the summer and autumn of 2008, geomorphological surveys, River Habitat Surveys and invertebrate surveys were undertaken on the Hermitage Stream and its tributaries to update the baseline information from 1999 and assess the potential for restoration work within the catchment.

This presentation will discuss the preliminary results.

UPPER GADE RESTORATION OPTIONS APPRAISAL

Judy England (Environment Agency) & Di Hammond (formerly Entec, now River Restoration Centre)

The Environment Agency's Restoring Sustainable Abstraction Programme (RSAP) had identified the River Gade as suffering from over-abstraction. Options appraisal for river restoration was carried out to identify appropriate works which would improve the functioning of the river at times of low flows and ensure sustainable management of the river.

The options appraisal methodology includes GeoRHS surveys (River Habitat Surveys with an enhanced geomorphological component), detailed topographic surveys of the river, comparison of natural and gauged flows, hydraulic modelling of the discharge pipe and diversion weir, and a cost-benefit assessment.

Eight options were identified and associated costs identified. The overall recommendation was for the removal of a number of weirs and the re-profiling of the river through Gadebridge Park, but with the proviso that flow restoration should also be carried out. In addition, habitat improvements were recommended resulting from the GeoRHS surveys. The results of the study are discussed in the context of the local ecology and the potential for recovery.

15 YEARS OF EXPERIENCE – WHAT HAVE WE LEARNT AND HOW HAS PRACTICE CHANGED?

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River restoration practice is a relatively new discipline within the UK. The number of projects undertaken has increased significantly following the demonstration projects on the River Cole (near Swindon, Wiltshire) and the River Skerne (Darlington) as a part of the River Restoration Project (early form of the RRC). These two projects were installed in late 1995 and demonstrated a wide variety of different techniques ranging from planform restoration, channel narrowing, willow spiling (for bank protection), construction of backwaters and riffle installation. These schemes were subject to detailed monitoring of their outcomes to assess their overall success.

Over the next 14 years restoration practice has significantly evolved. While the undertaking of monitoring and appraisals has yet to become commonplace there has been increased evidence that restoration projects have had significant success at improving overall habitat quality. Over the last decade the approaches undertaken in the restoration of rivers have also changed. Early schemes often remained cautious. Concerns about how a river would adjust following completion often meant that some degree of bank protection was undertaken to ensure that the channel remained in a relatively fixed location. While these projects had significant ecological benefits for the surrounding habitat the rivers remained unable to fully adjust to the hydrological and geomorphological conditions within the catchment.

Recent practice has seen a move towards the restoration of a fully naturalised river system within projects. The absence of any restrictions to adjustment is now frequently becoming one of the main objectives in such schemes. To undertake this approach it is necessary to acknowledge that there is an element of uncertainty in how a river will respond to such conditions. Allowance for this uncertainty is thus a key requirement and making space for a river to adjust is a priority. This paper seeks to illustrate how river restoration practice has evolved over time using a number of different case studies. The future for such practice is bright with strategic restoration plans such as the London Rivers Action Plan now becoming a significant driver for change. However, there still remains a need for continued monitoring and appraisals to ensure that further evidence of the benefits of such approaches are obtained and lessons learnt from such projects can be disseminated.

THE LONDON RIVERS ACTION PLAN

Dave Webb (Environment Agency) and Rob Oates (Thames Rivers Restoration Trust)

Introduction

Excluding the tidal Thames there are over 600 km of river within London, of which approximately 400km are heavily modified. Within the Mayor's London (development) Plan and the London Biodiversity Action Plan there is a target to restore 15km by 2015, which represents a doubling of the existing rate of delivery. The delivery of restoration across London is through numerous programmes with varying objectives, therefore it was essential for partners get a clear view on what, where and how this restoration would be delivered.

The London Rivers Action Plan (LRAP) enables this by engaging a wide range of partners and identifying the range of benefits delivered by schemes and linking river restoration to spatial planning, through the Regional Spatial Strategy and Local Development Framework process.

Development of the Plan

The link between river restoration and spatial planning was established with the production of the South London River Restoration Strategy (2002) and North London River Restoration Strategy (2006), which described the range of social, economic and environmental benefits that could be gained from restoration. In 2007, work began on the development of a London-wide tool which would align of restoration opportunities with five key aspirations: improve flood management using more natural processes; reduce the likely negative impacts of climate change; reconnect people to the natural environment through urban regeneration; gain better access for recreation and improved well being; and enhance habitats for wildlife.

The plan was developed through a partnership between the EA, NE, GLA, LWT, WWF and Thames Rivers Restoration Trust (TRRT). Key to the project was the River Restoration Centre, both as the data manager and as a facilitator for the partnership.

The plan is in two parts. One part advises on the development of river restoration projects, to encourage developers, community groups and others to take action. The second part takes the form of an updatable web site managed by the RRC. This documents completed projects, those in development and aspirations. It forms a searchable database for anyone interested in projects in the London area. The directory of sites also enables the links between project outcomes and policy aspirations to be established.

Key to the success of the plan is the continual input into and updating of the directory, and engagement with local groups. The launch of the plan has already stimulated debate on new projects and how we can integrate existing and emerging strategies. A first fruit of the new plan is likely to be a new 'Vision for the Wandle' coordinated by the Wandle River Trust. This vision will set out the first proposal for restoring a whole river in the capital. The LRAP partners will be helping to produce this Vision and to promote it as a model for catchment-scale restoration in urban areas.

See the RRC website for the plan and the database of sites – http://www.therrc.co.uk/lrap.php

RIVER RESTORATION – ENTERING A PHASE OF BOOM AND BUST?

Will Bond, AlaskA Environmental Contracting Ltd, Dorset

River Restoration is becoming more familiar and ambitious and more resources are being made available. The credit crunch will slow growth a bit, and as an industry its capability is unlikely to grow much in the immediate future. However, in 2012 the implementation phase of the Water Framework Directive will pick up, with only three years to 2015 to complete the first works. Demand for skilled designers, managers and contractors will boom; but where will they come from?

Drawing on experience and demonstrating with examples from another specialist ecological operation (habitat translocation) and its parallels with river restoration, the author highlights the risk of boom and bust for the river restoration industry.

The purpose of the paper is to stimulate debate about how growth could be managed to reduce the risks of excessive expansion: it includes commentary about why simply 'leaving it to the market' is not the best way forward, and makes some suggestions about what might be done between now and 2012 to encourage a more sustainable and better quality development.

SITE VISITS

FRIDAY 3RD APRIL

Sence Valley Forest Park

This section of the Sence Valley formed part of a large opencast mining area covering around 460 acres. Leicester County Council were given 150 acres to create a forest park, and the park was opened as part of the National Forest in 1998. As part of the restoration work the River Sence, which had been diverted around the mine, was reinstated to its original position. The new channel was largely constructed without bank reinforcement, although there are a few small sections where stones have been used for support. This has been successful, and there have been no major problems with erosion or collapse. The channel has naturally moved since its creation, with areas of erosion and deposition and the formation of berms and meanders. There are some interesting conflicts between farming, recreation and ecology at this site, as well as insights into how the work would have been done differently today with the benefit of hindsight and experience.

Attenborough Nature Reserve

Established in 1966, the Attenborough Nature Reserve is a 145 hectare complex of flooded gravel pits and islands alongside the River Trent. It is designated as a SSSI and is managed by Nottinghamshire Wildlife Trust in partnership with the owners, CEMEX, with support from Broxtowe Borough Council. Most of the soil has now been returned to the water-filled pits creating an intricate patchwork of lakes and islands providing valuable habitat for many important species. In addition, the site is part of the Nottingham Trent Left Bank Flood Alleviation Scheme. This scheme will result in the loss of approximately 1.7 ha of the SSSI, and to mitigate against this a series of environmental compensation works will be undertaken, such as infilling pond margins to create reed beds and wet woodland, re-profiling islands in the lakes, and clearing vegetation. It is also planned to divert the River Erewash back into the Trent to protect the SSSI from the poor water quality (phosphates and nitrates) of the Erewash. The Erewash is currently diverted to discharge into the Attenborough lakes, but will be restored back to its original course into the Trent over Winter 2008/2009.

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Date for your diaries:

THE RIVER RESTORATION CENTRE

Working to restore & enhance our rivers

RRC Annual Network Conference

14th – 15th April 2010

Possible site visit on 16th April 2010

University of York, England

Site visit attendance list – Day Brook Water Meadow Project

Name		Organisation
Mohamed	Abidin	Department of Irrigation and Drainage Malaysia
Susan	Chambers	Environment Agency
Andrew	Crawford	Environment Agency
Katy	Dickson	Environment Agency
George	Ganda	Environment Agency
Neil	Ireland	London Wildlife Trust
Kye	Jerrom	Environment Agency
Ros	Kaye	Environment Agency
Oliver	Lowe	Environment Agency
Laura	Parkhill	NIEA
Ian	Rees	Lincolnshire Chalk Streams Project
Victor	Richardson	Thames 21
Robert	Riddington	Peter Brett Associates
John	Robinthwaite	JPR Environmental
Katharine	Seager	Environment Agency
Miskon	Seliman	Department of Irrigation and Drainage Malaysia
Mary	Toland	NIEA
Amanda	Turner	Heritage Lottery Fund
Julie	Wozniczka	RRC

Site visit attendance list – Sence Valley Park and Attenborough Nature Reserve

Name		Organisation
Ulrika	Aberg	Leeds University
Mohamed	Abidin	Department of Irrigation and Drainage Malaysia
Cesar	Alcacer	Capita Symonds
Lenka	Anstead	University of East Anglia
Ben	Bailey	Environment Agency
Will	Bond	Alaska
Ian	Brown	RRC Staff
Matt	Buck	Environment Agency
Donal	Cassidy	Loughs Agency
Ruth	Clarricoates	Wiltshire Wildlife Trust
Gareth	Codd	RRC Staff
Andrew	Crawford	Environment Agency
Judith	Crompton	Environment Agency
Bella	Davies	Wandle Trust
Karen	Fisher	RRC Board
Allan	Frake	Environment Agency
Alison	Graham Smith	Natural England
Di	Hammond	RRC Staff

Joanna	Heisse	Environment Agency
Andy	Hill	Alaska
Kathy	Hughes	Environment Agency
Elizabeth	Iles	Environment Agency
Emil	Janak	North-Transdanubian District Environment & Water Directorate
Martin	Janes	RRC Staff
Helena	Kralova	Brno University of Technology
Jitka	Mala	Brno University of Technology
Jenny	Mant	RRC Staff
Sandie	Moors	Environment Agency
Damian	O'Malley	Loughs Agency
Abi	Pryce	RRC Staff
Petra	Repnik	Institute for Water of the Republic of Slovenia
Victor	Richardson	Thames 21
Archie	Ruggles-Brise	Association of Rivers Trust
Katharine	Seager	Environment Agency
Miskon	Seliman	Department of Irrigation and Drainage Malaysia
Kevin	Skinner	RRC Board
Colin	Thorne	Nottingham University
Ildiko	Toth	North-Transdanubian District Environment & Water Directorate
Alice	Wilson	Environment Agency
Paul	Winfield	Royal Haskoning
Julie	Wozniczka	RRC

the RIVER RESTORATION CENTRE (RRC)

PROJECTS DATABASE

The River Restoration Centre is dedicated to sharing information and experiences relating to river restoration and river management. There is a great deal to be gained from imparting to others information on your activities and experiences in this field. One way to do this is to help RRC collate a detailed database of information on projects relating to river and floodplain restoration and enhancement. To do this the Centre needs some basic information about your project work.

Project information is then entered in the RRC 'projects' database, while contact details are stored in the RRC 'contacts' database. This information can then be used in a number of ways:

- to promote project work widely within the UK
- to use as examples given out to enquiries received by the centre
- to put practitioners of river restoration in touch with other practitioners
- to analyse trends in river restoration and enhancement

Please complete the summary form below and the project details/background forms that follow.

THE RRC 'PROJECTS' DATABASE CURRENTLY EXCEEDS 1000 PROJECTS.
THIS INFORMATION IS FOR YOUR USE AS WELL AS OURS.

Return forms to: Gareth Codd, *the* River Restoration Centre, Building 53, Cranfield University, CRANFIELD, BEDFORD, MK43 0AL Tel/fax: 01234 752979 Email: rrc@theRRC.co.uk

PROJECT DETAILS

SUMMARY OF PROJECT

Project name……..6 Figure Grid Reference and sheet number …….…….
Catchment River...…… ……Site county ……...….
Watercourse ……..Site country…….
Section length (m)……..……Agency region……..
Start of project (*month/year*)……...……End of project (*month/year*)……..…….
Location……..……...
……..……
……
……
……..……
Site background……..……...
……..……
……..……
……
……
……
……
Project objectives and methods……
……..……
……
……
……
……
……

Main Focus/Driver

- ❑ Bank erosion
- ❑ Community Demand
- ❑ Development gain
- ❑ Fisheries
- ❑ Flood Defence
- ❑ Habitat
- ❑ Landscape
- ❑ Navigation
- ❑ Pollution mitigation
- ❑ Opportunistic
- ❑ Other……
  ……

Project Status

- ❑ Proposed
- ❑ Detail design stage
- ❑ In-construction
- ❑ Completed (no monitoring)
- ❑ Completed (monitoring/appraisal)

MAIN CONTACT (full details)

Name……Job title……...
Address……
……
…… Post code……
www links http://……email……

PROJECT TEAM

	Name/ Organisation	Telephone number
Hydrologist……		
Geomorphologist……		
Ecologist……		
Landscape architect……		
Design engineer……		
Works contractor……		
Flood defence……		
Conservation……		
Fisheries……		
Water quality……		
Community liaison……		
Other……		

PROJECT COMMENTS AND DOCUMENTATION

Success and lessons learned……..
……
……
……
……

Documentation held

- ❑ Stated objectives
- ❑ Job specification
- ❑ Technical Specifications
- ❑ Contract documents
- ❑ Audits
- ❑ RHS/RCS
- ❑ Fisheries survey
- ❑ Monitoring reports
- ❑ Photographs Pre works
- ❑ Photographs Post works

Other documents……..
……
……
……
Journal citation ?…… ……
……
……
……

PROJECT FEATURES

1. Identify which of the **5** generic **TYPES** was the **Primary** focus by ticking just one of the **grey** boxes.
2. If the other **4** generic **TYPES** were of **Secondary** or **Minor** (incidental) consideration please tick accordingly.
3. Next go through each section and tick the boxes where applicable (primary, secondary, minor).

NB You should not normally have more than **3 ticks** in the **Primary** column for each section.

		Primary	Secondary	Minor
Type 1	**Rehabilitation of watercourse features**			
1.1	Reach re-meandered (>500m)			
1.2	Reach re-meandered (<500m)			
1.3	Culverted reach re-opened (state approximate length)			
1.4	X-sectional habitat enhancement (>500m) – two–stage channel profiles etc			
1.5	Long section habitat enhancement (>500m) – pool/riffle sequences etc. restored			
1.6	River narrowing due to depleted flows or previous over-widening			
1.7	Backwaters and pools established/reconnected with watercourse			
1.8	Bank re-profiling to restore lost habitat type and structure/armouring removed			
1.9	Boulder etc. imported for habitat enhancement			
1.10	Gravel and other sediments imported/managed for habitat enhancement			
1.11	Fish cover established by other means			
1.12	Current deflectors/concentrators to create habitat and flow diversity			
1.13	Sand, gravel and other sediment traps to benefit wildlife			
1.14	Tree/shrub planting along bankside (only if covers >500m of bank or >0.5ha)			
1.15	Artificial bed/bank removal and replaced by softer material (>100m)			
1.16	Establishment of vegetation for structure/revetment (e.g. use of willows)			
1.17	Eradication of alien species			
1.18	Provision of habitat especially for individual species – otter, kingfisher etc			
1.19	Fencing along river banks; fencing floodplain habitats for management			
1.20	Aquatic/marginal planting			
1.21	Removal of floodbanks			
1.22	Other (please specify)			
Type 2	**Restoration of free passage between reaches**			
2.1	Obstructing structure replaced by riffle			
2.2	Obstructing structure replaced by meander			
2.3	Obstructing structure modified/removed to enable fish migration			
2.4	Obstructing structure retained, but riffle/meander structure established alongside			
2.5	Culverted reach re-opened/daylightened			
2.6	Obstruction within culvert (e.g. lack of depth, vertical fall) redresses			
2.7	Dried river reach has flow restored			
2.8	Other measures taken to restore free animal passage			
2.9	Other (please specify)			
Type 3	**River floodplain restoration**			
	Water table levels raised or increased flooding achieved by			
3.1	**Unspecified means/rationalised control*			
3.2	**Watercourse re-meandering*			
3.3	**Raised river bed level*			
3.4	**Weirs established specifically to increase floodplain flooding/water-table*			
3.5	**Termination of field drains to watercourse*			
3.6	**Feeding floodplain with water (Sluice feeds, water meadow restoration)*			
3.7	**Narrowing watercourse specifically to increase floodplain wetting*			
3.8	Lakes, ponds, wetlands established (maybe flood storage areas)			
3.9	Lakes, ponds, wetlands, old river channels restored/revitalised)			
3.10	Vegetation management in floodplain			
3.11	Riparian zone removed from cultivation			
3.12	Substantial floodplain tree/shrub planting			
3.13	Other (please specify)			
Type 4	**Catchment Activities**			
	State key activities implemented ……..…….. ……*continue on separate sheet*			
Type 5	**River Management**			
	❑ Maintenance changed	❑ Equipment changed	❑ Maintenance withdrawn (natural regeneration)	

BACKGROUND INFORMATION

SITE INFORMATION (PRE-PROJECT)

Floodplain soils (*tick all that apply)*

- ❑ Alluvium
- ❑ Clay
- ❑ Chalk
- ❑ Peat
- ❑ Cobbled
- ❑ Sand
- ❑ Gravel
- ❑ Loam
- ❑ Tipped material
- ❑ Artificial

River type

- ❑ Cobble bed
- ❑ Gravel bed
- ❑ Lowland clay
- ❑ Chalk stream
- ❑ Sand bed
- ❑ Tidal

Altitude

- ❑ High altitude
- ❑ Mid altitude
- ❑ Lowland

River substrate (*tick all that apply*)

- ❑ Clay
- ❑ Sand
- ❑ Gravel
- ❑ Silt
- ❑ Cobble
- ❑ Boulder
- ❑ Bedrock
- ❑ Artificial

Flow type

- ❑ Steady
- ❑ Regulated steady
- ❑ Flashy
- ❑ Regulated flashy
- ❑ Ephemeral

Was water quality a constraint?

- ❑ Yes *If yes, please provide details*…….
- ❑ No ……

River bed gradient……..……

CATCHMENT INFORMATION (OUTLINE)

Catchment type

- ❑ Urban (housing)
- ❑ Urban (industrial)
- ❑ Urban (parkland)
- ❑ Rural (arable)
- ❑ Rural (pasture)
- ❑ Rural (forestry)
- ❑ Mixed (urban and rural)

Catchment geology

- ❑ Calcareous (chalk)
- ❑ Siliceous (igneous and sand)
- ❑ Organic (peat)

data (cumecs)

Normal low flow……..……
Bankfull flow……...……
1:100 event flow……...……

PROJECT FUNDS AND SOURCE

Total cost (£) ……

Percentage breakdown of total cost:

%Promotion/Design/Planning/Consultation…….
%Works Contact/supervision…….
%Monitoring/Post Appraisal……..

Primary Funding Organisation……...£ ……
Other Funding Organisation (s)……£……..
Other Partners…….…….
……..……

Return forms to: Gareth Codd, *the* River Restoration Centre, Building 53, Cranfield University, CRANFIELD, BEDFORD, MK43 0AL Tel/fax: 01234 752979 Email: rrc@theRRC.co.uk

FEEDBACK FORM: RRC Annual Network Conference
Wednesday 1st – Thursday 2nd April 2009
Site visit on Friday 3rd April 2009

University of Nottingham, Nottingham

We would appreciate it if you would spend 5 minutes filling in this form so that we can take suggestions/comments into account when organising next years Annual Conference.

1. What did you expect to learn or gain from the Conference?

2. Have your expectations of the Conference been fulfilled?

If not was it useful anyway?

3. This year there were no workshops to allow more speakers. Next year would you prefer:

- ❑ More workshops
- ❑ More papers
- ❑ No preference

4. Were there any themes or topics that you would like to see presented at future Conferences?

By yourself?

By others?

5. How did you hear about the Conference?

- ❑ RR News (RRC newsletter)
- ❑ Flier sent to me by email/post mailshot
- ❑ Info passed on by my colleagues
- ❑ Other (please state)……

6. Were the venue, facilities and location suitable?

If not, please comment.

How did the service compare to others?

7. How did you travel to the conference?

- ❑ Car
- ❑ Train
- ❑ Bus / Coach
- ❑ Plane
- ❑ Other ……

8. This year we do not have a choice of site visits. Would you be more likely to attend the Friday site visit at next year's conference if you have a choice of visits?

- ❑ Yes
- ❑ No

9. Were the discussion sessions long enough, and frequent enough?

10. Would you be interested in:

A) Details for next year's conference? Yes/No

B) Presenting a paper at next year's conference? Yes/No

11. Any additional comments or suggestions

If you would like to discuss comments further please provide your name and organisation:

Name…….

Organisation…….

Thanks for your time