The RIVER RESTORATION CENTRE'S 9th ANNUAL NETWORK CONFERENCE

Is restoring back the best way forward?

Wednesday 16th April – Thursday 17th April 2008
Plus site visit on Friday 18th April 2008

University of Exeter,
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PROGRAMME

The River Restoration Centre 9th Annual Network Conference 2008
University of Exeter

Day 1: Wednesday 16th April 2008

9.00 – 10.20	REGISTRATION & TEA/COFFEE	

Main Auditorium (Lecture Theatre A)

10.30	**Announcements:** Martin Janes (*River Restoration Centre*)	5 mins
10.35	**Introduction:** Andrew Pepper (*River Restoration Centre Chairman*)	15 mins
10.50	**Keynote Speaker:** Jim Harris (*Cranfield University*). Key concepts in restoration ecology and their implications for river restoration.	25 mins
11.15	**Discussion**	10 mins

Main Auditorium (Lecture Theatre A)

Session 1 How to get it done

CHAIR **Angela Gurnell** (*King's College London*)

11.25	Nigel Holmes (*Alconbury Environmental*). River rehabilitation - getting on with it instead of wasting money on the obvious.	15 mins
11.40	Simon Johnson (*Wild Trout Trust*). A Cinderella river: The river Glaven conservation group (RGCG) / Wild Trout Trust (WTT) in-river habitat improvement project.	15 mins
11.55	**Discussion**	10mins
12.05	Ed Matthiesen (*P.E Wenck Associates*) & Peter MacDonagh (*RLA, Kestrel Design Group*). Pike Creek: Lost and Found, A Creek with No Name.	15 mins
12.20	Gemma O'Connor (*Halcrow Group Ltd*), Richard Vivash (*Riverscapes*), Carolita Wilson (*Environment Agency*). Bed lowering in Boscastle.	15 mins
12:35	**Discussion**	10 mins
12.45	LUNCH	1 hr 10 m

Session 2 commences at 14:05 (parallel sessions – see next page of programme)

Please allow sufficient time to get to your chosen session

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

Session 2	**A – Hydromorphology**	**B – Benefits through restoration**	
	Main Auditorium (Lecture Theatre A)	**Second Auditorium (Lecture Theatre E)**	
CHAIR	**Mervyn Bramley** *(Independent Consultant/RRC Board Member)*	**Jo Shanahan** (*Atkins*)	
14.05	Natalie Phillips (*Environment Agency*) and Andrew Brookes (*Jacobs*). Managing hydromorphological pressures in rivers: is current practice adequate?	Emma Westling (*University of Sheffield*). Opportunities and constraints when using secondary data to analyse socio-economic impacts of water management: a focus on river restoration.	15 mins
14.20	Richard Jeffries (*SEPA*). The shape of things to come: planning the future of morphology restoration.	Trevor Turpin (*Nicholas Pearson Associates*). River Marden, Calne: A successful urban River Restoration with Positive Social benefits.	15 mins
14.35	Kieran Conlan (*Cascade Consulting*), Colin Thorne, Nick Clifford, Steve Dangerfield, Gary Priestnall (*University of Nottingham*), Tom Coulthard (*Hull University*), Steve Dunthorne (*Jacobs*), Jenny Mant (*River Restoration Centre*), Nick Reynard (*CEH Wallingford*), Philip Soar (*Jeremy Benn and Associates*). Restoration design for re-routed watercourses.	Fiona Bowles (*Wessex Water*). Reviewing the cost benefit of River Restoration against restoring flows to achieve favourable conservation status on the River Avon.	15 mins
14.50	**Discussion**	**Discussion**	15 mins
Session 3 15.05	POSTERS & TEA/COFFEE (Peter Chalk Centre, Hall 2) Please refer to pages 19 - 22		40 mins

Session 4 commences at 15:55
Please allow sufficient time to get to your chosen session

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

Session 4	**A – Project case studies** **Main Auditorium (Lecture Theatre A)**	**B – Farming floodplains** **Second Auditorium (Lecture Theatre E)**	
CHAIR	**Allan Frake** *(Environment Agency)*	**Wendy Brooks** *(Environment Agency)*	
15.55	Stuart Hedgecott (*Halcrow Group Ltd*), Karen McHugh (*Environment Agency*), Nikki Hiorns (*Natural England*), John Durnell & Michael Boxall (*Hampshire & Isle of Wight Wildlife Trust*). Restoring the Transitional River Lymington - Painful but Pragmatic Decisions in Water Level Management.	Deidre Murphy (*Environment Agency*). Were changes in land use and management just a passing solution to flood risk management?	15 mins
16.10	Jenny Wheeldon (*Natural England*). Demonstrating strategic management and restoration: STREAM from concept to construction.	Tim Hess & Joe Morris (*Cranfield University*). Joining things up in floodplains - theory and practice.	15 mins
16.25	James Burke (*Environment Agency*). Inter-tidal Habitat Creation Scheme - Environmental Stewardship in practice on the Camel Estuary, Cornwall.	Matt Jones (*Staffordshire Wildlife Trust*). Farming floodplains for the future: Understanding the role of farming in sustainable Flood Risk Management.	15 mins
16.40	**Discussion**	**Discussion**	15 mins
	Return to Main Auditorium (Lecture Theatre A)		10 mins

Session 5 — Delivering the vision

Main Auditorium (Lecture Theatre A)

CHAIR — **Nigel Holmes** *(Alconbury Environmental Consultants)*

17.05	Stuart Greig (*SEPA*) & Joyce Carr (*Scottish Government*). Shaping Scotland's policy landscape to deliver restoration.	15 mins
17.20	Duncan Huggett, Jane Rawson (*Environment Agency*), Oliver Harmar & Jo Cullis (*Halcrow Group Ltd.*). Costing delivery of river restoration: what is practical and affordable?	15 mins
17:35	Carrie Hume (*RSPB*). A Wetland Vision for England – how do rivers fit in?	15 mins
17.50	**Discussion**	15 mins
18.05	**Open Discussion**	20 mins
18.25	**End of Day 1**	

19.30 **CONFERENCE DINNER, HOLLAND RESTAURANT**
19.30 for 19.45

Bar extension until 01.00

PROGRAMME

The River Restoration Centre 9th Annual Network Conference 2008
University of Exeter

Day 2: Thursday 17th April 2008

8.30 – 8.50	REGISTRATION FOR DAY DELEGATES		
Session 6			
9.00	**Announcements**		10 mins
	The good, the bad and the ugly!	**A climate of change**	
	Main Auditorium (Lecture Theatre A)	**Second Auditorium (Lecture Theatre E)**	
CHAIR	**Andrew Pepper** *(ATPEC River Engineering /RRC Chairman)*	**Mark Everard** *(Environment Agency)*	
9.10	Rob Oates (*Thames Rivers Restoration Trust*). A personal vision for the Thames river basin.	Andrew Brookes, Sally Kelday & Duncan Wishart (*Jacobs*). River channel management and climate change: some potential impacts and mitigation strategies.	15 mins
9.25	Stuart Downward (*Kingston University*) & Matt Graham (*Environment Agency*). Defining best-practice geomorphological design guidance for urban river restoration: PPA lessons from London rivers.	Robin Chase (*Cain Bio-Engineering*) & Alastair Morriss (*Edenvale Young*). A practitioners approach to producing robust and sustainable river restoration projects by incorporating climate change within the design method.	15 mins
9.40	Rebecca Wade & Andrew McMullan (*Abertay Dundee*), Lian Scholes & Abiodun Adeyemi (*Middlesex University*), Geraldene Wharton (*QMUL*) & Jenny Mant (*River Restoration Centre*). Restoring forward – An interdisciplinary story of rags-to-restoration on the River Brent.	Dave Webb (*Environment Agency*). The Development of The London River Restoration Action Plan: Addressing Climate Change Pressure and Engaging with Communities.	15 mins
9.55	**Discussion**	**Discussion**	15 mins
10.10	TEA & COFFEE		30 mins
(10:20)	Goosemoor RSPB Site Visit – Please be on the coach for **10:20** (a bottle of water will be provided)		(2.20hrs)
10.40	Move to Workshops		
10:45	Workshops (*see pages 38-41 for further details*)		1hr 55 m
12.40	LUNCH (Peter Chalk Centre, Hall 2)		1hr 10 m

Session 7 commences at 14:00 (parallel sessions – see next page of programme)

Please allow sufficient time to get to your chosen session

Day 2 - PARALLEL SESSION PROGRAMME

Session 7	Further afield	Taking a catchment view	The learning process; how monitoring helps	
	Main Auditorium (Lecture Theatre A)	**Second Auditorium (Lecture Theatre E)**	**Third Auditorium (Lecture Theatre C)**	
CHAIR	**Martin Janes** *(RRC)*	**Jenny Mant** *(RRC)*	**Andrew Gill** *(Cranfield University/RRC Board Member)*	
14:00	Uta Grünert, Leszinski, Frank Fredrich & Jörg Gelbrecht (*Leibniz-Institute of Freshwater Ecology and Inland Fisheries*). Colonisation of macrophytes, invertebrates and fish in a dredged and reconnected oxbow lake – a project appraisal.	Sally German (*Arup*), David Lerner (*Sheffield University*), Jacqueline Bernet, Irantzu Lexartza, Emma Westling and Anna Ritchie (*Sheffield University*). Integrating geomorphological, ecological and socio-economic elements of the River Don Catchment to develop a framework for river catchment management.	Kevin Skinner (*Jacobs*) & Judy England (*Environment Agency*). Integrative monitoring and the setting of objectives – the key to project success.	15 mins
14.15	Heleen Vreugdenhil (*Delft University of Technology*). The role of pilot projects in creating synergy between nature and flood defence in river management.	Jo Cullis, Richard Ashby-Crane & Oliver Clegg (*Halcrow Group Ltd*). River restoration drivers and benefits – Are we getting what we want?	Ian Griffin (*Wildfowl and Wetlands Trust Consulting*). Monitoring and appraisal of the River Nith Diversion, 2000-2007- A case study.	15 mins
14.30	Ed Matthiesen (*P.E Wenck Associates*) & Peter MacDonagh (*RLA, Kestrel Design Group*). Hardwood Creek: Hey, Where Did My Floodplain Go?	Joanna Eyquem (*Royal Haskoning*), Judith Crompton (*Environment Agency*), Helen Dangerfield & Nicola White (*Royal Haskoning*). River Avon and Frome SSSIs – Application of a prioritisation process to plan and implement local actions, which deliver catchment-scale enhancement; a review of delivery to date.	Karen White (*Atkins*) & Jo Sayers (*Wiltshire Wildlife Trust*). Restoration of the River Ray: Lessons Learned and Measuring for Success.	15 mins
14.45	**Discussion**	**Discussion**	**Discussion**	20 mins
15.05	**Interval (Return feedback forms)**			15 mins

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

Session 8 — Time for reflection

Main Auditorium (Lecture Theatre A)

CHAIR **Jim Harris** *(Cranfield University)*

15.20	Peter Worrall, Andy Keen & Gene Hammond (*Penny Anderson Associates*). Restoring the Upper Catchment Functions of Rivers: the SCaMP Experience.	15 mins
15.35	Angela Gurnell (*King's College London*). Vegetation Dynamics and River Restoration: Project Experience and Climate Change Implications.	15 mins
15.50	Jenny Mant & Martin Janes (*River Restoration Centre*). River Restoration in a global context.	15 mins
16.05	**Discussion and closing remarks**	25 mins
16.30	********* End of Conference ******** TEA & COFFEE	30 mins

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

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

Delegates staying for the site visit have the evening free to explore Exeter.

KEY CONCEPTS IN RESTORATION ECOLOGY AND THEIR IMPLICATIONS FOR RIVER RESTORATION

Professor Jim Harris, Chair in Environmental Technology, Department of Natural Resources, School Of Applied Sciences, Building 37, Cranfield University, Cranfield, Bedfordshire, MK43 0AL

The field of restoration ecology has been characterised by its blend of science, policy and practice. Although there continues to be lively debate about such topics as "goals, targets, and reference systems", the need for useful metrics and the likely impacts of climate change, there is some consensus emerging as to those features we might expect to find in a restored ecosystem. These are set out in the Society for Ecological Restoration International's "Primer on Ecological Restoration" in the form of the "nine attributes" of a restored ecosystem. In summary these attributes include the views that in a restored system:

1. Characteristic assemblages of species that occur in the reference ecosystems should be included.
2. Species used should be indigenous wherever possible.
3. All functional groups necessary for continued developed/stability are represented.
4. The abiotic environment provides ecosystem characteristics able to sustain species populations.
5. Ecosystem functions naturally and dysfunctional signs are absent.
6. Restoration in one area integrates into the larger ecological matrix.
7. Threats to future health of the restored site are reduced or eliminated.
8. The ecosystem is sufficiently resilient to survive periods of stress and disturbance.
9. The system is self-sustaining in line with any reference conditions although it must be recognised that an ecosystem may evolve as environmental conditions change.

These attributes will be discussed in the context of current theory, how useful they might be in providing meaningful and measurable characteristics for use in guiding restoration projects, issues around climate change, and in particular what implications they might have for river restoration.

RIVER REHABILTATION - GETTING ON WITH IT INSTEAD OF WASTING MONEY ON THE OBVIOUS

Nigel T H Holmes, (Alconbury Environmental), The Almonds, 57 Ramsey Road, WARBOYS, Cambs, PE28 2RW.

The presentation will draw on a number of examples where rehabilitation has been undertaken following the minimal amount of pre-implementation costs. The prime aim is to highlight that all rehabilitation work in non-contentious areas (e.g. landowner support; absolutely no flood risk to properties; severe degradation where no extant ecological, historical, landscape etc. interests remain) does not require huge investment in topographical surveys, flood models and pre-scheme biological monitoring to prove the b' obvious and leave no money or time left to get on with the work itself.

This is **not** to say that all the above, and much more, don't have their place. For example unless it is impossible to logically outline why there will be no additional flood risk, or how the natural processes will act to create and sustain your creation, then pre-implementation investigations will be essential. All rehabilitation should not be supported by pre- and post- ecological monitoring either!! Are you totally mad I hear some say – well yes, but it is better to have more money than is now spent on monitoring being spent in the future on say only 10% of rehabilitation projects. Monitoring it in far greater detail and for far longer so that we collect really good data from the hard work needed to do this element of rehabilitation. Only then will we get a better idea of the biotic responses to the physical dimension of change. But remember, take really extensive, well catalogued, and frequently taken digital photos to show before, during and after from many angles and perspectives.

The presentation will illustrate some key elements of how the 'commonsense approach' works through several examples, but most specifically through simple, but 'life changing!!', works on a chalk stream (Darent; Kent) and a small flashy stream (Dockens Water; New Forest). Some key aspects include:

- Having an obvious and non-contentious situation with opportunities and no/minimal risks
- Being able to recognise it
- Being able to convey the opportunities and lack of risks simply
- Achieving consensus support from owners, occupiers, interest groups and organisations with 'responsibilities'
- Getting multi-function support from within EA (i.e. in England & Wales as examples there, but principle applies to other agencies with multi-functional roles in river management)
- Specifically having open-minded and helpful development control/flood defence personnel
- Clear proposals and designs that are 'not set in concrete' – support for 'adjustments' on the ground in reaction to hydromorphic responses
- Fantastic contractors
- Proper supervision of works.

A CINDERELLA RIVER: THE RIVER GLAVEN CONSERVATION GROUP (RGCG) / WILD TROUT TRUST (WTT) IN-RIVER HABITAT IMPROVEMENT PROJECT

Simon Johnson, Director, Wild Trout Trust.

The River Glaven is a small chalk stream in north Norfolk. The river flows for some 17km, first in a south-westerly direction, then turning to the north before finally entering the sea at the tidal sluice at Cley. The RGCG undertook a river restoration project upstream of Letheringsett Ford, between TG 060383 and TG 057376. Most of the practical work took place in October 2006, but there was a spread of tasks through to August 2007.

The project had a long gestation period. Proposals were developed through a Wild Trout Trust advisory visit by Simon Johnson in September 2003. The finance required to make it happen was granted in May 2006 through the newly formed Cinderella Chalk Rivers Project (CCRP). The CCRP is a joint project undertaken primarily with the Wild Trout Trust and the Environment Agency. The Wild Trout Trust helped initiate the project and provided technical support, with generous funding through the CCRP, which aims to initiate partnerships to improve the conservation status of lesser known chalk rivers.

This paper sets out the main steps as the concept, preparation work and the implementation. It also includes an overview of the proposed improvements, and the thinking behind these. The part on implementation sets out in some detail how the work was done: logistics and materials; construction work for riffles, river narrowing, mid stream islands, large woody debris deflectors and bank spoil removal and protection; project costs and control; and the follow-through.

This was the first major project to be undertaken by the RGCG. To finish, the paper highlights key points to consider in the planning and implementation a river restoration project. It is hoped that other community conservation groups in a similar situation might find these experiences useful when planning and delivering river habitat projects.

PIKE CREEK: LOST AND FOUND, A CREEK WITH NO NAME

Ed Matthiesen, P.E Wenck Associates, Inc. Maple Plain, Minnesota.
Peter MacDonagh, RLA, Kestrel Design Group, Edina, Minnesota.

Pike Creek is an urban stream in the upper basin of the Mississippi River in the western suburbs of Minneapolis, Minnesota. The stream experiences intensely flashy flows, resulting in severe erosion and bank loss. In 2003 a multi-jurisdictional project reconstructed the stream using bioengineering practices to restore a more natural form and function. This highly successful project has turned a previously unnamed eyesore into a neighbourhood amenity with a new name - Pike Creek. The story of the restoration of Pike Creek is a case study illustrating how an urban channel can both convey stormwater while maintaining its biotic integrity.

The 1,900-foot channel conveys stormwater runoff from a fully developed watershed through residential back yards to Pike Lake. In 1995, city and citizen complaints noted bank loss of up to 0.5 feet per year, resulting in loss of back yard property and in some cases potential for structural damage to homes. The degraded, deeply shaded woods were populated with native and non-native trees that due to fire suppression had stem densities of more than 200 per acre. 1853 public land survey notes indicated a sparsely treed oak savannah with stem densities of 3 to 5 per acre. Sediment loss and deposition resulted in severe habitat degradation in the creek, and degradation of downstream water quality in Pike Lake.

In response to past citizen complaints, early stabilization attempts used gabion baskets and plastic sheet pile to limit bank loss. Both of these methods saw the channel bypass the structures with additional channel loss and sediment accumulation. By 2002 the cities through which the creek flowed and residents were demanding a permanent solution that addressed the channel erosion while being aesthetically pleasing.

The project involved the removal of 480 trees to open up the channel corridor to re-vegetation and to allow bioengineering practices to be used to naturally stabilize the banks. In the newly cleared corridor, oak groves and eyebrow wetlands were planted in the upland and flood fringe, and willow and dogwood live stakes stabilized the banks. A low-flow meandering channel was constructed in a newly re-established floodplain, and a new riffle-pool step system provided grade control and habitat enhancements.

The extensive tree removals now allow sunlight to penetrate to the ground, allowing shrubs and grasses to recreate the pre-settlement landscape. Root wads from some of the removed trees were installed in the banks to provide refugia. Rock vanes maintain a low flow channel and pools for habitat during low flow periods. Post project inspections for macroinvertebrates have shown significant numbers of ephemeroptera, plecoptera and tricoperta species inhabiting the rock substrate.

BED LOWERING IN BOSCASTLE

Gemma O'Connor, Environmental Scientist, Halcrow.
Richard Vivash, Director, Riverscapes (Advisor to the River Restoration Centre).
Carolita Wilson, Team Leader (SW) National Environment Assessment Service, Environment Agency.

In August 2004 a devastating flood hit Boscastle, North Cornwall, calling for a rapid response to protect this former fishing village and trading port from future disasters. The Environment Agency commissioned Halcrow to design a flood risk management scheme for the River Valency. The Valency incises a steeply wooded valley where it has been largely unmodified; it then enters the village and harbour and discharges out to sea. The lower reaches of the Valency have been historically straightened and are set within a high quality built environment designated as a Conservation Area and Historic Settlement. The Valency valley and rugged coastline is designated as an Area of Outstanding Natural Beauty. Against this setting severe restrictions were imposed on the design of the flood risk management scheme.

The scheme is designed to give the river more space, particularly in areas where sediment and debris deposition during a flood event is likely. Efforts were made to avoid the use of intrusive forms of flood defence, such as walls and embankments. Instead, a number of measures were taken to modify the landform in a sympathetic manner. This included the lowering of the riverbed (the subject of this paper), and a system of sediment management systems, to encourage deposition upstream of the village and increase conveyance throughout the village. A key feature of the bed lowering was to achieve a better 'fit' between the natural longitudinal profile of the valley and the gradient of the river bed. Much of the lowering involved the removal of high spots above the mean gradient of 1 in 50.

One of the main challenges for the team was lowering the slate river bed by a depth of 1m over a length of 300m. This reach is thought to be constructed in the late 17th Century, and is now a prominent historical and landscape feature of the village. This paper focuses on the integrated approach by the Environment Agency, River Restoration Centre, Halcrow, National Trust and Carillion to design and excavate the river bed.

With an understanding of the unlimited supply of sediment and debris from the valley, the team's objectives for bed lowering were to balance the conveyance required to meet flood risk management criteria with:

- a requirement for pools, weirs and embayments for migrating salmonids;
- a low flow channel for visual amenity; and
- ledges to protect the historic walling and Grade II Listed buildings perched on either side of the river bed.

These features are carved out of the slate following the natural bedding planes and fracture lines.

Site Supervision by the River Restoration Centre was essential to the success of the excavation process and involved using pools, weirs, ledges and low flow channels found naturally occurring in the river as 'visual templates' to guide the Contractor. The form of the new channel was shaped to mimic erosion patterns found within the existing River Valency valley. This avoided a deep and geometrically engineered channel and improved the flat and unvarying appearance of the existing man made channel.

The bed lowering is currently underway and is scheduled for completion in April 2008.

MANAGING HYDROMORPHOLOGICAL PRESSURES IN RIVERS: IS CURRENT PRACTICE ADEQUATE?

Natalie Phillips, Environment Agency, Midlands Region.
Andrew Brookes, Jacobs

In order to answer this question we will initially look at current practice in terms of river restoration schemes in England and Wales, discussing the various methods and techniques employed to monitor, survey and analyse morphological variables in rivers. We will then draw upon international experiences in restoration schemes to maximise the opportunity for lessons learned.

It is in this context that we aim to investigate whether current practice can provide the evidence necessary for evaluating success in terms of the WFD requirements to meet good ecological status or potential. Conversely, where the requirements of the WFD are not met, it is crucial to distinguish between the failure of a measure to ameliorate the desired pressure and cases where the identified pressure is not the obstacle to achieving good ecological status.

THE SHAPE OF THINGS TO COME: PLANNING THE FUTURE OF MORPHOLOGY RESTORATION

Richard Jeffries & Stuart Greig, Scottish Environment Protection Agency (SEPA).

Planning and delivering morphology restoration at a national scale is a new and quite distinct task. Although undoubtedly a challenge, it is also an opportunity to develop innovative restoration planning tools and methods. These methods must aim for maximum environmental benefit by using the available resources as efficiently as possible.

For morphology restoration to be most effective, both in terms of ecological benefit and resources invested, it is necessary to:

- Adopt a catchment-focused approach to prioritising and implementing measures;
- Plan measures in recognition of other environmental pressures, e.g., water quality;
- Plan measures in recognition of social issues, e.g., flood risk management.

This presentation will introduce SEPA's draft method for planning and prioritising morphology restoration. The method forms part of the Scottish Government's work to develop a policy & funding framework for morphology restoration. The morphology restoration method will use the policy principles to prioritise at the scale of River Basin Districts, and then to plan measures at the catchment scale, taking into account morphological processes and other significant factors – for instance opportunities to improve biodiversity, or to promote sustainable flood management. Ultimately – though probably not for the first River Basin Plan – the new method will lead to a series of catchment restoration plans for morphology.

Planning morphology restoration has not previously been undertaken at these scales, so the new method is being trialled on catchments in Scotland.

RESTORATION DESIGN FOR REROUTED WATERCOURSES

Kieran Conlan[3], Colin Thorne[1], Nick Clifford[2], Tom Coulthard[4] Steve Dangerfield[5], Steve Dunthorne[6], Jenny Mant[7], Gary Priestnall[8], Nick Reynard[9], Philip J Soar[10]

This presentation reports on how watercourses that had to be rerouted due to a water resources development in the UK were designed through an interdisciplinary project performed by a team of scientists and engineers with backgrounds in civil engineering, hydrology, geomorphology and ecology. The team identified early in the project that no single analysis was capable of producing a channel design that met all the functions required of the rerouted watercourses, which include flood control, land drainage, public amenity, good ecological quality and low maintenance. Consequently, the team employed a range of approaches to sustainable channel design for river restoration and rehabilitation, within the framework of a set of broad geomorphic principles and in the context of climate change predictions for the UK up to the 2080s.

Approaches drawn upon included: 1. Catchment Baseline Study and Fluvial Audit to establish the 'catchment context' for the scheme and identify suitable 'reference reaches'. 2. Regime and Hydraulic Geometry analyses to determine indicative ranges of dimensions for stable channels. 3. Experience gained by the UK River Restoration Centre on other stream restoration projects with similar environmental attributes to identify 'best practice' and predict likely post-construction evolution of the channel systems. 4. Field sediment monitoring to calibrate sediment transport equations. 5. Hydraulic modelling using iSIS to route water through the new channels and check their performance in terms of flood conveyance and land drainage. 6. Consideration of the reach-scale sediment balance using the Copeland Method to match the capacity of the rerouted channels to convey sediment to the supply from upstream and so avoid the need for heavy or frequent maintenance. 7. Long term sediment modelling using the CAESAR cellular automata model to investigate the whole life impacts of the scheme on sedimentation. 8. Production of an inter-active map on CD-ROM for use by experts and to communicate the results to stakeholders.

The project to design the rerouted channels encountered and overcame significant hurdles and in doing so provides a useful practical case study from which to evaluate the science base for restoration design, including its physical basis, practical utility and the value added by currently available analytical tools and design approaches. It further shed light on the difficulties of technology transfer between research and application in river restoration given budgetary and time constraints. Successful production of a design that should meet the needs of the client while also being acceptable to regulators demonstrates the value of interdisciplinary collaboration among geomorphologists, engineers and ecologists.

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OPPORTUNITIES AND CONSTRAINTS WHEN USING SECONDARY DATA TO ANALYSE SOCIO-ECONOMIC IMPACTS OF WATER MANAGEMENT: A FOCUS ON RIVER RESTORATION

Emma Westling, University of Sheffield.

Integration of environmental, economic and social aspects is crucial for future water management. Despite this, socio-economic aspects are often neglected in the decision making process. Stakeholder engagement is regularly used to account for social aspects, but there is a need to go beyond only talking to stakeholders. Stakeholder involvement is important for the decision-making process, but what is also important to achieve integrated water management is to incorporate socio-economic indicators and to analyse how these indicators respond to changes over time.

In order to include socio-economic indicators in water management the links between an action (water management decision) and an outcome (socio-economic impact) must be explored and understood. Decision-making requires prediction of the likely outcomes of a decision, and prediction is often based on previous experiences and evidence. To predict socio-economic impacts of future water management, we must first look back in time and carry out post appraisals of previous water management projects. This requires secondary data from different spatial and temporal scales, and involves analysis of data from a variety of sources.

The aim of this paper is to explore what kind of socio-economic data are available to support the analysis of links between water management decisions and socio-economic impacts, how they may be used, and what issues arise in their use. A key challenge in using secondary data is that they are originally collected for another purpose. Therefore the quality of the socio-economic data is assessed based on a set of criteria.

The Don catchment is used as a pilot study in order to illustrate how secondary data can be used to identify socio-economic outcomes of water management at catchment scale. In the first phase river restoration is used as a practical outcome of a water management decision.

RIVER MARDEN, CALNE: A SUCCESSFUL URBAN RIVER RESTORATION WITH POSITIVE SOCIAL BENEFITS

Trevor Turpin, Nicholas Pearson Associates, 30 Brock Street, Bath, BA1 2LN.

The paper will show slides of the above scheme during construction and as it looks now. They will show that the scheme has been both a success both from a river restoration and social perspective acting as a positive model for developers. The scheme has won several design awards and was opened by the Queen.

The River Marden, a tributary of the River Avon, runs through the centre of Calne, Wiltshire, the home of the former large scale Harris meat products company which closed in 1984. The river ran through the centre of the factory complex within a concrete lined channel with a weir. The surrounding area comprises attractive buildings and is a conservation area. After the factory was demolished, the town centre underwent gradual redevelopment, the first phase being residential. In 1998/99 the remaining area was redeveloped by North Wiltshire District Council as further residential over shops, a new library and a river side park.

Nicholas Pearson Associates acted as the landscape architects for the project, working alongside Richard Vivash from Riverscapes. Additional geomorphological input was provided by Southampton University.

The scheme included the realignment of the steeply flowing River Marden within the park and included a series of pools and rock riffles, shoals and rock current deflectors. Extensive use of rockwork laid to mimic a limestone outcrop was used at the river edges and above these, rock faced walls were built to contain the channel. A new river bed substrate was added and the area also had to be designed to contain potential major flood events requiring the use of flood gates which could be closed if required. Emergency access routes also had to be provided to the river. Local artists were employed to add creative features within the river walls and in adjacent floor mosaics. Planting of trees and shrubs was undertaken. Public access was allowed to the riverside.

Since the completion of the scheme, the riverside park has functioned as a key town centre feature. Local people and visitors alike now use this attractive park for informal recreation and children fish along its banks. During the summer the town's people gather around the river at the start of the annual Duck Race. In the winter, the annual illuminated parade ends up along side and within the park. This has included the stringing of lanterns across the river producing a 'river of light'. Calne Town Council now maintains the park and the surrounding railings are festooned with floral baskets (tastefully done). Customers from an overlooking café spill out onto the pavements. The planting has matured and the park has lost its raw 'newness'. The original scheme is almost wholly intact save a few lost rocks. The scheme has functioned well and the bed substrate has largely remained in place.

REVIEWING THE COST BENEFIT OF RIVER RESTORATION AGAINST RESTORING FLOWS TO ACHIEVE FAVOURABLE CONSERVATION STATUS ON THE RIVER AVON

Fiona Bowles, Wessex Water, Claverton Down Rd, Bath, BA2 7WL.

This paper reviews a cost benefit analysis method used to compare river restoration as mitigation for ground water abstraction for public water supply (PWS) against other options such as alternative new sources and demand management initiatives.

Wessex Water is required to assess the impact of abstraction for PWS from ground waters of the River Avon catchment to determine whether it may cause an adverse effect on the designated interest of the River Avon system Special Area for Conservation. The data collected will be used by the Environment Agency to review the abstraction consents under the Habitats Directive 1994. If the licence is reduced, then Wessex Water will need to reduce demand or develop alternative resources. In parallel therefore, Wessex Water is undertaking a strategic cost benefit assessment of possible 'solutions'. This strategic assessment follows a standard methodology developed by UK Water Industry Research Limited and the Environment Agency for water resource planning, known as the Economics of Balancing Supply & Demand. This method develops an Average Incremental Societal Cost (AISC) for each solution, which includes both capital development and operating costs, and includes an environmental and societal cost, based on willingness to pay for information.

River Restoration was considered to be a possible mitigation for the impact of abstraction because the tributaries of the River Avon , in particular the River Wylye have been subject to historical modification for milling, agriculture (including land drainage and water meadows) cress production, flood protection and wartime defence (Solomon 1997). The riverine ecology is affected by water velocity, wetted perimeter and water depth, rather than absolute flow or discharge. These parameters are affected by both the physical dimensions of the river channel and the flow regime, so it is possible to alleviate impacts on river ecology by altering or restoring the channel morphology as well as reducing the flow impact.

The paper shows how an option to mitigate the impact of abstraction by restoration of the River Wylye was developed, based on a geomorphological audit carried out in 2002 (German and Sear 2003). This was further extended to the River Bourne following a survey in 2007 (ARUP 2007).

It demonstrates that, at a strategic level, river restoration may contribute more to meeting the River Avon System conservation objectives than the cessation of abstraction, and at a lower cost. It explores the relative costs of grant aiding riparian owners to restore their property with those of contracting the work directly and it identifies where further work is needed to determine how much flow change the river restoration may offset.

RIPARIAN RESTORATION OR RIVER ALTERATION? OVERVIEW OF A COMMUNITY BASED INITIATIVE FOR THE IMPLEMENTATION OF SMALL CHECK DAMS IN A TROPICAL MOUNTAINOUS WATERSHED IN NORTHERN THAILAND

Javier González-Soria, PhD Candidate, Department of Geography, Durham University.

The Mae Tia-Mae Tae Watershed (148 km^2) is located 80 km south of Chiang Mai city, in a region subjected to monsoonal rains from approximately July to October followed by a cold and dry season. In the watershed, the high topographic relief allows little water storage and with granites and migmatites as main materials, mountain streams are basically rainfed with seasonal flow in stormflow pulses. In terms of the social environment, the watershed is inside a national park with lowland and upland communities in conflict due to seasonal water shortage and forest protection policies. Responding to this conflict, the communities are constructing small check dams (CDs) aiming to: recharge the foothills aquifer, control soil erosion and induce sedimentation, retain soil moisture for riparian restoration and create habitats. There are now over 300 sandbag and 60 concrete CDs (50 open-type, 10 close-type). Sandbags CDs are mostly close-type with a shallow opening. Length ranges from approx. 2 to 14 m. and height from approx. 1 to 2 m. Structural designs are diverse with, commonly, concrete CDs openings working as gates which are closed at the end of the rainy season to retain the streamflow and, theoretically, opened again.

The CDs seems to be successful as a social level bringing communities closer through a common strategy. On the other hand, how effective and how much the CDs integrate physical and ecological aspects requires further attention. At a physical level, the CDs affect the geomorphic processes changing drainage patterns, acting as sediment traps and reducing the CDs' capacity due to the proportionately larger evaporative losses that occur as siltation reduces water depths. Additionally, topsoil clogging and the topsoil and riverbed over granites and migmatites are no likely to allow a good percolation. On the other hand, CDs filled up by sediment will perhaps help to retain water, but if the CDs are not appropriately designed, the river will simply modify the channel course. There is a risk that a heavy rain event combined with the saturated sediment accumulated might compromise the structure and its efficiency as seen in other case studies. The CDs can also be seen as an ecological disturbance interact with the natural disturbances of drought and floods and natural stream flow in pulses., the question is whether this disturbance brings any ecological benefits. In the upland part of the watershed, pools behind the CDs regulate the streamflow and provide faunal shelter and food security as the pools support edible species. Hence, CDs might be seen by local communities as beneficial for habitat creation. Different designs and the location's hydrological and ecological characteristics (permanent or temporary streamflow) will affect the ecosystem differently; it all depends on the CD's objectives. If there are too many close-type CDs, habitat fragmentation and sediment built-up are potential disadvantages. Undesirable environmental impacts can over-ride good intentions and riparian restoration can become river alteration without any substantial benefit to the communities. Before building more CDs, it is advisable to first approach water shortages through water efficiency practices for agricultural irrigation; in any case these will always be complementary to other possible solutions.

RESTORATION OF A WETLAND IN CENTRAL SPAIN: THE "LAGUNA DE CONQUEZUELA 40 YEARS DRAINED" PRESENTS THE ONLY ASSESSMENT1 OF ITS WETLAND STATUS AFTER CONVERSION TO AGRICULTURAL LAND IN 1959 AND PRIOR TO THE SPANISH GOVERNMENT'S DECISION FOR ITS RESTORATION

Javier González-Soria, PhD Candidate, Department of Geography, Durham University.

The Laguna de Conquezuela was an inland freshwater marsh, a wet grassland in the headwaters (1100 m.) of the Bordecorex River, tributary of the Duero River in Central Spain. Nowadays, in spite of ditches, poplars and 40 years of farming, the area frequently remains waterlogged. Waterfowl following ancestors' migration routes can often be seen in the area. Fifty years after drainage, Spanish environmental policies have changed to the point that wetlands should be restored if the reason for which the wetland was drained not longer applies. Whether this is the case for the Laguna is debatable; and, how the Government has come across this area is unknown; perhaps, because archaeological sites have made the area well known, from the Ambrona Museum to the discovery of the earliest evidence of beer in Europe. The first reference to the Laguna dates back to 1847 referring to *fiebres terciarias*, Malaria, and the collection of leeches by the French during the peninsular wars. In 1890, a Geological Survey described the Laguna as no less than 1 Km^2, shallow, with aquatic plants and providing summer pastures to livestock. The site was mentioned again in the 1948 National Wetlands Survey, a few years before it was drained for agricultural use and, probably, for malaria eradication. A few decades later, it was included as "disappeared" in the 1990 National Wetlands Inventory.

The study conducted in 1999 followed US multi-agency wetlands manuals and Spanish scientific literature. The methodology was based on the presence of hydric soils, hydrophytic vegetation and wetland hydrology. The results showed evidence of a fluctuating water table (hydric soils). In spite of the presence of wetland plants —Butcher's Broom *Ruscus sp*., Iris *Iris sp*., Clubrushes *Scirpus maritimus/lacustris*, Common Reed *Phragmites australis*, knotweed, knotgrass *Polygonum sp.* possibly *Amphibium*, Hairy St John's-wort *Hypericum hirsutum or Hypericum pariflorum*, *Scirpus efusum*, Duckweeds *Lemna sp.* (soil samples under the microscope did not initially present carex seeds) — evidence was not enough for the wetland delineation. Considering that the annual evaporation exceeds precipitation (600 mm) with a distinct dry summer, the results of the soil resistivity mapping summer campaign matching the wetland contour (from 1954 aerial photograph) was taken as a convincing indicator. The wetland is a flatland where clay soils over Triassic marls are prone to waterlog from direct rain, seeping from permeable materials surrounding the endorheic basin, run off and seasonal creeks. Nowadays, this flatland is drained by ditches. Earthworks could reverse this and other wetlands connected to the Laguna could provide biological resources. Waterfowl are already attracted to the area. The social survey conducted did not specifically indicate any opinions against the restoration although it is locally well know that some land owners are firmly against it. Finally, any reasonable restoration plan has to seriously understand the seasonality of the wetland. It is also important that visitors and local population appreciate this.

POSTERS

THE IMPACT OF CULVERTS ON BENTHIC MACROINVERTEBRATE COMMUNITIES USING THE RIVER DON AS A CASE STUDY

Jacqueline Bernet, Sheffield University.

The recovery of macroinvertebrate communities from long-term disturbances in stream systems might be limited by several factors such as catchment-scale impacts and barriers to dispersal pathways. The aim of this work is to understand what structures along a river corridor impede dispersal and the colonization of new sites in a stream.

HYPORHEIC ECOLOGY IN THE RIVER DON CATCHMENT

Anna Ritchie, Sheffield University.

The Groundwater Framework Directive, a daughter directive of the Water Framework Directive indicates actions that should be taken to ensure clean groundwater as well as requirements to manage for the ecology of these systems. The hyporheic zone comprises the saturated substrates beneath and adjacent to streams and other water bodies. It is a zone of transition between surface water and groundwater. As such, it serves to filter out contaminants, and provide nutrients from one system to another. Up-welling and down-welling zones in streams have been shown to have different ecological roles for stream organisms; most notably, the presence of up-welling zones and success of salmonid spawning. Studying invertebrates that inhabit the hyporheic zone may increase our understanding of how this system responds to varying pressures. Knowledge of the ecology will help to classify the overall ecological status of streams and rivers as well as offering alternative options for monitoring groundwater and surface water conditions.

Questions to be asked:

- Are hyporheic invertebrate communities more stable than benthic communities and how do they differ in their responses to anthropogenic pressures?
- How to hyporheic communities respond to changes in groundwater composition of the hyporheic zone?
- How do hyporheic communities respond to channel modifications and restoration actions?

UNDERSTANDING CONNECTIVITY AND SEDIMENT TRANSFER IN THE DON CATCHMENT

Irantzu Lexartza, Sheffield University.

As part of the CatSci project for a multidisciplinary study of the Don Catchment, flow connectivity and sediment transfer are being investigated at different nesting scales to assess processes that influence habitat characteristics in the catchment.

FISHERIES IMPROVEMENTS IN THE THAMES VALLEY: TAKING A STRATEGIC APPROACH

Matt Carter, Regional Strategic Specialist (Fisheries), Thames Region, Environment Agency.

A large proportion of river catchments throughout the Thames valley have been modified to varying degrees to help accommodate over 1/6th of the UK's population living in this one area.

The principal pressures affecting fish populations are river modifications for land drainage and agriculture, modifications for urban development and flood risk management, a variety of diffuse and point source pollutions, water abstraction and resulting low flows exacerbated by low average rainfall and drought. These pressures all result in degraded river habitats which can adversely affect fish migration, recruitment, fry survival and suitable environments for the many native freshwater species that should be abundant in our rivers.

Improvements funded by the Environment Agency, derived from angling rod licence revenue, often seek to restore rivers to a more habitable condition for fish. Various improvements augment general river restoration given that objectives to improve fish populations are often a common goal and mutually beneficial to other kinds of wildlife. Importantly, physical enhancements need to be aligned with water quality and resource management to be fully functional and effective.

Aligning river improvements with key drivers such as the Water Framework Directive (WFD) is essential for future and continued success. Fisheries improvements are already delivering some positive results in fundamental ways that the WFD is likely to be delivered, for example by forming strong local partnerships and through effective strategic planning.

This poster describes, with examples, how limited fisheries funds are used to improve fish populations in Thames region by tackling some of the main pressures on fish, and by working closely with local people and organisations.

RESTORING THE TRANSITIONAL RIVER LYMINGTON - PAINFUL BUT PRAGMATIC DECISIONS IN WATER LEVEL MANAGEMENT

Stuart Hedgecott, (Halcrow Group Ltd), Karen McHugh (Environment Agency), Nikki Hiorns (Natural England), John Durnell (Hampshire & Isle of Wight Wildlife Trust)& Michael Boxall (Hampshire & Isle of Wight Wildlife Trust).

The Lymington River Reedbed SSSI is situated in the upper part of the Lymington estuary, separated from the seaward estuary by a causeway, originally built in 1731. The reedbed itself has established since the causeway was modified to exclude high tides from the area, probably at the end of the 19th Century. It extends landwards for approximately 2km. The main nature conservation interests of the SSSI are large roosts of autumn migrants (yellow wagtail, sand martin, house martin and swallow), breeding bearded tit and breeding Cetti's warbler. Other notable species include reed warbler and water rail, plus water voles, otters and sea trout.

Natural England has determined that the condition of 50.1% of the SSSI is "unfavourable declining" with a "very high water table" being identified as a key problem. Management of the reedbed has been prevented for a number of years by high water levels. A Water Level Management Plan (WLMP) review was undertaken to determine whether the flood control structures in the causeway influence water levels across the SSSI and, if so, whether a water level regime could be prescribed to support the nature conservation interest of the SSSI. The review concluded that the existing water levels are dominated by tidal levels (rather than river flow) to the extent that any modified management will not deliver the lower water levels required to allow reedbed improvement. In addition, the latest prediction of sea level rise along the central south coast of England is 4mm per annum now, rising to 15mm per annum by the end of the century.

In the light of these findings, it was considered that there was no environmentally and economically sustainable option for reducing water levels across the SSSI. The alternative aspiration is to allow a more naturalised and dynamic system to develop, involving a degree of tidal inundation (regulated tidal exchange) to allow the development of inter-tidal habitats within the SSSI. These new habitats would support the conservation interest features of the Solent and Southampton Water Special Protection Area (SPA) and Ramsar Site. A feasibility study was implemented to investigate:

- Restoration of partial tidal conditions within the SSSI - by manipulation of the water level control structures that pass under the causeway.
- Responses in the upper estuary – habitat evolution and flood risk.
- Implications for the lower estuary – changes in tidal prism, sediment transport and accretion, and implications for navigation, fisheries and seaward nature conservation interests.
- If appropriate, the design and monitoring of a reversible trial implementation period.

The paper reports on the feasibility study, its approach and conclusions.

DEMONSTRATING STRATEGIC MANAGEMENT AND RESTORATION: STREAM FROM CONCEPT TO CONSTRUCTION

Jenny Wheeldon, STREAM Project manager.

Demonstrating **ST**rategic **RE**storation **A**nd **M**anagement (STREAM) is a £1 million four-year conservation project centred on the River Avon and the Avon Valley in Wiltshire and Hampshire. STREAM will address two key issues: the need for a strategic approach to large-scale river restoration, and the need to integrate the management of the river and valley. The project is supported financially by the European Commission's LIFE Nature programme.

The STREAM project has highlighted particular issues that should be considered in the design and delivery of large scale restoration:

- **organisational change** - the nature of the partner organisations, and availability of staff involved, may alter. Splitting the work between internal staff and consultants minimises risk to the project, but still enables development of in-house expertise
- restoration proposals contained in funding bids tend to be based on limited site information. The final design and implementation are influenced by **constraints** such as protected species, landowner aspirations, hydraulic controls, machine access routes etc, but must still meet the objectives set out in the bid
  early consultation is crucial in obtaining the relevant permissions and often identifies a way to "design out" many issues. Particular areas to consider include: waste licensing, planning permission, environmental impact assessment, and flood risk assessment.
- **procurement** – for large projects, specialist construction contract management is required, and the contracting process can be lengthy
- **cost** - site facilities, supervision, reinstatement, etc, require a larger proportion of the budget than for smaller-scale projects
- partner organisation staff may have done lots of general river work but little river restoration - **clear communication** and extensive **site supervision** are needed to ensure designs are feasible to build, and are implemented effectively
- **community awareness** - local meetings, press releases and project briefing notes should all be used to communicate the aims of restoration and what people can expect to see in the short medium and long term. This is particularly important where controversial action is planned i.e. felling large trees, or works in existing areas of high flood risk.

These issues and approaches to them will be briefly described in relation to the restoration projects carried out by STREAM to date.

Working closely with the River Restoration Centre, STREAM will be hosting events and publishing reports and advice notes to share the findings of the project. Further details will be available on www.streamlife.org.uk and on the RRC website.

INTER-TIDAL HABITAT CREATION SCHEME - ENVIRONMENTAL STEWARDSHIP IN PRACTICE ON THE CAMEL ESTUARY, CORNWALL

James Burke, Biodiversity and Recreation Officer, Cornwall and Devon Environment Agency.

The lower end of the River Camel was heavily embanked in the 19th century to create agricultural gain. Previously this land had been saltings and this project has used historic features of the floodplain to mimic old creeks and allow salt intrusion.

This project extends the range of natural habitats on the River Camel which is already designated as a Special Area of Conservation for freshwater features. To the east of the river, freshwater ponds were designed to recreate some of the historic meanders that had been realigned in the 1970's. To the west, 25 hectares of land were entered into the Intertidal Habitat Creation Scheme under Environmental Stewardship. Here, the banks were breached and the intrusion of tidal water through a reinstated creek system now creates upper saltmarsh habitat.

The design and on-site works took seven years to complete; a significant proportion of this was negotiation with land owners, interests and statutory bodies. The meadows have a network of power lines, water supply and gas pipes and there are active fishing clubs. The Gaia Trust, the major land owner was fundamental in maximising the conservation benefits.

A monitoring regime has been designed to capture the environmental responses, especially vegetation, invertebrate, fish and bird use. The impacts of increased recreational access on the flooding meadows will also be assessed.

WERE CHANGES IN LAND USE AND MANAGEMENT JUST A PASSING SOLUTION TO FLOOD RISK MANAGEMENT?

Deirdre Murphy, former project manager for the Ripon Multi-objective Project, Defra Flood Management Division. Currently Biodiversity Technical Officer, Environment Agency, Newcastle upon Tyne.

The Defra led Ripon Multi-objective Project started August 2004 and lasted for three years. Over that time, farmers and land managers were encouraged to change land use and management to reduce the risk of flooding. Efforts were targeted locally by influencing practical works on the ground and nationally by influencing policy across parts of the Defra family.

But has any of this actually made a difference?
Have we been bold enough to shift the mindset of policy makers and practitioners?
Have suitable strategies been implemented which make a difference to flood risk management?
Was the assumption that Environmental Stewardship could deliver appreciable flood risk benefits expecting far more than could be delivered?
Will the Environment Agency embrace and promote changes in land management for flood management gain?
Are the time scales we are working within suitable for this kind of works?
What lessons were learned and will these be acted on?

JOINING THINGS UP IN FLOODPLAINS: THEORY AND PRACTICE

Tim Hess[1], Joe Morris[1], David Gowing[2], Helena Posthumus[1], James Rouquette[2], Quentin Dawson[1], Paul Trawick[1], Graham Tucker[3]

Agricultural Flood Defence Schemes in floodplain and coastal areas were once an important element of Government support for farmers in Britain. More recently, however, changing priorities in the countryside, concern about environmental quality and perceptions of increased flood risk in lowland areas, in part linked to climate change, have promoted a re-appraisal of land management options and policies for floodplain areas.

With support from the UK Economic and Social Sciences Research Council*, a number of Agricultural Flood Defence Schemes in England, previously studied by the research team in the 1980s, are being re-examined to identify and explain changes in land and water management that have occurred over the last 40-years. The paper explains the application of a conceptual framework (Figure 1) that integrates the main components of the research. It uses the concept of ecosystem functions and services as a basis for representing the major domains of flood risk management, farming systems and ecology, as well as linking these aspects to dominant stakeholder interests.

The paper reports the use of generic scenarios, to consider management options that focus on single or multiple objectives, such as maximising agricultural production, maximising biodiversity and minimising flood risk to built development in the catchment. This emerging analysis demonstrates how an integrated, ecosystems approach can help to inform future policy and practice for floodplain management, hopefully in ways that appeal to key stakeholders.

* as part of the Rural Economy and Land Use (RELU) Programme.

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FARMING FLOODPLAINS FOR THE FUTURE: UNDERSTANDING THE ROLE OF FARMING IN SUSTAINABLE FLOOD RISK MANAGEMENT

Matt Jones, Wetlands Officer, c/o Staffordshire Wildlife Trust.

The Project

Farming Floodplains for the Future is an important national pilot project intended to inform the development of future policy. It is a partnership project, hosted by Staffordshire Wildlife Trust and funded by Defra through the Flood and Coastal Erosion Risk Management Innovation Fund. Geographically it is concentrating on the catchments of the rivers Sow and Penk (and associated section of the Trent) in west Staffordshire.

The key aim of the project is to develop an understanding of how the farmed landscape can be viably managed in ways that reduce flood risk downstream, while also enhancing the natural environment. The project is set against a background of perceived increasing flood risk and key organisations advocating more sustainable approaches to flood risk management (e.g. Defra's *Making Space for Water* strategy), a background brought into sharper focus by the severe flooding of summer 2007.

The project's focus is the implementation of solutions on the ground, ranging from changing ditch maintenance practices, to restoring wetland habitats and creating new attenuation opportunities. Engaging with the farming community, it will look to determine current farmer attitudes, the hydrological impacts, the real costs of implementation, the barriers to success and the potential spin-off benefits of sustainable flood risk management. The project is also working with the local IDB considering aspects of its role in this area.

New Emphasis and Key Questions

On the back of work for the Environment Agency updating the flood models for the Rivers Sow and Penk, JBA Consulting were asked to review the models to highlight areas to target work. The results were something of a surprise - there is virtually no difference in the flood outlines for 'functional' and 1 in 100 year floodplains: along much of the main rivers there is no obvious additional flood storage capacity. This has interesting implications for the project - the key is to take a wider, whole catchment approach, slowing flows off land and looking to attenuate water in headwaters and on key tributaries (i.e. much closer to where it falls).

Initial discussions with farmers have highlighted interest in the project and a potential preparedness to implement innovative projects on their land. However the perhaps inevitable questions have arisen regarding appropriate compensation mechanisms, maintenance of schemes and contention over channel management by statutory bodies.

Despite this, potential opportunities are already being progressed including headwater wetland restoration; raised water levels on drained, agriculturally marginal land; and temporary flood storage on key tributaries.

SHAPING SCOTLAND'S POLICY LANDSCAPE TO DELIVER RESTORATION

Stuart Greig, Scottish Environment Protection Agency/Scottish Government and Joyce Carr, Scottish Government.

To achieve the objectives set by the Water Framework Directive, it is essential that SEPA and other bodies and stakeholders have tools and funds to deliver improvements across the full range of pressures on Scotland's waters, including damage to habitats (morphology).

In Scotland, improvements will be delivered through a variety of instruments, including:

- regulation and planning regimes;
- incentive and grant based schemes such as Rural Development Contracts;
- stakeholder led projects and collaborations; and
- Sustainable Flood Management.

For some pressures, for example pollution and abstraction, regulation will be the primary tool used to deliver improvements. However, where restoration/remedial work is required to address damage to habitats, SEPA and stakeholders will need to employ a combination of instruments to deliver improvements. These should be set within an appropriate restoration planning framework.

To help support the work of SEPA, stakeholders and Area Advisory Groups, the Scottish Government is developing proposals for a new policy and funding framework to support delivery of remedial and restoration measures.

The policy framework will set out:

- options to address gaps in powers/instruments/funds to deliver restoration measures;
- a series of principles to underpin catchment planning of remedial measures;
- a prioritisation framework for planning and delivering restoration measures across catchments; and
- new funding arrangements to support delivery of restoration efforts.

This presentation will summarise these proposals and their implications for delivering restoration measures in Scotland.

COSTING DELIVERY OF RIVER RESTORATION: WHAT IS PRACTICAL AND AFFORDABLE?

Duncan Huggett & Jane Rawson, Environment Agency.
Oliver Harmar & Jo Cullis, Halcrow.

In England, the government has set a target of ensuring that 95% of Sites of Special Scientific Interest (SSSI) in England (by area) are in a favourable, or unfavourable but recovering, condition by the end of 2010. A particularly challenging area of work is the restoration of river SSSIs in order to meet these targets. Although river SSSIs in England do not cover a large area, half of them are designated as a Special Area of Conservation (SAC) and consequently there is a strong legal imperative that appropriate steps are taken to restore these sites. However, a pilot project on the River Wensum suggests that full restoration costs may be prohibitively expensive and consequently may not be considered 'appropriate' under the Habitats Directive. It is therefore important to have regard for the cost-effectiveness of required measures.

In 2005, the Environment Agency and Natural England (NE) developed an ideal strategy for the restoration of physical and geomorphological condition of river SSSIs. This is dependent on the completion of geomorphological appraisals before costed action plans can be developed. This approach could cost up to £1M and take until 2010 before the costs of delivering the PSA target for river SSSIs can be estimated, funds allocated and then actions delivered. Clearly, this does not fit in with the PSA target deadline. However, while it may not be possible to establish a full plan of action, it may be possible to identify certain types of cost-effective actions that would make a positive contribution to SSSI condition and which could begin before 2010. Consequently, in 2007, a project was undertaken to establish which river restoration activities the Environment Agency could progress within the time scale of the SSSI PSA targets. The key purpose was to outline a broad programme of costed works that could feasibly be taken forward as a practical, cost effective contribution to the achievement of the PSA target through delivery of real action on the ground before the end of 2010.

In total, 17 relevant SSSIs were identified (15 riverine SSSIs, and two non-riverine SSSIs). For each of these, the river units requiring restoration actions were delineated. Indicative costs for appropriate restoration activities were developed based on a short list of generic restoration measures or groups of activities which the Environment Agency Flood Risk Management has the power to progress. These indicative costs were then applied to each river unit in order to calculate estimated restoration costs. The cost-effectiveness of these actions were then assessed based on the confidence and understanding of the problem, presence of social, political, physical or environmental obstacles, geomorphological risk, and what permissions and consents might be required.

The total cost of restoring these 17 SSSIs was estimated to be £147.8 million. Of this, £18.8 million of works were considered to be cost-effective actions that could be implemented before the end of 2010. £10 million of works were considered to be possible but unlikely to be implemented by the end of 2010, whilst it was concluded that £118.9 million of works were not cost-effective and/or could not be delivered before the end of 2010.

A WETLAND VISION FOR ENGLAND: HOW DO RIVERS FIT IN?

Carrie Hume, Wetland Vision Project Manager, The Wetland Vision Project c/o Water Policy Team, the RSPB, The Lodge, Sandy, Bedfordshire, SG19 2DL.

The Wetland Vision for England is a joint project between English Heritage, the Environment Agency, Natural England, the RSPB and The Wildlife Trusts. It expresses our mutual aspirations for the conservation, restoration and creation of freshwater wetlands in England over the next 50 years. Our Vision is for a future where freshwater wetland wildlife flourishes; the record of our past is preserved; everyone can enjoy wild wet places for recreation and tranquillity; and wetlands are valued for the benefits they can bring to our society.

It is becoming increasingly obvious that we need to take a landscape-scale approach to restore wetland functions and enable wildlife to adapt. We also need to work more closely with others and target our scarce resources to areas where action will have maximum effect and multiple benefits. The Wetland Vision provides a strategic steer and signposts priority areas where we should be working to deliver new wetlands in association with others. It is clear that our partners and we need to move towards investment in large-scale improvements. The Vision also helps us to illustrate how current policies could impact on the delivery of future habitat creation targets.

Over the past three years and through extensive consultation with >300 stakeholders from over 50 organisations, we have developed technical tools to help us understand where aspects of the Vision could be delivered. Three principle maps show how extensive wetlands used to be, how small and fragmented the current resource is, and how extensive the opportunities to restore the woodland and grasslands, blanket bog, reedbed and lowland raised bog could be in the future. We have factored in some constraints on our aspirations and highlighted the need to consider these issues in more detail when developing local projects. We have also recorded the existence of over 100 local visions already in development or delivery phase, and hope to provide guidance so that more can be initiated.

But what of rivers? The Vision has long had difficulty in adequately positioning (and mapping) a rivers agenda within its material. This is almost entirely due to its traditional Biodiversity Action Plan (BAP) habitat approach and origins, and the array of data available to identify wetland habitat potential. Have we under represented the most important wetland of all, one that provides inherent connectivity across the landscape, and the potential means to deliver much of the habitat described within the Vision? This presentation describes the Vision project and outlines how we have made a start in describing how rivers fit in. It calls for further input to improve our articulation of the relationship between landscape scale delivery for biodiversity and the historic environment, and aspirations and techniques arising from within the river restoration community.

A PERSONAL VISION FOR THE THAMES RIVER BASIN

Robert Oates, Director, Thames Rivers Restoration Trust.

It is dusk on an April evening in the year 2027, and a bullet train stops silently at a platform in a wood. The passengers disembark into electric buggies which take them to eco-lodges built into a hillside. At dawn the next morning they draw back the blinds of their panoramic windows and look across a floodplain dotted with trees and pools of water. Herds of wild cattle and horses are grazing in the distance. The bugling of mating Cranes is mixed with the cries of White-tailed eagles fighting over the carcass of a Red deer. After breakfast at their window, some visitors take a solar-powered boat trip around reed-fringed lakes, which are refilled each winter using Thames floodwater. They are thrilled by close views of beavers busy felling an Aspen, creating a wet meadow for a hundred other species, including a large Elk eating pondweed in the shallows. Other visitors are fishing a designated stretch of river, where Salmon and Trout have returned from the sea. Some visitors spend the day walking or cycling the many paths, stopping at tree hides for panoramic views. Children play and learn in a green activity zone. At the end of the day, all return to the station and take the twenty minute train ride back to London after a weekend safari with almost no carbon footprint.

You may say that this scenario is impossible, because the Thames river basin is one of the most developed in the world; with a high human population, no spare land, and a network of barriers from roads, railways and fences. But actually, everything in this picture already exists, somewhere in the UK or within 50 miles of the channel coast in Western Europe. We just haven't put them all together in one place in England yet. But we can. The Water Framework Directive is a powerful driver, and the England Wetland Vision maps out the areas of opportunity. In East Anglia there are already landscape scale restoration projects of up to 5,000 hectares at Wicken Fen and The Great Fen, with plans for others around the country. After the South Downs National Park, why not have the Chilterns National Park, or the Upper Thames Wilderness Area, or the Thames Marshes National Wetland? We just need to re-orientate our water management stakeholders around common goals and join up the many funding pots.

Climate change is exacerbating long-standing problems such as flooding, water shortages and the loss of wildlife. It is also causing more people to think twice about flying abroad. However, we can use these problems as drivers for solutions based on more naturalised systems. River restoration will be an important element in those solutions, but only if it is part of a multi-functional approach, linking catchment restoration, flood management, biodiversity, tourism, recreation, angling, boating and new built development.

And these benefits can be achieved even in the city. The new London Rivers Restoration Target is fifteen kilometres of river restored by 2015. And a London Rivers Action Plan will be published in the autumn to help achieve this. There is even the prospect of the world's first Climate Change Park in East London, based on a river restoration project.

This is a personal vision but I hope to achieve as much of it as possible during my time as Director of the Thames Rivers Restoration Trust, a post which I took up only in March. The Trust was originally established in 1986 as the Thames Salmon Trust, but the objectives were widened in 2005. It has benefitted from support by the Environment Agency, Thames Water, British Waterways and many individuals. We have some exciting projects in view, and are always keen to hear of others. For further information please see our website - www.trrt.org.uk.

DEFINING BEST-PRACTICE GEOMORPHOLOGICAL DESIGN GUIDANCE FOR URBAN RIVER RESTORATION: PPA LESSONS FROM LONDON RIVERS

Stuart Downward, Kingston University .
Matt Graham, Environment Agency, Thames region.

Long-term geomorphological pre and post project monitoring (PPM) provides a valuable insight into the character and magnitude of river responses to restoration works. Post project appraisals (PPA) of these findings, provide feedback to inform on-site adaptive management interventions and off-site transferable lessons that help define best-practice geomorphological design guidance.

This presentation reviews initial results based on repeat geomorphological surveys over 3.8km of the lower Quaggy River in southeast London between 2002-2008 that coincide with extensive channel enhancements. The enhancements methods include restoring and day-lighting once-culverted and channelised reaches, gravel seeding, log groynes, toe-board/ledges and simple urban debris removal.

We discover that the net geomophological quality of the river has dramatically improved as a direct result of the enhancement works and these improvements are sustained by enhancements in geomorphological functionality. We evaluate the relative geomorphological successes and failures of the enhancement methods through time and compare restored and non-restored reaches. We note that long-term PPM is required if we are to better appraise the sustainability of these enhancements and discuss opportunities for transcribing best-practice experiences to similar urban rivers and integrate our geomorphologial findings into a multi-criteria PPA.

RESTORING FORWARD – AN INTERDISCIPLINARY STORY OF RAGS-TO-RESTORATION ON THE RIVER BRENT

Rebecca Wade and Andrew McMullan (Abertay Dundee),Lian Scholes and Abiodun Adeyemi (Middlesex),Geraldene Wharton (QMUL) & Jenny Mant (RRC).*

**Corresponding Author: Dr. Rebecca Wade, Research Fellow, Urban Water Technology Centre, University of Abertay Dundee, Bell St. Dundee. Scotland, DD1 1HG.*

This paper presents a critical interdisciplinary appraisal of an urban river restoration case study site; the River Brent, North London (UK). The paper briefly introduces the history of this heavily modified urban watercourse and discusses how it has responded to restoration from a variety of physico-chemical, ecological and recreational use perspectives. The concepts of urban ecosystem sustainability and amenity provision, in combination with the geomorphological imperatives of physical form and function, are discussed within the context of this hydrologically regulated, high amenity inner-city setting.

Like many urban rivers, the River Brents' current form and function are so far from natural that restoring back to a previous state is not possible. The only feasible option for these systems must be to start over and 'naturalise' them in a way that is appropriate to their current setting, and in a way that 'fits' with their modern urban infrastructure limitations, rather than 'restore' them to what they might once have been.

The River Brent restoration scheme provides an excellent context in which to site the urban river 'rehabilitation versus restoration' debate as both prior to and following its completion in 2002 a wealth of data on the system has been collected. This paper offers a unique insight into the many factors critical in restoring within urban areas. It uses a single geographic reference point, the River Brent at Tokyngton Park, London and draws data from a variety of sources (formal and informal, research and public sector) to inform on issues such as geomorphologic response to changes, physico-chemical quality, ecological recovery, public attitudes towards the river and its surroundings and recreational use by the local community. For the first time this paper brings together these separate strands of both quantitative and qualitative data to support the implementation of an interdisciplinary assessment of this restored river section located close to the heart of a capital city.

The main data sources are as follows:

The research work carried out by Lian Scholes and Rebecca Wade, supported by The Carnegie Trust (2007)

The Master thesis completed by Andrew McMullan (summer2007) on ecology and geomorphic response

The continuing work towards a PhD thesis by Abiodun Adeyemi on geomorphology & contaminated sediments.

The data from the original restoration of the site

The Geomorphological report on the Brent commission by the EA and carried out by Babtie, Brown and Root.

The Ecology data collected by Judy England - and followed up by Andrew for his MSc

The social attitudes study conducted by Geraldene Whartons student.

RIVER CHANNEL MANAGEMENT AND CLIMATE CHANGE: SOME POTENTIAL IMPACTS AND MITIGATION STRATEGIES

Sally Kelday, Andrew Brookes and Duncan Wishart, Jacobs (UK). School Green, Shinfield, Reading, Berkshire RG2 9HL.

The Water Framework Directive (WFD) is the most substantial piece of European water legislation to date. One of its aims is for all inland and coastal waters to achieve "Good Status" by 2015, which includes "Good Ecological Status". GES is supported by hydromorphological quality elements including the form and function of a river channel and its connectivity. For Heavily Modified Water Bodies then the same hydromorphological elements allow an alternative objective "Good Ecological Potential" (GEP) to be set. Management and restoration of river channels is already complex and uncertainty is inherent. However, it is responsible to consider what the impacts of climate change may be. By reference to examples of river management projects completed over the last 15 years or so this paper describes some of the measures implemented to date that may allow accommodation for climate change scenarios. These include 'imaginative' solutions allowing adaptation to climatic change, such as:-

- Allowing space for erosion and sediment deposition – and therefore adjustment
- Using multi-stage channels to help deal with both floods and low flows
- Preventing grazing and land use pressures from affecting the riparian zone

Climate Change Scenarios for the United Kingdom: The UKCIP02 Scientific Report

predicted impacts for 2080 including:-

- 1.5 to 2^{o}C warmer in winter; up to 3.5^{o}C warmer in summer; and possibly 4^{o}C warmer in autumn. Summers suffering some significant heat waves.
- Milder temperatures in winter resulting in wetter conditions, with extremes of rainfall leading to serious flooding events.

Under such scenarios it is important to adapt the entire approach to river management (flooding, restoration, conservation) to take account of predicted changes in flow patterns. There is massive scope for developing restoration type projects as mitigation of developments, thereby meeting the goals of the WFD and other initiatives such as the Government's "Making Space for Water".

The specific risks for river projects include increased erosion from floods and the potential for adverse low flow conditions. There will potentially be marked contrast between urban areas (with increased 'flashiness' of rivers) and rural locations. Ultimately increased flooding may mean more opportunities for floodplain restoration which in itself presents challenges. Hydraulic models built for river projects simplistically make an allowance for climate change of the 1:100 year flood plus say 15%-20%. Due for release in 2008, UKCIP08 will introduce probabilities to climate predictions for the first time to improve risk assessment and management of climate change.

By drawing on practical experiences, this paper presents a detailed checklist of potential impacts of climatic change for a range of different river types, possible mitigation measures and residual impacts for river projects. It also develops a general method for incorporating climate change scenarios into the design process.

A PRACTITIONERS APPROACH TO PRODUCING ROBUST AND SUSTAINABLE RIVER RESTORATION PROJECTS BY INCORPORATING CLIMATE CHANGE WITHIN THE DESIGN METHOD.

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Alastair Morriss, Edenvale Young, St Thomas Street, Bristol, BS1 6JJ.

Many river restoration projects require Flood Risk Assessment (FRA) to be carried out to manage flood risk. Typically this is achieved using hydrological data from FEH to input to ISIS or HEC-RAS computer models, with climate change being accommodated as a 20 year add on to the 1 in 100 year flood flows.

Whilst the high flows allow checking of channel stability in terms of critical velocities to confirm bed and bank stability, this only deals with the rarer events. We therefore calculate sediment transport thresholds under periods of low flow, as this determines deposition, and probable vegetation succession which is more likely to determine the success of a project into the longer term.

The method is illustrated by use of a case study. The intention of the paper is to provide river restoration project managers or commissioning clients with guidance as what to include in specifying projects where there is a need to manage long term sustainability.

THE DEVELOPMENT OF THE LONDON RIVER RESTORATION ACTION PLAN:ADDRESSING CLIMATE CHANGE PRESSURE AND ENGAGING WITH COMMUNITIES.

David Webb, Environment Agency. Swift House , Frimley Business Park, GU16 7SQ.

In 2007, the London Biodiversity Partnership established a London target of restoring 15km of river by 2015 and 25km by 2020. These targets have been adopted within the Further Alterations of the London Plan.

The London River Restoration Action Plan (LRRAP) arose from the commitment to combine the North London and South London Strategies, which were developed to expand the existing programme of river restoration by highlighting the environmental, social and economic benefits of river restoration in London. The action plan takes this further by identifying the restoration opportunities that need to be developed to meet targets and highlighting the importance of restoration has a climate change adaptation measure.

It is estimated that over 70% of London's Thames tributaries flow through either culverted or concrete channels. Habitat fragementation, lack of habitat availability, and loss of refugia hinders the ability of species to adjust distribution in response to changing conditions and reduces the probability of surviving an extreme event.

Two recent examples of river restoration schemes on the River Quaggy at Sutcliffe Park and Chinbrook Meadows involving deculverting and the naturalisation of a concrete channel resulted in significant increases in biodiversity. Both of these schemes promoted the establishment of natural processes including restoring floodplain, channel re-adjustment and natural recolonisation. In both instances the ecological value of the sites have remained stable despite London experiencing unprecedented drought and flood events and fragmentation has been reduced.

Both schemes provided benefits for flood risk management, while social studies have demonstrated that the schemes have resulted in increased visitor numbers and community participation. Both schemes have resulted in park ‘friends groups’ being established. At Sutcliffe Park the number of park visits increased by 78%, while at Chinbrook Meadows 75% of local residents reported that the restoration had encouraged more people to visit the park.

The benefits of restoration at a site level have been demonstrated, but to address climate change pressures a network must be established, requiring an heirarchy of restoration measures. The London vision is to restore rivers in existing areas of open space while rehabiliating the river corridor between to establish habitat connectivity. The result of this is the establishment of a cohesive network of restored rivers and associated wetland sites providing multiple environmental, social and environmental benefits.

Workshop 1: The evidence base for river restoration and habitat management

PETER CHALK CENTRE HALL 1, ROOM 1.6

Andrew Brookes (Jacobs), Jenny Mant (River Restoration Centre), Jonty Gibson & Kevin Hall (Environment Agency).

Background

Good practice river restoration requires integrated thought from a range of perspectives (i.e. engineering, hydrology, geomorphology, ecology, biology, landscape, water quality). There are several types of evidence base for river restoration science and practice. Increasing the scientific evidence base for restoration success can rely upon improved research monitoring. It is also important to further practical understanding through exchange of information based on previous experience.

The need for an improved evidence base is growing as more hopes are placed on river restoration as a mitigation measure to undo past damage to natural riverine systems. It appears that the Water Framework Directive (WFD) will be required to report on outcomes of mitigation measures to demonstrate improved ecological potential/ ecological status. Furthermore, the Water Framework Directive requires assessments of cost effectiveness of mitigation measures, based on levels of confidence in the ability of the measure to off-set pressures, whilst funders need similar justification for investment. As a river restoration community, we need to access this information and use it to ensure restoration outputs are targeted to achieve optimum ecological and hydromorphological benefits and to identify new river management practices where appropriate.

So where are we in terms of the evidence base? Recent studies have been commissioned by the Environment Agency: Managing Hydromorphological Pressures in Rivers: Stage 1 Science and Practice (Jacobs) and a Digital Good Practice Manual for Flood Risk Management and Land Drainage (Jacobs). This work has suggested that: whilst there is considerable scientific and grey literature to support the growing science of river restoration, overall there is a paucity of robust scientific evidence that links together geomorphology, hydrology and ecology in a truly integrated and inter-disciplinary way. Furthermore, this work acknowledges that the measures are not necessarily ineffective just because there is a lack of research but highlights that we are now in a position where evidence base needs to be targeted to help provide guiding principles for river managers. The projects have also highlighted that coverage of information on restoration measures in the UK is uneven, both geographically and according to river type and for different measures.

Workshop aims

To evaluate the current evidence base for river restoration and identify any gaps in the recent compendium.
To discuss the importance of scientific evidence base, grey literature and expert knowledge information and the perceived value of these in terms of formulating best practice river management.
To identify how best to disseminate the information in a format that is valuable to practitioners and policy makers.

Workshop outline

The workshop will commence with an overview of the recent work commissioned by the Environment Agency which will also outline the amount of evidence available and highlight specific gaps.

The workshop will then address the following in a discussion forum.

1. Scientific evidence base
   - Does the report cover the majority of scientific evidence?
   - What else is out there?
   - How can we better report project outcomes in scientific journals – how can this be achieved?

   Un-published reports and results
   - What is the volume of 'grey' literature available?
   - Have studies been undertaken to evaluate this?
   - What is the perceived 'value' of this information?

   What should be the ratio of reliance upon scientific analysis and expert judgement?

2. Project databases
   - What data exists within different countries
   - How easy is it to access and how reliable is it
   - How do we the judge the value of such information
   - How can we best implement understanding of previous successes and failures to help improve the planning of new projects?

3. Data collection and storage
   - What data fields are required for river restoration, WFD, floods directive, etc and in what format will they best help end users (i.e. is what is on the RRC database sufficient or are there gaps)?_
   - What is the best format and location for storage of evidence base material?
   - How can the information be best disseminated?
   - How can this collection and dissemination be financially supported?

Workshop structure
Short (10 mins) introductory presentation followed by a discussion of points above in small groups. Key points fed back to main group.

Workshop 2: Costing River Restoration

PETER CHALK CENTRE HALL 1, ROOM 1.3

Martin Janes, Oliver Harmer, Jo Cullis, Duncan Huggett, Richard Jeffries, Fiona Bowles, Jenny Wheeldon, Oliver Clegg.

Background

Restoring rivers costs, but how much? Comments such as "river restoration costs too much" are often based on guesswork and gut feeling, or a comparison to an ecology or conservation 'project'. We have only recently begun to accept that river restoration work is complex and can involve the same planning, design, implementation and post project adaptive management as flood risk management, or engineering works. In comparison with these large capital investments, structural river restoration is often just another 'construction project'. However, in other cases 'working with the river' and 'natural recovery' costs can be comparatively inexpensive.

Various costing projects have sought to answer the question "how much does river restoration cost?". These were initially very vague and unhelpful, mainly because the question was equally vague and unhelpful. Collection of costing information has been sought by RRC for 10 years, but this is equally fraught with difficulties of exact cost breakdowns (costs lost within a larger scheme, hidden costs, free in-house labour, and unwillingness to be transparent about how much a 'cheap project' actually costs).

Costing tools are currently being developed for different needs: ball park national scale figures for 'programme of measures' budgeting verses precise site specific costs for implementation. The former needed for long term budgeting and the latter precise but often too variable to 'scale up' effectively.

Aim

The workshop will summarise the findings and costing tools developed for a number of initiatives in the last few years. This will propose different ways of costing river restoration, with benefits and limitations for each method. Often scale is a major concern, especially when needing 'lumped' figures for budgeting.

The workshop will consider a number of key questions:

- What is the need for cost information and by whom?
- What is the role of agencies, consultants, contractors, project managers and can each benefit?
- What costs are we able to define, and how?
- What costs are difficult or missing, and why?

- Do these 'draft' tools/approaches offer a good platform for further development?
- Should one approach be chosen over other?
- How can we better co-ordinate cost information?

Outline and Structure

- Introduction and aim ***(5 mins)***
- Summary of costing work/tools ***(15 minutes)***
- Small group discussion (I) ***(40 minutes)***
  Key questions

- Reporting ***(15 mins)***

Feedback to key questions reported to main group

- Small group discussion (II) ***(20 mins)***
  How can we better populate the available costing information
  - Dedicated costing working group.
  - Pooling of information and flexible tool for costing river restoration elements.
  - Interested parties and possible funding based on current work priorities and future need.

- Feedback, discussion and proposed ways forward ***(20 minutes)***

Workshop 3: A Wetland Vision for England – how do rivers fit in?

PETER CHALK CENTRE HALL 1, ROOM 1.1

Carrie Hume, Wetland Vision Project Manager, The Wetland Vision Project c/o Water Policy Team, the RSPB, The Lodge, Sandy, Bedfordshire, SG19 2DL.

Introductory presentation

The Wetland Vision for England is a joint project between English Heritage, the Environment Agency, Natural England, the RSPB and The Wildlife Trusts. It expresses our mutual aspirations for the conservation, restoration and creation of freshwater wetlands in England over the next 50 years. Our Vision is for a future where freshwater wetland wildlife flourishes; the record of our past is preserved; everyone can enjoy wild wet places for recreation and tranquillity; and wetlands are valued for the benefits they can bring to our society.

Workshop presentation

Long-term aspirations associated with rivers, and the synergy of this with future delivery of Biodiversity Action Plan targets, and other aspirations, has been explored within the Vision, but it has been difficult to gain input on how to express this. In fact, rivers were not considered within the original remit of the Wetland Vision. It became obvious that rivers cannot be excluded from a Wetland Vision, especially given their critical potential role in enabling the restoration of more natural processes that can deliver the large-scale dynamic wetlands we aspire to. There is lots of opportunity via the projects launch, and proposed guidance material, to improve how best practice for rivers is expressed within the context of wetland visions in the future, and that is what we hope to gain views on.

Workshop discussion – supported by mapping outputs

1. Is there an independent Vision for rivers?
2. What do you think about the way we have generally expressed the Vision with respect to rivers and what opportunities do you think the 'future wetlands' map holds for furthering river restoration aims?
3. What kinds of BAP habitat aspirations expressed within the Vision do you think show the most synergy with river restoration objectives?
4. What kind of guidance could we point potential 'wetland visioners' at to ensure they are considering rivers adequately in the development of local visions?

Feedback – facilitated discussion about take home messages for the Wetland Vision and for river restoration community – list of key ways forward we can advocate for the future.

Workshop 4: Goosemoor regulated tidal exchange project, Exe Estuary

Jane Brookhouse, RSPB Area Reserve Manager.

Introduction

Intertidal habitats are disappearing at an alarming rate, as a result of climate change and sea level rise. Managed realignment is an accepted technique for offsetting some of the habitat losses; however, opportunities for such realignment are unlikely to replace the predicted area of loss. A less well-known technique is **Regulated Tidal Exchange (RTE),** the controlled exchange of seawater to an area behind fixed sea defences, through an engineered structure. The RSPB identified an opportunity at Goosemoor, a 6ha under-performing part of the Society's Exe Estuary reserve adjacent to the River Clyst, to trial this technique using a self-regulating tide-gate. The objectives for the Goosemoor project are to: demonstrate the potential uses of the RTE technique, including for flood defence/management benefits and the creation/restoration of intertidal habitat; to improve the biodiversity of a potentially important part of the Exe Estuary; and to develop the project in partnership with the Environment Agency, English Nature, Defra, (all of which gave financial support) and other coastal decision makers.

Contractors were on site for approximately 2 months during the late summer of 2004, reprofiling ground levels, installing a large pipe through the seawall, and attaching the tide-gate (imported from the US, as they are not yet manufactured in the UK). The work progressed extremely well and was completed by the end of October 2004. Early engineering advice for such a project is essential, and liaison with partners has been extensive throughout.

Monitoring

A comprehensive monitoring programme has been undertaken during the few years, and some good results obtained. The attachment of data loggers to the tidegate has monitored both internal and external water levels, providing some interesting, if complex, results. Monitoring of accretion levels has shown a mean accretion rate of 29 $\pm$ 5mm, the highest accretion rate being on the lower ground. The botanical monitoring, undertaken by point quadrats, has revealed colonisation by a range of saltmarsh species, including glasswort (*Salicornia sp)*, sea aster (*Aster tripolium*), annual sea-blite (*Suaeda maritime*), and the rare stiff saltmarsh grass (*Puccinellia rupestris)*, although this now seems to have disappeared as it is a pioneer species. The sediments have also shown colonisation by species of benthic fauna, and all three main bird prey species, *Corophium, Nereis,* and Chironomids present. *Corophium* and Chironomids in particular have shown significant increases within the last 18 months. Although no wetland birds have bred on the site, regular counts have indicated that the number of passage and wintering waterfowl using the site for feeding and roosting has increased dramatically, along with the variety of species. Peak winter counts have included the following: wigeon (320), teal (390), brent goose (348), black tailed godwit (250), lapwing (620) and curlew (207). We are proposing to undertake monitoring of fish populations in 2008, as there seems to be significant use of the site by grey mullet.

There is further monitoring to do, and it seems that further adjustments may be required to fine-tune the internal water levels in order to enable further habitat development. However, in just two or three years, the site has demonstrated a significant shift from a freshwater system to a distinctly brackish/saline system.

Future

Regulated Tidal Exchange may be a short- to medium-term measure, as it relies on the maintenance of flood banks, which is often likely to be unsustainable in the long term. The technique may prove a good way of preparing land behind defences for subsequent realignment. Whatever the circumstances, it is hoped that the Goosemoor site will provide a valuable demonstration of what the Regulated Tidal Exchange technique can deliver.

COLONIZATION OF MACROPHYTES, INVERTEBRATES AND FISH IN A DREDGED AND RECONNECTED OXBOW LAKE: A PROJECT APPRAISAL

Uta Grünert, Marc Leszinski, Frank Fredrich and Jörg Gelbrecht
Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Müggelseedamm 301, 12587 Berlin, Germany.

Re-activating abandoned meanders is a sensible way to increase river length, often resulting in a higher flow and habitat variability present to the riverine species community. A selected abandoned meander of the low energy, sand-bed river Spree (Germany) was restored (approximately 6 600 m^3 of nutrient rich organic mud layer in order to prevent sediment mobilisation, and reconnected to the main river course in 2005. Succession of submerged macrophytes, invertebrates and fish species was monitored over a three year time period in order to evaluate restoration success. A reference site was chosen in the main channel, and where possible target species reconstructed based on historical and paleo-limnological studies.

The restored river bottom was rapidly re-colonized by riverine species present in the nearby reaches of the main river channel. Succession of submerged vegetation was dominated by species characteristic for slow flowing reaches, such as *Sagittaria sagittifolia, Sparganium emersum and* 5 *Potamogeton* species, but showed a less uniform colonisation than the main channel. Species diversity was higher than prior to re-connection of the meander. The newly established submerged macrophyte community met the dominant submerged vegetation in reaches with slow flowing velocities under pristine conditions. Succession of the macroinvertebrate community reached a high biocoenotic similarity to the reference site within a year after reconnection. The associated species turnover from a lenitic to a lotic community was highly correlated to an increase of habitat heterogeneity and led to a higher diversity compared to the pre-restoration state. Endangered rheobiont species, such as *Unio crassus* and *Ophiogomphus cecilia*, were among the latest colonisers and only few lenitic species were lost. The fish community in the re-connected meander changed from a typical backwater fish community to a riverine one. The number of rheophilic species increased from one to six, and the frequency of individuals of rheophilic species increased from 0.1 to 6.6 % while the frequency of individuals of limnophilic species decreased.

The restoration measures successfully established a wider variability of habitats for the endangered riverine community of the Spree. However, more physical disturbance and a higher discharge variability is needed in order to maintain or re-establish lotic species communities in the re-connected meander, as the river bottom already shows signs of siltation. Also, the river system looses a part of its still water areas and therefore important spawning grounds and growing areas of juvenile fish. We suggest a well balanced river system with typical riverine habitats and still water areas. Therefore in the frame of future rehabilitation projects at the Spree river system it is also important to maintain or even to build new still water areas.

THE ROLE OF PILOT PROJECTS IN CREATING SYNERGY BETWEEN NATURE AND FLOOD DEFENSE IN RIVER MANAGEMENT

Heleen Vreugdenhil, Delft University of Technology, the Netherlands, Faculty of Technology, Policy and Management.

Pilot projects are an increasingly used instrument in the field of river management. Reasons to apply them are usually to test innovative ideas and collect 'evidence', which is often considered a prerequisite for modern policy making. The focus of this research is on technical concepts, which aim to restore or imitate elements of the natural functioning of a river and thereby contribute simultaneously to the restoration of the river health and flood defence levels.

Despite the increase in the use of pilots, the instrument itself, as applied in river management, has been limited in its evaluation. Therefore, a first inventory of characteristics and uses of pilots has been made. Examples of characteristics include the use for knowledge and strategic purposes, the relation to policy programs (phased implementation versus loose idea) and the innovative character. This has lead to a typology in which pilots can be classified.

Since pilots are not conducted in isolation, the next step is the identification of the context, with elements like the physical and institutional situation in which the pilot is introduced. Different perspectives, such as the 'playing field' and the 'multi-actor context' give insights into how the context can impact the pilot. This context in itself evolves as well, partly because of the interaction with the pilot, partly because of the existence of a broader context, such as wider policies or norms and values.

Through the interaction of the pilot and the context, system elements change. Together, this has lead to insights in mechanisms that contribute to certain outcomes and the establishment and potentially the diffusion of the tested concepts in other projects or policies.

This framework of pilot types, contexts and their interaction leading to changing states is applied on two case studies. The first is a project on 'Cyclic Floodplain Rejuvenation' in the Netherlands, where vegetation growth had lead to the decrease of discharge capacities. Restoring biogeomorphodynamic processes, which are currently lacking, should reset vegetation to pioneer stages, thereby simultaneously enlarging ecological diversity and discharge capacities. The second project is in Germany (Baden-Wurttemberg) on 'Ecological Floods'. Re-establishing regular floods in former wetlands should help the vegetation population to adapt to wetter circumstances. When a real flood occurs, the area can be used as a floodplain with limited negative ecological impacts.

HARDWOOD CREEK: HEY, WHERE DID MY FLOODPLAIN GO?

Ed Matthiesen, P.E Wenck Associates, Inc. Maple Plain, Minnesota.
Peter MacDonagh, RLA, Kestrel Design Group, Edina, Minnesota.

Hardwood Creek is located in the upper basin of the Mississippi River in Anoka and Washington counties in Minnesota, in a landscape that is changing from rural to urban. 1854 public land survey notes indicated open "E" type prairie streams with occasional Maple-Basswood plant community of less than 30 stems per acre. Deep shade due to tree stem densities of 100-200 per acre, because of fire suppression, exceeded stem densities of all landscape types in this portion of the state. The hydrologic consequence of this change in land use is an increase in flow volumes, quicker response time to peak flows, accelerated channel bank loss and head cutting. Significant erosion and bank loss was centred on 1/2 mile in two reaches of a total channel length of 5 miles. The land use in this channel reach is a mix of agriculture and large lot (greater than three acre) residential lots.

A pre-project assessment showed the channel to have a high susceptibility to bank loss based on the Bank Erosion Hazard Index (BEHI). The main cause of the bank loss was due to the channel flows continuing to head cut resulting in all of the energy staying within the channel. As the stream lost its ability to access its floodplain, the channel began to overwiden, and aggradation from fine sediment settling resulted in the loss of macroinvertebrate habitat.

The selected approach was to install rock vanes to raise the channel bed so more frequent access to the floodplain could be obtained. Riffles were also selected to address head cutting in the more moderately sloped channel sections and to provide habitat.

The resulting project removed and reused trees in the near bank area as root wads to allow sunlight penetration to the overbank area and as resistive force control and refugia. An investigation of land use prior to European settlement showed the area to be comprised of an oak savanna land use cover complex. Plantings of native willow and dogwood were used as vegetative cover to provide for greater rooting depth and density.

Macroinvertebrate colonization was observed within 48 hours of the installation of the first riffle. Subsequent searches for macroinvertebrates showed caddis flies in numerous quantities in stream bank restoration areas while no macroinvertebrates were found in the segments without improvements. It is likely that the prevalence of macroinvertebrates in the restored sections is due to the installation of rock substrate, narrowing of the channel to maintain a low flow stream as a secondary consequence of raising the channel to access the floodplain and the creation of pools at the downstream end of vanes and riffles.

INTEGRATING GEOMORPHOLOGICAL, ECOLOGICAL AND SOCIO-ECONOMIC ELEMENTS OF THE RIVER DON CATCHMENT TO DEVELOP A FRAMEWORK FOR RIVER CATCHMENT MANAGEMENT

Sally German (Arup), David Lerner, Jacqueline Bernet, Irantzu Lexartza, Emma Westling and Anna Ritchie (University of Sheffield).

In partnership with the Environment Agency and the Catchment Science Centre (CatSci) at Sheffield University, Arup are undertaking a geomorphological assessment of the River Don Catchment. The aim of this assessment is to gain a better understanding of both the catchment and channel geomorphology. The overall project objectives are:

- To develop a framework for the restoration of the physical habitats of the River Don
- To determine the lateral and longitudinal connectivity of habitats (physical and ecological)
- To inform a separate socio-economic study assessing the economic and social benefits associated with river habitat restoration

This assessment will utilise the current knowledge of individual CatSci students and set a foundation for characterising the river in terms of its character and potential. This in turn should provide key data for planning and management in conjunction with other CatSci projects and contribute to their overall understanding of the function of the river and the role that geomorphology plays in that.

This will act as an overarching paper for the posters detailed below. This paper will explain how this geomorphological assessment will provide an understanding of the physical, ecological and socio-economic elements of the river catchment resulting in the development of a framework for river management.

RIVER RESTORATION DRIVERS AND BENEFITS – ARE WE GETTING WHAT WE WANT?

Jo Cullis, Richard Ashby-Crane & Oliver Clegg, Halcrow Group Limited, Burderop Park, Swindon, Wiltshire SN4 0QD.

The practice of river restoration has grown hugely in the last few years. But what do we mean by river restoration? Why do we do it? Who/what benefits?

The motivation for 'restoring' rivers varies considerably as do the results, which are often dependent on the key drivers (statutory or otherwise), location (rural or urban), funding sources, land ownership, stakeholder power and desired after uses. For example, the key driver and funding route is often flood risk management, which may result in 'spin-off' restoration projects. In this instance, do we get excellence in river restoration or do we create 'Jacks of all trades' (i.e. mediocrity) in our desire to create multifunctional river corridors and meet the needs of a range of stakeholders? Also, it is difficult to determine the desired restoration state in a contemporary landscape. For example, chalk streams running through water meadows and floodplains of wet grassland are a totally man-made landscape.

A recent Environment Agency study has estimated the costs of river restoration on riverine SSSIs in England (December 2007). It has demonstrated the huge task we are faced with in restoring them to favourable condition, and these SSSI rivers are just the tip of the iceberg. To achieve restoration on all rivers that need it in the UK, we must think more holistically and maximise the benefits of each scheme by bringing together various funding streams. The Water Framework Directive is a new driver for ecological and morphological restoration of rivers. We hope this will allow a wider interpretation of benefits within cost-benefit analysis, reducing the need for river restoration to rely on those accruing for specific sectors, such as flood risk management or fisheries enhancement. A strategic catchment approach is likely to be important in maximising benefit, and creating a mosaic of different river restoration projects across a catchment to meet the needs of the catchment as a whole.

This paper examines a number of river restoration case studies including:

- River Kennet (Berkshire) where the main driver is meeting the Public Service Agreement (PSA) 3 target for SSSIs;
- Quaggy River (London) where restoration was carried out as part of a flood risk management scheme;
- River Nith (East Ayrshire) where restoration (diversion of channel) resulted from plans to develop an opencast coal site.

The paper compares their drivers, funding mechanisms and stakeholder motivations, with the range of benefits provided by the schemes and the degree of 'naturalness' achieved. It considers the tensions between stakeholders and conflicting uses that are inherent in delivering multi-functional schemes.

RIVER AVON AND FROME SSSIS - APPLICATION OF A PRIORITISATION PROCESS TO PLAN AND IMPLEMENT LOCAL ACTIONS, WHICH DELIVER CATCHMENT-SCALE ENHANCEMENT; A REVIEW OF DELIVERY TO DATE

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In order to meet Natural England's conservation objectives, Water Level Management Plans (WLMPs) were developed for designated Sites of Special Scientific Interest across the country. The plans were designed to ensure that water levels are managed to benefit a range of needs, including conservation, fisheries, agriculture and flood risk management and integrate successfully with other river restoration initiatives such as the STREAM project.

The Avon and Frome are key catchment-scale, chalk stream SSSIs in Wessex that incorporate the following SSSIs:

- River Avon System
- Avon Valley
- East Harnham Water Meadows
- Lower Woodford Water Meadows
- River Frome

Natural England has identified that appropriate water level management is critical to achieving favourable condition within these SSSIs. Because of this, and in order to meet the UK Government target to get 95% of SSSIs into favourable condition by 2010, the WLMPs for both catchments have recently been reviewed and now need to be implemented by 2010.

The WLMPs propose a range of in-channel, floodplain and structural works that aim to balance water level management needs between upstream and downstream reaches, and between the river and the floodplain for the benefit of SSSI habitats and species. Over 200 WLMP actions were proposed throughout the Avon and Frome catchments. The key challenge faced by the WLMP team is to implement the actions in a way that ensures both value for money and achievement of favourable or unfavourable recovering SSSI condition by 2010.

This paper outlines the process that has been used to appraise, verify and prioritise the Avon and Frome WLMP actions to ensure that the funding available is spent on achieving maximum improvement of SSSI condition throughout the catchment. The key factors that have been taken into account are described, including technical effectiveness, benefit area: cost ratio, secondary benefits, timescales and ease of implementation. The performance of the live prioritisation system is also reviewed in terms of:

- how it has informed delivery to date
- lessons learnt that could be applied to prioritisation of other localised actions aiming to deliver catchment benefits.

INTEGRATIVE MONITORING AND THE SETTING OF OBJECTIVES: THE KEY TO PROJECT SUCCESS

Dr Kevin Skinner, Principal Geomorphologist, Jacobs.
Dr Judy England, Environment Agency, Thames Region.

Monitoring is an important aspect of any procedure that seeks to determine whether a technique has worked effectively. The river restoration process is no different. Unfortunately, monitoring is often not undertaken due to constraints on time and resources, as well as the commonly held belief that river restoration is inherently a good thing and so monitoring is unnecessary. However, there are many reasons to monitor projects and amongst the most important is the need to learn from experiences and for regulatory compliance.

This talk reviews the basic principles of monitoring and appraisal from objective setting to reporting the results. We will review how integrating monitoring within the project process ensures that a scheme success at meeting its objectives is analysed effectively. We examine some of the reasons for failing to undertake monitoring or reporting the results. We suggest some ways which this can be improved and the expertise of practitioners be utilized to help ensure that restoration projects help in the delivery of the obligations of the Water Framework Directive.

MONITORING AND APPRAISAL OF THE RIVER NITH DIVERSION, 2000-2007- A CASE STUDY

Ian Griffin, Wildfowl and Wetlands Trust Consulting.

The monitoring and appraisal of river diversion and restoration projects is essential to build a knowledge base which guides future projects and helps to develop and refine best-practice guidelines.

The River Nith was diverted at House of Water, Ayrshire, south-west Scotland in 2000, to allow opencast coal extraction from the valley floor. A 2.7 km section was designed and engineered to mimic the natural gravel bed river, with a sinuous channel with constructed riffle and pool morphology.

Geomorphic adjustment and biological development of the diversion reach was monitored over 3 years using a range of techniques. Repeat aerial photography of the diversion and cross-section surveys of a 1 km experimental reach provided information on the channels physical adjustment in response to the hydrological regime. Bio-monitoring of the diversion involved examining vegetation and macro invertebrate community development. Baseline surveys of the pre-disturbance channel in 2000 and upstream repeat controls were used to assess the rate of community development in the diversion reach.

This paper presents an overview of the monitoring regime conducted on the River Nith diversion. The application and sensitivity of the different monitoring methods is discussed and the results of the monitoring programme and success of the channel design are detailed.

The successful engineering of large river diversions is a complex process. Understanding the timescales and recovery pathways and ensuring that geomorphic and ecological principles are incorporated at the earliest stages are essential for project success. As the detailed nature of this scientific research project is unlikely to be replicated under normal budgetary conditions, the development of rapid, cost-effective assessment methodologies and more meaningful biological indices must be considered a priority for future research.

RESTORATION OF THE RIVER RAY: LESSONS LEARNED AND MEASURING FOR SUCCESS

Karen White[1] & Jo Sayers[2]
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The River Ray Restoration Project is led by Wiltshire Wildlife Trust in partnership with the Environment Agency, Swindon Borough Council and Thames Water. Atkins was commissioned to develop the detailed design for the scheme based on specialist geomorphological input while Anthony Stiff Associates were the Landscape Architects.

This ambitious scheme involved the restoration of a 2km reach of the River Ray through an urban area in the middle of Swindon. The scheme consisted of 3 phases; each with a different set of aims to reconnect wildlife corridors, floodplain processes and community awareness along the River Ray. In addition, there was an underlying objective to improve the ecological status of the River Ray in line with Water Framework Directive requirements.

Phase 1 of the scheme was completed in 2004 and involved meeting the challenge of designing a 'habitat haven' for a 500 m reach of the River Ray. The design was geomorphically led and consisted of creating a two stage 'mini floodplain channel' using features such as berms, pool riffle sequences and floodplain ponds to add biodiversity within a reach with a highly modified hydrological regime. A key element of the design was the restoration of natural processes to reduce the requirement of costly maintenance by the Environment Agency to maintain flow conveyance.

Phase 2 was completed in 2006 with the aim to reconnect river processes and promote biodiversity for a 500m reach. This was achieved by restoring the once straight, embanked, trapezoidal drainage channel back to its historical meandering river form. By carefully designing the channel using geomorphological principles, we were able to return natural floodplain processes to the area by allowing the river to overtop onto the floodplain in key locations. This not only improves river processes but also reduces flood risk for the properties in Swindon downstream. To ensure the natural functioning of the channel, the design also included the installation of pools, riffles, backwaters, fish refuges and wetland ponds. Volunteers, led by Wiltshire Wildlife Trust, also contributed to the scheme by erecting bird nesting boxes, removing alien plant species, thinning vegetation and planting marginal plant species.

Phase 3 of the scheme was completed in 2007 and involved re-meandering the channel to improve instream habitat, installation of new pools and riffles, creation of a fish pass to reconnect fish passage in the river and establishment of a formal footpath to increase the recreational value of the river corridor.

Along the way there have been many lessons learned in terms of design, construction and engagement of the community and local businesses. This presentation will discuss some of those lessons and outline the initial results of the Phase 4 of the River Ray Restoration Project; Measuring for Success.

RESTORING THE UPPER CATCHMENT FUNCTIONS OF RIVERS: THE SCAMP EXPERIENCE

Peter Worrall, Technical Director, Penny Anderson Associates (Consultant Ecologists).
Andy Keen, Hydrologist, Penny Anderson Associates (Consultant Ecologists).
Gene Hammond, Principal GIS Manager, Penny Anderson Associates (Consultant Ecologists).

The shift from the concept of flood 'protection' to flood 'management' brings with it a requirement to consider strategies that involve landscape scale changes to river catchments in much the same way as has happened in the past. In our upland catchments river processes have been substantially altered by centuries of land management that has involved removing and altering vegetation cover, draining catchments and intensifying agricultural production. These management practices have altered both the nature and character of flow in many rivers as well as the quality of water discharging into the river systems. If we are to restore these upper river catchments as part of the flood management process then the way our uplands are used and managed requires a fundamental re-think.

In response to this United Utilities (UU), who own some 20,000ha of upland water catchment, mostly in the Peak District, South Pennines, Bowland and the Lake District, embarked in 2006 on a Sustainable Catchment Management Programme (SCaMP). This is an innovative, large scale project aiming to improve river catchment functions and at the same time restore nature conservation value to the uplands, as well as providing a sustainable future for the company's agricultural tenants. The project is being undertaken principally in the Bowland Estate of UU's Central Region and much of its Southern Region in the Peak District.

As part of an associated five year study, an array of hydrometric monitoring systems has been installed within several of these catchments to recover data on characteristics such as rainfall, groundwater levels, river discharge and water quality, particularly colour and turbidity. Baseline hydrological features and relationships are being established against which the affects of land management changes will be judged.

The land management of the selected catchments is undergoing large scale changes which include: the extensive blocking of peat grips (most of these upland peat bog catchments have a dense pattern of drainage channels installed in earnest with agricultural grant aid from the 1940's onwards); the significant reduction of sheep grazing, and the restoration of blanket bog, upland heath and other natural habitat systems.

The conference presentation will report on the findings of the project to illustrate how such large scale changes to the management of these upland river catchments is affecting stream hydrograph character and water quality. In addition, the contribution such land management changes make to flood management will be discussed.

VEGETATION DYNAMICS AND RIVER RESTORATION: PROJECT EXPERIENCE AND CLIMATE CHANGE IMPLICATIONS

Angela Gurnell, King's College London, Department of Geography, Strand, London WC2R 2LS, UK.

Vegetation is becoming increasingly recognised as an important control on river form and process. This paper will demonstrate the potential to use 'natural' vegetation dynamics in river restoration as a replacement or complement to engineering of channel form and seeding or planting of river banks.

Three particular aspects of vegetation dynamics will be discussed:

- the role of hydrochory in dispersing diverse and abundant plant propagules (seeds, vegetative fragments) to recolonise restored river channels and banks
- the role of particular plant species in engineering and accelerating riparian and riverbed landform development
- the implications of climate change for the above

These will be illustrated using several examples drawn from the UK and Italy.

RIVER RESTORATION IN A GLOBAL CONTEXT

Jenny Mant and Martin Janes, River Restoration Centre.

The RRC's annual conference provides a forum for discussion about how to best manage and restore rivers in the UK. Those examples from overseas projects do provide differing perspectives, however there is often little time to reflect on what river restoration means in a global context. Where does UK practice fit and what lessons might be learnt from other countries experiences?.

Part of the RRC's remit is to be aware of what is happening in terms of river restoration globally and report back to the UK on new research and developments from elsewhere that will be of interest.

Over the last year the RRC has worked with other groups and organisations, through training, seminars and project advice. This has also given us the opportunity to find out what is happening in other countries in terms of approaches to river management and restoration, what are their future aspirations, what are the key difficulties being faced, how these are being overcome and what concepts are being considered in terms of best practice monitoring both for ecological and social benefits.

This paper will provide a short overview with key messages and demonstrate how practices elsewhere may help to inform the UK's aspirations for improved river environments, both for the water framework directive requirements and for wider deliverables.

SITE VISITS
FRIDAY 18TH APRIL

Visit 1 – Exmoor Mire Restoration Project

Restoration proposals are in place at this site which involve the blocking up of ditches in the upper Exe valley, which are draining the mire communities adjacent to the river. It is hoped that such restoration work will re-create the stable high water table conditions required for the growth of bog plants. Additional proposals also include the construction of sediment trapping dams to slow the flow in the upper canalised section, which currently experiences high levels of erosion.

Visit 2 – Tale Valley, Escot Wetlands

The Tale Valley contains important and in some cases unique opportunities for country-side and river management, conservation, landscape history and geography based studies. These include the Escot Wetlands, a carefully preserved area which enjoys stewardship status. The Tale is the subject of a significant programme of work by the Tale Valley Trust and landowners including two river management demonstration sites. The potential of these and other study sites is exploited to the full by an Education Ranger who works closely with course tutors to optimise study programmes.

Visit 3 – Harbertonford Flood Defence Scheme

This project is located around Harbertonford, a village that historically has been flooded on average once every three years, and on six occasions between 1998 and 2000. The development of the village around the river has resulted in there being no significant floodplain that can be reconnected, and also restricts any potential channel enlargement. The aim of the scheme was to provide a combination of flood defence measures that were also capable of providing environmental enhancement. The scheme has two main features – an upstream flood storage reservoir, and flood defence works through the village. This has reduced the risk of flooding to a minimum of once in 40 years.

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Dates for your diaries:

RRC 10th Annual Network Conference

1st – 2nd April 2009
Possible site visit on 3rd April 2009

University of Nottingham, England

European Centre for River Restoration (ECRR)

4th International Conference on River Restoration

16th – 21st June 2008

San Servolo Island, Venezia Italy

Workshop Allocations

Workshop 1 - The evidence base for river restoration and habitat management

Name		Organisation
Ulrika	Aberg	University of Leeds
Tina	Ainsley	Environment Agency - South West Region
Denise	Ashton	Wild Trout Trust
Jeremy	Bailey	Environment Agency - South West Region
David	Bamford	Environment Agency - North East Region
Chris	Bell	Environment Agency - Thames Region
June	Bell	Environment Agency - Thames Region
Jacqueline	Bernet	University of Sheffield
Roger	Bettess	HR Wallingford Ltd
Rick	Bossons	Alaska Environmental Contracting Ltd
David	Bradley	APEM (Aquatic Scientist) Ltd
Chris	Bromley	SEPA
Andrew	Brookes	Jacobs UK Ltd
Rob	Butler	Environment Agency - South West Region
Matt	Carter	Environment Agency - Thames Region
Melanie	Challis	Environment Agency - Thames Region
Catherine	Chapman	Environment Agency - Southern Region
Robin	Chase	Cain Bio-Engineering Ltd
Tom	Cook	Environment Agency - Southern Region
Laura	Covington	Haskoning UK Ltd
Liz	Dawson	Environment Agency - North West Region
Jake	Dew	Cain Bio-Engineering Ltd
Stuart R	Downward	Kingston University
Arnaud	Duranel	Berks Bucks & Oxon Wildlife Trust
Laura	Edwards	Environment Agency - Head Office
Karen	Fisher	KR Fisher Consultancy Ltd
Allan	Frake	Environment Agency - South West Region
Alison	Futter	Environment Agency - Thames Region
Julia	Gallagher	RSPB - England
George	Gerring	Environment Agency - Thames Region
Jonty	Gibson	Environment Agency - North East Region
Claire	Gladdy	Environment Agency - Thames Region
Stuart	Greig	SEPA
Ian	Griffin	WWT Consulting
Kevin	Hall	Environment Agency - North West Region
Ruth	Hanniffy	Environment Agency - Thames Region
Jim	Harris	Cranfield University
Nigel	Holmes	Alconbury Environmental Consultants
Vincent	Hussey	Office of Public Works
Simon	Johnson	Wild Trout Trust
Tim	Jones	Environment Agency - Thames Region

Renata	Kowalik	London Wildlife Trust
Peter	MacDonagh	The Kestrel Design Group, Inc
Jenny	Mant	River Restoration Centre
Gareth	Martin	Cascade Consulting
Edward	Matthiesen	Wenck Associates, Inc
Paul	McAleavey	Environment & Heritage Service
Greg	McCleary	Environment & Heritage Service
Alastair	Morris	EdenVale-Young Associates Ltd
Suzie	Mundell	Island 2000 Trust
Lesley	Newport	Environment Agency - South West Region
Damien	Nixon	Environment Agency - Southern Region
Gemma	O'Connor	Halcrow Group Ltd
David	Oldmeadow	Haskoning UK Ltd
Charlotte	Owen	Environment Agency - Wales
Amy	Parrott	Environment Agency - Anglian Region
Gareth	Pedley	Environment Agency - North East Region
Charles	Perfect	Sure Limited
Natalie	Phillips	Environment Agency - Midlands Region
Jeff	Pickles	ARUP
Bob	Preston	Environment Agency - Thames Region
Neil	Punchard	Wessex Water Services Ltd
Anna	Ritchie	University of Sheffield
Jo	Sayers	Wiltshire Wildlife Trust
Jo	Shanahan	Atkins
Brian	Shields	Environment Agency - North West Region
Kevin	Skinner	Jacobs UK Ltd
Emma	Smith	Halcrow Group Ltd
Paul	St Pierre	Environment Agency - Thames Region
Ilse	Steyl	ARUP
Kate	Stokes	Cornwall Wildlife Trust
Lucy	Taylor	Environment Agency - North West Region
Rhian	Thomas	Countryside Council for Wales
Angus	Tree	Scottish Natural Heritage
Heleen	Vreugdenhil	Delft University of Technology
Rebecca	Wade	University of Abertay Dundee
Simon	Whitton	Environment Agency - Wales
Bryn	Williams	Environment Agency - South West Region
Sarah	Williams	Dorset Wildlife Trust
Julie	Wozniczka	University of Nottingham
Hannah	Wright	Environment Agency - Southern Region

Workshop 2 – Costing river restoration

Name		**Organisation**
Steve	Barge	Atkins
Sebastian	Bentley	JBA Consulting
Fiona	Bowles	Wessex Water Services Ltd

James	Brameld	Environment Agency - South West Region
David J	Brown	Environment Agency - North West Region
Gail	Butterill	Environment Agency - North West Region
Paul	Campbell	Maccaferri Ltd
Katherine	Causer	Environment Agency - North West Region
Andy	Chalmers	ARUP
Lee	Church	Maccaferri Ltd
Oliver	Clegg	Halcrow Group Ltd
Kieran	Conlan	Cascade Consulting
Jillianne	Cross	Jacobs UK Ltd
Jo	Cullis	Halcrow Group Ltd
Dawn	Davison	Environment Agency - Southern Region
Richard	Dooley	Office of Public Works
Rob	Dryden	Environment Agency - Anglian Region
Mark	Everard	Environment Agency - Thames Region
Joanna	Eyquem	Haskoning UK Ltd
Ceri	Gibson	Tyne Rivers Trust
Gareth	Greer	Rivers Agency
Adela	Griffin	Southern Water
Anthony	Guay	Gifford Services Ltd
Suzanne	Hall	Environment Agency - North East Region
Di	Hammond	Entec UK Ltd
Matthew	Hardwick	Haskoning UK Ltd
Oliver	Harmar	Halcrow Group Ltd
Emma	Hay	Scottish Natural Heritage
David	Hetherington	ARUP
Felicia	Hicks	ARUP
Jonathan	Hillier	Kier Mining Group
Duncan	Huggett	Environment Agency - Anglian Region
Martin	Janes	River Restoration Centre
Richard	Jeffries	SEPA
Tristan	Josh	Eco-tech Systems Ltd
Jimmy	King	Central Fisheries Board
Christopher	Lally	Department of Transport - Drainage Division
Mary-Rose	Lane	Environment Agency - South West Region
Anne	Lewis	Environment Agency - North East Region
Drew	McVey	RSPB
Dan	Nixon	D & M River Restoration and Woodland Management
Robert	Oates	Thames Rivers Restoration Trust
Matt	Parr	D & M River Restoration and Woodland Management
Petra	Repnik	Institute for Water of the Republic of Slovenia
Russell	Spencer	Cain Bio-Engineering Ltd
Dave	Webb	Environment Agency - Thames Region
Emma	Westling	University of Sheffield
Karen	White	Atkins
Carolita	Wilson	Environment Agency - South West Region
Mike	Wilson	Environment Agency - Thames Region

Workshop 3 – A wetland vision for England – how do rivers fit in?

Name		**Organisation**
Amara	Barlow	Haskoning UK Ltd

Will	Bond	Alaska Environmental Contracting Ltd
Wendy	Brooks	Environment Agency - Head Office
James	Burke	Environment Agency - South West Region
Denise	Delaney	Office of Public Works
Ruth	Eales	Environment Agency - Thames Region
Alice	Fellick	River Restoration Centre
Sally	German	ARUP
Jo	Harkness	Sheffield Wildlife Trust
Tim	Hess	Cranfield University
Kareen	Holliday	RSPB - England
Carrie	Hume	RSPB - England
Sally-Beth	Kelday	Jacobs UK Ltd
Oliver	Lowe	Environment Agency - Midlands Region
Parveen	Mann	Environment Agency - North West Region
Anna	McFarlane	Jacobs UK Ltd
Karen	McHugh	Environment Agency - Southern Region
Louise	Miles	Freshwater Biological Association
Timothy	O'Shea	Atkins
Graeme	Peirson	Environment Agency - Midlands Region
Mike	Porter	Environment Agency - South West Region
Jane	Robertson	Natural England
Archie	Ruggles-Brise	Tyne Rivers Trust
Lucy	Shuker	Entec UK Ltd
James	Stickler	Haskoning UK Ltd
Chris	Stock	National Trust
Sebastien	Tellier	JBA Consulting

Workshop 4 (Site Visit) – Goosemoor regulated tidal exchange project

Name		**Organisation**
Judith	Bankhead	Rivers Agency
Philip	Brewin	Somerset Drainage Boards
Julian	Brooke Houghton	Environment Agency - South West Region
Ian	Brown	River Restoration Centre
Sally	Chadwick	Environment Agency - Southern Region
Nick	Clark	Jacobs UK Ltd
Elizabeth	Clements	Scottish Natural Heritage
Gareth	Codd	River Restoration Centre
Michael	Collins	Office of Public Works
Alex	Draper	London Wildlife Trust
Joanne	Evason	River Restoration Centre
Chris	Farmer	Environment Agency - Midlands Region
Charles	Forman	Environment Agency - North East Region
George	Ganda	Environment Agency - Southern Region
Andrew	Gill	Cranfield University
Jo	Goodson	Entec UK Ltd
Uta	Gruenert	Leibniz Institute of Freshwater Ecology and Inland Fisheries
Anne	Halpin	Somerset Drainage Boards

Elinor	Harris	Jacobs UK Ltd
Suzi	Hawkins	Environment Agency - North West Region
Andy	Hill	Alaska Environmental Contracting Ltd
Douglas	Kite	Natural England
Fiona	Lang	Environment Agency - North West Region
Jason	Lovering	Five Rivers Environmental Contracting Ltd
Philip	Marshall	National Trust
Giles	Matthews	Environment Agency - Midlands Region
Deirdre	Murphy	Environment Agency - North East Region
Jenna	Oliver	Environment Agency - South West Region
John	Pask	Environment Agency - South West Region
Andrew	Pepper	ATPEC River Engineering Consultancy
Helen	Powell	Natural England
Jed	Ramsay	Environment Agency - Thames Region
John	Robinthwaite	JPR Environmental
Howard	Simpson	Environment Agency - South West Region
Claire	Thirlwall	Thirlwall Associates
Emma	Thompson	Environment Agency - Southern Region
Peter	Thornton	Haskoning UK Ltd
Richard	Vivash	Riverscapes Consultancy
Mike	Williams	Environment Agency - South West Region
Peter	Worrall	Penny Anderson Associates
Emma	Thompson	Environment Agency - Southern Region
Peter	Thornton	Haskoning UK Ltd
Richard	Vivash	Riverscapes Consultancy
Mike	Williams	Environment Agency - South West Region
Peter	Worrall	Penny Anderson Associates

Site visit 1 attendance list – Exmoor mire restoration project

Name		Organisation
David	Bamford	Environment Agency - North East Region
Rob	Butler	Environment Agency - South West Region
Elizabeth	Clements	Scottish Natural Heritage
Tom	Cook	Environment Agency - Southern Region
Jillianne	Cross	Jacobs UK Ltd
Mark	Everard	Environment Agency - Thames Region
Joanne	Evason	River Restoration Centre
Karen	Fisher	KR Fisher Consultancy Ltd
Allan	Frake	Environment Agency - South West Region
George	Ganda	Environment Agency - Southern Region
Adela	Griffin	Southern Water
Ruth	Hanniffy	Environment Agency - Thames Region
Elinor	Harris	Jacobs UK Ltd
Carrie	Hume	RSPB - England
Audrey	Johnson	River Restoration Centre
Mary-Rose	Lane	Environment Agency - South West Region
Peter	MacDonagh	The Kestrel Design Group, Inc
Jenny	Mant	River Restoration Centre
Philip	Marshall	National Trust
Edward	Matthiesen	Wenck Associates, Inc
Jane	Robertson	Natural England
Kate	Stokes	Cornwall Wildlife Trust
Carolita	Wilson	Environment Agency - South West Region
Mike	Wilson	Environment Agency - Thames Region

Site visit 2 attendance list – Tale Valley, Escot Wetlands

Name		Organisation
Rick	Bossons	Alaska Environmental Contracting Ltd
Ian	Brown	River Restoration Centre
Sally	Chadwick	Environment Agency - Southern Region
Ruth	Eales	Environment Agency - Thames Region
Alison	Futter	Environment Agency - Thames Region
Sally	German	ARUP
Ceri	Gibson	Tyne Rivers Trust
Alice	Hall	River Restoration Centre
Sally-Beth	Kelday	Jacobs UK Ltd
Giles	Matthews	Environment Agency - Midlands Region
Charlotte	Murray	Environment Agency - Southern Region
Robert	Oates	Thames Rivers Restoration Trust
Charles	Perfect	Sure Limited
Mike	Porter	Environment Agency - South West Region
Chris	Stock	National Trust

Claire	Thirlwall	Thirlwall Associates
Karen	White	Atkins

Site visit 3 attendance list – Harbertonford flood defence scheme

Name		**Organisation**
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Chris	Farmer	Environment Agency - Midlands Region
George	Gerring	Environment Agency - Thames Region
Gareth	Greer	Rivers Agency
Felicia	Hicks	ARUP
Andy	Hill	Alaska Environmental Contracting Ltd
Martin	Janes	River Restoration Centre
Tristan	Josh	Eco-tech Systems Ltd
Christopher	Lally	Department of Transport - Drainage Division
Anne	Lewis	Environment Agency - North East Region
Anna	McFarlane	Jacobs UK Ltd
Damien	Nixon	Environment Agency - Southern Region
Charlotte	Owen	Environment Agency - Wales
Gareth	Pedley	Environment Agency - North East Region
Andrew	Pepper	ATPEC River Engineering Consultancy
Anna	Ritchie	University of Sheffield
Jo	Shanahan	Atkins
Kevin	Skinner	Jacobs UK Ltd
Emma	Westling	University of Sheffield
Mike	Williams	Environment Agency - South West Region
Julie	Wozniczka	University of Nottingham

FEEDBACK FORM: RRC Annual Network Conference
Wednesday 16th – Thursday 17th April 2008
Site visit on Friday 18th April 2008

University of Exeter, Exeter

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

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. Was 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 have a choice of 3 site visits. Would you be more likely to attend the Friday site visit at next years conference if you have a choice from three?

- ❑ Yes
- ❑ No

9. Would you be interested in:

A) Details for next years conference? Yes/No

B) Presenting a paper at next years conference? Yes/No

10. 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