The RIVER RESTORATION CENTRE'S 6th ANNUAL NETWORK CONFERENCE

13th - 14th APRIL 2005

De Havilland Campus
UNIVERSITY OF HERTFORDSHIRE,
HATFIELD

Sponsored by WWF and
The Environment Agency (NE Area Thames Region)

ENVIRONMENT AGENCY

PROGRAMME

NOTE TO ALL: IT IS A REQUIREMENT OF THE UNIVERSITY THAT WE FINISH PROMPTLY. PLEASE AIM TO KEEP TO THE PROGRAMME TIMES

Day 1: Wednesday 13th April 2005 *(AUDITORIUM)*

9.50 – 10.50	REGISTRATION *(AUDITORIUM)* /COFFEE *(ATRIUM)*	
10.50	**Welcome & Chair:** David Gilvear *(University of Stirling & RRC Chairman*	15mins
11.05	**Key Note Speaker:** Walter Binder *(Bavarian National Office for Water management, Germany)* 'Why River Restoration? (an overview of three decades of river restoration)'	25mins
11.30	David Collins *(Defra)* 'Conclusions of the flood and coastal erosion risk management strategy'	20 mins
11.50	**Discussion**	20mins

Session 1: **River Restoration Projects & Tools**

CHAIR: Andrew Pepper (*ATPEC River Engineering Consultancy*)

12.10	Paul Smith *(Environment Agency)* 'Shopham Loop River Restoration Project'	15mins
12.25	Paul Ritchie *(Corporation of London)* 'Restoring The Rye Brook – An Integrated Approach'	15mins
12.40	Warren Bradley *(Halcrow)* & Camilla Bennett (*Environment Agency*) 'Opportunity or constraint for enhancing river environments: Practical experiences of the DEFRA priority score system on taking forward flood alleviation schemes'	15mins
12.55	**Discussion**	15mins
13.10	LUNCH 13.10 – 14.15 *(REFECTORY)*	

Day 1 Cont:

Session 2: **Sustainable Flood Management & River Restoration**

CHAIR: David Collins *(Defra)*

14.15	Mike Donaghy *(WWF)* & Richard Johnson (*Mountain Environments Ltd*) 'The River Devon Sustainable Flood Management Project: river and wetland restoration'	15mins
14.30	Oliver Kaiser *(Institute for Landscape Management, Freiburg, Germany)* 'Flood protection and ground water replenishment through the revitalisation of a flood plain along the upper Danube near Ulm, Germany'	15mins
14.45	Julie Waldron *(Landscape Architect, Edinburgh City Council)* 'The Niddrie Burn – A sustainable approach to combining river restoration with flood management in an area of regeneration'	15mins
15.00	Discussion	15mins

Session 3: **POSTERS** & TEA/COFFEE 15.15 – 16.05 *(ATRIUM)*

Session 4: **Restoring the Ecology of Urban Rivers**

CHAIR: Alastair Driver (*Environment Agency*)

16.05	Mark Scott *(Project Manager (SMURF) / Environment Agency)* 'Sustainable urban river management - the example of SMURF'	15mins
16.20	Geraldene Wharton, Claire Hulbert, Nicola Sackwild *(Queen Mary University of, London)* and Richard Copas (*Environment Agency*) 'River Restoration and its Social and Environmental Benefits in South East London'	15mins
16.35	Valerie Bain & Roger Bettess *(HR Wallingford)* 'International Approaches to Achieving Ecological Objectives of Urban River Basin Enhancement'	15mins
16.50	**Open Discussion**	35mins

Session 5: **River Restoration Strategy for North London**

CHAIR: Martin Janes (*RRC*)

17.25	Professor Max Wade *(RPS Group)* 'Introducing a London wide strategy for Urban River Restoration'	10mins
17.35	Fran Bayley and Toni Scarr *(Environment Agency)* 'Restoring London's Rivers; challenges and opportunities'	15mins
17.50	**Questions & close**	5mins

EVENING MEAL *(REFECTORY BAR)* 19.00 for 19.30

For residential & pre-booked delegates only. Bar open until 12.30am

Day 2: Thursday 14th April 2005

8.50	REGISTRATION *(AUDITORIUM)*	
9.00	Welcome to day 2 explanation of format *(AUDITORIUM)*	10mins
Session 6:	**Restoration Developments: Near & Far**	
CHAIR:	Nigel Holmes *(Alconbury Environmental Consultants)*	
9.10	Kevin Skinner & Nick Haycock *(Haycock Associates)* 'Sinderland Brook - concept, design and implementation of a 1.8km river and corridor restoration scheme prior to urban development'	15mins
9.25	Alfons Oberhofer *(Architekt Landschaftsplaner, Vienna)* 'Restoration measures on the lowland river Morava'	15mins
9.40	Tony Burch *(Environment Agency)* 'Land drainage is a wonderful thing: changing attitudes'	15mins
9.55	Mike Crafer & Nick Lutt *(Thames Water)* 'Upper Kennet Rehabilitation Project: selecting, using and developing rehabilitation techniques on a chalk river'	15mins
10. 10	**Discussion**	20mins
10.30	COFFEE/TEA *(ATRIUM)*	30mins
11.00	**Parallel sessions** ***(see page 7 for details and rooms)***	95mins
12.35	**All Return to Auditorium for Sum Up Discussion**	30mins
CHAIR:	Jenny Mant *(RRC)*	
13.05	LUNCH (REFECTORY BAR) 13.05 - 14.05	
13.25	Coach leaves for site visit to River Brent (13.30pm sharp) - Return approx. 4.30pm **or** Reconvene for chosen workshop at 14.05 ****Please note: a packed lunch will be provided for those going to the site visit****	
	Workshops - 14.05 to 15.25 ***(see page 6 for details)***	
15.25	TEA/COFFEE (*ATRIUM*)	30mins
15.55	**All Return to Auditorium for Workshops Discussion**	30mins
CHAIR:	Martin Janes *(RRC)*	
16.25	**Final Words and CLOSE**	5mins

SUMMARY OF WORKSHOPS

Option 1: 'Monitoring and appraisal in river restoration. How does it fit with the objectives of the Water Framework Directive' Kevin Skinner (*Haycock Associates*) & Jonty Gibson (EA)

(AUDITORIUM)

Option 2: 'Establishing long term goals for urban river restoration; an open forum to discuss constraints and opportunities with a view to developing a realistic long term vision for our urban rivers' Matt Carter (*Environment Agency, Hatfield*)

(Room N110)

Option 3: 'Ask the Expert' (*RRC staff, Advisors and others*): Practical advice on rivers and restoration – A range of individuals available to answer your questions

(Room N105)

PARALLEL SESSION PROGRAMME

Parallel Session	7. STRATEGIES/ACTION PLANS (N110)	8. TECHNIQUES (AUDITORIUM)	9. CASE STUDIES (N105)	
CHAIR:	Helen Dangerfield *(Royal Haskoning Ltd)*	Jenny Mant *(RRC)*	Walter Binder *(Bavarian National Office for Water Management)*	
11.10	Ian Frearson *(Derby City Council)* 'Keeping up appearances'	Simon Johnson *(Wild Trout Trust)* 'The work of the WTT in delivering restoration at the local level'	Sally German *(Gifford)* & Robin Chase *(Cain Consultancy)* 'The use of fluvial geomorphology for sustainable ecological restoration of an urban watercourse'	15 mins
11.25	Gary Jones-Wright *(Environment Agency)* ' Carlisle & Lower Eden flood risk management strategy'	Roy Richardson (*SEPA*) 'Restoring streams using engineering log jams – a case study from Northern California'	Stuart Smith, Nathan Richardson, Max Carstairs, Mark Sudworth (*Atkins Water*) 'Low flows and river restoration in East Anglia: current approaches and future challenges'	15 mins
11.40	**Discussion**	**Discussion**	**Discussion**	10 mins
11.50	Nigel Holmes *(Alconbury Environmental Consultants)* 'The River Darent: A Strategy for Recovery'	Sally Sudworth & Paul Maliphant *(Halcrow)* 'Rhondda Fach River Diversion – birds, bats and battered fish'	Armin Peter & Sharon Woolsey *(EAWAG)* 'Local river widenings as river enhancement techniques'	15 mins
12.05	Matt Carter *(Environment Agency)* 'Improving degraded urban rivers for fish populations'	Pete Worrall *(Penny Anderson Associates)* & David Palmer (*Black & Veatch)* 'Rivers of Concrete: creating ecological value in concrete rivers'	Katy Read *(Middlemarch Environmental Ltd, Coventry)*, Philip Fermor & Colin Bundy *(Severn Trent Water)* 'Riverine and Floodplain Rehabilitation Best Practice: A Case Study at Aston Hall Farm'	15 mins
12.20	**Discussion**	**Discussion**	**Discussion**	10 mins
12.30	**Return to the Auditorium**			5 mins

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SUMMARIES OF PAPERS

WHY RIVER RESTORATION?

Walter Binder (Bayerisches Landesamt für Wasserwirtschaft, Lazarettstraße 67, 80636 München)Tel.: ++89/9214-1016 Fax: ++89/9214-1041 e-mail: walter.binder@lfw.bayern.de

More than 100 years of river- and drainage works in many parts within Europe and also other places in the world couldn't ban the danger of floods, but brought a loss of nature to rivers streams and wet lands.
Within the last three decades restoration projects were started and river restoration is a growing business in many states in Europe, but also in the USA, in Australia and Japan. Especially the floods in 1999 and 2002 in Central Europe pushed programs for flood protection. Today the objectives are to preserve natural retention areas and to restore rivers beside technical flood control works. River assessment methods where developed, to show how much of the hydromorphological components in our rivers has altered by river works and where river restoration should be concentrated.

Rivers needs space. The objectives for River restoration projects are:

- to give more space to the river within the flood plain
- to allow the natural morphodynamics processes
- to find new techniquess for mitigation to support or to limit morphodynamic processes
- to win stakeholders, residents and others for river restoration projects.

Many projects were published in the last two decades dealing with River restoration. Not all of them were perfect, some are already redesigned by floods. But there are many successful projects along streams and rivers, where we can learn by studying the technical solutions and the experiences which were made.

There will be shown restoration projects in Central Europe and the importance of maintenance work for river restoration, also in the view of the Water Framework Directive.

SHOPHAM LOOP RIVER RESTORATION PROJECT

Paul Smith, Project Manager, Fisheries, Recreation and Biodiversity, Environment Agency, Saxon House, Little High Street, Worthing, West Sussex, BN11 1DH. Tel: 01903 703874. paul.smith@environment-agency.gov.uk

Shopham Loop is a multidisciplinary river restoration project incorporating novel approaches to design, construction and funding. The project, which was led by the Environment Agency, aimed to improve the environment by: -

- restoring 1km of degraded watercourse and its associated floodplains.
- restoring natural river processes to provide additional habitat diversity to benefit the ecology of the river Rother.
- enhancing and diversifying the fishery of the lower river Rother catchment.
- protecting the old lock structure from further erosion from the river.

Shopham Loop is a large natural meander on the lower reaches of the river Rother in West Sussex, which historically supported good fisheries habitats and a wealth of wildlife. This has been progressively lost as a result of siltation, which has caused the channel to dry out with the associated loss of river and floodplain habitats in the area.

The reasons for the degradation of Shopham Loop are partly historic and partly due to changes in land management. The Loop is the remnant channel of the natural river course that remained unaltered during the development of the Rother Navigation. When the navigation opened in 1795, a straight canal cut had been created with lock gates that ensured the main river flowed through the Loop, while barges could travel along the canal. However, when the canal was officially closed, the lock structure fell into disrepair and the navigation became the main course of the Rother with little or no flow travelling through the meander, except in times of flood. In more recent times, changes in agricultural practices within the Rother valley have led to large quantities of soil being washed into the river, damaging wildlife and fisheries habitats. These combined impacts created a silt trap and sandy deposits from the surrounding catchment filled the loop.

The RRC were commissioned to undertake a technical appraisal and to provide restoration options. The EA developed the final design, which involved re-establishing the meander by removing the large quantities of sand and silt that had accumulated, blocking off the man-made cut and diverting the main flow back through the loop. The artificial levees were also lowered to restore a naturally functioning river system and floodplain.

The construction phase was successfully completed in September 2004. The original sinuous, dynamic lowland watercourse has been reinstated with tight meander bends and varied bed and bank profiles. The river has been reconnected with the floodplain, a large backwater, shallow ponds and wader scrapes have been created. The design has already been tested this winter, as the floodplain has already been inundated with flood flows. Furthermore, the natural dynamics of the system have been kick started and erosion and deposition has occurred as predicted.

The Shopham Loop restoration was a partnership project between the Environment Agency, DEFRA, Sussex Downs Conservation Board, The Rother Valley Project and the landowners. The project was funded by contributions from the Environment Agency (Fisheries and Flood Defence), DEFRA (agri-environment scheme grants) and the Sussex Downs Conservation Board. This range of funding sources highlights the diverse benefits that river restoration can bring.

A three year post project appraisal has now begun which will not only involve a detailed appraisal of the scheme against its aims and objectives, but also consider the wider benefits. The research will be fundamental in quantifying the benefits of river restoration projects as well as the interrelation between physical changes and biological responses. As a result the project will provide a complete case study to inform similar projects in the future.

RESTORING THE RYE BROOK: AN INTEGRATED APPROACH

Paul Ritchie,
Senior Keeper, Ashtead Common National Nature Reserve, Surrey
(Corporation of London, Ashtead Common Estate Office, Woodfield Road, Ashtead, SURREY, KT21 2DU, Tel: 01372 279083)

The Rye Brook is a tributary of the River Mole, flowing from its source at the foot of Epsom Downs to the main river at Leatherhead in Surrey. During its journey, the Rye runs through Ashtead Common, a National Nature Reserve (NNR) and public open space owned by the Corporation of London. The Common is a unique resource, managed for the use and enjoyment of the public, for the conservation of wildlife and as a historic landscape.

Background of the Project

Recent surveys confirmed that a 365 metre stretch of the Rye Brook had been straightened and that this channelised section supported a much-reduced biodiversity compared with other, more natural reaches of the brook. Following a 1999 feasibility study, the Corporation recently instigated a River Restoration Project, agreeing the following objectives with the Environment Agency and other key stakeholders:

- To restore and sustain natural processes to the river channel
- To improve the quality and role of the river corridor
- To enhance and sustain biodiversity
- To increase flood storage capacity
- To provide an attractive, accessible and safe river for all people to enjoy
- To encourage local community involvement
- To develop stimulating opportunities for teaching and learning

Theme of the Presentation

The purpose of the presentation will be to emphasis the importance of adopting an integrated approach to planning projects and the benefits that such an approach has to gaining support of stakeholders and perhaps most importantly, attracting funding. In particular I will stress the importance of inclusive objectives for a project, the benefits of extensive public consultation and the learning associated with combining staff, contractors and volunteers on one project. I will make reference to our varied sources of funding for this project.

Format

The presentation will be provided on a CD in Microsoft PowerPoint 2002.

Additional Information

It is possible to provide handouts in the same format as the PowerPoint presentation or a more general information sheet about the project prepared in Microsoft Word that fills two sides of A4 (i.e. one double-sided A4 page). Later in the year a full project report will be produced.

OPPORTUNITY OR CONSTRAINT FOR ENHANCING RIVER ENVIRONMENTS?

PRACTICAL EXPERIENCES OF USING THE DEFRA PRIORITY SCORE SYSTEM TO FORWARD FLOOD ALLEVIATION SCHEMES

Warren Bradley, Design Team Leader, Halcrow Group Ltd.
E-mail: bradleywt@halcrow.com

Camilla Bennett, Flood Improvements Engineer, Environment Agency
E-mail: Camilla.bennett@environment-agency.gov.uk

The DEFRA priority scoring system is used to help prioritise which flood alleviation schemes are taken forward at a regional and national level. It takes three main criteria into account; economics, people and environment.

The question is, what effect does this system have on the type of schemes that are taken forward and are they really aligned with the strategic objectives of the Environment Agency? The system is designed to rate schemes from their early stages and throughout their development, so it is acknowledged that it is a simplified but pragmatic approach to weighting projects.

The purpose of the scoring system is to ensure that the most worthwhile projects are carried out first, and it is therefore focused around the cost of the proposed works and the benefits it provides. However, with the simplified approach, how well does it prioritise between schemes that have comparable costs and numbers of houses protected, but very different environmental effects?

This paper will look at the experiences of taking forward two case study projects and identify if anything can be learnt from the process. The Harbertonford Flood Defence Scheme was constructed in 2002 and is considered as one of the most sustainable flood alleviation schemes recently constructed. The Ripon Flood Alleviation scheme is currently under development and with a project cost of around £8M, the scheme is very sensitive to financial factors, which have affected the scheme development.

WWF RIVER DEVON NATURAL FLOOD MANAGEMENT PROJECT, CLACKMANNANSHIRE, SCOTLAND

Mike Donaghy, WWF Scotland
Richard Johnson, Mountain Environments

A number of major flood events have recently occurred throughout the UK and it is now widely agreed that there is a need for better flood management. This is particularly important in the context of the impacts of climate change. Floods are natural events generated by rain and snowmelt but they are also affected by human activities including land use changes, artificial drainage, confinement of the rivers and blockages in channels. Flood alleviation in the past would often look to hard engineering solutions such as the construction of flood banks or channel excavation. In most cases these techniques are now considered to be un-sustainable and possibly damaging to the wider environment.

A number of river and catchment management practices have recently been developed to benefit the wide environment including flood alleviation. In 2003, the Water Framework Directive was transposed into Scots Law as the Water Environment Water Services (Scotland) Act 2003. Amongst other additions it included a duty for sustainable flood management and defined wetlands as watercourses. The techniques, which are accepted as best practice, have now been written into national legislation enabling local authorities and other government agencies to better manage flooding. However in many situations there is still a need to put these techniques into practice.

The River Devon flood management project is being undertaken to demonstrate these best practices in river management within a single catchment. The Devon has been selected because of the range of river and catchment modifications which have taken place in the past, the existing work being undertaken in the area by Clackmannanshire Council and the willingness of the local land-owners to take part in the study.

The project will be implemented over a two year period and the flood management work will include:

- Reservoir management – drawdown before heavy rain falls
- Rehabilitation of artificial drains in plantation forests
- Restoration of wetlands to increase flood storage
- Floodplain storage
- Riparian woodland restoration to prolong floodwater retention
- Bankside habitat management
- Erosion and sediment control to improve the conveyance of floods down the main channels
- Storm water management in quarries to increase retention times
- Urban watercourse rehabilitation to reduce the risk of channel blockages

A monitoring system has been established before the work starts to show the effectiveness of the work on flood alleviation and the wider benefits to the environment.

FLOOD PROTECTION AND GROUND WATER REPLENISHMENT THROUGH THE REVITALISATION OF A FLOOD PLAIN ALONG THE UPPER DANUBE NEAR ULM, GERMANY

Oliver Kaiser, (Institute for Landscape Management, Faculty of Forest and Environmental Sciences, Albert-Ludwigs-University Freiburg, Germany) Phone 0049 (0)761 203 3641 Email: oliver.kaiser@landespflege.uni-freiburg.de Website: www.landespflege-freiburg.de

In the beginning of the 19th century many important flood plains and detention areas along the upper Danube were lost due to river engineering measures and the canalisation of the river-bed, as well as the draining and utilisation of flood plains. This led to aggravated flood effects in the area near Ulm. Vertical erosions of the river-bed increased and, consequently, the ground water level lowered substantially. The federal state Baden-Württemberg plans to revitalise large stretches of the Danube between the towns Hundersingen and Binzwangen in order to stabilise the bed of the Danube, raise the ground water level and improve flood protection. Altogether, around seven kilometres of the old river bed will be restored and approximately 100 ha of the flood plain will be revitalised to serve as a natural retention area. The objectives are to create typical flood plain habitats, to support natural water dynamics and to reconnect the river and its flood plain. The raising of the river bed level, as well as the widening or relocation of the river are necessary for achieving these goals. Taking this into account, the Institute of Landscape Management (University of Freiburg) developed a management concept for the Water Authority of Baden-Württemberg. The principal problem for the planners is the severe vertical erosion of the river bed near Binzwangen, since it impedes the natural development of the Danube river. In addition, a former household rubbish dump, supply grids and sewers in the planning area further limit the development possibilities. Taking these obstacles into account, two main development options are currently discussed.

The first option considers the widening of the river bed in the whole planning area and the creation of side branches between Hundersingen and Binzwangen. Those should reconnect some of the former river branches in the flood plain. The second option is to create continuous meanders, which could be achieved by completely relocating the course of the Danube. In that case the old river bed would only serve as a side branch. The new river bed would be more than two kilometres long and would mainly follow existing flood hollows and old branches. To achieve a retention effect, the river should flood the surrounding area about three times a year. By early 2005 the assessment of these two options with respect to water resources engineering, nature protection and investments should be concluded and, if necessary, modified. The results will serve as a basis for a water resources management concept, which will be developed in co-operation with experts of different backgrounds such as water engineering, forestry, fisheries, agriculture and nature protection, as well as the affected communities.

THE NIDDRIE BURN – A SUSTAINABLE APPROACH TO COMBINING RIVER RESTORATION WITH FLOOD MANAGEMENT IN AN AREA OF REGENERATION

Julie Waldron (Edinburgh City Council) Julie.Waldron@edinburgh.gov.uk

The Niddrie Burn is a small river in Edinburgh that flows west to east, through the suburb of Craigmillar. This is a very deprived community, the 4th most deprived in Scotland, and suffers from poor quality open spaces with many areas of housing that have been recently demolished. The City of Edinburgh's City Joint Venture Company (CJVC) is leading the regeneration of Craigmillar and part of the new scheme lies on the 1:200 flood plain.

The river has been culverted, straightened and split in the past. This project presents the opportunity to bring the river into the heart of the new community and create a new riverside park with a flood plain that links the new hospital, housing and regeneration areas with a strategic greenspace that runs north -south. The new river course will take it 1.4 km across land with a variety of different owners both public and private.

The City of Edinburgh Council Planning and Strategy team is leading the river project, using previous projects and reports as a starting point. It is being run as a partnership project with a steering group. This approach has ensured that all statutory consultees and the private, public funders have an opportunity to raise their concerns and views and discuss their varying remits. This will enable the redesign of the river to be holistic as opposed to a piecemeal series of river designs submitted with a planning application for each new development site.

The Steering Group for the project will be linked by an agreement enabling money to be brought into the Council, before section 75 agreements have been established, and to ensure all parties are secure in the working arrangements. The Council and the CJVC has also applied to external funding sources.

The Council has drawn together a detailed brief that includes the overall vision for the riverside park clearly indicating the different interests of the parties around the table. There is a joint overall brief and separate more technical briefs which include a landscape design, ecological community involvement brief, an engineering brief, a geomorphology brief and an artists brief. The geomorphology brief was drawn up with SEPA and a fluvio-geomorphologist, funded by Scottish Natural Heritage, has recently done some preliminary work on the river. All the parties involved had an opportunity to input and comment on all the briefs. Community consultation within the brief is linked to community consultation that has taken place as part of the ongoing regeneration of Craigmillar. The community artist whose project 'Art in the Environment' is a perfect compliment to the project keeps in close contact with the landscape architect within the Council.

The talk will explain the delicate balance between the various interests within the project, the current position, the vision and future of the restoration works and how the partnership has, so far, achieved a sustainable approach to a complex project.

SUSTAINABLE URBAN RIVER MANAGEMENT: THE EXAMPLE OF SMURF

Mark Scott, Environment Agency, Riversmeet House, Northway Lane, Tewkesbury, Glos, GL20 8JG; Tel: 01684 864525; E-mail mark.scott@environment-agency.gov.uk

In August 2002, the Environment Agency began working with a number of partners to investigate how implementing sustainable land-use planning and water management techniques could tackle the problems associated with urban rivers. The three-year project, called SMURF (Sustainable Management of Urban Rivers and Floodplains), has been developed under the EU LIFE-Environment programme and is based on the River Tame in the West Midlands.

The River Tame is a typical example of an urban river suffering from a number of problems caused by years of pollution from surrounding industry and development, in addition to heavy modification and re-routing and the replacement of natural bank features with concrete and other man-made materials.

SMURF tackles these problems by integrating the planning and management of land-use, water quality, ecology and flooding in a sustainable way. Sustainable means finding a balance between the environment, the economy and people's quality of life.

The SMURF project partners believe that longer term planning of the floodplain and river system can only be undertaken with the direct involvement of stakeholders and local communities. In order to develop a vision for the management of the River Tame in Birmingham, three community groups were established. The participants attended a series of meetings during which they discussed the rivers and developed their views on how the rivers should be managed.

A set of environmental sustainability indicators for urban rivers has been developed using data from detailed habitat surveys of over 100 stretches of the River Tame. The indicators describe features of the river and classify each stretch according to three key characteristics: materials, physical quality and vegetation characteristics of the channel and riverbank. Each stretch of river can be assigned a score according to these three characteristics, allowing water managers to make informed decisions about which stretches of river might be targeted for rehabilitation. They also allow rehabilitation targets to be set to assess the success of the scheme.

To demonstrate the SMURF project approaches to urban river management, two demonstration schemes have been implemented. These schemes have closely involved the local community and been guided by the application of the urban river survey and indicators. The selection of the demonstration sites and design and implementation of the demonstration schemes will be described during the presentation.

RIVER RESTORATION AND ITS SOCIAL AND ENVIRONMENTAL BENEFITS IN SOUTH EAST LONDON

Geraldene Wharton[1], Richard Copas[2], Clare Hulbert[3] and Nicola Sackwild[4]

[1] Department of Geography, Queen Mary, University of London, London E1 4NS (g.wharton@qmul.ac.uk)

[2] Environment Agency, Thames Region, Kings Meadow House, Kings Meadow Road, Reading RG1 8DQ (richard.copas@environment-agency.gov.uk)

[3] Former student of Queen Mary, University of London (richard.hulbert2@btopenworld.com)

[4] Former student of Queen Mary, University of London (nicsackwild@hotmail.com)

Throughout most of the 19th and 20th centuries many of the watercourses in the Ravensbourne catchment, one of the most urbanised in the UK, were engineered out of the landscape. In 1992 the National Rivers Authority undertook a landscape assessment to ascertain the state of the catchment and the need and opportunities for river restoration. It found that about a third of the river was highly modified by containment in a culvert. So when another scheme that would have further modified significant sections of the Quaggy River was proposed in the early 1990s, both the professional environmentalists concerned with the scheme and local people objected. The Quaggy River flood alleviation scheme was thus reconsidered. Between 1992 and 2004 significant parts of the Ravensbourne river system have been restored in terms of landscape, geomorphology and ecology. This has been achieved through a series of restoration projects at Norman Park, Chinbrook Meadows, Bromley Common Golf Course, Sundridge Park Golf Course and the flood alleviation scheme and restoration at Sutcliffe Park.

After a brief overview of past flood defence engineering in the Ravensbourne catchment, this paper will focus on two of the restoration schemes on the Quaggy River. First, the findings of a post project appraisal of the Chinbrook Meadows scheme, undertaken one year after its completion in 2003, will be presented and discussed. Geomorphological and ecological surveys of the restored reach, when compared to upstream and downstream control sections, showed increased physical habitat diversity and generally positive changes in macrophyte and invertebrate species abundance, richness and diversity as a result of the restoration. And the results of a survey of 65 park users indicated that the scheme had been successful in improving the amenity value of the park.

Secondly, the more recent restoration and flood alleviation scheme at Sutcliffe Park (completed in 2004), which has enhanced the environment for people and wildlife and brought about local regeneration, will be used as an example to show the benefits of multi-functional planning and design for flood risk management in urban catchments.

INTERNATIONAL APPROACHES TO ACHIEVING ECOLOGICAL OBJECTIVES OF URBAN RIVER BASIN ENHANCEMENT

Valerie Bain[1],Roger Bettess[1], Jochen Schanze[2], Alfred Olfert[2], Joachim Tourbier[3] and Ines Gersdorf[3]

1. *HR Wallingford Ltd, Howbery Park, Wallingford, OX10 8BA. Telephone 01491 822333. Email vba@hrwallingford.co.uk*
2. *Institut fuer Oekologische Raumentwicklung, Weberplatz 1, 01217 Dresden, Germany. Telephone +49 (0) 351 4679 228. Email j.schanze@ioer.de or A.Olfert@ioer.de*
3. *Technische Universitaet Dresden, Institute of Landscape Architecture, Landscape Construction Department, Mommsenstrasse 13, D - 01069 Dresden, Germany. Telephone +49 (0) 351 463 334 53. Email tourbier@rcs.urz.tu-dresden.de or urbem@mailbox.tu-dresden.de*

It is common for urban river enhancement to focus on improving the aesthetic quality of the river since this results in the most visible benefit for improving the quality of life for people living and working in the urban environment close to the river. However, rehabilitating the landscape alone will not necessarily result in any improvement of the river ecology, which in urban rivers has frequently been highly degraded. With the advent of the European Water Framework Directive (WFD), there is significant motivation for EC states to improve the ecology of their urban rivers in order to comply with the legislation.

This presentation will describe case studies of river rehabilitation from around Europe and the rest of the World, identifying methods that have been used to improve the ecology of urban rivers. The research has been carried out under the URBEM (Urban River Basin Enhancement Methods) Project, which is part of the EC Fifth Framework Programme and started in November 2002 and will finish October 2005. The work on existing river rehabilitation schemes supports other work packages which develop methods for identifying rehabilitation potential and carrying out rehabilitation projects.

The case studies demonstrate that urban planners and river managers are often aiming to satisfy a number of objectives when carrying out river rehabilitation. For example, the objective of ecological improvement cannot, in many cases, compromise flood control. This places constraints on the techniques available for implementation. In addition, there are constraints on the rehabilitation project due to the fact that it is being carried out in an urban setting, for example, there is often restricted space along the river corridor and urban rivers are commonly channelised. Information on successful approaches to improving urban river ecology within these constraints is, therefore, of great use to river managers and planners.

The presentation will discuss the ways in which both hydromorphological and water quality elements can be improved and will explore the relationship between these parameters and the river ecology. The analysis of the case studies will examine the ecological impacts of rehabilitation in terms of WFD classes. The case studies will be used to establish current best practice, defining a bench mark on which the science of river rehabilitation must build.

RESTORING LONDON'S RIVERS; CHALLENGES AND OPPORTUNITIES

Fran Bayley and Toni Scarr (Environment Agency) fran.bayley@environment-agency.gov.uk

For millennia rivers have been integral to connecting people with their environment, but in London, as with many modern cities, these connections have been lost. River restoration is therefore a key process that can help re-establish these broken links between people and wildlife, thereby making it an important part of the wider challenge of urban regeneration.

A healthy environment is known to improve people's quality of life and rivers and their floodplains are recognised as being a key element to maintaining a healthy environment; as such this strategy forms one of many important initiatives currently being promoted across London.

The restoration strategy for London is presented in two documents. The South London Strategy produced in 2002, highlighted opportunities for river restoration in South London, with the principal aim of ensuring that river restoration became an integral part of regeneration rather than being seen as a 'secondary' consideration.

The new North London Strategy promotes a similar message but with a slightly different flavour. Containing examples of previous successes at a variety of different project scales, the document goes on to describe the actual process of 'how' to plan river restoration and identifies areas of opportunity using colour coded maps. In addition, other useful information such as links to potential partners and funding opportunities is also provided.

Together these strategies form a London wide approach to river restoration. They promote and advocate the overriding principle of working in partnership to seek opportunities in line with other plans and strategies, to deliver outcomes that maximise social, economic and environmental benefits, through restoring and re-connecting rivers to wildlife and people.

Together these documents set out the Agency's vision for the future and place it in context with other major strategies currently taking place across London.

SINDERLAND BROOK - CONCEPT, DESIGN AND IMPLEMENTATION OF A 1.8KM RIVER AND CORRIDOR RESTORATION SCHEME PRIOR TO URBAN DEVELOPMENT

Nick Haycock, Haycock Associates Limited (nehaycock@haycock-associates.co.uk)
Kevin Skinner, Haycock Associates Limited (kskinner@haycock-associates.co.uk)

In the late 1990s proposals were put forward to restore Sinderland Brook as part of broad range of environmental enhancements associated with a new housing development at Brookside Farm, Broadheath, near Altrincham. The National Trust, who own the land, will use the funds raised from the sale for vital restoration and maintenance work in the remainder of the Dunham Massey Estate. After many years of negotiations, design and planning, the construction of the river scheme finally started in the summer of 2004 and will be completed in autumn 2005.

The Sinderland Brook restoration will have a multitude of benefits. Geomorphologically, the river will be transformed from a 1.8km channelised reach, that possessed a limited floodplain (1m wide), to a diverse, meandering planform, in a newly formed valley. The new floodplain will be constructed at a lower elevation and range from 30-60m wide. The low flow channel itself will be narrower than the current channelised course (low flow channel of around 1-2m wide) to enable a more frequent interaction between the river and its floodplain. The design of the river was broadly based on the historical form (e.g., tithe maps) but takes into account the urbanised nature of the catchment. The construction of the new valley will create a large increase in floodplain storage area that will cause a reduction in the flood peak levels and attenuate the flood pulse. The scheme will dramatically increase flood protection to the existing properties (currently Q35 raised to +Q70) while providing a very high level of protection for the new housing development (Q100 + 20%). A further key benefit is to habitat. The physically diverse channel and riparian corridor will provide new and varied habitats to Sinderland Brook that previously had not existed in its former channelised state. Finally, the restoration work will provide significant aesthetic and recreational benefits for the local public, who have been key stakeholders in the development of the scheme concept and resulting landscaping.

Throughout the whole process, the vision has been to create a river corridor that is based on local relevant geomorphological analogues of channel forms but also floodplain and terrace features. This design also had to accept that the channel form would not be static, as is the case with all holocene sand geology floodplains. The wide floodplain allows the channel freedom to migrate and reform the floodplain. The removal of key utilities as part of the development plan (CSO's, mains water pipes, electricity) from the river corridor ensured that the channels movement does not present a threat to these assets, and further ensures that the system can re-naturalise over the long term without any major intervention.

Partnership of The National Trust, Redrow Homes and Taylor Woodrow (Bryant Homes).

RESTORATION MEASURES ON THE LOWLAND RIVER MORAVA

Alfons Oberhofer, (Atelier Oberhofer), Albert Schwingshandl (riocom), Stephan Nemetz and Robert Konečny, (Federal Environment Agency Austria) and Werner Lazowski (Consulting engineer for ecology)

The river Morava is a lowland river which has its source in the Czech Republic and at its lower reach forms the border between Austria and Slovakia at a length of approximately 70 kilometres. Originally, this section of the Morava was a typically meandering river, but due to river regulation measures in the first half of the 20th century the river morphology was changed to a high extent: meanders were cut off to straighten the geometry and nearly the whole length of the river banks was stabilized by riprap in order to fix the national border between Austria and Slovakia. The construction of flood dams caused a significant loss of retention area and wetlands. Nevertheless, the remaining riverine landscape is the most valuable lowland river ecosystem in Austria and still has a high potential for restoration. The floodplain areas are protected by various national and international regulations e.g. Ramsar Convention.

In the beginning of the 1990's a planning and decision making process was launched by the administrative boards responsible for water management and nature protection in both countries, Austria and Slovakia. This process led to the implementation of a first set of restoration measures in 2002. In our presentation we would like to show some of the steps in this process with an emphasis on the construction measures implemented within the pilot project and on the preliminary results of the monitoring.

At the beginning a *Ramsar Concept* was elaborated on the Austrian side in order to develop general criteria and objectives for all uses relevant to the area, such as agriculture, forestry, water use and river management. The Ramsar Concept was the basis for *MARTHA95*, a general river engineering and ecological study carried out between 1995 and 1997. Within *MARTHA95* a detailed current state analysis of the Morava river system was carried out, comprising hydraulic modelling, flood dynamics and groundwater analysis, the survey of landscape, bank and river bed structures. A scenario analysis was carried out, and a leitbild and a catalogue of measures were elaborated. The methodology of the scenario analysis and the leitbild development were very innovative and proved, to support the interdisciplinary collaboration and communication within the project as well as the external communication of the results.

MARTHA95 was implemented within the framework of the first LIFE-project carried out in the Morava region. In the second LIFE project the focus was set on detailed planning and implementation of a pilot restoration project in the section of river-Km 15 to 25 of Morava.

As a first step of a detailed planning phase various types of measures were developed. They can be seen as modular elements and were grouped in the following categories depending on their objectives: A Increase of development of river course; B Variability of cross section morphology; C Lateral connectivity; D Meander reconnection; E Improvement of structures in low water channel; F New types of river bank stabilization; G Design of river banks in urban areas.

In the second phase the types of measures were applied to the project reach. One of the framework conditions dominating the planning process were certainly the restrictions imposed by the current legislative regulation of the national border between Austria and Slovakia. The border is not defined by a list of coordinates, but as "movable" border that must not change more than a quarter of the width of the river Morava!

The measures were taken in 2002 and since 2003 an interdisciplinary monitoring has been carried out (participated by ornithologists, fish-experts, biologists and engineers). The preliminary results of the monitoring are considered to be promising, e.g. the increase of fish species from 22 to 36. However, the positive effects of the project are not restricted to an improvement of the ecological situation but also can be seen in the joint cooperation of the 2 states: In 2004 a project started to develop a bilateral strategy for the restoration of the complete Austrian/Slovakian border reach of the Morava.

LAND DRAINAGE IS A WONDERFUL THING (CHANGING ATTITUDES)

Tony Burch (EA Strategic Planning Engineer) EA rep on FD2114 Steering Group and EA's FD member of Defra's working group which designed the High Level part of the new Environmental Stewardship Scheme

This paper explores the statement Land Drainage is a Wonderful Thing.
It considers the current negative attitude towards land drainage. It challenges that attitude. It proposes that a change in the way in which we think about 'land drainage', the physical process by which precipitation drains from the soil to the sea, would provide a powerful tool which will help to deliver river and floodplain restoration as part of Integrated Catchment Drainage Planning and the Water Framework Directive's Programme of Measures, for the benefit of both people and wildlife, for all states of flow.

It proposes that the 'process and system' concept can be applied to catchment drainage and that this could provide a scientific model of the physical, the quantity and the quality aspects of water management, which could be used for integrated catchment management.

In the light of the results of Defra/EA research project FD2114 *'Review of the impacts of rural land use and land management on flood generation'*, and the High Level part of the new Environmental Stewardship Scheme, it discusses how rural land-use/management and river and floodplain restoration can be used to reduce flood risks and to improve bio-diversity, with caution and planning.

The WFD focuses on the management of the quality and quantity of water in water bodies to achieve 'good ecological status or potential', and it places flood risk management and agricultural land drainage outside the fold. Yet, good ecological status or potential is, perhaps, equally or more dependent on the physical management of water courses (geomorphology), and this is principally governed by the land drainage and flood defence legislation. It poses the question …… could this legislation - which has been used for decades to physically modify arterial water courses for flood defence and agricultural land drainage purposes - be used in its present form, or with modifications, to undo these modifications for bio-diversity purposes as part of Integrated Catchment Drainage Management?

UPPER KENNET REHABILITATION PROJECT – SELECTING, USING AND DEVELOPING REHABILITATION TECHNIQUES ON A CHALK RIVER

Mike Crafer, (Conservation Manager) mike.crafer@thameswater.co.uk
Nick Lutt, (Environmental Scientist) nick.lutt@thameswater.co.uk

The River Kennet Site of Special Scientific Interest (SSSI) is a lowland chalk river of national importance as a wildlife habitat. This importance is reflected in the identification of chalk rivers as a priority habitat within the UK Biodiversity Action Plan (BAP).

The recent history of chalk rivers has not been favourable, with many human pressures imposed upon these fragile habitats. One of the most striking adverse changes resulted from heavy dredging works in the 1950s and 60s, which were at that time designed to alleviate flooding. These works altered the natural morphology of the river channel to such an extent that they destroyed the varied flow pattern, so crucial to the healthy development of key ecological features such as clean gravel beds for spawning wild brown trout and grayling and the –rich beds of chalk stream water-crowfoot.

A five-year project led by Thames Water in partnership with the Environment Agency, English Nature, Action for the River Kennet (ARK, a local conservation group), local landowners and river keepers has been completed to help reverse some of this deterioration.

The main project objective was to:
"Design, implement and monitor rehabilitation measures along 10km of the Upper River Kennet to demonstrate a range of environmental rehabilitations and be a catalyst to encourage further restoration work in the future".

Subsidiary project objectives included:

- *Enhance visual amenity; improve angling and other recreational experiences;*
- *Better fishery (increasing breeding success of native species);*
- *Enhanced character of in-channel, riparian and floodplain habitats;*
- *Improvements for nationally or locally important species that are typical of chalk rivers, e.g. water vole, brown trout, water-crowfoot*

Since 1999, the project has successfully completed seven river rehabilitation schemes on a 10km target reach of the river between Marlborough and Knighton in Wiltshire. Rehabilitation techniques used include bed raising, river narrowing using groynes, deflectors, ledges, causeways and islands, planting of common reed, water-crowfoot, sedges and modified water level management.

The final year (2004) has been devoted to project reporting to encourage further river rehabilitation projects in the UK, and elsewhere. A series of advisory and education materials have been produced and will be illustrated in the presentation. These include:

- a technical CD, which uses a series of video clips to allow specific topics to be explored ranging from the importance of chalk rivers through to consideration of different rehabilitation techniques and lessons learnt from the project;
- a short video presenting a history (video diary) of the project
- a series of case study sheets, giving details of the techniques used.

KEEPING UP APPEARANCES

Ian Frearson, (Engineering Design) Email: Ian.Frearson@derby.gov.uk

A cursory look at the problems involving flood management in Derby.
OK, so flooding has to be managed, so flood defences are required, so what?
Well if they have to be provided they need maintenance – obviously.
If they have to be provided and maintained they might just have an effect on the surroundings.
If this is the case then, as public servants, Local Authorities have a duty to their public, after all, they pay our wages don't they? So -

Why Bother? In three words, Heritage, Achievement, Sustainability.

What can be done?

- Do nothing — Reasoned justification :- Required works already done, minimise further disturbance of nature; allow natural ecology to find its own balance.
- Do minimum — Prevent flooding, do not allow situation to worsen.
- Do something — Carry out Regular Asset Assessment, remove degradation; provide regular routine maintenance; restore and improve as deterioration takes place.

Who can do it?

- Riparian Owner — Incentive - Why should they other than personal satisfaction, Finance – frequently, limited,
  Economics - large schemes on private land crippling,
  Time – insufficient available to dedicate,
  Energy – Sheer effort required can be beyond individuals,
- Ecological Groups (Do Gooders) — Unable to be there at correct or required time,
  Cost - finances frequently limited,
  Skills - frequently marginal or not across whole board,
  H&S Considerations - Often unable to be easily met through structure of Group,
  Specialisation - Often required to take further advice.
- Public bodies — Incentive - Public Duty, practical reasons (prevention of flooding),
  Finances (public purse & suitable grant allowances where available),
  Time (Not restricted to part time or availability of disparate groups),
  Skills (Trained specialist staff designed to carry out similar schemes,
  H&S Requirements (Formal contracts using known compliance contractors),
  Specialisation (Ability to divide work into specific disciplines to suit requirements.

How do we do it?

- Think big — Tackle the whole problem not just a fraction of it.
- Think CAMP — Consider whole catchment not solely direct area affected.
- Think long — Approach scheme with a view to long term future, 125 years for structures
- Think others — Remember that actions taken now may not affect environment for some years

STRATEGIC APPROACH TO FLOOD RISK MANAGEMENT AND HABITAT CREATION

Case Study River Petteril, Eden & Petteril Flood Alleviation Scheme, Carlisle

Gary Jones-Wright & Rachel Gerrard, Environment Agency

The study area lies within the River Eden catchment in Cumbria. The River Eden SAC is one of the most important environmental assets in England. The River Petteril, along with the River Caldew, flow into the Eden at Carlisle.

The Environment Agency produced a flood risk management strategy for the Carlisle and Lower Eden sub-catchment, in order to underpin the promotion of capital works to reduce the risk of flooding in Carlisle. Residential and commercial property had been flooded significantly in 1822, 1968 and very recently in Jan 2005 – just two months after the circulation of the first version of the flood risk management strategy.

This presentation will outline the process undertaken to date, the benefits associated with a strategic approach to flood risk management, and the opportunities which it presented for habitat creation. The presentation will also include abstracts, which will graphically show the extent of flood damage experienced during the January 2005 flood event, the largest flood event ever experienced by a single Environment Agency Region.

As part of the data gathering process, project staff consulted various plans and strategies put forward by professional partners and local groups, which may have constrained or provided opportunities for future flood defence proposals. One of these strategies, was Carlisle City Council's 'Three Rivers Strategy'. This strategy, published more than 10 years ago, was largely forgotten due to a lack of funding opportunities. Having reviewed the strategy however, it was felt that the basic idea could be re-ignited, with the flood defence improvement scheme providing the catalyst to make it happen.

Largely due to the significant numbers of residential and commercial properties which are at risk of flooding, and due to the risk to life, as was unfortunately borne out by the January flooding, the preferred strategic option was to hold the line and improve existing defences in Carlisle. The preferred strategic option also identified the need to identify opportunities to locally retard the defences, in order to increase flood storage and/or to create new or improved habitat. The existing flood defences are largely remote from the Eden cSAC channel, but the defences to the Petteril, have taken the form of an artificial channel with earth banks which constrain the river and its natural morphology. The Three Rivers strategy identified an opportunity to create a recreational and wildlife habitat creation opportunity, at Melbourne Park, just off Warwick Road, within the Eden & Petteril study area.

The River Petteril runs though Melbourne Park along a canalised route engineered by the Environment Agency's predecessors. It was realised that there could be significant opportunity to re-engineer the River Petteril channel in the Melbourne Park area, to retard defences, and convert open low value park areas into specific habitat types.

The results of the strategic investigations to date are promising. Although natural processes have improved the canalised River Petteril and wildlife habitat is developing, the realignment and opening up of the currently constrained watercourse could significantly improve its environmental and recreational value. Local interest groups and English Nature have expressed their support during initial consultations.

The next stage will comprise the development of specific objectives for the flood defence/habitat creation opportunity. It will also address funding opportunities and future maintenance and management. The early identification of this opportunity within a flood risk management strategy should ensure that all the pieces of the puzzle are in place to maximise the potential and develop this asset as an integral part of the flood alleviation scheme.

THE RIVER DARENT: A STRATEGY FOR RECOVERY

Nigel Holmes, (AEC – n.holmes3@btinternet.com) & Eddie Bradbrook, (EA – edward.bradbrooke@environment-agency.gov.uk)

The River Darent, in Kent, is recognized at one of the most impacted rivers in the country due to abstraction. The river water quality is generally very good, with low phosphate levels. Physically, parts of the river exhibit good habitat quality, but many reaches are heavily modified as armoured channels, impounded for historic mills, or been over-widened for flood defences.

In 1992 the *Darent Action Plan* was set up in response to the river drying: its aim was to restore the river. Since 1997, significant reductions in abstractions have been achieved, and more are planned form the future. However, to successfully implement river restoration requires sound knowledge on the status of the environmental assets and character of the river. All factors that have positive and negative influences must be considered, not just addressing a single pressure.

In 2004 the Water Resources section of the Environment Agency (EA) initiated works to enable river restoration to be effectively implemented on the river. The primary objective was to develop a river management and restoration strategy to enable characteristic chalk river habitats to be maintained, enhanced, restored or created through promotion of projects and sensitive river management.

Two parallel studies will assist the EA implement sustainable management and restoration on the River Darent in the future. The first is an assessment of the ecological status of the river, its limitations and potential. This involved reviewing all available ecological data, and the practices and pressures that influence river ecology. This is reported in the '***River Darent Environmental Appraisal'*** report.

A second report, the '***Draft River Darent Environmental Strategy'*** assesses what has been achieved through the 1992 *Darent Action Plan* so far and how catchment land-use, water resources, flood defences and other activities might be managed in the future in a more integrated and sustainable manner. This is needed to benefit the ecology of the river and its natural landscape assets, its resources for recreation and amenity, and provide cost-effective and sustainable water use and flood management.

The work has just been completed, and was carried out over a six month period. It was coordinated by a consultant, but crucially involved EA staff who know the river well, and ultimately will greatly influence the effectiveness of achieving the desired goals through working with others who have an interest in the river. The presentation will outline how the investigation was approached, its key findings (in essence, the river needs great help to fulfill its potential), and how it is proposed to take forward the strategy. This will involve positive involvement of local groups.

It is hoped that the project may provide a blue-print for more cost-effective assessment of ecological problems besetting many other catchments in the country, and thereby improve the ability for organizations to meet their biodiversity targets and other responsibilities, including those covered by the Water Framework Directive (WFD).

IDENTIFYING AND PRIORITISING OPPORTUNITIES TO IMPROVE FISH POPULATIONS IN THE RIVERS OF LONDON

Matthew Carter, (Environment Agency) m.carter@environment-agency.gov.uk

There are approximately 2000km of arterial open watercourse throughout Greater London and surrounding urban districts. These watercourses drain basins from the north and south into the River Thames, which meanders in an easterly direction through the centre of London to the nearby English channel. The River Thames often draws public focus and interest away from these tributaries, commanding central attention with an internationally recognisable shoreline vista.

Londons' arterial watercourses vary in size and nature but are intrinsically characterised by their urban setting, and the profound engineering and general man-handling they have surcomed to over many centuries. This has led to a highly manufactured environment where fish and other wildlife exist because they are simply tolerant; as always there are a few exceptions.

Fish populations vary in abundance and diversity from river to river, and those in London are no exception. A recent review suggests that Londons' larger watercourses inherently present a greater range and availability of habitats, and perhaps due to scale are better 'buffered' against sudden changes in water quality, which in combination provide conditions that support more abundant and diverse populations compared to smaller watercourses (Carter & England, 2005). This work also indicates that fish populations have improved in recent times, however there appears to be an increased presence of non-native species and native fish more commonly associated with still waters living in rivers. Fish habitat is regarded as being generally poor throughout the majority of Londons' rivers, hence there are many and large scale opportunities for enhancement. The main habitat related issues are: barriers to fish migration, the lack of marginal habitat for juveniles, a lack of in-channel structure refuge for maturing and adult fish, a lack of floodwater refugea and insufficient spawning habitat, in particular for rheophilic species.

Given the scale and range of opportunities for fish habitat rehabilitation, the decision making process for determining suitable projects must be clear. London's' rivers are introduced in the presentation to assist in orientation and give a context of scale. This is followed by our local Environment Agency's step-by-step 'vision' for London's' fisheries. Brief summaries of drivers that underpin this vision are discussed, followed by examples of specific initiatives currently delivering enhancements on the ground. This includes the River Lee Fisheries Action Plan (Lee FAP) illustrated by using the local stakeholder owned table of issues, and a summary of collaborative actions to date. To complement this, a short footnote of considerations, or 'top-tips', are included to safeguard newcomers against typical pitfalls. A three-phase approach to identifying and prioritising opportunities within a complex environment (social, economic, political as well as ecological!) is discussed. These include: consultation with people, reviewing ecological data using preference models, and the integration of social data (e.g. Areas of Deprivation indices, AoDs) to the decision making process. To conclude the presentation, an example of an integrated project is given supported by pre and post project appraisal data.

THE WORK OF THE WTT IN DELIVERING RESTORATION AT THE LOCAL LEVEL

Simon Johnson (Wild Trout Trust) director@wildtrout.org

The Wild Trout Trust is a charity dedicated to:

'The conservation of wild trout in Britain and Ireland through protection and restoration of their habitats'

(The term wild trout means any trout that has spawned naturally, including sea trout).

Strategic Objectives

1. To increase the public awareness of the need for conservation of wild trout habitats; the beneficial effects of conservation; and that conservation begins with grass roots effort.

2. To provide practical advice to those sufficiently inspired by the message in goal 1 to start conservation work of their own.

3. To provide practical demonstrations of how to implement conservation work.

4. To provide funding to help kick-start grass roots conservation effort.

5. To provide funding for selected areas of research, which will add to the sum total of knowledge, and facilitate goals 1,2 and 3. To increase understanding of the critical factors for sustaining wild trout.

6. To increase membership in general, and also particularly amongst landowners, farmers, riparian owners, angling associations, wildlife trusts, and anglers.

7. To conduct all business fully in compliance with the requirements of the Charities Act 1993, and without recourse to debt financing.

This presentation will focus on the WTT's strategic programme of habitat advisory visits (AV's), project funding and Open Days. The Cinderella Chalk Rivers Project will be highlighted as an example of the WTT emphasis on collaborative work with organisations such as the Environment Agency and English Nature.

RESTORING CREEKS WITH ENGINEERED LOG JAMS: A CASE STUDY FROM CALIFORNIA

Roy Richardson
Scottish Environment Protection Agency
Galashiels Office
Mossilee Road
Galashiels, TD1 1NF

Tel No: 01896 754797
roy.richardson@sepa.org.uk

Engineered Log Jams (ELJs) have been used widely on the West Coast of North America and elsewhere as an alternative to traditional 'hard' engineering for bank protection and as a tool in restoring damaged in-stream habitats, particularly for Pacific Salmon. The design of ELJs is based on naturally occurring stable accumulations of large woody debris in river systems of the West Coast.

In the summer of 2003, the habitat in 1km of Redwood Creek was enhanced using 12 Engineered Log Jams. The project also involved the removal of embankments and re-grading of large areas of floodplain to recreate a functioning river and floodplain system. Indications from early monitoring of the project indicate the success of the structures in increasing important rearing and refugia habitats for endangered Coho Salmon and Steelhead Trout.

This paper will present a review of ELJ technology and the design process for its application in Redwood Creek. The results of early monitoring of the project will also be presented. It is hoped similar opportunities for using Engineered Log Jams in the UK, particularly on rivers and streams supporting Atlantic Salmon and Sea Trout can be found.

RHONDDA FACH RIVER DIVERSION: BIRDS BATS AND BATTERED FISH

Sally Sudworth & Paul Maliphant, (Halcrow Group Ltd - One Kingsway, Cardiff, CF10 3AN)
Email: sudworthsm@halcrow.com and maliphantpc@halcrow.com

The Rhondda Fach River diversion at Wattstown in the Rhondda valley is necessary because of a new road improvement, the Porth Relief Scheme. A stretch of 300m is required to be moved approximately 20m to the north of the existing river channel. The new river channel will incorporate many mitigation and enhancement features in order to protect and minimise the impact on the local wildlife.

To contain the channel a mixture of retaining walls and sloping revetments are being used and a new otter resting area is to be created at the upstream end of the diversion. The needs of birds and bats are being addressed with special features that are to be incorporated into the retaining walls such as nesting boxes and tunnels. A range of bird species were recorded in the site surveys and Kingfisher were identified as using the river. Green Woodpecker was also noted in the adjacent woodland. Although no bat roosts have been found at this location there exist potential bat roost sites in the wooded area adjacent to the river and Common Pipistrelle were observed feeding in the vicinity. A tree bat box is to be located in the vicinity as a mitigation measure.

The river retaining walls are to be constructed of reinforced concrete with a stone cladding finish to comply with the terms of the planning conditions. An additional feature is being introduced at the base to simulate overhanging riverbanks and vegetation. A ledge is to be constructed to provide shelter for fish and other aquatic life. Other fish friendly features are the salmon boulders, a v shape formation of blockstone, to be placed in-channel for shelter and feeding grounds.

The river control structures comprise a rock ramp formation with a blockstone weir and three shallow blockstone steps, that have been designed taking into account requirements of the national fishpass manual for appropriate flow depths and velocities (particularly Salmonids and Grayling). The structures will have the effect in reducing peak velocities in the reach reducing them from 3.75 m/s to 3.2 m/s for the $Q_{100+20\%}$ flows. The steps are to be placed to achieve variable flow and velocity profiles and with a maximum 300mm rise to ensure the safe passage of otter.

It is expected that the river bedload will accrete soon after construction, with predicted deposition of bedload in and around the new formations that will result in a self maintaining rock ramp feature. We were discouraged by the EA from removing the bed-load material from the existing channel so as to prevent pollution from disturbance. A controlled and managed fish rescue procedure is to be implemented by specialists to protect the fish population.

RIVERS OF CONCRETE (CREATING ECOLOGICAL VALUE)

Peter Worrall, Technical Director, Penny Anderson Associates Ltd
David Palmer, Principal Engineer, Black & Veatch

The Duke of Northumberland's River (DoNR) and Longford River (LR) are artificial 'river' systems built in the 16th and 17th Centuries to convey water from the River Colne, north of Heathrow Airport, to a variety of sites to the south, and eventually into the River Thames. The DoNR is owned and administered by the Environment Agency and was built in the 1530's to supply water for domestic and industrial uses to the south-east of Heathrow. The LR, owned by the Crown and administered by the Royal Parks Agency, was constructed in 1638 to supply water to Bushy Park and the fountains at Hampton Court Palace, a function the river still retains. The rivers used to cross Heathrow Airport via inverted siphons beneath the northern and southern runways (approximately 1 km in length) and within open trapezoidal sections (c.500m) through Perry Oaks Sludge Disposal Works (POSDW). The gradients of these rivers in the vicinity of Heathrow are very flat, with the DoNR falling only 0.17m in 3.6km and the LR falling 0.20m in 2.4km. The resultant 'typical' flows were low, further limiting the nature conservation potential of these water conduits. Within POSDW the LR was confined in a concrete lined channel whereas the DoNR had natural banks. Although the nature conservation value of these open stretches of channel were diverse (with healthy fish populations in both rivers and water vole along the DoNR), their ecology was severely constrained by the barrier created by the upstream and downstream siphons beneath the runways.

As part of the permissions given by the Secretary of State in 2001 for the development of Terminal 5 at Heathrow Airport, there was a condition requiring that planning permission be granted for the permanent diversion of the DoNR and LR before work could commence on the main terminal scheme. The eventual scheme involved the diversion of both rivers, in largely open concrete channels (95% of their length), around the western perimeter of the Airport. The creation of approximately 6km of new channel not only represents a significant engineering and logistical achievement but demonstrates how ecological potential and function may be established in the most seemingly limited environment of slow flowing concrete lined channels.

Ecological potential of these new concrete sided channels was achieved through a combination of approaches, these included:

- using specially roughened surfaces were the rivers flow against the concrete walls, to encourage niches for algae and macro-invertebrates;
- creating micro-variations in flow velocities through channel narrowing and the installation of in-channel structures, such as tree trunks and cobble beds, to encourage fishery and invertebrate interest ;
- using local materials to create the river beds suitable for invertebrates;
- creation of artificial berms, using gabions in-filled with local low nutrient subsoils, to establish a diverse 'riverside' flora;
- use of pre-established coir pallets and rolls to form vegetated zones and structures within the concrete channels, in part to facilitate re-colonisation by water vole;
- the use of ledges through culverts to assist mammal movements, and
- the translocation of plant and invertebrate materials from the original river channels.

Completed in April 2004, the diverted rivers are already functioning ecologically and are demonstrating how engineering and ecology can rise to the challenge of achieving biodiversity in the most constrained situations.

THE USE OF FLUVIAL GEOMORPHOLOGY FOR SUSTAINABLE ECOLOGICAL RESTORATION OF AN URBAN WATERCOURSE

Sally German [1], & Robin Chase [2]

[1]*Gifford, Carlton House, Woodlands, Southampton, Hants, SO40 7HT: sally.german@gifford.uk.com*
[2]*Cain Consultancy, Lower Woodford, Salisbury, Wilts, SP4 6NQ: robin@riverdoctors.co.uk*

The River Lambourn (Berkshire) is a chalk river and designated as a SSSI and cSAC. Upstream of its confluence with the River Kennet it runs through Newbury, where it has been heavily modified. This paper is based on work carried out for English Nature regarding 'an ecologically based restoration' of these heavily modified sections of the River Lambourn, returning it to 'preferred condition'. There was a particular need to identify key 'success criteria', for the improvement in habitat, especially for the cSAC species that the Lambourn was designated for. This includes, Ranunculus habitats, Bullhead and Lamprey.

Previous work has shown that fluvial geomorphology is a key factor in: determining the physical parameters required to maintain habitat conditions; ensuring that 'favourable status' is met. Identifying the most appropriate physical form and process makes this approach to restoration sustainable. Therefore, this research attempts to establish relationships between flow types, sediment, and habitats for each key species (or ecological class) within a semi-natural section of the River Lambourn. These relationships are based on the physical parameters of the system, and include:

- channel dimensions
- long profile/slope/channel gradient
- sediment supply and storage
- discharge

The required physical form of the channel can be derived by identifying geomorphological patchiness and diversity, (in addition to channel dimensions) for a 'control reach' of semi-natural section of river, and for the degraded reaches, so establishing what is missing. By understanding the relationship between ecological habitats and geomorphological features in the semi-natural, it is possible to then apply this understanding to the degraded reaches, both further downstream and also in bifurcated channels, by proportioning features according to discharge.

Therefore the geomorphology supplies information to determine the physical features for the ecological habitats, which delivers the improvements in the key species and ultimately delivers 'preferred condition'.

KEY WORDS: river restoration; sustainability; fluvial geomorphology; ecological habitats; biotopes; chalk river.

LOW FLOWS AND RIVER RESTORATION IN EAST ANGLIA: CURRENT APPROACHES AND FUTURE CHALLENGES

Stuart Smith (stuart.smith@atkinsglobal.com), Nathan Richardson (nathan.richardson@atkinsglobal.com), Max Carstairs (max.carstairs@atkinsglobal.com), Mark Sudworth (mark.sudworth@atkinsglobal.com) Atkins Water, Broadoak, Southgate Park, Bakewell Road, Orton Southgate, Peterborough PE2 6YS. Tel: 01733 366900

Atkins has undertaken a series of investigations into the consequences of abstraction for potable water supply upon flows and riverine ecology across eight East Anglian river catchments. The work has been undertaken over the past three years to satisfy Anglian Water Services' obligations for the National Environment Programme under AMP3.

An overview of Atkins work on the Laceby Beck will consider the following components:

- Hydro-ecological review of existing data to determine links between abstraction and flow in the Laceby Beck and to characterise wider responses to periods of reduced rainfall. For example, evidence of flow induced stress in historical water quality and biological records
- Identification of potential management measures and channel enhancements to address observed problems. Measures including flow support and channel restructuring.
- Flow targets were obtained using statistical relationships between the riverine ecology (LIFE index) and hydrology (flow regime). These were used to inform the level of flow augmentation required to achieve favourable ecological status.
- Discussions with landowners, the Environment Agency and Anglian Water Services regarding the funding of a programme of measures.

The studies have highlighted the need for an integrated approach to address water quantity, quality and habitat structure if our rivers are to reach their ecological potential. A range of novel methodologies, such as the use of the LIFE index to derive ecologically based flow targets, have been applied to determine in-stream ecological requirements. The need for and effectiveness of river support schemes and habitat creation have been investigated. However, without parallel progress to address habitat limitations and water quality issues the ecological potential of the rivers investigated will remain unfulfilled.

Specific issues raised by the work are brought into the wider context of river restoration, looking at the possible future opportunities arising from the implementation of the Water Framework Directive.

IMPORTANCE OF LOCAL RIVER WIDENINGS AS REHABILITATION MEASURES: EXPERIENCES FROM SWITZERLAND

Armin Peter & Sharon Woolsey
EAWAG
Swiss Federal Institute for Environmental Science and Technology
Limnological Reserach Center
CH-6047 Kastanienbaum/Switzerland
Phone 0041 41 349 21 36, Fax 0041 41 349 21 62
e-mail:armin.peter@eawag.ch, sharon.woolsey@eawag.ch

Swiss rivers are highly channelised, resulting in a significant lack of longitudinal and lateral connectivity. Channel morphology, river dynamics, bedload transport, habitat availability for aquatic biota and diversity of aquatic communities are all drastically altered. Today Switzerland has a rehabilitation potential of around 37 % of its total river length. The river corridor, the instream habitat, and the longitudinal and lateral connectivity are in clear need of improvement. For these reasons a large sum will be invested in sustainable river management and river rehabilitation in the near future.

During the past 10 years several local widenings of channelised rivers have been implemented. In general, widenings have three important objectives: improving river morphology conditions, increasing capacity and conditions for biota, and improving socio-economic acceptance. Such benefits of local river widenings will be presented.

Unfortunately the ecological success of widenings is hardly documented. We therefore carried out monitoring studies after the realisation of various widenings. Results from monitoring studies and a comprehensive set of indicators for local river widenings will be presented. Monitoring parameters should include functional indicators to describe the river's habitat, as well as structural indicators to investigate its actual colonisation. Functional indicators comprise aspects of morphology, hydraulics, hydrology and connectivity, while various faunal (macroinvertebrates, shoreline fauna, fish and small mammals) and floral indicators characterise community structure. Additionally, socio-economic indicators for determining recreational value and river engineering indicators for assessing flood protection are recommended. Further indicators, such as project acceptance, stakeholder participation and project costs, give a valuable insight into the project's procedural success.

Ecological success of a widening mainly depends on the length, the width and the ecological potential of the river. The latter is mainly a function of geomorphic features and the presence of local species pools. If the distance to a local species pool is too great, immigration of potential settlers may occur only very slowly or not at all, despite the habitat improvement achieved by the widening.

RIVERINE AND FLOODPLAIN REHABILITATION BEST PRACTICE: A CASE STUDY AT ASTON HALL FARM

Katy Read[1], Philip Fermor[1], and Colin Bundy[2]

[1] *Middlemarch Environmental Ltd, Triumph House, Birmingham Road, Allesley, Coventry, CV5 9AF. Tel: 01676 525880. Email: admin@middlemarch-environmental.com*

[2] *Severn Trent Water, PO Box 51, Raynesway, Derby, DE21 7JA. Tel: 01332 683450. Email: Colin.Bundy@severntrent.co.uk*

Aston Hall Farm is a 120 ha mixed farm located in Stone, Staffordshire adjacent to the River Trent. The farm is owned by Severn Trent Water (STW) used for the recycling of sewage biosolids to agriculture and managed by tenant farmers. To meet targets outlined in National, Local and STW Corporate BAP, the biodiversity of STW's non-treatment landholdings were reviewed as part of their BAP implementation process. STW undertook a biodiversity enhancement scheme at a pilot site with existing biodiversity data. Aston Hall Farm was chosen and feasibility and design works were carried out in early 2001.

A steering group was established with representatives from STW, Environment Agency, RSPB, FWAG, and Staffordshire Wildlife Trust. Habitat creation objectives were identified which included: the restoration of the River Trent margin - re-profiling of meanders to encourage natural river processes (EA priority); the rehabilitation of 17.5 ha of floodplain grazing marsh (STW priority); and, the creation of breeding wader habitat (RSPB priority).

The site was entered into a Countryside Stewardship agreement in 2001 and Stewardship payments help the financial viability of capital works such as hedgelaying and field margin creation as well as the reduced intensity of the farming operation.

Phase I of the habitat creation works were completed in 2001 and the site was monitored monthly to assess changes in hydrology, ecology and ornithology. Minor habitat improvements were recommended at the end of the two-year monitoring project and Phase II works were carried out in 2004.

On-going monitoring identified that post-habitat creation the following change in species were noted: (1) the number of breeding or possibly breeding bird species increased from 24 to 42; (2) the number of RSPB Red List species increased from 5 to 8; (3) the number of RSPB Amber List species had increased from 3 to 8; and (4), the number of UK BAP Priority bird and mammal species recorded in and around the floodplain increased from 5 to 9. The Environment Agency reported an improvement in the Trent fishery habitat and also highlighted other improvements including: restoration of river and floodplain functions; contribution to flood alleviation; and, the minimisation of agricultural run-off due to buffer zones. The wet grassland area constitutes 25% of numerical wetland creation target for Staffordshire under UK BAP.

The project at Aston Hall Farm provides a model for the enhancement of the biodiversity on Severn Trent Water's farm estate landholdings, and can be applied throughout the wider water industry and the agricultural community. The success of the project has been recognised through winning a national 'Green Apple' award in 2003 and the CIWEM/RSPB 'Living Wetland' award in 2004.

The RIVER RESTORATION CENTRE'S
6th ANNUAL NETWORK CONFERENCE

13th - 14th APRIL 2005

De Havilland Campus
UNIVERSITY OF HERTFORDSHIRE,
HATFIELD

SUMMARIES OF POSTERS

THE NEED FOR PROJECT APPRAISAL – THE DEVELOPMENT OF THE POST RIVER RESTORATION ASSESSMENT (PRRA)

Laura de Smith (the River Restoration Centre /MSc student Cranfield University at Silsoe)
Email: l.r.de-smith@cranfield.ac.uk

A recent study completed by the RRC revealed that scientific evidence for the success of river restoration is limited due to the lack of post-project appraisals. To date, in the UK, few standardised procedures or techniques for evaluating projects exist, hence most post-project appraisals specifically aimed at assessing best practice river restoration have been completed qualitatively, by a small number of people with a vast experience of restoring rivers. We therefore continue to rely on expert opinion/professional judgement to ascertain what constitutes best practice sustainable techniques. There is now a need to develop a system for evaluating river restoration projects which records information more systematically, guiding all users from various disciplines and with varying levels of river restoration experience, through the same route.

The PRRA was developed as an initial rapid assessment providing an 'overview' evaluation of a river restoration project based on a visual assessment, to identify whether the project is proceeding in the right direction to achieve its objectives. It must be stressed that there will always be the need for more detailed research of restoration projects through full post-project appraisals, however current financial and time constraints suggest that this interim post-project assessment would be beneficial.

The following processes informed the creation of the PRRA: extensive research into the range of river surveying/assessment methodologies most widely available and currently utilised (literature review); a questionnaire on post-project appraisal, evaluating practitioners' views on the adaptability of existing methodologies for appraising river restoration schemes and encouraging feedback on the principal design criteria of the methodology proposed; shadowing river restoration 'experts' in order to gain an insight into appraising river restoration projects through an expert's eyes; and, a personal trial of the methodology on a local river restoration project.

The final PRRA is structured as a guidance framework, with key prompting questions directing the user as to the most important areas to consider and assess, and much space allocated for the user to evaluate and summarise their own views regarding the development of the project. Key background information is recommended for discussion with the accompanying project officer on-site and/or research prior to the site visit, to help inform the appraisal process. The assessment is also multi-disciplinary in focus (hydro-geomorphology, fisheries, visual elements and social value etc.), with the aim of identifying any unexpected/wider outcomes of the project.

The next phase in the development process involves a trial of the assessment at a river restoration project with a range of participants from various disciplines and varying experience in river restoration. Overall, it is hoped that the 'Post River Restoration Assessment' will at least provide: an opportunity for collecting data on a range of projects; a means for exposing areas of concern within the project development process; and, a tool for directing project monitoring needs by identifying areas for further investigation, which require a more detailed, post-project appraisal. These outcomes suggest that the PRRA can only be a positive step towards addressing the need for wider project appraisal, which is of particular importance as a means of meeting the requirements of the Water Framework Directive, highlighting the need to improve the ecological status of our rivers.

ECOLOGICAL APPRAISAL OF THE RIVER BRENT ENHANCEMENT PROJECT, TOKYNGTON PARK, WEMBLEY

Judy England (Environment Agency, Thames Region)
Email: judy.england@environment-agency.gov.uk

In 1999, the Environment Agency and the London Borough of Brent formed a partnership with the aim of carrying out improvements in Tokyngton Park, particularly rehabilitation of the river. Halcrow produced a Feasibility Study in July 2000 and the report recommended the design and construction of enhancements at the site. The London Borough of Brent undertook a public consultation survey, called Planning for Real™ and held several local community meetings on the future of Tokyngton Park and Wembley Industrial Estate. The majority of residents were in favour of improvements to the park and river, and came along to further meetings to help develop the design.

Enhancement works to the river through Tokyngton Park, St Raphael's Estate and the Wembley Industrial Estate include stabilisation of banks, naturalisation of the channel and improvements to the open space, but maintain the current levels of flood protection. The first phase of restoration work was completed during the early summer of 2003.

The project aims to:

- create a safe and enhanced environment
- generate interest in nature conservation
- create a 'green route' to the employment area
- maintain flood protection to existing properties
- improve the quality of the public open space
- reduce crime and fear by encouraging greater use of the site for walking, cycling and jogging
- create job opportunities during construction.

One of the main environmental aims of the work is to enhance the ecology and wildlife value of the river through the park. In order to assess the ecological benefit of the scheme the baseline status of the river was surveyed prior to the start of the work. River corridor and habitat surveys were completed to establish the plant and habitat distribution and a macro-invertebrate survey conducted to assess the in-stream ecological status.

To assess the benefits of the scheme a series of post project appraisals are planned and initial results presented within this poster. Details from baseline surveys and post project appraisals will be lodged with the River Restoration Centre where they will be freely available to students and it is hoped that on-going studies will provide valuable information about the development of the site.

TEN YEARS OF RESTORATION IN NE AREA OF THAMES REGION OF THE ENVIRONMENT AGENCY

Judy England and Chris Catling (Environment Agency, Thames Region)
chris.catling@environment-agency.gov.uk
judy.england@environment-agency.gov.uk

Enhancement, restoration and the rehabilitation work has been undertaken in the NE area of Thames Region of the Environment Agency for ten years. A team of Engineers, Ecologists and Fisheries Officers have collaborated on numerous projects. This poster highlights the location aims and extent of the work with a couple of key examples.

The approach to schemes has been varied with many of the first schemes selected on an opportunistic basis. A more strategic approach has been adopted for a couple of watercourses such as the Rivers Chess and Ver. Both of these rivers are regarded as high priority since they are chalk streams with their high conservation status and subject to the biodiversity Habitat Action Plan. Historic anthropogenic influences on these watercourses have included a series of mill structures and cress beds. Negotiation with land and mill owners to create by pass channels and reduce impoundments has often been long and protracted but lead to some very successful schemes.

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

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

ASSESSMENT AND DEVELOPMENT OF URBAN WATERWAYS IN THE CITY OF FREIBURG WITH THE PARTICIPATION OF LOCAL CITIZENS

Oliver Kaiser, (Institute for Landscape Management)
oliver.kaiser@landespflege.uni-freiburg.de
www.landespflege-freiburg.de

Freiburg, a city in southern Germany, is famous for its "*Bächle*" – small medieval canals. These medieval canals are the central feature of the city's old parts. In contrast, Freiburg's other waterways, e.g. the *Gewerbekanal,* an old industrial canal and the brook *Glasbach* are less attractive. Both of these waterways are heavily modified, inaccessible and their riverbeds are sealed and of poor structural quality. In many places, the waterways disappear behind walls or underneath roads. These waterways provide poor quality habitat for flora and fauna, and are of little recreational value for humans. Nevertheless, there is great potential for development along both waterways.

The *Urban Waterways* research project (Projekt StadtGewässer) at the Institute for Landscape Management dealt with the development of the waterways. First of all, methods for the assessment of urban waterways were developed. Not only "hard", i.e. quantifiable factors but also "soft" factors, such as the recreational value, were included in the assessment. The assessment criteria developed can also be applied to other natural, artificial or modified water bodies. Therefore, the criteria will be a useful amendment to the assessment criteria defined by the EU Water Framework Directive.

After the development of the assessment criteria, it was possible to evaluate the shortcomings and the potential for development along the *Gewerbekanal* and the *Glasbach* stream. A participatory approach was chosen to deal with the development potentials. The aim was to develop practical development concepts for the two waterways in cooperation with Freiburg citizens and authorities. The focus was on aspects such as recreational value, accessibility and the integration of both canals into urban planning. After nine months the 120 participants, including university students and schoolchildren, had drafted more than 50 development plans and sketches for over 30 different sections of the two waterways. There was a great variety of suggestions, including artistic installations, ecological assessment of various stream sections and the development of recreational areas. In addition, a historical trail along the commercial canal was developed (see www.landespflege-freiburg.de/stadtgewaesser).

A large majority of the participants praised the participation process and the quality of the drafted development plans. However, due to the city's tight budget, it is difficult to implement the ideas within the next few years. The Urban Waterways research project illustrates how citizen participation contributes to the water resources development. Ideas that would otherwise not have been generated in the course of a conventional planning process could be put to use. An important prerequisite for successful participation is an open discussion, which allows the participants to develop ideas.

APPRAISAL OF OFF RIVER SUPPLEMENTATION UNITS (ORSU) ON THE RIVER COLNE AT WATFORD, AND FISH REFUGES SITED ON THE RIVER LEE AT ENFIELD

Phil Belfield, Jim Allan, Karen Austin, Rob Argent, Judy England and Matt Carter
Environment Agency, Thames Region, North East Area.

River Colne ORSUs

To protect against a 1 in 100-year flood event, significant channel realignment works where carried to the River Colne at Watford in 1989/90. Watford Borough Council partnered the Environment Agency and the River Restoration Centre in a £57K enhancement project at the site. This involved the reintroduction marginal vegetation, the addition of riffles and stone deflectors and conversion of three balancing ponds to Off River Supplementation Units (ORSU).

Post Project Appraisal

Fishery surveys carried out after the completion of the enhancement (1994) showed a dramatic increase in fish numbers, and included the presence of barbel *Barbus barbus*, a species not found at this site for ten years prior to the work. Further fish surveys of the inlets to the ORSUs were carried out in 1998, and are currently being repeated. This poster illustrates fish survey and habitat data recorded to date. Comparisons indicate a significant change in the type habitat present; the inlets to each ORSU being in varying stages of succession. This has resulted in an apparent reduction in numbers of fish using the site, and suggests a level of management is required to allow continued fish movement and utilisation of the ORSUs.

River Lee fish refuges

Due to a current perception that fish numbers throughout the Lee Navigation have declined as a result of poor fish habitat and predation of fish by cormorants, a series of floating marginal reed rafts were installed at a central location along the navigation between 2002 and 2004. The Lee Valley Fisheries Action Plan (Lee FAP) steering group, consisting of partners from British Waterways, the Environment Agency, Thames Water Plc, RMC Angling, and local Angling Consultative groups initiated this project. The fish refuges covering 1.5km of river, incorporate an anti-predator screen to help protect fish from cormorants, and are planted with native emergent plants with dense submerged roots providing fish with food and cover.

Post Project Appraisal

Pre and post fish surveys have been carried out to evaluate this work, in addition angler catch data and questionnaires have been collated. This poster includes a summary of these findings to date.

ASSESSMENT OF STREAM PASSAGE OBSTRUCTIONS CAUSED BY FLOOD DETENTION BASINS

Sandra Röck & Oliver Kaiser (Institute for Landscape Management)

The European Water Framework Directive demands free passage in all streams. Passage obstructions in streams should be eliminated.

Flood detention basins obstruct free passage for migrating species. Their dams cut through the landscape and their outlets block the passage at differing levels, depending on their construction. Terrestrial as well as aquatic species have difficulties moving from the lower part of the stream to the upper part. In the worst case this could lead to declining populations or even local extinctions.

A survey is now being undertaken to assess how flood detention basins obstruct free passage. The survey is divided into three parts:

1. evaluation of how different outlet constructions block stream passage,
2. comparing the conditions in a stream before and after a flood detention basin is built,
3. identifying the influence of a flood detention basin on the natural flood scheme by examining the conditions before and after flooding and documenting the recovery of stream habitats and comparing it to the same conditions in a natural stream.

The survey includes the examination of migrating aquatic, amphibian and terrestrial species. In addition to the ecological factors, hydraulic and hydrologic data will be collected. In combination the results show how the alteration of habitat structure by means of the detention basin influences appearance or disappearance of certain species.

At the end of the survey technical recommendations and design guidelines can be developed to determine how to build an outlet which allows free passage to as many species as possible.

Sandra Röck
Oliver Kaiser
Fakultät für Umwelt- und Forstwissenschaften
Albert-Ludwigs-Universität Freiburg
Tenenbacherstr. 4
D - 79106 Freiburg
http://www.landespflege-freiburg.de
Sandra.Roeck@landespflege.uni-freiburg.de
Oliver.Kaiser@landespflege.uni-freiburg.de

HOW NATURAL CAN ARTIFICIAL WATERBODIES BE? THE CASE OF THE RENCH FLOOD CHANNEL

Sandra Röck, (Institute for Landscape Management)

Flood channels are common features seen in the landscape of the upper Rhine valley. Their function is the discharge of floodwater into the Rhine in order to protect settlements and agricultural areas. These channels are regulated and have to be maintained. According to the European Water Framework Directive, they are to be classified as heavily modified or artificial waterbodies. As such, they are considered to be of minor ecological quality. In spite of this, the Rench flood channel shows that within artificial waterbodies valuable ecological habitats can develop.

The Rench flood channel is classified as a protected area with Natura 2000 status. It harbors different species of the Habitats Directive. The most numerous and important of these species in the channel is the mussel *Unio crassus.* One objective of the survey was to examine the *Unio crassus* population. Data from this survey showed that the artificial flood channel provides well-structured habitats for one of the biggest *Unio crassus* populations in the whole state of Baden-Württemberg.

Survey data was utilized to evaluate how river maintenance influences structures in the stream bed. River maintenance can have a devastating impact on naturally established bed structures, such as sand banks, riffles and pools or coarse woody debris. If these ecologically important structures are removed, habitats are lost and a blank channel is left. The abundance and diversity of aquatic species is reduced to a minimum. But this must not necessarily happen. If river maintenance is executed correctly, habitat diversity can even be increased. As a result of this survey, suggestions can be made on how to carry out river maintenance most gently. By this means structures can be created and preserved that are used as habitats by rare species like *Unio crassus*.

Dipl. Biol. Sandra Röck
Institute for Landscape Management
Faculty of Forest and Environmental Sciences
Albert-Ludwigs-University Freiburg
D - 79085 Freiburg
Germany
Phone 0049 (0)761 203 3641
http://www.landespflege-freiburg.de
Sandra.Roeck@landespflege.uni-freiburg.de

IMPLEMENTING THE BIODIVERSITY STRATEGY AND ACTION PLAN FOR THE ENVIRONMENT AGENCY (THAMES REGION) THROUGH PARTNERSHIP

Sarah Scott and Geoffrey Angell
Environment Agency, Thames Region, North East Area.

Reedbeds Habitat Action Plan

Batford Springs Wetland Restoration

Batford springs is an important wet woodland - reedbed mosaic habitat adjacent to the River Lee, managed by a local volunteer group. The area of reedbed on site has been gradually declining as the area has historically been used to place dredgings on. The Agency's Operations Delivery Team scraped back historical dredgings to expose to the original bed levels and hidden reed mat. Water control on the site has been adjusted to provide a more consistent supply to the bed. The restoration of this reedbed has been carried out in partnership with the St Albans District Council and Hertfordshire's Countryside Management Service.

Pipistrelle Bat Species Action Plan

Pill box project

A number of pill boxes have been identified in the flood plain of the River Colne that have the potential to be converted to quality bat hibernacula. At present three pillboxes have been assessed and plans are currently underway to implement the conversions. This is a collaborative project between the Environment Agency, Herts and Middlesex Wildlife Trust and the Herts and Middlesex Bat Group.

Bats and boats

Assessing the use of river corridors by bats has historically been a long, time consuming exercise. A new monitoring tool has been on trial in a project between the Environment Agency, the Herts and Middlesex Bat Group and the Bat Conservation Trust. The project used a boat based, tranquillity detector to rapidly record and assess bat activity over water.

Coastal and Floodplain Grazing Marsh

The Hertford and Ware Meads

An area of 96 hectares of ancient flood meadow, ditches, scrapes and pools has been protected and enhanced through a continuing wildlife partnership of the Environment Agency, Herts and Middlesex Wildlife Trust, Thames Water, East Herts District Council and GlaxoSmithKline. Characteristic features were being lost, ditches overgrown and silted and grassland overgrazed. Following 5 years of successful partnership and management work, watervoles, along with otters and 16 of the 19 dragonfly and damselfly species found in Hertfordshire have been assured a promising future. The continuing partnership provides a template for future conservation schemes, to bring both wildlife organisations and industry together with a common aim.

SUSTAINABLE WETLAND RESTORATION IN THE NEW FOREST

David Sear (Southampton University) and Maxine Elliott (Environment Agency Southern Region). Further details on the partnership project can be found at www.newforestlife.org.uk., or by contacting maxine.elliott@environment-agency.gov.uk.

The project, now approaching it's final year of work, has so far seen restoration of 5.5km out of the total 10km to be delivered as part of this European LIFE-Nature funded contract.
Despite the reputation of being amongst the least impacted lowland rivers in the UK, significant reaches of New Forest Rivers have been severely environmentally degraded, primarily due to forestry drainage operations.

Deepening and straightening of channels, placement of dredged bed material along the bank top, extensive removal of woody debris dams and the cutting of new drainage grips well into the catchment have altered the geomorphology and hydrological characterisation of these watercourses, and severed the functional integrity between the channel and its natural flood plain.
Amongst the project aims is the integration of nature conservation and flood defence objectives by combining habitat restoration works with the development of the River Lymington Strategy (a flood management strategy), ensuring such restoration works makes a positive contribution to flood management further down the catchment. Further survey work will help improve understanding of the possible benefits such schemes can deliver in terms of flood management, and will provide a useful input to the Agency's Catchment Flood Management Plans. In addition, production of implementation plans for each of the six Forest catchments will help serve as a mechanism for ensuring their integrated management.

Generic river and floodplain restoration techniques that have been employed include:

- Transferring flow from the drainage channel into the relic meanders;
- Replacing lost substrate with locally sourced, comparable material
- Creating new meanders;
- In-filling drains with heather bales;
- Utilising spoil heaps to help in-fill the channelised river, along with dredged & imported material;
- Installing woody debris, along with improved timber management;
- Providing floodplain scrapes;
- Modifying existing river crossing structures;
- Providing enhanced livestock access across newly restored channel;
- Generating backwaters;
- Removing non-native species from the floodplain.

Post-restoration monitoring has confirmed the intended increase in overbank flooding, and associated erosion and deposition over the floodplain surface. Debris dams have also developed, creating diverse physical habitat both within the channel and on the floodplain surface. Rates of floodplain and channel adjustment have been rapid and have created management challenges at the point of transition between the restored and impacted reaches.
In terms of the management of the works on site, operating within a highly designated site has required a heightened degree of environmental sensitivity and close consultation with the landowner (Forestry Commission) and English Nature, as well as local communities and interest groups. This has worked well and has fostered a positive attitude among stakeholders towards the restoration.

APPLICATION OF FLUVIAL GEOMORPHOLOGICAL TECHNIQUES TO AID FLOOD DEFENCE MANAGEMENT

Matthew P Hardwick
Fluvial Geomorphologist, Royal Haskoning, Rightwell House, Bretton, Peterborough PE3 8DW
email: m.hardwick@royalhaskoning.com

Wendy Johnston
Senior Environmental Scientist, Royal Haskoning, 10 Bernard Street, Leith, Edinburgh EH6 6PP
email: w.johnston@royalhaskoning.com

The use of geomorphological survey techniques, such as Fluvial Audits and Conservation Baseline Assessments to aid the understanding of the morphological forms and processes operating within river systems, can provide valuable sources of information for river engineers, planners and designers.

This poster illustrates the importance and value of applying these techniques, in tandem with sediment modelling, to develop flood alleviation options for the town of Rothes in Moray and demonstrates how this facilitates a more holistic approach to reducing flood risk.

Degradation of physical stream habitat caused by a combination of factors including intensive land-use practices, agriculture, flood defence and development within the riparian zone has been widespread in Rothes. These factors have had a significant impact on the hydrology and sediment regime of the four burns running through the town, producing channels with low flood capacities, low conservation values and limited ecological diversity.

The use of geomorphological survey techniques is enabling a more sustainable catchment approach to the appraisal of flood alleviation options incorporating the requirements of the EC Water Framework Directive to ensure good ecological status, and has identified areas where potential management and enhancement opportunities exist. Such methods will enable the future design and construction of a scheme which optimises future capital works and maintenance, by working with, not against natural processes.

URBAN RIVER BASIN ENHANCEMENT (URBEM)

Valerie Bain, Roger Bettess

HR Wallingford Ltd, Howbery Park, Wallingford, OX10 8BA. Telephone 01491 822333. Email vba@hrwallingford.co.uk

Urban River Basin Enhancement Methods (URBEM) is an EC Fifth Framework Programme Project that started in November 2002 and will finish October 2005. The aim of the project is to develop new tools, techniques and procedures to enhance watercourses located in urban areas. The project has 13 partners in 6 countries across Europe and the methods developed will be applicable to the range of different types of rivers and cities in Europe.

URBEM is developing a decision support framework that will help river managers and city planners to plan, implement and review projects for enhancing urban rivers. The project recognises the need to take an holistic approach to improving urban rivers and provides tools, techniques and guidance on tackling problems such as degraded ecology, poor aesthetics, highly modified morphology and complex social issues with the urban communities in which the rivers are situated. The project outputs that achieve this include:

- Tool for assessing the rehabilitation potential of urban rivers. This guides the user through a set of processes from developing objectives to options appraisal and implementation and provides assessment methods for each process. The tool will help to prioritise a location for enhancement from a range of potential sites and will support the decision maker in selecting a suitable option for improving the river.
- Aesthetic evaluation methodology for objectively examining the aesthetic quality of the river to identify ways in which it may be improved.
- Social appraisal tool for measuring the social capital associated with the river in order to assess how it may be improved. The tool also provides a means for involving and consulting citizens and stakeholders in itself.
- New techniques for river rehabilitation recommendations, specifications and guidelines.
- Indicators of success guidance which recommends suitable success indicators for different objectives, provides information on their application and suggests existing data that can be used.

In addition to these tools and methods, the project provides support, including:

- Report on case studies of existing river rehabilitation projects. This describes the methods used by other planners and river managers in past projects and outlines where projects have been successful or where they have encountered problems.
- Report on study site monitoring and associated data management system. This work can be used to inform other studies on river rehabilitation and provides a system for the storage and management of data for new rehabilitation projects.
- Training and dissemination of all the project outputs in a ready-to-use training package aimed at stakeholders, planners and river managers.

PROBLEMS OF THE TRANSPORT OF DANGEROUS GOODS ON INLAND WATERWAYS IN SERBIA

Dusko Isakovic[1], & Dusan Stojadinovic[2]

[1]Agency for Maintenance and Development of Inland Waterways, Francuska 9, Belgrade
phone: +381 11 30 29 877; fax: +381 11 30 29 808
e-mail: disakovic@plovput.co.yu

[2]Institute for the Development of Water Resources "Jaroslav Cerni" P.O.Box 33-54; 11000 Belgrade
phone: +381 11 390 64 50; fax: +381 11 390 64 81
e-mail: dusanstojadinovic@hotmail.com

Transport of dangerous goods is an action of great significance for every country. Such a transport is followed with a great threat to human health and environment. Compared to road transport, waterway transport has a higher accident risk as well as the risk of environment pollution. Such accidents can be particularly critical concerning the downstream transport of spilled hazardous substances and they happen despite all the safety measures. Those spilled substances can reach aquifers located in the vicinity of large rivers such as the Danube, thus intruding exploitation wells. They easily penetrate through vulnerable roof layer of the soil and jeopardize ground waters.

All the same, winter ports for admission of the ships with dangerous cargo appear to be a problem of great significance. On inland waterways in Serbia with international regime of navigation, winter ports have usually been provided with maintenance of the depths at the approaching sections and entrances to the winter ports. On the other hand, banks of winter ports usually are not trained; they are without mooring places and other infrastructure such as potable water facilities, equipment for treatment of solid and liquid waste, electricity facilities, fire protection equipment, post offices and health care services. It particularly calls the attention to the need for the setup of special winter ports for admission and treatment of the ships with hazardous cargo.

All the same it is necessary to adjust legislative that is in force in Serbia to current European laws on transport of dangerous goods as well as to sign European Agreement Considering the International Carriage of Dangerous Goods by Inland Waterways (AND).

Key words: dangerous goods, inland waterways, winter port, ADN

RIVER RESTORATION PROJECTS IN CHINA

Dongya Sun, Jinyong Zhao (Tel: +86 (0)10 68515511 Ext.1909 Fax: +86 (0)10 63204013, E-mail: Sundy@iwhr.com; zhaojy@iwhr.com, China Institute of Water Resources and Hydropower Research, Yu Yuan Tan, Haidian District, Beijing, China, 100038)

In the past, people only regarded rivers as resource from which they can get what they want, e.g. hydropower, fishery, flood control etc. But many rivers degraded because people exploit them beyond their self-rehabilitation ability. Especially in urban, many rivers become sewer, collecting pollutants through a connected series of underground concrete pipes. In recent years, with the development of society in China, more and more people begin realizing the important role that the river with healthy ecological system plays in the whole environment. Rivers, as one core of the ecology, are being understood again from various aspects. In China, river restoration is being paid more attention at the scale of watershed, instead of only water quality control in one reach of the whole river. This paper focuses on introducing the current situation of river training works in China, the principles that should be utilized in river restoration, policies that act as the basis of this kind of projects, techniques that have been implemented in some projects, and the problems encountered during the process of river restoration in China. In the end, the paper gives some recommendations to the development of river restoration projects.

Key Words: River Restoration, Principle, Policy, Technique

RIVER RESTORATION AND SUSTAINABLE DRAINAGE SYSTEMS WEST OF WATERLOOVILLE MAJOR DEVELOPMENT AREA

Lucy Sheffield (Environment Agency) lucy.sheffield@environment-agency.gov.uk

This project is based West of Waterlooville, Portsmouth, Hampshire. Winchester City Council have identified a site to be developed into a Major Development Area (MDA) covering an area of 415 hectares. It will incorporate initially 2000 houses with a further 1000 houses in reserve, with community facilities, employment and associated infrastructure, meeting some of the local housing needs until 2011.

This present green field site has 2 rivers running through it, these are the River Wallington and Old Park Farm Steam, both designated as 'main rivers'. The catchment is made up of primarily London Clay. In the North of the site there is a 1km (approximately) stretch of concrete trapezoidal channel which runs through the proposed development site from East (urbanised) to West (agricultural).

The river restoration phase of this project is in the early stages. The Environment Agency is currently monitoring river flows, which will help to calibrate computer models to ensure that there is adequate capacity in future designs. Due to the characteristics of the catchment both the upstream urbanisation and also the London Clay, the river is very flashy in nature.

At this early stage of the restoration, it is predicted that the design will emulate the downstream natural system. Historical maps have indicated that the river, prior to being culverted, developed from a field drainage system, so has always been relatively straight.

The proposed river restoration within this planned high-density urban area has many potential benefits. The concrete channel at present is potentially very dangerous both to people getting trapped in the channel in storm conditions and as the concrete is showing signs of requiring structural refurbishment. Habitat enhancement created by the river restoration will be beneficial to both the new community and wildlife and potentially increase property values in the area.

The project is going hand in hand with the implementation of a fully integrated Sustainable Drainage System (SUDS) on the site. The main aim of the SUDS is to treat the runoff as close to it's source as possible, to deal with both water quantity and quality issues, whilst increasing wildlife and amenity value in the area. Therefore, the impact of traditional drainage systems and their influence on the river can be minimised, whilst creating a sustainable solution within the development itself.

The SUDS strategy has been developed at an early stage, within the planning process, so that sustainable drainage is integral to the design of the entire site and not an after thought. The Environment Agency has also set up a monitoring project on site to measure the effectiveness of SUDS in the long term.

the RIVER RESTORATION CENTRE (RRC)

PROJECTS DATABASE AND SUMMARY FORM

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

As a minimum please complete the summary form below as well as the 'tick-box' project features form overleaf. This should only take 10mins. If further information is also available then please complete as much of the rest of the form as possible. The entire form should take less than half an hour to complete if the project file is at hand. Please copy forms as required.

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

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

THE RRC 'PROJECTS' DATABASE CURRENTLY EXCEEDS 1000 PROJECTS.

THIS INFORMATION IS FOR YOUR USE AS WELL AS OURS.

the River Restoration Centre – Summary of Projects

Project name……
OS Grid ref……
Main River……
Watercourse ……
County……
Country……
Site Background……
……
…..……
……
……
……
Objectives……
……..……
……
……
……
……

Main Focus/Driver

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

Project Status

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

Main Contact:……. Tel:…….Fax:…….

Organisation:……...Email……
Address:…….....

Return forms to: Jenny Mant, River Restoration Centre, Silsoe Campus, Silsoe, BEDFORD, MK45 4DT
Tel/fax: 01525 863341 Email: rrc@theRRC.co.uk

PROJECT FEATURES

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

NB You should not normally have more than **3 ticks** in the **Primary** column for each section (see sheets below)

		Primary	Secondary	Minor
Type 1	**Rehabilitation of watercourse features**			
1.1	Reach re-meandered (>500m)			
1.2	Reach re-meandered (<500m)			
1.3	Culverted reach re-opened (state approximate length)			
1.4	X-sectional habitat enhancement (>500m) – two–stage channel profiles etc			
1.5	Long section habitat enhancement (>500m) – pool/riffle sequences etc. restored			
1.6	River narrowing due to depleted flows or previous over-widening			
1.7	Backwaters and pools established/reconnected with watercourse			
1.8	Bank re-profiling to restore lost habitat type and structure/armouring removed			
1.9	Boulder etc. imported for habitat enhancement			
1.10	Gravel and other sediments imported/managed for habitat enhancement			
1.11	Fish cover established by other means			
1.12	Current deflectors/concentrators to create habitat and flow diversity			
1.13	Sand, gravel and other sediment traps to benefit wildlife			
1.14	Tree/shrub planting along bankside (only if covers >500m of bank or >0.5ha)			
1.15	Artificial bed/bank removal and replaced by softer material (>100m)			
1.16	Establishment of vegetation for structure/revetment (e.g. use of willows)			
1.17	Eradication of alien species			
1.18	Provision of habitat especially for individual species – otter, kingfisher etc			
1.19	Fencing along river banks; fencing floodplain habitats for management			
1.20	Aquatic/marginal planting			
1.21	Removal of floodbanks			
1.22	Other (please specify)			
Type 2	**Restoration of free passage between reaches**			
2.1	Obstructing structure replaced by riffle			
2.2	Obstructing structure replaced by meander			
2.3	Obstructing structure modified/removed to enable fish migration			
2.4	Obstructing structure retained, but riffle/meander structure established alongside			
2.5	Culverted reach re-opened/daylightened			
2.6	Obstruction within culvert (e.g. lack of depth, vertical fall) redresses			
2.7	Dried river reach has flow restored			
2.8	Other measures taken to restore free animal passage			
2.9	Other (please specify)			
Type 3	**River floodplain restoration**			
	**Water table levels raised or increased flooding achieved by*			
3.1	*Unspecified means/rationalised control			
3.2	*Watercourse re-meandering			
3.3	*Raised river bed level			

3.4	*Weirs established specifically to increase floodplain flooding/water-table				
3.5	*Termination of field drains to watercourse				
3.6	*Feeding floodplain with water (Sluice feeds, water meadow restoration)				
3.7	*Narrowing watercourse specifically to increase floodplain wetting				
3.8	Lakes, ponds, wetlands established (maybe flood storage areas)				
3.9	Lakes, ponds, wetlands, old river channels restored/revitalised)				
3.10	Vegetation management in floodplain				
3.11	Riparian zone removed from cultivation				
3.12	Substantial floodplain tree/shrub planting				
3.13	Other (please specify)				
Type 4	**Catchment Activities**				
	State key activities implemented …….. ……**Continue on separate sheet**				
Type 5	**River Management**				
	❑ **Maintenance changed**	❑ **Equipment changed**	❑ **Maintenance withdrawn (natural regeneration)**		

Call for Expressions of Interest

International Conference on "Riverine Hydroecology: Advances in Research and Applications"

Incorporating –

the 10TH International Symposium on Regulated Streams (TISORS II) and 2nd International Symposium on Wood in World Rivers (ISWWR II).

August 14th-18th 2006

Stirling, Scotland.

The scientific understanding of riverine hydroecology has advanced immeasurably in recent years and the knowledge gained is now being applied widely to undertake ecologically sound and sustainable river management and restoration. Allocation of water, prevention of flooding, safeguarding fish stocks and maintenance of biodiversity are global problems. Large wood is also now recognised as an important element of conservation of biological diversity from reach to landscape scales. This conference will contribute to the science of riverine ecology and the application of research to the global goal of safeguarding and improving our rivers for future generations.

Key Themes

- Assessing ecological integrity
- Atlantic Salmon
- Fish passage and behaviour
- Environmental Flows
- Flooding and Climate Change
- Hydropower
- Large Rivers: integrating physical and biological models.
- Riparian Zones and Floodplain Wetlands
- Wood in Regulated Rivers and Managed Landscapes.
- Physical and Ecological Functions and Dynamics of Large Wood.
- Wood and River Restoration.

There will also be poster sessions and sessions for contributed papers on other topics. Selected papers will be published in major journals including *River Research and Applications* and *Earth Surface Processes and Landforms.*

Social events are likely to include a reception at Stirling Castle, a conference dinner, John Wiley Book launch, a golf tournament, and excursions to Edinburgh (the conference will be held during the world famous Edinburgh Festival), Pitlochry and the Loch Lomond and Trossachs National Park. A 3-day post-conference field trip will explore river management and conservation issues within Central and Northern Scotland including fisheries management, hydropower, flood management and river conservation. There will also be an opportunity to visit the Tagliamento River, north-east Italy.

http://www.stir.ac.uk/sbes/riversconference

The Conference will be hosted by the School of Biological and Environmental Sciences at Stirling University and is supported by the International Rivers Society; Scottish Environment Protection Agency, Scottish Natural Heritage, British Hydrological Society, British Geomorphological Research Group and Fisheries Research Scotland.

Organising Committee: Dr David Gilvear (Chair) [d.j.gilvear@stir.ac.uk], Dr Andy Large, Dr Nigel Willby, Professor Geoff Petts (TISORS II) and Professor Angela Gurnell (ISWWR II). Scientific Committee: Dr Ian Bainbridge, Dr Iain Malcolm, Dr Andrew Black, Dr Phillip Boon, Professor Stan Gregory, Dr Roger Owen, Professor Herve Piegay, Dr Alistair Stephen, Dr Paul Kemp, Dr Fred Swanson and Mr Pascal Lardet.

LAND DRAINAGE FROM FIELD TO SEA
Clayton 1919
Republished Logaston Press 2004
ISBN 1 904396 28 3
Price £15.00

The republication of Clayton's historic book offers a unique opportunity for modern day river managers to gain first hand knowledge and understanding of the policies and practices that sustained decades of land drainage and flood defence work to help render the UK's fertile lands fully productive in feeding the nation.

In the book dedicated to Clayton's memory, we are wisely reminded that 'those who show idle respect for the past are said to be poor guardians of the future.

This, of course is an appeal to those who in pursuit of modern day agri-environmental goals, global markets etc, would undo much of what has been achieved. The book cannot fail to foster a pause for thought as well as better informed judgements on the way ahead. Clayton was not without vision. River Restoration practitioners will empathise with his philosophies for 'planning at a catchment scale' as well as his view that 'part at least of floodwaters…… should be sent to earth'.

If you are interested in purchasing a copy please contact Logaston Press for more information

Website: www.Logastonpress.co.uk

Tel: +44 (0)1544 327344

Address: Little Logaston, Woonton, Almeley, Herefordshire HR3 6QH, UK

FEEDBACK FORM: RRC Annual Network Conference 13th & 14th April 2005, University of Hertfordshire, Hatfield

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?	**7. Were the venue, facilities and location suitable?** If not, please suggest other.
2. Have your expectations of the Conference been fulfilled? If not was it useful anyway?	**8. How did you travel to the conference?**
3. Were the discussion sessions long enough, and frequent enough?	**9. Would you be willing/able to attend a conference if it was held in Scotland in the future?**
4. This year we have had three parallel sessions to choose from. Did you feel this was a good idea?	**10. Any additional comments or suggestions**
5. Were there any themes or topics that you would like to see presented at future Conferences? By yourself? By others?	
6. 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)……	**If you would like to discuss comments further please provide your name and organisation:** **Name…….** **Organisation…….** ***Thanks for you time***