



River Restoration NEWS

Issue 12
July 2002

NEWSLETTER of the RIVER RESTORATION CENTRE

3rd RRC Conference Engineering River Rehabilitation

Stockton-on Tees, close to the award winning River Skerne demonstration project, was the venue for this year's 2 day event held in April. Not even the April showers on the morning site visit to the Tees Barrage could dampen the enthusiasm of those visiting this impressive engineering structure, nor the subsequent visit to the local Tees Valley Wildlife Trust site at Portrack Marsh.

During the course of the conference around 130 delegates listened to a wide variety of presentations on projects ranging from flood alleviation schemes to river diversions to community focused projects from both within the UK and abroad.

Speakers repeatedly advocated the importance of involving all interested parties in restoration schemes at the earliest opportunity, from the contractor to the planner to the community. In doing so a multi-disciplinary team can achieve more, with less conflict of interests. Discussion sessions allowed plenty of time for questions and healthy debate. The closing session



included the fundamental question of why do we restore rivers in the first place? A variety of responses followed from the floor; to restore the natural processes, potential flood

alleviation benefits, people enjoy having healthy rivers the audience were reassured of the increasing importance and value of river restoration.

Why Restore Rivers?

"Twenty five years ago I stood on the banks of the River Dearne in South Yorkshire with the Rivers Division Manager of the Yorkshire Water Authority. The river smelt, was a nasty shade of brown and flowed straight as a die between high flood banks as far as the eye could see. I was told in no uncertain terms that there was nothing that could, or was going to be done. When Roger Bettess asked the above question at the conference I was sitting next to my very old friend Chris Firth. He had seen the water quality in the Dearne improve over the years and has recently persuaded the Flood Defence function of the EA to allow him to carry out a restoration scheme on the river. Chris and a gang of flood defence

operatives, the very people who made the river straight in the first place, put the bends back into the channel and created riffles, pools, backwaters and bankside vegetation. He restored the river, and it is featured in the RRC Manual of Techniques as a fine example.

Now people come to look at the river and say that it is good. More importantly fish, invertebrates and plants have returned and by their presence are indicating that they think it is good too. And that is why we bother to restore rivers."

Dr John Shillcock, RRC director

INSIDE THIS ISSUE

This months issue of RR News is devoted to presentation write-ups and the discussions provoked when river engineers and other practitioners were put on the spot at RRC's 3rd Annual Network Conference

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Keynote Address

Development of Engineering in River Restoration

Principles...

My early experiences in river management (in Malaysia on VSO) led me to a better understanding of sustainability in river engineering than my professional training in water resources engineering in the 1970s (where the trapezoidal river channel still reigned supreme)! Three clear principles that I learnt were:

- The river can be asked to perform several different functions (navigation, aesthetic, fishery, water supply, ecology). Stakeholders with different interests must reach a consensus about how the river is managed.



Multiple use of a Malaysian river

- Man's use of the river must be managed within the capacity or capability of the natural systems and an understanding of the relevant natural processes. The human species is the most problematic part of the river ecosystem!
- While there is a role for one-off schemes, best river engineering practice involves a range of interventions. We now call this "adaptive management" whereby the cycle of "monitor / understand / plan / act or intervene / monitor" enables the river manager to respond appropriately.

Art or science...

Engineering fits into river restoration as both an art and a science. An "art" as we are managing an uncertain environment where cause and effect is not always clear. A "science" as we have enough rational principles, tools and techniques to achieve "sustainable river engineering". We are also able to learn a lot from the success and failures of past schemes. The River Restoration Centre now has a national role as a focus for holding and interpreting this information. Engineering practice in river restoration must always seek to achieve an appropriate balance between the art and the science.

The first River Restoration Project on the Rivers Cole and Skerne in

Dr Mervyn Bramley is Flood Defence Development Manager for the Environment Agency and Engineering Theme Leader for the Joint DEFRA/Environment Agency Flood and Coastal Defence R&D Programme. Below, Mervyn provides a synopsis of his experiences and thoughts on river management and the role of engineers.

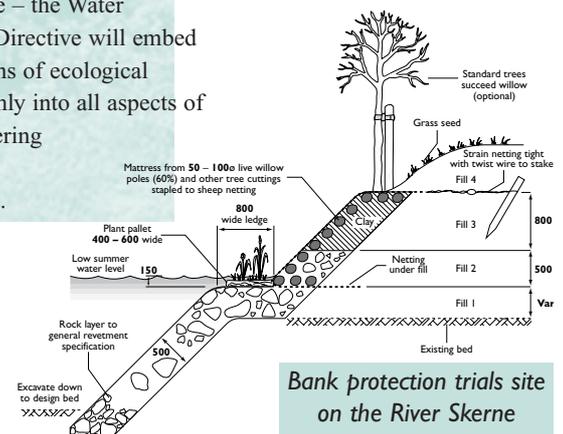
1992 demonstrated a range of engineering techniques for river restoration, particularly the "soft" bank protection on the Skerne. This is a good example of functional design – i.e. specific engineering provision is made for (a) flood erosion, (b) ecosystem, and (c) amenity use. The project resulted in the original Manual of River Restoration Techniques. The Environment Agency and the River Restoration Centre have just updated this as a web-based Manual now containing information from 17 river sites. Important engineering issues covered by the new manual include: bed and bank resilience to flood events; engineering for diverse habitats; and improvements to amenity use and urban riverscapes.

The Environment Agency now intends to work with the RRC to develop a 'toolkit' of river restoration techniques by linking relevant information on other websites.

The Future...

Looking to the future direction of developments in engineering for sustainable river restoration, there are a number of key drivers:

- Political – increased flooding is now driving a long-term, strategic approach to flood management (not flood defence) based on improved understanding of catchment processes. This in turn will drive improved land management and related sustainability in rural and farm-level drainage systems.
- Legislative – the Water Framework Directive will embed considerations of ecological function firmly into all aspects of river engineering design and management.



Bank protection trials site on the River Skerne

- Business efficiency and skills shortage – will increasingly drive the need for improved skills and more integrated tools (covering planning, design and management).
- Climate change - higher flood peaks will drive requirements for additional storage and flow capacity, and for adaptable and resilient river systems.
- Socio-economic – communities will increasingly demand a high amenity and landscape function to rivers in the urban and developed environment.

Engineers will need to develop their skills to address these new developments, but they and the River Restoration Centre can be assured they will continue to have key roles to play.



Urban restoration on the River Marden

Economics of Washland Creation

With more and more emphasis placed on catchment scale river and flood management, Prof. Joe Morris from the Institute of Water and Environment, Cranfield University at Silsoe, looked at the economic benefits and constraints to the wider use of washlands

Flood defence for farm land, along with high levels of subsidies, has been an important element of Britain's production oriented agricultural policy. Many flood plain areas benefited from publicly funded flood defence and land drainage schemes which reduced crop damage and facilitated a change to more intensive farming systems. Recently, however, greater emphasis has been placed on environmental enhancement, diversity of economic activity as a basis for sustainable rural livelihoods, and public enjoyment of the countryside. Funds previously committed to support farm output are increasingly diverted to encourage land managers to deliver environmental benefits.

Potential Benefits

In this context, there is reduced justification in some areas for high standards of flood defence for agriculture. Indeed, there may be substantial benefits if some flood plain land is returned to its previous unprotected, un-drained condition. The positive creation of washland and/or flood storage facilities can provide relief to areas presently subject to unacceptable flooding; reduce the need for expensive flood defence measures elsewhere in the catchment; help the management of scarce fresh water resources; provide wildlife and amenity benefits, and, through credits for flood storage and extensive farming methods, provide alternative sources of income to land managers.

Financial Impacts

The creation of washland/flood storage on farm land will impact on land use, farming practice, productivity and farm incomes, depending on the change in flood regime (both surface flooding and waterlogging of soils) and the degree to which existing land use is sensitive to this change. Much depends on the frequency, seasonality, duration, and to a lesser extent the depth of flooding on farm land. Short duration flooding on grassland in winter has little impact, but a month's flooding on improved grass in spring can severely limit productivity. Arable crops are generally unsuited to frequently flooded areas. Furthermore, waterlogged soils, as well as directly depressing crop yields, have reduced strength and this reduces field access by machines or grazing animals.

Income loss will depend on land use and profitability before and after the introduction of the washland option, and on particular farm circumstances, such as whether whole farms or parts of farms are involved. A switch to extensive grassland would probably reduce annual financial returns by between £200/ha and £300/ha, although this would be less if farms could save overhead costs over the longer term. For these reasons, payments to farmers may be necessary to compensate for loss of income and provide an incentive to adopt washland options.

In some designated Environmentally Sensitive Areas, such as the Somerset Moors and Levels, farmers already receive annual payments of about £125/ha to retain permanent grassland, and between £200/ha and £430/ha to maintain wet grassland. The higher rate applies for permanently raised field water levels. It is possible that a similar payment regime could be designed for washland creation/flood storage.

Economic Consequences

Although, in the absence of compensatory payments, farmers may incur 'financial' losses due to washland creation, there is potential 'economic' benefit from moving to extensive washland systems. This is because in existing grassland areas, livestock production is heavily dependent on subsidies, and after removing these, many livestock enterprises show negative returns. Hence, reducing the intensity of farm production in some areas would be beneficial from the viewpoint of the national economy as a whole. Given the opportunity to achieve economic and environmental benefits, and to sustain farm communities through targeted support, it would appear in the public interest to redirect funding, both from the agricultural and flood defence budgets, into washland creation and flood storage.

Administrative Options

There are four main options for the administration and management of washlands, namely: land purchase, easements, management agreements and leaseback partnership. Their suitability varies according to the purposes to be achieved, the longevity of the commitment to change, and linked to these, the preferred link between the farming community and the management of the land. The range of circumstances in flood plain areas implies that a diversity of approaches may be required.

Scope

It is apparent that there is considerable scope and potential benefit from the development of washlands and flood water storage on farm land. However, there is a need to confirm practical ways to reconcile the flood storage, environmental and farming objectives in washland areas, and to join up the various arms of agricultural, environmental and flood defence policy to support this process.

Four Years of the River Restoration Centre

Martin Janes, Centre Manager and Karen Phillip, Information Officer comment briefly on the past four years of the River Restoration Centre and what has been achieved.

UK Information and Advisory Centre

The River Restoration Centre has now been operational for 4 years. The Centre provides a focal point for the exchange of information and expertise relating to river restoration and enhancement in the UK. RRC's focus is to disseminate information on river restoration and enhancement projects and to provide advice on site-specific technical issues.

Re-profiling works at the River Rhee demonstration project, Cambs.



Information - Collection and Dissemination

The RRC houses a 'projects' database, an inventory of over 800 past, current and planned projects ranging from brief summaries to more detailed case studies and 'independent audits'. Projects include:

- small-scale local bank enhancements;
- community-based initiatives;
- catchment-wide projects;
- large scale demonstration projects.

Project information is available in a number of ways; through database searches to find examples of 'best practice', through the hosting of workshops, and the distribution of this newsletter to over 1000 river restoration practitioners.

Themed workshops have been organised in response to a recognised need to focus on a particular area of river restoration and to bring together practitioners within that area.

Those workshops held to date include:

- River Restoration and Geomorphology, Coventry, April 2001;
- River Restoration and Chalk Streams, Hatfield, January 2001;
- Rural River Rehabilitation and Sustainable Land Management, Perth, December 1999.

We also run 'training' workshops, for mixed audiences, and of course we are now reporting on our 3rd Annual Network Conference. This annual event represents RRC's commitment to broadening the river

restoration network and to provide a forum for river restoration practitioners to share their experiences

Advice - Projects and Techniques

As rivers and the environment steadily creep up the agenda of the public and the Government, this in turn poses problems for inexperienced

staff and non-specialist organisations.

Since 1998 RRC has advised organisations (councils, conservation bodies and government agencies) on rivers and their restoration, enhancement and management. Common needs include:

- identifying degraded watercourses and their potential;
- integrating a more natural river environment with the built environment;
- contacts and expertise, examples and demonstrations;
- supporting and 'mentoring' inexperienced staff.

The nature of much of the advice given is generic and seeks to guide the enquirer to look at the 'issues' in a more

A field visit to the River Tummel for the SEPA/SNH River Habitat and Geomorphology course



detailed manner, and to provide the relevant contacts specific to each enquiry.

Techniques Manual

In 1999 the Centre produced a Manual of River Restoration Techniques, based on experiences from two rivers. This Manual has proved extremely popular and effective. This has now been updated to include a further fifteen UK projects demonstrating an additional twenty techniques.

The interleaved Manual (original and update) is now available (in an early form) on the Environment Agency's new website for Flood Defence R&D outputs (<http://www.environment-agency.gov.uk/subjects/flood/211195/264395/286585/>) and will also be available through the RRC website shortly, and as a printed insert later this year.



The diverted course of the River Nith, Ayrshire. One of the featured schemes in the RRC Manual update



An Integrated Approach to Flood Defence Design

Matt Jones and Warren Bradley, Halcrow Group and Deborah Dunsford, Environment Agency highlight an effective integrated approach to flood defence design - respectively the Environmental Scientist, Project Engineer and EIA Co-ordinator.

The village of Harbertonford in South Devon has been flooded 21 times in the past 60 years, including six times since 1998. Due to this repeated disruption and misery caused to the local residents, the flood defence scheme was given 'accelerated status' by DEFRA - one of only nine such schemes in the UK. Construction commenced in February 2002 and is set to be complete by October 2002. Total scheme cost: £2.25 million.

Flooding at Harbertonford



The scheme was designed through an integrated approach of environmental, engineering and cost considerations.

Approach

The approach to the design of the flood defence scheme was based on the following:

- Establishing engineering, cost and environmental (including geomorphological) scheme objectives at project inception. These formed the foundation of the scheme design against which scheme options were assessed;
- Allowing scheme design to be an iterative approach between engineering, cost and environmental considerations at all times;
- Assessing a wide range of options, including land management approaches, storage options, localised defences.
- Considering the 'environment' as an opportunity, not a constraint. Possibilities for 'environmental gain' were identified early on and developed as the project progressed;
- Beginning consultation with the public, statutory bodies and non-statutory organisations at project inception. This informed scheme design and also allowed 'ownership' of the scheme by respective 'stakeholders'. Partnership opportunities were also identified;
- Contacting specialists at appropriate stages of design. e.g. the River Restoration Centre; and

- Engaging contractors into the design team at an early stage. As well as improving the quality and 'buildability' of scheme design, adverse environmental effects were either 'designed-out', 'programmed out' or else identified for management.

The proposed scheme is a combination of storage upstream of Harbertonford and channel works within the village.

Storage

The storage area involves the construction of an earth dam across the valley upstream of Harbertonford. The dam has been designed to allow a 1:10 year flood event to flow through the opening of the dam whilst retaining larger events up to a 1:40 year.

Key attributes of the dam are as follows:

- Varying dam topography to 'fit' with surrounding landscape of the valley;
- Planted with trees on upstream slope and semi-neutral grassland for downstream slope;
- In-stream pools created both sides of the structure;
- Culvert designed in accordance with Scottish Executive guidance on migratory fish;
- Creation of 4.1 hectares of wet grassland/ woodland in flood storage area.

Channel works

The principal component of the works within the village is the lowering of the river bed to provide defence for the 1:10 year flood event, through the creation of a series of 'fixed riffle/pool' sequences on a steeper gradient.

Reach identified for lowering through a series of 'fixed riffle/pool sequences'

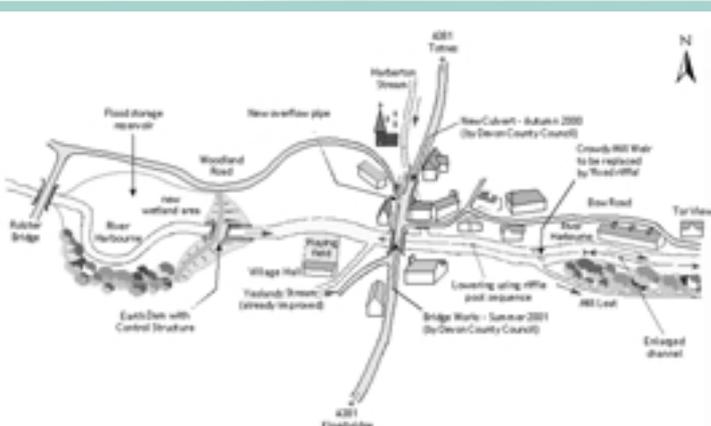


Schematic diagram of the flood defence scheme

A sound understanding of the geomorphology of the River Harbourne, and a desire to integrate with the natural sediment transfer underpinned this design, providing flood defence benefit whilst also enhancing the river environment.

A new model?

A cost-effective flood defence scheme has been designed that integrates with the geomorphology of the river, whilst also preserving and enhancing the natural and built environment. This approach to flood defence schemes could be applied to ALL flood defence schemes being implemented in both the UK and elsewhere. The integration of the various environmental disciplines to support engineers in designing such projects cannot be over-stressed.



Rehabilitation of the Pozuelo Stream, Madrid

Marta González del Tánago talks about her work on the assessment of river and stream engineering projects, dealing with environmental enhancement and rehabilitation. Her work also involves collaborating with Madrid municipality (Water and Environmental Department) in rehabilitating urban streams such as the example of the Pozuelo Stream

Traditionally, the majority of the rivers and streams crossing urban areas of Madrid and its surroundings have been piped and buried. The aims of this have been (1) to avoid serious problems of pollution and poor aesthetics, especially in summer when natural mediterranean conditions produce very reduced flows, and pollution and physical degradation of channels are much more evident; and (2) to occupy fluvial space for urban purposes.

along a sinuous pedestrian path by the stream. These rehabilitation works have amounted to half of the cost of the total project, and have been very well received by people living near by.

Although the physical structure of the channel has been clearly improved, ecological recovery is severely constrained. Much of the surrounding runoff is diverted into pipes and by-passes the urban reach of the stream. The scarcity of flowing water limits both biological recovery and morphological development, and is one of the biggest limiting factors to achieving urban stream restoration in dry regions.

Ecological Restoration...

This example shows the hydrological impact of urbanisation in areas with Mediterranean climatic conditions, by means of altering the superficial flow patterns and preventing ground water recharge. The necessity of an integrated approach, rehabilitating the stream together with the hydrology of its urban watershed, has been highlighted. Increasing permeable areas to allow infiltration during rainstorms, and constructing storm drainage pipes connected with the natural channel, seem to be future ways forward to help promote ecological restoration.

Marta González del Tánago is a Senior Lecturer of Hydrology at E.T.S. Ingenieros de Montes, Universidad Politécnica de Madrid, Spain.

The fate of too many Spanish urban streams.



Natural Processes...

A new more environmentally sensitive approach has been followed by the Water and Environment Department of Madrid city during the last few years, trying to rehabilitate some urban streams where the space is still available. The idea is to enhance the urban fluvial corridors as much as possible, promoting natural processes compatible with recreational activities inside the urban areas.

The case of the Arroyo de Pozuelo is presented as an example. A civil engineering project to replace an existing sewage pipe near to the stream has been developed simultaneously with the rehabilitation works.

Local Support...

The layout of the pipe has been determined by the presence of mature trees and the 'designed' channel morphology of the Pozuelo stream. A sinuous channel with enlarged cross-sections and small lateral slopes (1:3 to 1:4) has been created, replacing the old ditch-type channel. The stream corridor has been planted with native riparian species and equipped with wooden benches, footbridges and streetlamps

Half of the budget was invested in rehabilitation works and recreational facilities.



The Padiham Weir Project

Day two's final session looked at 'overcoming obstacles for species, sport and society'. Here, Carol Holt and Gary Jones-Wright of the Environment Agency, North West Region report how regeneration, leisure and fish passage have been improved on the River Calder at Burnley.

The redundant weir was a major barrier to fish and public enjoyment



A man-made barrier

The River Calder is a tributary of the River Ribble. Over the last 30 years the water quality in the River Calder has been gradually improving and salmon and sea trout now run the system. Padiham Weir was constructed on the River Calder in the 1950s to control the abstraction of cooling water to the now demolished Padiham Power Station. The former power station site has recently been decontaminated and brought back into economic use. The weir is 2.1 metres high and stands as a man-made barrier to public enjoyment of the river, as well as being a barrier to the migration of fish in the River Calder.

Padiham weir canoe facility

Canoeing is a hugely popular recreational activity in the UK as well as a serious sport in which Great Britain excels. The Environment Agency is project managing the construction of the new facility near Burnley. The British Canoe Union (BCU) has designated this as a Sport England Category 2 facility (something that can be used by anybody at anytime, and is of regional and national importance), the only one in the North West of England and seen as critical to the long-term development of canoeing in the region. Padiham Weir will complement facilities at Teeside (Cat. 2) and Holme Pierrepont (Cat. 1).

Incorporation of the weir into the proposed canoe facility will bring a series of direct sporting benefits, and

also deliver indirect benefits in terms of fish migration, angling opportunities and as a catalyst for further water quality and environmental improvements.

Direct sporting benefits

- A modern Category 2 white water canoeing facility for the N. West in a deprived E. Lancashire area
- A facility for existing canoeists to improve their skills and a safe environment for coaching of novices and beginners
- Enhanced access to rivers for canoeists in an area where general lack of access is apparent

Indirect benefits

- Revitalisation of the river that will encourage informal recreational use and countryside access
- Removal of a barrier to fish migration and re-colonisation of 100 hectares of upstream habitat by salmon and sea trout
- Enhanced scope for anglers to have access to the river

A free-flowing river

The project involved constructing an island, extending 108 metres upstream of the existing weir, which will produce a bifurcated channel. The southern channel will retain the free-flowing river and the northern channel will contain the white water canoe facility.

The northern channel will have the existing weir removed at its western end and three pools will be constructed, allowing canoeing to take place on an east-west axis. In addition to the white water course, a canoe access agreement has been put in place along a 2-kilometre stretch of the River Calder centring on Padiham Weir. The facility will also have a dedicated building located on the north bank of the River Calder comprising changing rooms, boat store, training room, kitchen and office.

The total cost of the scheme is £2.4M and work is expected to start in spring 2003.



An artist's impression of the new canoe facility at Padiham

Joining the River Restoration Centre

If you are not a member of RRC, and wish to continue to receive the Newsletter, know more about the activities and outputs of the Centre, and also contribute to widening the Network of sharing experiences and knowledge, please contact us.

News and Events

New Corporate Member



Land Wood & Water Group has joined the Centre as a corporate member. The group is an amalgamation of former RRC members - Land, Wood & Water Co. Ltd, MMG, Merton Hall Pond Ltd and Fluvial Environmental Services Ltd.

Corporate members are those who subscribe a minimum of £1K per annum to support RRC, and to secure the services of the Centre to help their own activities.

Books

The EU Water Framework Directive - An Introduction.

Peter Chave

The EU Water Framework Directive: An Introduction is an invaluable source of guidance on the implementation of the water Framework Directive for all those concerned with water management including water quality planners and scientists, pollution control and environmental staff in the water and wastewater industries and environmental regulators who all have to adapt to the new approach to their work.

For more information: <http://www.environmental-center.com/publications/iwa/1900222124.htm>

Urban Rivers, Our Inheritance and Future

Geoff Petts, John Heathcote, Dave Martin

Urban Rivers provides an illustrated overview of the effects of urbanisation on the aquatic environment, potential solutions to the resulting problems, and new opportunities for the regeneration of urban streams and rivers, and of land along their corridors and of adjacent urban areas. The book is written to be accessible to a broad audience and should provide a stimulating and informative introduction to the subject for all those concerned with the urban river environment.

For more information: <http://www.iwapublishing.com/template.cfm?name=isbn1900222221>

ECRR study tour 2002

The Netherlands 9 - 13 September 2002

The main goal of this first international ECRR study tour is to contribute to the further development of a Pan European network on river restoration under the umbrella of the European Centre for River Restoration (ECRR).

During the study tour, diverse issues as to the restoration of rivers in the Netherlands from small-scale brooks to large-scale rivers and estuaries will be identified. As well as in-depth discussions regarding specific projects and items, the driving forces behind the river action programmes in The Netherlands will be discussed. What is the reason for "the Dutch approach" and could it also apply to other countries?

For more information: http://www.ecrr.org/sider/meet_and_conf.html#NL1

Conferences

13th International Salmonid Habitat Enhancement Workshop Westport, Co. Mayo, Ireland September 16th - 19th, 2002

The Workshop will be held over a four-day period - The first two days a series of talks will be held in the Hotel Westport. Experienced fishery biologists from North America, Europe, Britain and Ireland will make presentations on some of the many bankside and instream work programmes which have contributed to the restoration of salmonid stocks worldwide.

For more information: http://www.therrc.co.uk/news_events.php

FBA Annual Scientific Meeting 4th - 6th Sept 2002

"FRESH WATER IN THE LANDSCAPE" University of Durham

Organised by The Freshwater Biological Association. Two days of scientific sessions, with offered papers and posters and internationally renowned invited speakers.

For more information: http://www.therrc.co.uk/news_events.php

Courses

Flood Modelling and Management; Continuing Professional Development

19th - 30th August 2002

The University of Glasgow is running a series of short one-day courses in Flood Modelling & Management, including Environmental Enhancement & River Rehabilitation (Lecturer: Dr Nigel Holmes).

For more information: http://www.therrc.co.uk/news_events.php

Staff changes

In May RRC said farewell to Karen Phillip who has returned to Aberdeen to take up the post of Natura 2000 – Grampian Project Officer with Scottish Natural Heritage. Our new Rivers Information Officer, Jenny Mant, starts in August. Jenny has just completed her PhD and comes to RRC from Portsmouth University where she has been working as a Research Associate in the Department of Geography.

Integrated approaches to restoration



River, estuary and coastal restoration
from feasibility to design,
implementation and monitoring

Unique team with hydraulic modelling,
geomorphology, ecology, archaeology,
civil engineering and social issues
expertise

UK Offices in Southampton, London, Chester, Oxford,
York and Manchester. Contact: Dr Andrew Brookes,
Associate Tel: 023 8081 7500 email: andrew.brookes@gifford-consulting.co.uk

Gifford

FIRST CLASS
environmental
engineering and science

RRC is most grateful to all those who have contributed text or photos for this Newsletter

The following statutory organisations provide Core Funding for the River Restoration Centre and their Representatives form the Advisory Board who together with RRC's Directors make up the RRC Council.

