River Restoration NEWS

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Newsletter of the RIVER RESTORATION CENTRE

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Meades Water Gardens Regeneration Project

Meades Water Gardens on the opening day, July 2008

In common with the majority of the UK's chalk streams, the River Chess has been heavily modified by human activity over time. Allen Beechey reports on a recent restoration project led by the Chilterns Chalk Streams Project (CCSP) focusing on one such affected stretch in Chesham.

The River Chess is one of eight classic dip slope chalk streams that flow through the Chilterns Area of Outstanding Natural Beauty. The river rises from springs in and around Chesham in Buckinghamshire and flows southeastwards for 18km before joining the River Colne at Rickmansworth.

The Meades Water Gardens are a public amenity area through which the River Chess flows. Originally part of a mill pond and subsequently watercress beds, the land was given to the town in the late 1970's. Soon after, the council re-landscaped the area to create formal water gardens, excavating the beds and river to form two ornamental ponds.

It was soon found, however, that the ponds could not be maintained in the long term due to rapid accumulation of silt, decreasing their wildlife and aesthetic value. Lack of tree management reduced light levels in the gardens and the area became unwelcoming to the public and a focus for anti-social behaviour.

Restoration of the gardens was first mooted in the early 1990's but little progress was made until 2004, when a local community partnership, 'Impress the Chess', was set up to improve the condition of the river in Chesham. Following extensive public consultation, approval was received in 2005 to restore the River Chess to a more natural chalk stream as part of a larger plan to renovate the gardens.

A successful fundraising campaign enabled the first of two phases of work to begin in March 2007 with extensive tree work to increase the amount of light reaching the river.

With the assistance of the RRC, a detailed plan for the river channel reinstatement was developed and following receipt of Land Drainage Consent work commenced in February 2008.

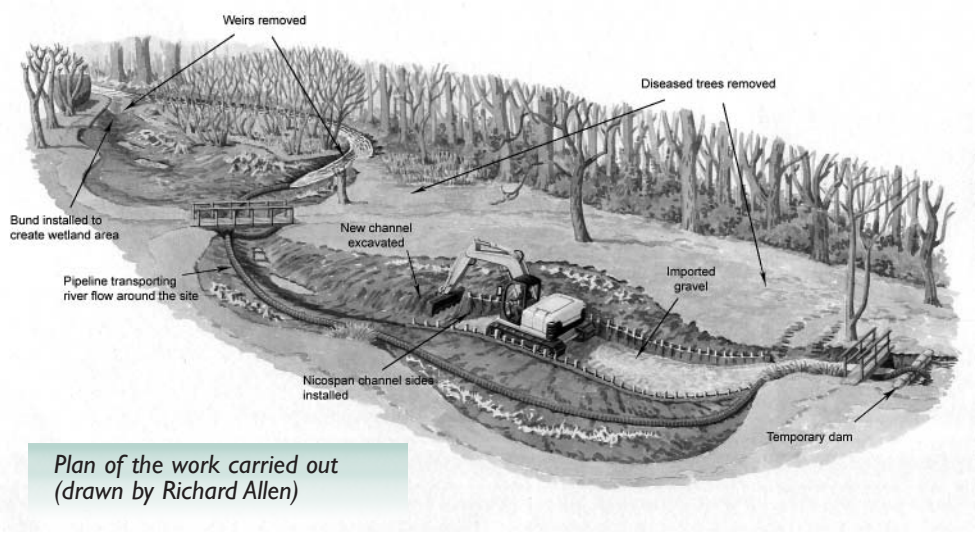
The two weirs, which had been used to retain water in the ponds, were removed and the site was allowed to

Continues on Page 2

Inside this issue

Continues from Page 1

drain. A temporary dam was built at the top of the site and river flow was piped around the working area. Working from the upstream end a new channel was dug through the accumulated silt following the line of preferential flow. Nicospan was installed to provide support to the new channel sides and to ensure separation of the silt from the gravel infill, which was imported to form the new river bed. Excavated silt was distributed around the site within the boundary of the old ponds. The new channel was tied into the original course of the river which flowed around the back of the island in the lower pond. A low-lying bund was installed in place of the weir at the front of the island to create a wetland feature.



Plan of the work carried out (drawn by Richard Allen)

Following completion of the river restoration work, new paths were laid in the gardens and an interpretation board installed to explain the work that had been carried out.

Post-restoration, colonisation of the site has been rapid. Water Crowfoot (*Ranunculus*) has already started to grow within the new channel and marginal vegetation has swiftly become established on the new banks, softening the channel edges. The more open nature of the gardens and refurbished paths has resulted in an increase in visitor numbers. The project has improved a valuable urban green space for both people and wildlife and serves as a case study for how local community partnerships can bring about real improvement to rivers in urban areas.

Meades Water Gardens: the finished result, February 2008

If you would like any further information on the Meades Water Gardens scheme or the Chilterns Chalk Streams Project, contact:
Allen Beechey,
Tel. 01844 355502 or email:
abeechey@chilternsaonb.org

Appropriate modelling for river rehabilitation

What can be done when questions are raised about proposed river restoration, rehabilitation or enhancement schemes at the planning stage because of concerns over potential increase in flood risk?

Rehabilitation works which require consent from Development Control and Flood Risk Management staff on the issue of flooding rightly require evidence of the impact of the works. The costs of modelling, however, can be more expensive than the installation of the enhancement. The scale and type of modelling required should be appropriate to the technique, dependent on the type and extent of works, the location and the flood risk. The Conveyance and Afflux Estimation System (CES/AES) has been used in a number of rehabilitation projects to provide appropriate modelling to investigate the impact of narrowing, riffles and channel re-profiling on a small scale.

What is the CES/AES?

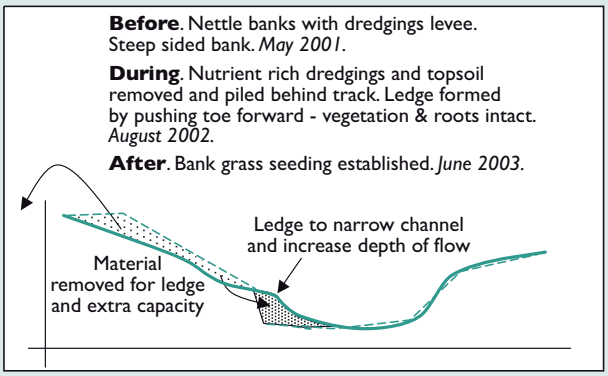
The CES/AES is a software tool for the improved estimation of flood and drainage water levels in rivers, watercourses and drainage channels. The software development followed recommendations by practitioners and academics in the UK Network on Conveyance in River Flood Plain Systems, following the Autumn 2000 floods, that operating authorities should make better use of recent improved knowledge on conveyance and related flood (or drainage) level estimation. This led to a Targeted Programme of Research aimed at improving conveyance and afflux estimation.

The final product is a software tool for estimating conveyance (water levels, rating curves, etc), spatial velocities and boundary shear stresses at river sections; undertaking simple reach-based backwater calculations and estimating afflux upstream of bridges and culverts. It also provides a comprehensive database of river roughness, integrating diverse information from over 700 references, including photographs, information from the River Habitat Survey and advice on vegetation cutting and regrowth.

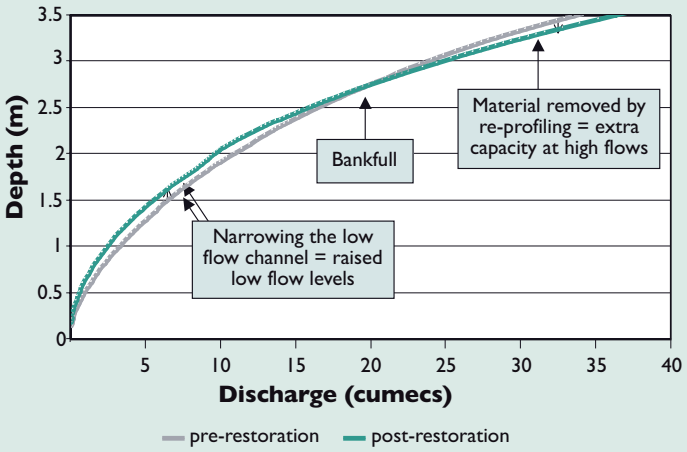
The CES/AES is incorporated into the ISIS and InfoWorks RS software for use where more complex river situations or unsteady state situations need to be modelled. It can also be used as a stand alone tool for investigation of smaller restoration projects or the impacts of maintenance, where a steady state assumption is reasonable. The stand alone tool is free of charge (download at: www.river-conveyance.net) and it is recommended that a one-day training course be undertaken to fully understand the applicability and range of options.

An example of the tool's use

The River Rhee at Wendy has been historically dredged and the channel was very deep and wide with little instream variation. Years of dredgings and weed cuttings left on the bank have raised bank levels. The enhancement scheme involved narrowing the low flow channel, creating a damp/wet ledge for marginal plant colonisation and re-profiling the bank to create extra capacity.



The CES/AES was used to confirm that the design would raise low flow levels whilst not increasing high flow levels. The output results from the CES/AES in the figure below show that the post-restoration channel has a greater depth for the same discharge. As the water approaches bankfull, this changes and the post-restoration depth is lower for the same discharge due to the increased capacity of the channel where the bank has been re-profiled.



The steady state CES/AES was an appropriate technique to use in this situation with limited data requirements (cross-section topography and slope) and limited resources (1 day for the data collection and 1 day for the analysis).

Further examples can be found in:

Janes, M., Fisher, K., Mant, J. and de Smith, L., River Rehabilitation Guidance for Eastern England Rivers.

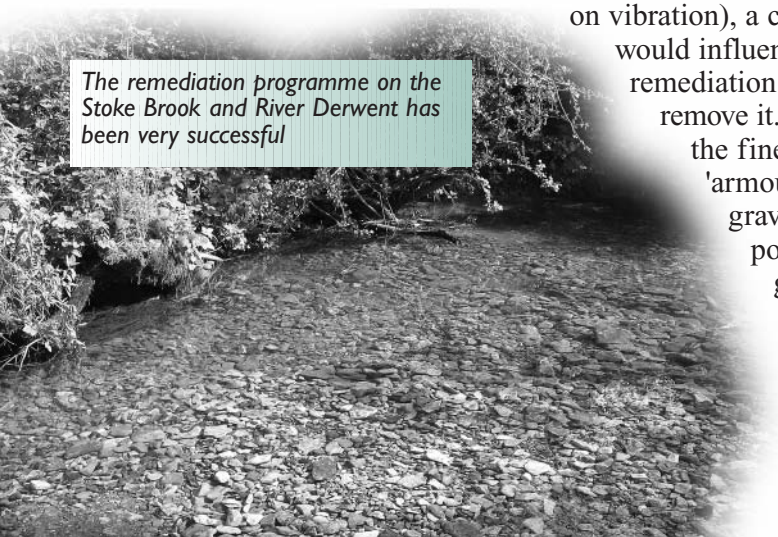
Prepared by The River Restoration Centre for the Environment Agency, November 2005.

Stoke Brook and the Riv
- remediation with minimal impact

The remediation of metal-loaded sediments following a tailings dam failure had to be achieved with minimal disturbance and damage to the Stoke Brook and River Derwent. This demanded use of specialist machinery and the application of sensitive, ecology-driven approaches to river remediation and restoration. Peter Worrall (Penny Anderson Associates Ltd) reports on the process.

The failure of a tailings dam at a fluorspar mine in Derbyshire in January 2007 sent a huge torrent of fine, metal-loaded sediment into the village of Stoney Middleton and on into the Stoke Brook and River Derwent, smothering the riverbed and banks with a dense coating of tailings material. This posed significant risks to the integrity of the ecology of these rich and diverse rivers within the Peak District National Park.

Once the village of Stoney Middleton had been cleaned up, attention focused on the remediation of the nearby Stoke Brook and River Derwent. These rivers support important salmonid and coarse fisheries as well as being one of the few sites in the region to have breeding populations of brook lamprey. In addition, the rivers have large populations of water vole together with species such as water shrew and otter. The wooded banksides, marshes and wet grasslands associated with the rivers support great crested newts, dippers, kingfishers and a rich invertebrate fauna. This, all set within the context of agricultural practices within Environmental Stewardship schemes and high levels of public access within the Peak District National Park, posed significant challenges for the remediation process.



The remediation programme on the Stoke Brook and River Derwent has been very successful

The processing of fluorspar generates a tailings material which, as a fine silty sand, contains metals such as lead, zinc and cadmium. After the tailings dam failure the initial environmental concern focused on the toxicological risks to the ecology of the rivers posed by the presence of such large quantities of this material. However, studies indicated that the metals are tightly bound into the tailings complex and do not leach easily. In addition, the results of fish tissue analysis led the Food Standards Agency to issue a statement that trout caught in the river were perfectly safe to eat. Therefore, the emphasis driving remediation was to address the physical impacts of the tailings materials on the river and its associated wildlife.

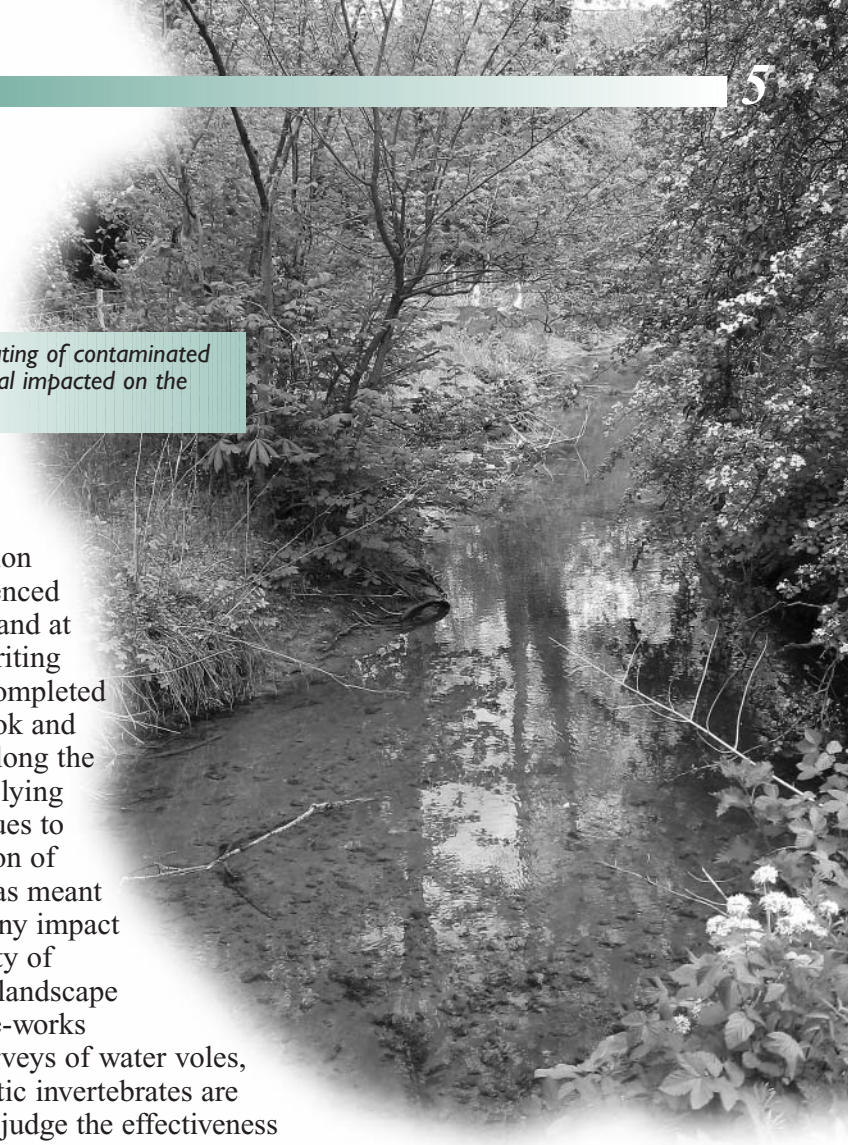
Once deposited on the riverbanks, the tailings material became thixotropic (solid turning to liquid on vibration), a characteristic that would influence the eventual remediation techniques used to remove it. More significantly, the fines in the tailings 'armoured' the riverbed gravels. Essentially, the pore spaces in the gravels became filled and 'locked' as a hard surface which deterred breeding brook lamprey and

Sediment removal using a specially built excavator

impacted on the trout fishery. The affected reaches of the River Derwent have extensive gravel redds and these important fish spawning areas were compromised by the addition of fine sediments not normally found in this system. Elevated levels of fines within the redds can cause armouring as described above, and also reduce the oxygen transfer within the gravels. The level of oxygen in fish spawning gravels is a critical factor in their function, so where the tailings materials smothered these gravels efforts had to be made to extract the fines whilst retaining the gravel beds.

Identifying the most appropriate and least interventionist approach to remediating the rivers took place at the same time as an intensive public consultation and stakeholder involvement process. This involved the management of multiple landowners and agency interests. Various techniques for removing the sediments were considered, but many faltered on the potential adverse impacts they might have on the river and its floodplain. Eventually, the remediation toolbox was confined to a limited number of components, comprising:

ver Derwent



The dense coating of contaminated tailings material impacted on the trout fishery

- The use of a high-powered vacuum system able to remove sediment in a dry or semi-dry state without too much mobilisation of the fines into the stream flow. This has been used to remove bankside and shallow water deposits;
- The use of a low ground pressure, walking excavator, specially built and imported from Italy. This was the critical piece of machinery used to achieve the minimal impact remediation. The excavator was able to walk over riverside fences but more importantly it could stand off 2m from the riverbank and step over the bank and into the channel. Given that large stretches of the riverbank played host to water voles and their burrow systems, it was essential to avoid placing pressure on the banks or damaging the bank face;
- A rotating, hydraulic excavator head was fitted to the walking excavator to enable the machine driver to stay within the river channel and at the same time cut the necessary angles to restore the channel and riverbank forms and features;
- A riddle bucket, manufactured in Holland, was used to break up armoured and silt-laden gravel beds and redds. The bucket, attached to the walking excavator, is able to remove particles of less than 4mm from the riverbed;
- Hand digging was a technique employed at several locations where any form of machine intervention would have been ecologically damaging;
- The modest use of 'sedimats' and coir rolls in-channel to reduce downstream redistribution of fines. In addition, at the confluence of the Stoke Brook and the Derwent a permeable silt curtain proved extremely competent at settling out remobilised material from upstream.

The remediation works commenced in June 2008 and at the time of writing works were completed on Stoke Brook and progressing along the Derwent. Applying these techniques to the remediation of these rivers has meant very little if any impact on the integrity of ecological or landscape resources. Pre-works ecological surveys of water voles, fish and aquatic invertebrates are being used to judge the effectiveness and the deliverability of low impact remediation. So far, there have been no mature trees lost, no loss or damage to water vole burrows or bankside habitat and in a recent fish survey undertaken by the Environment Agency, fish density has increased in Stoke Brook despite the works that have taken place there. Kingfisher and dipper continued to breed along the rivers throughout the remediation operations and public interest from walkers has been universally positive.

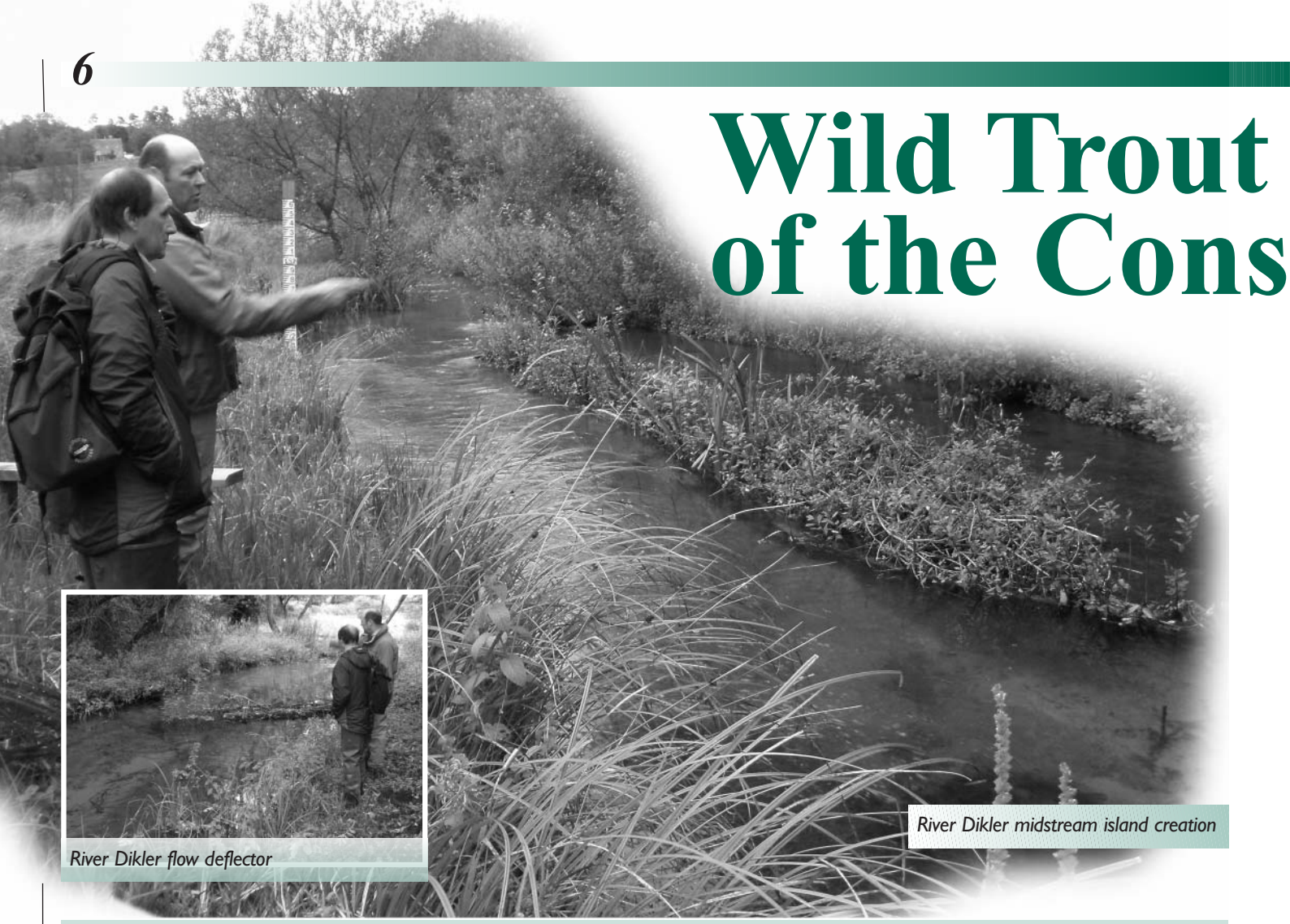
The success of this remediation programme cannot simply be put down to the use of special equipment and ecologically sensitive techniques. The involvement and participation of the Environment Agency and, in particular, the Peak District National Park has been critical to the achievability and deliverability of the scheme. However, the overriding lesson from this project comes from the effective management of communication between stakeholders in the scheme. If people are kept informed and given the opportunity to comment and/or contribute directly to the scheme, then the likelihood of success is significantly enhanced.

Many river systems in the UK are compromised by polluted sediments. The experience of Stoke Brook and the River Derwent exemplifies that it is perfectly feasible to remediate and restore these rivers without causing large-scale disruption and damage, as long as the appropriate commitment is made to using the best possible technology and stakeholder communication is seen as important, and is managed effectively.

Project Managers and Directors:
Penny Anderson Associates Limited (*Consultant Ecologists*)

Project Contractors:
AlaskA Environmental Contracting

Wild Trout of the Cons



River Dikler flow deflector

River Dikler midstream island creation

The Savile Club ballroom in London's Mayfair was the glamorous setting for this year's award ceremony sponsored again by the fishing company Orvis. Allan Frake, a Trustee of the Wild Trout Trust, reviews this year's winners, selected from an impressive list of 14 finalists involved in river rehabilitation projects throughout the UK.

The well-deserving winner in the Amateur category was the Cotswold Fly Fishers. With thought and ingenuity they have transformed the historically neglected River Dikler, near Stow-on-the-Wold, from an impounded, sediment-laden river choked with emergent vegetation to a really energetic little watercourse, by removing weirs and installing a variety of instream structures to increase physical and ecological variety. The extensive use of local materials and the opportunism shown in acquiring spawning gravels from the local water company resulted in an excellent 'value for money' project.

In a close-run contest the runner up was the River Bourne Scheme at Hurdcott in Wiltshire, where the local Bourne River Fisheries Conservation Group and the Wessex Chalk Stream Project have successfully sought remedies for poor water quality and significantly improved a featureless 'canalised' section of silted up river. In addition, the project has constructed a significant area of new floodplain wetland and planted an extensive woodland area adjacent to the river for additional wildlife gain, as well as building an effective fish easement structure to bypass a mill leat obstruction, thereby making the restored reach more accessible to migrating salmonids.

River Bourne 're-energised' river channel

Trust 10th Anniversary ervation Awards

The Professional Category trophy went to Natural England and Partners for the STREAM (Strategic Restoration and Management) project on the River Avon; a £1million project improving over 7km of watercourse using both traditional and innovative techniques especially involving extensive installation of 'large woody debris'. Particularly impressive was the emphasis placed on engaging a myriad of stakeholders and the public at all stages of the project and the comprehensive monitoring programme to measure both physical and ecological change.

'Dragon's teeth' flow deflectors on the River Nadder STREAM Project

Jenny Wheeldon & Sarah Yarrow from the STREAM Project with mid-channel islands in background

The runner up was the Bourne Rivulet rehabilitation project on this chalk stream headwater of the River Test in Hampshire. A beautifully well thought out and crafted project demonstrating how working with and thoroughly understanding the character of the river can produce a mosaic of habitats, which is so important for all components of the riverine and riparian flora and fauna. Using simple techniques of subtly redistributing gravels won from previously dredged materials on the bank, careful re-profiling and installing flow deflectors and woody debris, this project illustrated how careful planning with minimal intervention techniques can be sensitively used to great effect, at relatively low cost.

Bourne Rivulet channel re-profiled

News and Events

Conferences

Annual Stream Restoration Design Symposium
3rd to 5th February - Stevenson, Washington, USA
For more information please visit: www.rrnw.org/wb

The FBA Annual Scientific Meeting 2009
7th to 9th July - Bangor, Wales, UK
For more information please visit: www.fba.org.uk

Courses

Understanding River Restoration: Processes, ecology, planning and assessing potential (Module 1)
Due to high levels of demand, this course is being re-run first in February 2009, and again later during the year (exact dates and locations to be confirmed).
For more information please contact the RRC: rrc@therrc.co.uk

Seminars and Workshops

STREAM workshop and site visits for landowners and fishing clubs
14th May 2009 - Dinton nr Salisbury, UK

STREAM tools for managing rivers and floodplains: seminar and site visits
23rd to 25th June 2009 - Salisbury, UK
For more information:
Please contact elaine.swiffen@naturalengland.org.uk
to register interest or visit www.streamlife.org.uk

Book

The Riverscape and the River
S.M. Haslam (University of Cambridge)
ISBN: 978-0-521-83978-5 RRP: £65.00
The study of water in the landscape is a new and rapidly expanding field. This book examines how the quantity, function and ecology of water changes as it moves from watershed to river. This innovative book is written for graduate students and professionals interested in how water and riverscape interact.
For more information please visit:
www.cambridge.org/catalogue/catalogue.asp?isbn=0521839785

The hazel faggot cutting season has started
Faggot prices: 2m x 300mm - £5.50; 3m x 300mm - £7.50.
Discounts are available on larger orders.
Delivery is available (*cost on request*).
For more information please contact:
Matthew Parr on 07903 662389

New Staff

We would like to welcome Abigail Pryce (*pictured*) as the newest member of the RRC's staff. Abi has taken over from Alice Hall (*nee* Fellick) as Projects Adviser. Alice left in July to take up a new role as River Programmes Coordinator at Thames 21.

We would like to thank Alice for her valued contribution to the RRC, and wish her all the best for the future.

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 Management Board.

Environment Agency · Natural England · SEPA Scottish Environment Protection Agency · Rivers Agency · Scottish Natural Heritage · NIEA Northern Ireland Environment Agency www.ni-environment.gov.uk

the River Restoration Centre, Building 53, Cranfield University, Cranfield, Bedfordshire MK43 0AL

Cranfield University **RRC is grateful for the continued support of Cranfield University.**