

Managing Water

and it's
environment



Image: River Ebbw, with Tensar VMax P550 erosion control installed. See page 26

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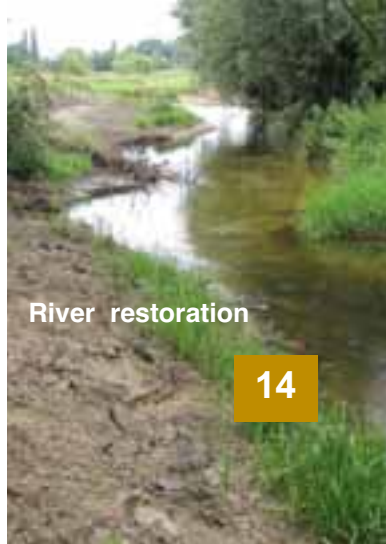


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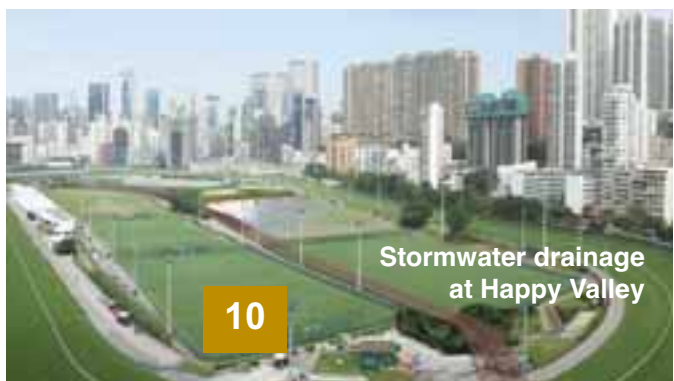
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Company Reg 07488993
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Lord Deben appointed chair of Committee on Climate Change



The Rt Hon Lord Deben PC has been confirmed as Chair of the Committee on Climate Change (CCC), as approved by Energy Secretary Ed Davey.

This follows a successful pre-appointment hearing on Tuesday 4 September, in which the Energy and Climate Change Committee (ECCC) recommended that he was suitable for the role.

DECC Secretary of State, Edward Davey, said:

"Lord Deben brings with him a huge amount of knowledge of working with businesses in the environment sector and of working with Government during his time as a Government Minister and an MP."

Lord Deben has a major contribution to make to the climate change agenda, and I look forward to working with him as we move into critical period on climate change issues both at home and abroad."

Lord Deben said:

"This appointment is a great honour. I look forward to building upon the solid foundations that Adair Turner has laid. I am determined that the Committee on Climate Change will remain firmly independent, giving impartial, scientifically well-founded advice to the UK Government and devolved administrations."

As Chair, Lord Deben will be responsible for steering and developing the overall work of the CCC, which advises the UK Government on setting and meeting carbon budgets and on preparing for the impacts of climate change.

Lord Deben will succeed Lord Adair Turner who stepped down earlier this year to focus on his role as Chair of the Financial Services Authority.



New head for DEFRA

Environment Secretary Spelman replaced by Paterson in cabinet reshuffle



Caroline Spelman has been replaced by the former Northern Ireland Secretary, Owen Paterson as the head of the Department for Environment, Food and Rural Affairs (Defra).

Paterson took over the job this morning after David Cameron's first major cabinet reshuffle since he became Prime Minister in 2010.

The conservative MP for North Shropshire, Paterson was shadow

agriculture, fisheries and food minister from 2003-2005 and campaigned extensively for the dairy industry. He was then moved to the Department for Transport in 2005, serving there until 2007, before taking up the Northern Ireland post in opposition and then becoming Secretary of State once the Coalition came to power.

The appointment of Paterson may concern green groups due to his previous hostility towards environmental campaigns. In the past he has demanded an end to all energy subsidies, as well as calling for the immediate fast-tracking of shale gas projects, giving George Osborne an important ally as the chancellor looks to orientate the UK's energy policy in favour of gas.

Of particular interest will be his approach to spending on flood defences in the UK, as well as the issue of the Draft Water Bill. Will we see it put before parliament before the end of the next session?



Professor Peter Matthews appointed as Chair of new Welsh Natural Resources Body



Environment Minister, John Griffiths, announced the appointment of Professor Peter Matthews as Chair of the Welsh Government's new body for managing natural resources in Wales, effective from the 1st August.

Prof Matthews has held a variety of senior positions in the environmental field, in both the private and public sectors. He has been deputy managing director of Anglian Water International, president of the European Water Association and chair of the Northern Ireland authority for Utility Regulation. He also served on the Royal Commission for Environmental Pollution and is a visiting professor at Anglia Ruskin University.

In announcing Professor Matthews' appointment, the Minister said:

"I am delighted to announce Professor Matthews' appointment. He has had a long and distinguished career in the environmental sector and his wealth of experience will provide an excellent foundation for driving forward our new single body."

"Prof Matthews has successfully worked with ministers within Northern Ireland's devolved administration. He also has

excellent business credentials due to his successful time at one of the UK's largest water companies."

Prof Matthews said:

"I am really excited to be appointed to this position. Realising the vision of a single body for Wales will be the culmination of my life's work of working in sustainable environmental management."

"The concepts behind this new body are cutting edge and I look forward to working with everyone to put Wales at the forefront of natural resource management. We will draw on the strengths of the current bodies and make the people of Wales proud of what we achieve."

"One of my early priorities is to recruit the new body's chief executive, followed by a board, to join me in providing strong leadership as we embark on this journey together."

It is a key Programme for Government action for the Welsh Government to bring together the Countryside Council for Wales, Environment Agency Wales and Forestry Commission for Wales as one organisation. The single body will become fully operational on 1 April 2013.

One single body will ensure the most sustainable and effective management of Wales' natural resources. The transition from three environment bodies to one is estimated to result in benefits worth £158m over a ten year period allowing greater investment in frontline delivery of services.



Alex Stephenson,

Alex has over 36 years experience in stormwater drainage design and related issues.

As well as being the UK Stormwater Director with Hydro International he is also Chairman of the British Water SuDS focus group. He is ideally situated to keep you up to date with the industry changes and legislation.

After the Floods – No more SuDS Delays

GOVERNMENT delays, inertia and uncertainty must not be allowed to undermine vital progress to tackle surface water flooding in England and Wales.

Regulation that will make Sustainable Drainage Systems (SuDS) compulsory for new developments has been delayed by Defra following widespread calls to improve on the proposed National Standards by which they will be judged.

We have been experiencing unprecedented flooding reminiscent of summer 2007 which prompted far-reaching proposals for reform. Yet, as the rains came down once again, there were still no workable plans for SuDS in place,

We welcomed the strong comments made by MPs on the parliamentary Environment Food and Rural Affairs (EFRA) committee in their report on the Water White Paper (published 5 July). The committee made it clear further delays were unacceptable and said they remained unconvinced that Defra's work to improve surface water management has been carried out with sufficient urgency.

The 2007 floods prompted the Pitt Review whose recommendations were embodied in the Flood and Water Management Act. As part of the Act, Local Authority SuDS Approving Bodies (SABS) were due to begin work assessing SuDS schemes on new developments from October 2012. A consultation on the proposed National Standards for SuDS, ended in March. However, Defra has deferred the date for SABS to begin their roles, giving assurances only that they will get at least six months notice before commencement.

There are strong indications that both local government and industry believe the standards, as they currently stand, are not yet fit for purpose and responses to the consultation cried out with one voice for more clarity,

More flooding this summer only goes to emphasise the urgency of the situation and the importance of getting things right from the outset. Even following implementation we risk patchy and inconsistent implementation of SuDS across England and Wales,.

The devil is definitely in the detail – but no-one is sure what the detail is. The Government has promised detailed Guidelines to accompany the National Standards. There's little doubt that the Standards in their current form are insufficient without them. Many agree the guidelines would need to have been written, scrutinised and agreed by industry before the new SuDS approval system begins. To be effective, the guidance also needs to be binding, not just advisory.

The EFRA committee also made it clear that Defra should do more to encourage retrofitting of SuDS. Stephenson added: "The current proposals are only the tip of the iceberg in tackling surface water flooding as they only apply to new development," adds Stephenson. How much more flooding will it take to prompt the urgent action we need to protect our homes and properties?

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Protecting Property

Preventing floods from within

FloodSax® sandless sandbags save a fortune tackling water leaks inside the home



Although originally invented to stop serious floods and have been used in action worldwide, the product has now evolved to show it is highly effective at preventing floods inside the home too.

It means they can quickly soak up leaking water from a range of domestic appliances and broken pipes – often in places where it is impossible to put a jug or a bucket – and this can save a fortune in water damage.

FloodSax® are patented and manufactured by Yorkshire-based Environmental Defence Systems Ltd.

Managing director Richard Bailey, who invented them, said: "The beauty about the product is that they are so easy to store, lift and handle and so are ideal for anyone – especially people who are disabled, frail or elderly. They come vacuum-packed and so can be popped under the bed or in a cupboard or garage until needed."

He added: "We find that more and more people are now buying them so they are fully prepared for floods both inside and outside the home. We have also discovered they are ideal for popping under dripping pipes or leaking domestic machines such as dishwashers or washing machines where they simply soak up the water, often in places where you just can't put a bucket or jug."

"They are sandless sandbags but give so much more flexibility than those filled with sand and far more effective inside the home."

FloodSax® have already been endorsed by the National Disabled Fire Association.

The organisation's mission statement is to 'champion the social model of disability through an informed, supportive, consistent and defensible approach to disability in the UK

fire and rescue service and the communities they serve.'

Chairman Duncan White said: "Having seen the FloodSax® flood defence system in operation and witnessed the versatility and simplicity of their operation I was able to fully support the feelings of the NDFA in endorsing FloodSax® as a product designed with disabled people and the elderly very much in mind."

"This lightweight and compact system will ensure that the most vulnerable members of our communities will be better prepared in the event of a threat from flooding."



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Paint-on flood protection

Preventing flood damage with NanoShell

BY JOHN ALEXANDER, REVETMENT UK

Once again, nanoShell's stone sealer has been chosen to protect homes in high risk areas from flooding. The flood protection works are being undertaken for West Oxford District Council in the village of Clanfield.



In the summer of 2007, severe flooding occurred when torrential rain caused the brook to overtop, which resulted in flooding of a large area of the centre of the village with depths up to knee high. Since then, insurance premiums have risen for most homeowners – it is hoped that the use of new flood protection measures will not only eliminate the risk of water entering their properties, but also lower the insurance premiums.

The contract is being undertaken by Revetment, a national flood protection specialist. Their works included installing window and door barriers, as shown in the photos below, to prevent water entering through these openings in times of flood. This is a perfect solution for large openings, however floodwater will also pass through stone and brick walling.



floodwater will also pass through stone and brick walling.

In order to further protect homes and resolve this risk, Revetment are applying **nanoShell Stone**, a stone protection nano coating, to each building to a height of 600mm. This height is decided by the Environment Agency as the limit of possible floodwater.

John Alexander, Managing Director of Revetment, stated "As we are an independent supplier and consultant for flood protection, we are able to offer the best-in-class solutions from a range of suppliers that are recognised by the Environment Agency and ABI (Association of British Insurers). We believe in giving the best advice possible based on our knowledge of the

best products available today and those next generation that we will make ourselves or bring to the market through our strong partner channel. nanoShell is one such product that we have only recently introduced into our portfolio. It's ground breaking technology, simple application and 20 year guarantee means that we will not supply anything else for waterproofing until something better comes along."

If you would like to find out more about how our protective coatings can be used for flood protection, please contact nanoShell for professional and personal advice and service.



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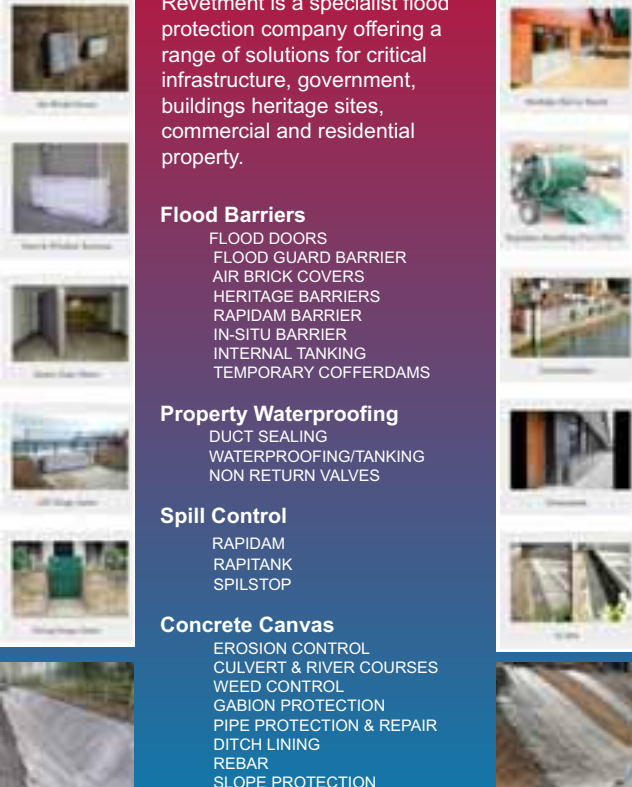
Revetment is a specialist flood protection company offering a range of solutions for critical infrastructure, government, buildings heritage sites, commercial and residential property.

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Water Ambition and
Imagination



Keeping up appearances

Upton's glass flood protection system

BY RAY MOULDS, IBS ENGINEERED PRODUCTS LTD

Often known as the most flooded town in Britain, Upton-upon-Severn has finally got a flood defence scheme to be proud of to protect it from future flooding.

Throughout 2010 and 2011 IBS Engineered Products Ltd worked closely with the Environment Agency, their consulting engineer and civil engineering contractors as well as Upton's town planning department, on the design of the glass to sit atop the flood wall. This element was one of the critical and most sensitive elements of the £4.5 million flood alleviation scheme.

The result of this collaborative working relationship is that the end product is a beautiful

demonstration of design and engineering working together. In total, just under 173m linear metres of glass has been installed on this project at a height of 0.5m, which makes it the longest flood defence of its type in the UK.

In this picturesque riverside location, the aesthetics of the flood scheme were of utmost importance to the local community, who were keen to ensure that it would blend in with the look and atmosphere of their town. To this end, IBS were happy to work with their clients to enhance the look of the finished flood wall, resulting in the aluminium components of the glass system being powder coated to a client specified colour.

IBS Engineered Products' Business Development Manager, Ray Moulds, said: "We're very proud to have worked on such a high profile project such as this and are delighted with the appearance of the end product, plus encouragingly the feedback so far tells us that everyone else is too. This scheme highlights our capability of working with clients from an early stage and further enhances our reputation as a leading provider of high quality flood protection equipment".

Upton-upon-Severn Mayor Andrea Morgan added: "A lot of thought has gone into the design of the flood wall with its innovative glass panels, and the reclaimed brick means it blends into our

town really well. During the design and construction phase opinions on the scheme were varied, but many people have recently told me this is a great asset for Upton, keeping us open for business during floods."

Anthony Perry, Flood Risk Manager from the Environment Agency said about the project: "We are delighted that the final phase of construction is now complete and will provide a more resilient flood defence system to protect homes and businesses in the town. The defences have already had their first test during April's rain when they prevented properties in Upton from flooding and enabled the Waterfront to be used for the Folk Festival."

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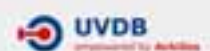
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Happy Valley Racecourse, Hong Kong

stormwater drainage project wins international innovation award for flood alleviation

BY CHERYL CHAN, BV

Black & Veatch and the Drainage Services Department of the Government of Hong Kong Special Administrative Region (DSD) received the 2012 Planning Award for IWA's East Asia region for the Happy Valley project. The award was presented to the team at an IWA Gala Dinner in Singapore on 3 July 2012. As a regional winner, the award is also put forward to win the Global Grand Prize, which will be announced at the 2012 IWA World Water Congress in Busan, Korea later this month. (September)

The Happy Valley Underground Stormwater Storage Scheme (HVUSSS), is an example of how cities around the world are rethinking the way they plan and manage intense rainfall in crowded urban spaces.

OBJECTIVE

Extensive flooding has been a problem for Happy Valley and the surrounding area, with major flooding events occurring in August 2000, April 2006 and June 2008.

The objective of the scheme is to provide off-line flood retention in the Happy Valley catchment during a 1-in-50 year rainstorm event.

THE SOLUTION

With climate uncertainties and urban densities, it was decided that simply throwing wider and deeper drains at the problem would not be a feasible long term solution and that a rethink of flood mitigation would be required for the complex challenge.

The solution adopts the latest technology as well as taking into consideration future climatic change. Another important consideration for the team was how this project could affect the community and every endeavor was taken to minimize the environmental and social impacts.

Lying below the famous Happy Valley Racecourse and sports facilities, DSD is consulting closely with the local sports clubs and community throughout the process. The planned works include the reprovisioning of sports pitches with a state-of-the-art turfing surface as well as developing other community amenities aimed to enhance quality of living.

The major components of the project include an inlet structure, twin cells diversion box culvert with overflow side weir system, an underground storage tank of 60,000m³ and a pump house with a pumping rate of 5,400 m³/hr.

During heavy rainstorms, excess runoff in the diversion box culvert will enter the storage tank via the overflow weir system. After rainstorms the storage tank will be emptied to prepare for upcoming rainstorm events.

At the heart of the innovation is a movable crest weir system together with Supervisory and Data Acquisition (SCADA) real-time monitoring of water and tidal levels. With intelligent data feedback, the volume of water within the storage tank can be monitored and adjusted to prevent either pre-mature or late overspill of stormwater.

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Alan Man, Vice President and Managing Director of Black & Veatch's North Asia Pacific water business said:

"We have had to be a lot smarter about this complex challenge and the beauty of the Happy Valley scheme is that it will work with nature and use real time, intelligent data to adjust the volume of stormwater within the storage tank."

Mr. Chan Chi-chiu, Director of Drainage Services, said, *"We put our best minds to work and have arrived at a solution that adopts the latest technology, takes into consideration future climatic*

change and reduces construction time, as well as cost. When planning, we were very aware of how this project could affect the community too, so we have paid close attention to accommodating their needs and minimizing the environmental and social impacts."

At a cost of HK\$1 billion, (£80m) the project commenced construction in September 2011, with the first phase scheduled for completion by early 2015 and the second by early 2018.

The project is one of the first examples in Hong Kong where innovative integrated one-

dimensional, two-dimensional and three-dimensional hydraulic modeling techniques as well as three dimensional Computational Fluid Dynamics (CFD) modeling

have been employed together. Long term options for sustainably reusing the stormwater are also been explored.



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Restoring our waterways

BY ANTONIA SCARR, ENVIRONMENT AGENCY

Photos courtesy of the Environment Agency

Europe's rivers have been suffering from the effects of engineering activities and the alteration of rivers and their floodplains.

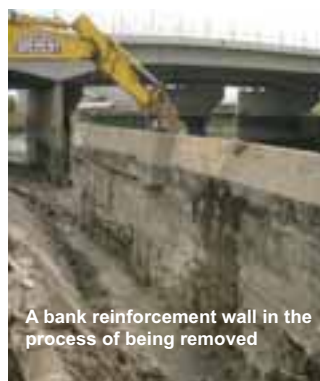
Activities commonly associated with the provision of services such as flood protection, navigation, water supply and hydroelectricity include the direct engineering of rivers (for example bed and bank reinforcement, river re-sectioning, extensive channelisation, culverting and dredging of channels), and alterations to natural hydrological regimes (e.g. water diversion, hydro-peaking, truncation of bedload transport followed by river bed degradation).

Habitat decline

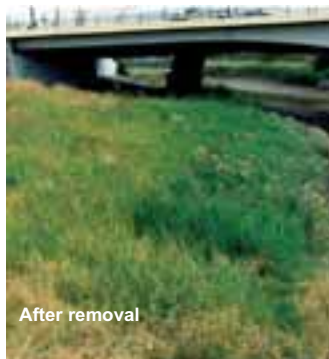
These activities coupled with widespread floodplain reduction and modification as land use intensifies have resulted in significant levels of river habitat decline, and alteration to the natural hydromorphology of riverine ecosystems. These impacts are well documented in the literature across the majority of major temperate zone rivers in Europe and the USA.

Less than 20% of Europe's rivers and floodplains are still in their natural physical state. Our remaining pristine rivers are mainly located in remote boreal and arctic regions. Most of our rivers and watercourses have

been modified to serve the needs of the human population with varying levels of impact. The European Environment Agency in 2009 found only 15% of freshwater habitats were of a favourable condition, 30% in bad status and 35% of inadequate status.



A bank reinforcement wall in the process of being removed



After removal

The large scale decline in river habitat and reduction in functional floodplain is also linked to significant reductions in associated biodiversity which include impacts on spatiotemporal

heterogeneity, functional processes and species.

What is involved?

River restoration refers to a large variety of ecological, physical, spatial and management measures and practices. These are aimed at restoring the natural state and functioning of the river system in support of biodiversity, recreation, flood safety and landscape development.

By restoring natural conditions, river restoration improves the resilience of the river systems and provides the framework for the sustainable multifunctional use of estuaries, rivers and streams. River restoration is an integral part of sustainable water management and is in direct support of the aims of the Water Framework Directive, and national and regional water management policies.

Technical measures that help to bring rivers closer to their natural state include the creation of fish passes and weir removal.

Click to download the River Restoration Manual from the UK River Restoration Centre.



When planning improvements to your rivers it is helpful to engage with people and organisations at a catchment level. The health of our waters will benefit from looking at the river and habitats, from source to sea. To learn more about

restoring estuaries and tidal waters you can download the Estuary Edges guidance from the Environment

Agency website by clicking. This guidance looks at a wide range of opportunities and constraints before looking into detail at four key approaches to estuary bank design. River restoration involves a wide range of stakeholders from the public and private sector including policy makers, practitioners, scientists and non-government organisations, as well as all citizens groups potentially impacted. By actively drawing these various stakeholders into the process, visions can shared and tuned towards each other. This makes for different interests to be met, and increases support for restoration efforts.



Cornmill Gardens, before restoration and after





BY NICK ELBOURNE

About Us

The RRC is a not-for-profit independent organisation based in Bedfordshire that promotes best practice river restoration and management. It is the UK information centre holding an inventory of over 2,000 schemes and it offers detailed advice and site visits to evaluate river restoration potential. An annual network conference attracts a wide range of people engaged in river restoration and river management from policy and planning to engagement and delivery, and those working to assess benefits for ecology and ecosystem services. In 2013, this will be held at Whittlebury Hall in Northamptonshire from 30th April to 1st May, and the deadline for abstracts is Monday 15th October 2012 (see flier on page 40 for details).

The RRC Manual of River Restoration Techniques details approaches that you may wish to consider in a restoration project design, while the Centre arranges technical, themed and bespoke workshops. Links and publications can also be found online. In addition to a newsletter for members which is published twice a year, a monthly bulletin is distributed freely with news on latest developments in the restoration field and upcoming events.

The RRC is the lead organisation for the Western Europe region of RESTORE covering the UK, Republic of Ireland, France, Germany, Netherlands, Denmark, Belgium and Austria. For more information and to be added to the circulation list, go online (www.therrc.co.uk) or email the RRC (rrc@therrc.co.uk).

Nick Elbourne: nick@therrc.co.uk

Want to know more about river restoration around Europe?

BY ANTONIA SCARR

Who are RESTORE

RESTORE is a partnership for river restoration in Europe, a project funded by the European Commission's LIFE Programme which supports environmental and nature conservation projects throughout the EU. Our partners include the River Restoration Centre, Wetlands International, Government Service for Land and Water Management (Netherlands), Finnish Environment Institute and Italian Centre for River Restoration. We hold between us a large bank of information on river restoration projects which you can find on the River Wiki. Alongside case studies, there is also best-practice guidance and project news from around Europe.

We are also developing our website (www.restorerivers.eu) to support a central repository of information on river restoration in Europe. The website is under development so please provide us feedback on information or comments on how we can improve the site. You can add your own schemes to the database and if you can recommend any useful research or guidance please email us.

River Wiki

The RESTORE partnership is delighted to announce the launch of our River Wiki <http://riverwiki.restorerivers.eu>.

The River Wiki is something like a Wikipedia for river restoration projects. By sharing and being able to comment on information about the experiences of river restoration in Europe, ideas for best practice will quickly emerge. You can search the database to find for example: all the case studies around France; case studies that have had monitoring on them or how much it costs to carry out river restoration.

This interactive Wiki system enables the collation and sharing of information on river restoration projects where ever you are. Just log in and add your project whether it is planned, in progress or completed.

For further information contact Toni Scarr, RESTORE project manager
01276454420.



Chinbrook Meadows, Lewisham
- This provides multifunctional space created through redevelopment in the local area and organisations working in partnership

River Restoration

the River Wensum

Much of the Wensum is highly modified and has a deepened, widened channel exhibiting low habitat diversity

BY AMY CAPON, ENVIRONMENT AGENCY TEAM

Introduction

The River Wensum is a chalk river of great value for its angling and wildlife, as well as being an important landscape feature of rural Norfolk.

The nature conservation interest of the river is recognised nationally through its notification as a Site of Special Scientific Interest (SSSI), and internationally through its designation as a Special Area of Conservation (SAC). In addition, chalk rivers such as the Wensum are a priority habitat of the UK Biodiversity Action Plan (BAP).

The Water Framework Directive (WFD) classifies the river as bad and the SSSI is in unfavourable ecological condition. The reasons for unfavourable condition include inappropriate water levels, water pollution from point sources and agricultural run-off, water abstraction, inappropriate weirs, dams and other structures, invasive freshwater species, and physical modifications to the channel (deepening, widening and straightening) that impede the river's hydrological functioning.

A number of projects/initiatives are in place to remedy these pressures. The water quality problems are being addressed by phosphate removal at sewage treatment works. Plans have been put in place to reduce the impacts

“The Water Framework Directive (WFD) classifies the river as bad and the SSSI is in unfavourable ecological condition”

of water abstraction on the river. The issue of agricultural run-off is being tackled by a Catchment Sensitive Farming project (lead by Natural England) and a Demonstration Test Catchment project lead by the University of East Anglia. The Norfolk non-native Species Initiative is taking steps to control invasive freshwater species.

This just leaves the physical modifications of the river, which are being addressed by the River Wensum Restoration Strategy (RWRS). The RWRS has been developed by the Environment Agency, Natural England and the Water Management Alliance to restore the physical functioning of the river so that it can sustain the wildlife and fisheries characteristic of a Norfolk chalk river.

In the past much of the Wensum has been widened, deepened and straightened for land

drainage and to facilitate water milling. The river is disconnected from its floodplain by spoil banks resulting from these activities, and much of the river is impounded behind water control structures.

For the first time, whole river scale restoration has been explored to see what action needs to be taken to remedy each section of the channel. The main recommendations of the strategy include narrowing the channel, restoring the gravel bed, reducing the extent of impoundment, re-connecting the floodplain, improving channel sinuosity and increasing the amount of large woody material in the channel. There is no intention to return the river to some former “natural” condition that it might have had at a specified time in the past. Rather, the aim is to restore as much hydromorphological function to the river as possible within existing constraints such as flood risk to people and property.

The Environment Agency is responsible for implementing the RWRS. The key drivers are the Protected Areas programme and the implementation of the Programme of Measures for the WFD as set out in the Anglian River Basin Management Plan. The RWRS is aiming to deliver the WFD objective of achieving Good Ecological Potential by 2027.



left: Reinstated meander loop at Great Ryburgh Common less than 1 year after construction.

above: Restored sections of channel provide improved habitat for species such as brown trout and bullhead.

Implementation of the strategy

To date the RWRS has worked with landowners to complete three major restoration schemes, at Bintree, Great Ryburgh Common and at Ryburgh End. As well as fitting into the local landscape, the key aim of the restoration schemes is to increase the ecological and physical habitat potential, and detailed monitoring has been undertaken to record the biological response to habitat improvements.

Taking the example of Great Ryburgh Common, where a 350m meander loop has been reinstated and a series of in-channel features installed, post-construction electric fishing surveys have produced excellent results, with nearly 400 fish being captured representing thirteen species. This compares to the previous year's results from the old straightened channel, which yielded only 31 fish, and demonstrates how river restoration has acted to improve local habitat quality for a wide range of fish, including good numbers of native

brown trout and target species such as bullhead and brook lamprey.

As well as monitoring fish, the responses of other important biological communities of the river ecosystem have been assessed in the new meander loop and original channel reaches. Again, results after one year are very promising, with a number of typical chalk stream plant species for which the river is designated having colonised the new channel. These include water starwort, lesser water-parsnip and whorl-grass. Colonisation by aquatic invertebrates of the habitats in the new meander loop was almost immediate. The communities which have developed on the gravels installed as part of the scheme are species rich and typical of "natural" free flowing gravel bed sections which are rare at a local scale. The invertebrate communities contain the aquatic life stages of over fifteen species of mayfly, caddisfly and stonefly, indicating a healthy system, good water quality and, importantly, good habitat variability as a result of the restoration works.

Current scheme progress

Works are currently nearing completion on the latest project, at Swanton Morley. As with other schemes this is being implemented by the Environment Agency's in-house workforce. Traditional restoration schemes have tended

to take place between late August through to March to avoid the main fish spawning and breeding bird seasons. This is the first time works have commenced earlier in the year and this has necessitated a carefully planned and stringent programme of mitigation measures.

The river channel at Swanton Morley is similar to much of the Wensum, being over wide and over deep with little flow variation. The restoration works have involved creating channel diversity through the installation of gravel glides, pools, lateral shelves (berms) and woody debris, together with selective tree planting to create riparian shade and removal of spoil banks to improve floodplain connectivity.

The changes to the river channel have been designed to ensure that under all flows the finest material is kept on the move, but under bank full conditions the coarser materials, which provide the best habitat, will not.

A small meander loop has been reinstated with a plug placed in the existing straight channel to divert flows along the loop. The meander loop, cut off by a straight channel excavated as part of a land drainage scheme in the 1950s, had become silted up and required de-silting to expose the natural hard bed consisting of pockets of gravel and chalk. The channel sinuosity has been further increased with the use of woody debris.

continued....

“ three major restoration schemes have been completed”



above: Straightened river channel at Swanton Morley pre-restoration



below: Post-restoration channel sinuosity achieved by the installation of lateral berms. Hydromorphological formulae have been used to calculate meander wavelength and the spacing of restoration features.



left: Silted meander loop cut off by bypass channel in the 1950s

below: Meander immediately after restoration.

“creating fish refuge areas by re-connecting floodplain drainage ditches to the river”

One of the missing features along this reach is tree cover. The only exception is around the meander loop, which has been untouched for many years, and mature willow and alder line the old course of the river. The majority of these have been retained, but in order to enable access for machinery selective coppicing has taken

place. All this material has been re-used as woody debris, and to create a brush wood berm in an area where plant is unable to safely access. The lack of tree cover impacts severely on the fish within the reach and may contribute to high predation rates as well as affecting recruitment. Later this year selective planting of native species will take place on the open stretches of channel to complement the restoration features.

Another aspect of the scheme has been to create fish refuge areas by re-connecting floodplain drainage ditches to the river. These will provide valuable shelter for fish and other wildlife during high flow events.

As a result of past drainage activities large spoil embankments exist either side of the river. These prevent the majority of high





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Managing & Maintaining our water channels

flows from inundating the floodplain, as would naturally occur, and force flow downstream carrying with it large amounts of sediment. As part of the scheme we have removed sections of embankment to encourage floodplain wetting during periods of high flow. This should have the combined benefits of increasing floodplain biodiversity and providing a sink for suspended sediment, as well as reducing flood risk to people and property in the downstream catchment. The level at which water will spill on to the floodplain has been set so that there is a low probability of summer flooding and therefore minimal impact on the agricultural use of grazing marshes.

Having a flow gauging station immediately upstream of the scheme has provided valuable data for the restoration design process, but has also imposed a restraint in that any physical changes to the river must not impact on the accuracy of the gauging station. Situated within the floodplain is an Internal Drainage Board main drain and the floodplain connection works have needed to ensure that the drain does not become surcharged with flood water which could have adverse impacts on downstream landowners. This has been overcome by working with the existing topography and using spoil to locally raise sections of the floodplain to create an isolated area which will wet up during high flows. The other important element of floodplain connection has been to provide a route for water to drain back to the river once river levels have receded.



left: Meander loop pre-works.

below: Downstream section of reinstated meander loop with brush wood berm created using locally won material felled to enable access for machinery.



above: Over wide river channel pre-works

right: Composite filled berms have been designed to influence water at levels up to Mean Daily Flow. Above this they drown out, creating a two-stage channel.



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above: Bed raising using gravel to create glide. In total 6 glides have been installed along the 800m length of river being restored.

below: Berm during construction showing how reject gravel is used to create the shape of the feature. Spoil from historic dredging is locally won as backfill material, then bankside vegetation is replanted along the margin to prevent erosion during high flows.

continued....

Historic river improvements and their relationship to river restoration

The river that everyone sees today is the result of centuries of endeavour on the river and flood plain. The two most significant changes have been due to the creation of mills, and changes to the drainage of the floodplain.

The physical changes to the river due to milling had ceased by the 20th Century, with the operation of the mills not lasting much beyond the middle of that century.

Physical changes to the river for land drainage really occurred in two phases a century apart: 1850s and 1950s. The first was due to land owners using new technology and techniques; the second due to government policy.

The modifications to the river were driven by the wish to pin down the water table, to allow improved growing conditions for either improved grass or conversion to arable crops. There was also a wish to move the water as quickly as possible so that the water table remained low.

To achieve lowering of the water table the river bed was deepened, and, to manage the resulting bank instability, bank angles were reclined, thus opening up the

cross section. This had the added bonus of helping improve flood flow conveyance and the movement of water down the river. To aid this purpose any variability in cross section and plan form (sharp bends) were also removed.

The result was a river channel that bore no relationship to the flows of water in it. Consequently the movement of the silt in the river was stopped, as water velocities in the new cross section were inadequate to continue to move it. This allowed the more vigorous water plants to colonise those silts near the banks and so start a natural reduction in the unnaturally large cross section.

This process of the return to an equilibrium size, where silt deposition had stopped because water velocities had increased due to the confining vegetation, was interrupted by maintenance dredging every 10 years or so. The dredging being to remove silts and vegetation which had previously moved by themselves or reached a maximum growth and helped re-define the natural channel size, that is, one related to the flows in it.

Like most capital dredging schemes, the Wensum improvement works would be based on increased agricultural production over the 50 year life of the works generating more

benefits than the cost of the initial dredging and the continued maintenance over the same period.

The original capital dredging, and the 10 to 20 year cycle of maintenance dredging has removed the original river bed and many of the natural in-channel features. This has severely impacted on the river ecology and therefore the fish populations. It has also prevented connection of the river with its floodplain, which is increasingly recognised as key to a healthy functioning ecosystem.

The historic improvement schemes focused solely on agricultural improvement and did not consider the impact on other uses, including conservation and fisheries, which are increasingly recognised and valued by today's society.

What is the need for change in the river management?

These days the prime focus of the Environment Agency's river maintenance is to protect people and built property from flooding. In order for us to exercise our permissive maintenance powers there has to be a cost to benefit justification. The low level of flood risk in the Wensum valley does not allow the continuation of the post war maintenance regime.

Perhaps more importantly, the way the country views the river has changed, with the Wensum becoming an SSSI in 1993 and a European SAC in 2001. These designations were implemented to protect the natural features within the river, which includes both the physical features and the associated wildlife. Historical maintenance practices are incompatible with these designations. There is now a statutory requirement on the Agency to further the conservation of the site, and to implement river restoration measures to help return the river to favourable condition. There are also opportunities to work with natural processes to minimise flood risk, for example by restoring floodplain connectivity to

attenuate flood risk to downstream communities. This new approach is recognised in strategic documents such as Catchment Flood Management Plans.

Managing the Wensum in the future

Feasibility reports have been written for each of the riverine SSSI units, setting out the actions required to restore the physical habitats in the river. Once river restoration has been implemented the channel size will be more in equilibrium with the flow regime, leading to a more sustainable system which will require less management intervention.

A Targeted Maintenance Protocol (TaMP) is also being developed for the Wensum so that appropriate, targeted maintenance of the river can be identified and implemented. Importantly, the protocol will help, in a small way, towards the objective of the RWRS. The protocol takes into account the Environment Agency's responsibility to protect people and property from flooding. It will define key locations for regular and programmed inspection and recommends maintenance activities, if necessary, according to set trigger rules for each activity and site.

One of the changes in management relates to recognising that retaining trees and fallen timber (woody debris) within the channel can be beneficial. It not only helps to vary the flow and shape of the channel but also creates physical habitat for many species of plants, invertebrates and fish. Nationally, we have recently adopted a new policy, whereby we will retain woody debris in rivers when carrying out maintenance provided that flood risk to people and property is not increased.

The aim is to manage the river for today's needs, based on experiences from the past, to help ensure we can manage it better into the future.

Ends

For further information on the River Wensum Restoration Strategy please visit the Environment Agency website, here:



or email river.restoration@environment-agency.gov.uk

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Lake Restoration & erosion control on working with nature

Damian McGettrick

Long reach excavator specialists, WM Longreach, are creating islands and wildlife habitats as part of the Fleet Pond restoration project. Using their specialist excavators mounted on floating pontoons, the silt is being removed from the lake bed and used in the construction of lake islands. These will reduce turbidity in the water by acting as a windbreak and improve the wildlife and ecology on the SSSI and nature reserve. The islands are being formed using a Nicospan material supported by timber posts.

Works will continue until later this year.



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About the Fleet Pond restoration project

Fleet Pond is Hampshire's largest freshwater lake covering approximately 21.4 hectares. It is located on the eastern fringe of the town of Fleet and forms an extremely valuable historical, social, recreational and biodiversity resource for the local community.



The lake and its surrounding habitats are managed as a Site of Special Scientific Interest (SSSI) and a Local Nature Reserve (LNR), and includes areas of open water, wet and dry woodland, reedbed, marshland and heathland.

Over the years, the ecological and physical condition of Fleet Pond has declined due to the build up of silt in the lake brought in from the Gelvert and Brookly Streams. The build up of silt is causing key habitats to deteriorate and the lake is now in an unfavourable and declining status, as described by Natural England's conservation objectives.

The Fleet Pond Restoration Project aims to recreate lost habitat and improve biodiversity value within the lake and to also protect the lake from future environmental changes.

This is a long-term project being carried out in partnership with Hart District Council, Environment Agency, Natural England and the Fleet Pond Society (amongst others).

The key objectives of the proposals include:

1. Creating an additional stream channel to carry some of the silty flow from the Gelvert Stream away from 'Sandy Bay' and to create the right conditions to allow this to settle out;
2. Creating new wetland habitats associated with this channel;
3. Small scale dredging within the lake to increase depth;
4. Creation of new lake island habitat, using the dredged lake sediment and providing new reedbeds for birds, fish, and insects;
5. Creation of sheltered marginal habitats to promote clear water conditions and the recovery of the lake's plant and insect life for which it was renowned.



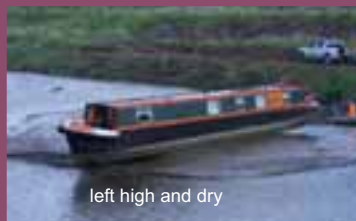
Dredging and de-silt



Silt removal on the Ouse

"Currently, when the tides are low, boats risk getting grounded on the island and we can only lock craft through on a very high tide. It is important that we carry out this work to ensure the river remains navigable."

Nathan Arnold,
Waterways Team Leader



left high and dry

Every two years a silt island forms, just downstream of the Denver lock, near Downham Market. The island forms due to the tidal nature of the River Great Ouse at Denver Lock.

The silt causes a potential flooding threat as well as causing problems for the boating community, with boats getting stranded until high tides come to their assistance.

The Environment Agency turned to



contractor ADC (East Anglia) Ltd who have a specialist piece of equipment to carry out the task. A **Conver silt-pusher** was used push the silt across to the bank where it could be removed and left to dry. Once dried, it is then used to maintain flood banks in the area.

The Conver Silt-Pusher, used by ADC is unique, being the only one in the UK. They are widely used in Europe and in its native country, Holland, 75% of waterways are cleared using silt-pushers. It is capable of working at widths of between 1 and 4.5 metres, collecting up to 10m³ of material in a single push. With a draught of just 450mm, it can navigate some of the shallowest and most inaccessible inland waterways and operates to a maximum depth of 1.2 metres



1500 tonnes of silt were cleared using the silt pusher, taking just over a week, with the work only taking place at low tide to minimise disruption to boaters.

It cost the Environment Agency £38,000, to complete the removal and they are looking into solutions that prevent future build up by catching the silt as it comes in on the tide.



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Bank Stabilisation

an alternative to blockstone revetment

BY RICHARD EDWARDS, SALIX RIVER & WETLAND SERVICES LTD

The scouring effect of fast flowing, frequently high volume water flows can have a destructive effect on the stability of channel banks. This can be of particular concern in urban areas where there is likely to be development on the adjacent land. This example, in Swansea, was threatening the stability of a road and housing development.

The developers were looking for a cost effective, natural looking solution to the problem as opposed to installing blockstone revetments. but the solutions would have to offer high energy scour protection in order to protect the bank.

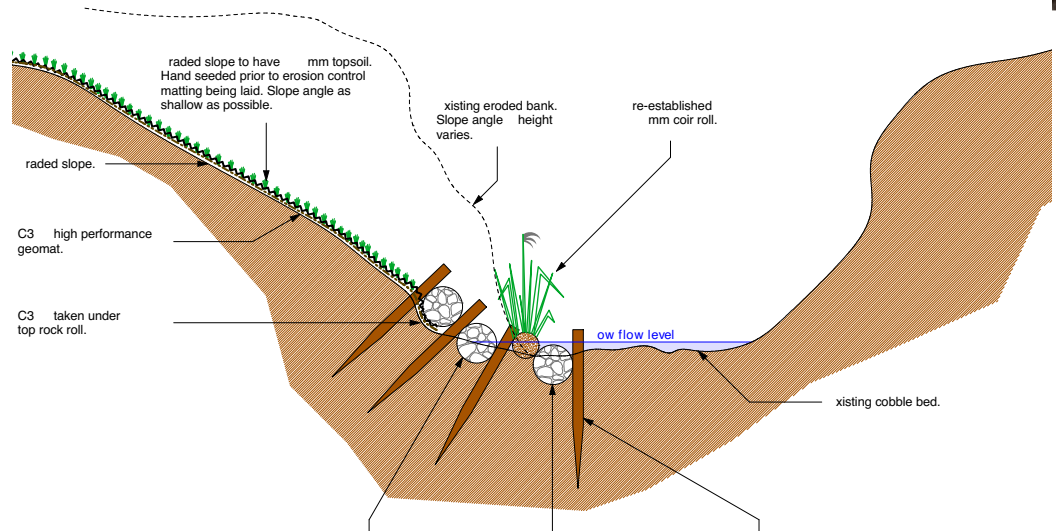
The developers approached a consulting engineer who in turn recommended Salix, who have expertise in this area.

Starting with a very steep gradient channel with high flows and a bed that was down cutting, Salix had to design a solution that offered high energy scour protection and bank stabilisation.

The solution was to bury rock rolls below the bed, pinned into place. This would prevent the toe scour and bank undermining. The rock rolls were designed to allow accretion and vegetation establishment by the use of small stones within high tensile nets.

The embankments were graded back before being covered with a turf reinforcement mat called VMax C350. This is a UV stabilised permanent turf reinforcement mat that reinforces the vegetation on the banks allowing the grass to take flows of up to 6m/sec without soil loss. (Unvegetated, it will provide protection against flows of 3.2m/sec).

Pre-established coir rolls were used between the rock rolls to provide marginal plant establishment.



rock rolls in place protecting the toe



the graded bank, covered with the VMax C350



just 3 months later



12 months later

The result is a natural looking channel offering high scour protection and bank stabilisation

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Sedimat™ is packaged individually and is easy to store, handle and transport. It can be installed on a streambed using either stones or stakes and can be placed in any configuration or number to provide desired coverage. It may be used alone or in conjunction with other methods of stream protection such as coffer dams, culverts or silt screen.

Sedimat™ was developed and tested under field conditions at eight different streams in central and western New York State during 1992. The amount of fine sediment (sand, silt and clay) in the streambed immediately downstream from the work sites was measured before and after the construction. At seven of the sites, the disturbance was the excavation of a 4 feet deep trench for the installation of a natural gas pipeline which was followed immediately by backfilling. At the eighth site the disturbance was extensive hand digging by shovel. These streams varied in width from 10 to 75 feet and in depth from 6 to 24 inches. Velocities

ranged from 0.8 to 3.3 feet per second. Trout were present in most of the watersheds, if not at the test sites specifically. Before construction, the average percent of sediment fines in the streambed just downstream of the work site was 12.2%. After construction, it rose slightly to 14.7%. Both concentrations of sediment represent levels conducive to trout reproduction (egg survival). In contrast, there were locations at six test streams that were subject to the disturbance but which were not protected by the mats. These were primarily areas between the edge of the trench and the upstream edge of the mats, or off to a side where mats were purposely not laid. After construction, the average percent of sediment fines at these unprotected sites rose from 11.5% to 24%. This post construction level of sedimentation is an amount which has been repeatedly documented to cause major declines in trout reproductive success. A comparison of the two before and after sediment concentrations indicates the mats trapped about 80% of the disturbed sediment and prevented or minimized adverse impact to trout reproduction.

Individual mats were able to trap and remove between 225 and 450kg of sediment each and did not interfere with construction operations. Because they were laid flat on the streambed, they were not affected by water velocity, nor did they raise water levels and thus flood the work area.

Since its UK launch in 1996 by Hy-Tex (UK) Limited, Sedimat™ has been used extensively throughout the country on a diverse range of projects; continually demonstrating the benefits of this unique, patented, product as a valuable tool for stream pollution protection due to its' low cost, simplicity, versatility and effectiveness.

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Bioengineering innovations and developments

The way forward

MIKE COOPER, AGA GROUP

Innovations and developments using bioengineering techniques have come a long way since 1990 when green engineering was introduced into the UK from Germany by MMGCES (now part of the A.G.A. Group).

To-day fibre coir rolls and indeed other coir modules are used with a variety of materials, both natural and synthetic, to resolve construction in watercourse projects. Bio-engineering has become the popular environmental and cost effective answer to many erosion control, channel maintenance and river training schemes.

Circumstances will often dictate the use of hard construction materials but where sound engineering solutions are not compromised the green option can be the preferred choice given considerations to, site location, channel usage, flow volumes, and of course fiscal aspects. Even where concrete, steel or plastic is employed, the introduction of bioengineering techniques will mitigate against the stark appearance of these materials. Keeping adverse environmental impact to a minimum is of prime importance in using bioengineering systems.

These examples of developments for clients by the A.G.A. Bioengineering Systems Ltd demonstrate the flexibility and scope to which bioengineering solutions can be put.

Reinstating disturbed habitat of engineering works quickly to their natural state may depend on design techniques and the correct use of pre-vegetated coir modules to ensure rapid and healthy growth. This is best achieved when pre-grown coir units maintain a reliable specification.

They should be densely packed to a high compression ratio, be grown under controlled conditions, supporting the correct selection of well-established vegetation. Native wetland plants used in A.G.A. Group projects are selected for their adaptation to varied physical conditions and also provide excellent cover for invertebrates, fish and wildlife.

The A.G.A. Group provide bioengineering solutions from Olympic parks to the village ponds.

A.G.A. Bioengineering Systems Ltd was formed in 2005 by amalgamating the 70 acre aquatic nurseries of Merton Hall Ponds, the geotechnical resources of MMG Civil Engineering Systems and over 30 years' experience of the various divisions of the A.G.A. Group.



Following bank erosion control measures immediate wetland areas behind were maintained using well packed hardwoods mattresses (eliminating the importation of heavy fill) over which pre-vegetated coir pallets were installed.

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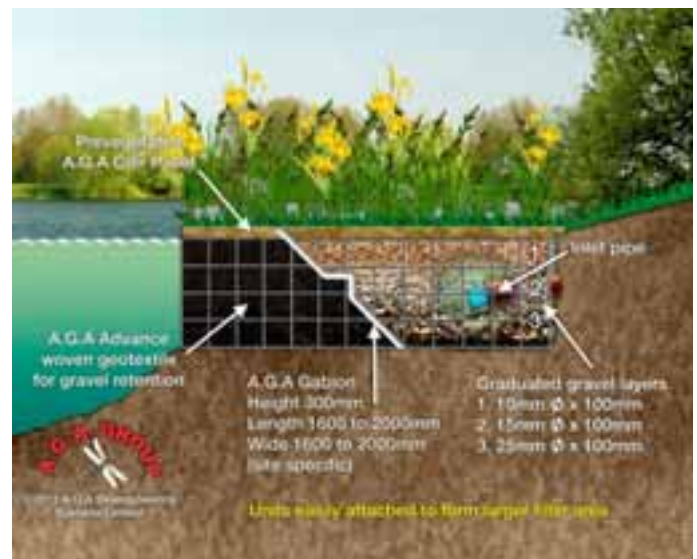
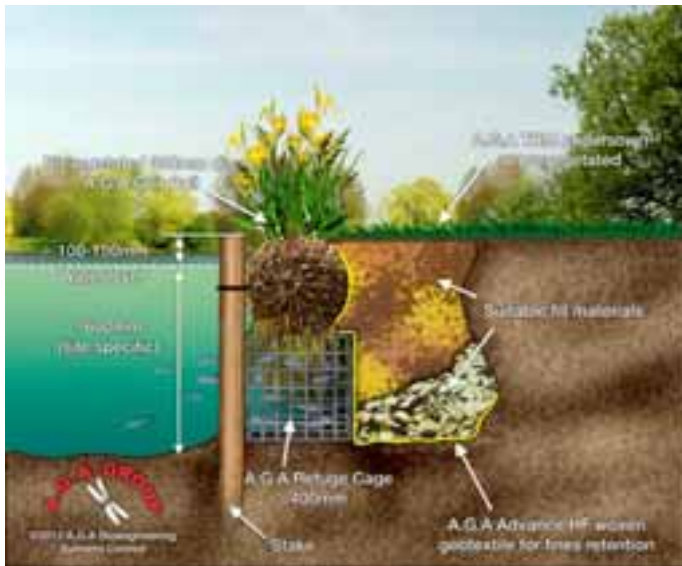









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Thetford, Norfolk. IP25 6QH England
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To provide improved water habitat, revetment work can incorporate fish refuge cages. These gabions support the pre-vegetated coir rolls and allows root growth below to offer habitat and spawning medium. Meanwhile the woven geotextile retains fines and prevents the fish refuge cage from excessive silting.

The structure of banks eroded through surface water runoff or discharge pipes also pose contamination risks. Revetment arrangements can be constructed which double as filter systems. When they are installed they deliver rigged banks with a vegetated surface that gives the required drainage opportunities with minimal risk of pollution.



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BIO-ENGINEERING OF WATERWAY BANKS BRINGS TANGIBLE EROSION CONTROL BENEFITS

DAVID HOLLAND, SALIX



“traditional hard engineering options have a detrimental impact on habitat quality which will reduce the likelihood that a watercourse will meet good ecological status”

David Holland, Technical Director of Salix RW, the UK's leading designer and supplier of bio-engineered sustainable solutions to soil and riverbank erosion, discusses the role of geotechnical materials in advanced 'soft' erosion control techniques for protecting watercourses and channels. While highlighting the benefits of using materials with known performance, he warns of the drawbacks of poor understanding of the fundamentals of design and construction and looks at projects where the right approach offered enhanced value beyond cost savings.

The consequences of the requirements of the EU's Water Framework Directive (WFD) have had many benefits. Not least of these has been where hydrological and civil engineers have started to make the connection between flood protection defences and flood prevention through SUDS based methods of surface water volume and quality control. Water quality is one aspect that contributes to the target of good ecological status along with physical habitat structure

“One of the problems has been that engineers have traditionally viewed protection and control in terms of solid structures, with calculations based on mass and strength to withstand the pressure and force of flowing water,” observes David Holland.

“Concrete revetments and facings, stone riprap, gabions and similar solutions are often the first methods considered. It's perhaps based on traditional coastal protection measures, such as those practised by Victorian engineers in building harbours, but the hard design attitude is still very pervasive. These traditional hard engineering options have a detrimental impact on habitat quality which will reduce the likelihood that a watercourse will meet good ecological status”

Directives to reduce water pollution

However, to meet the WFD's objective of achieving good ecological status water course environments from river sources to their local coastal marine environments, engineers must look at water quality control measures and ecological habitats

These include reducing the excess load of sediment and silt carried in rivers and channels, which can be achieved by reducing erosion as a direct or indirect result of human activity. Sediments and silts are also proven carriers of pollution, adsorbed onto the surface of particles carried in flow; contaminants can include hydrocarbons (e.g. from roads), toxic metals and undesirable organic materials.

Recreating natural control

Under natural conditions, waterway banks are vegetated with a range of plants which find the growing conditions very favourable. As a consequence, as well as preventing erosion and stabilising the soil, this vegetation also provides excellent traps for silts and sediments being carried by surface water flow over the surrounding land and across the banks to the water course.

The increasing pace of climate change and its accompanying incidence of storm events have thrown the problems of water-related erosion into sharp relief. Areas of the country with spate river systems characterised by sharp rises in level are particularly vulnerable, such as Wales and Northern England.

SUDS focus benefits

More attention is being paid to providing better protection from surface water by channelling flow, as well as refurbishing the existing networks of local drainage which were allowed to fall into disrepair in the late 20th century. With the growth of appreciation of the role of Sustainable Urban Drainage Systems (SUDS), the benefits of natural measures such as vegetated swales and ponds in mitigating flow and poor quality of surface water is also better understood.

For example, the Scottish Environment Protection Agency (SEPA), through its Pollution Prevention Guidelines, has formalised the incorporation of measures such as vegetated filter strips in providing run off control, for example alongside highways, especially those adjacent to rivers. As part of scheme proposals, designers have to demonstrate to planners that two or three different treatment measures are incorporated to protect water courses.

“The benefits are not just aesthetic,” states David, *“although this is often the first consideration after erosion protection. Certainly a vegetated bank to a seasonally or permanently wet water channel is much more attractive, as well as supporting a wide range of plants, animals and invertebrates.”*

“Such a sustainable measure can be considered a low carbon or even carbon neutral approach, especially when set against concrete or heavy quarried stone solutions.”

“low carbon or even carbon neutral approach”



left: River Ebbw, with Tensar VMax P550 erosion control installed
right: River Ebbw one year after erosion control and greening

“The value of this approach becomes more and more evident with time,”

Lower cost, higher sustainability

There is a strong economic benefit in many projects. Apart from the cost of concrete, shuttering, transporting aggregate and stone blocks, the actual riverside land can be difficult for the large scale construction plant needed for placing heavy materials.

“I have projects where I have demonstrated a 50% budget saving over traditional ‘hard’ measures, even before all the other benefits,” claims David. *“But where we really need to convince is in pointing out that properly selected materials and systems, used in correctly designed schemes, have fully proven and tested performance criteria.”*

Established shear performance requirements

Salix uses Tensar’s RollMax™ range of materials, which are widely known in the USA under Tensar’s North American Green label, because they have fully accredited performance data stating their erosion resistance up to a specific maximum water velocity and permissible shear stress. This allows design and installation of erosion control measures schemes with confidence, fully backed by Professional Indemnity assurance.

The core Tensar RollMax products are the Vmax™ C350 and Vmax™ P550 permanent turf reinforcement mats used as revetments on critical flow channels, which comprise a permanent high strength three dimensional matting structure with an internal fibre matrix.

The Vmax™ C350 uses a 100% coconut fibre matrix which supplements the permanent matting to enhance the shear resistance of grass and vegetation growth for up to 36 months while it becomes established, before the coconut fibre biologically degrades. Vmax™ bolsters the shear resistance of vegetation up to 576 Pascal, suitable for a maximum flow velocity of 6m/sec.

Vmax™ P550 is an ultra high strength solution with a 100% high strength polypropylene matting and internal fibre as a complete alternative to hard revetments, and provides a permanent erosion protection enhancing vegetation shear resistance up to 672 Pascal, suitable for 7.6m/sec flow velocity.

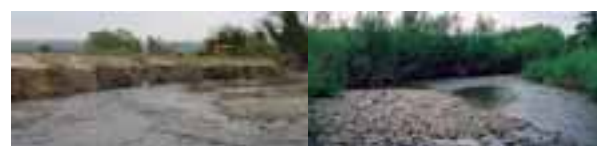
While these figures are quoted at full vegetation maturity, both products offer immediate erosion protection for mulch and seeds and for growing vegetation. For example, tender stems and undeveloped

root systems are prone to damage and removal at flow-induced shear stresses of only 29 Pascal. Even mature vegetation, if unreinforced, is susceptible to water erosion above 48 Pascal of shear.

Where immediate high shear stress resistance is required, each of these Tensar Vmax products can be supplied by Salix with precultivated turf, ready for unrolling down a bank for an ‘instant’ solution.



Building with Nature



Salix work within the context of the Water Framework Directive to achieve good ecological status in rivers, lakes and estuaries.

Combining innovative bioengineering techniques with our capabilities in traditional civil engineering, we aim to build with nature delivering cost effective environmentally sustainable solutions.

Salix

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To learn more call us on 0870 3501851 or e mail info@salixrw.com to request further information, a site visit or CPD lunchtime presentation.



Typical surface water channel erosion damage with unreinforced soil at Calverton Notts



Calverton, installing erosion control matting

Design solutions and system integration

As well as performance tested products and systems, perhaps the most critical element of successful bio-engineered erosion control is design of a solution appropriate to the application.

"Each situation has different characteristics," states David Holland, "and the designer has to be aware of how all the parameters interact, so that they work together. This includes understanding how the system is fastened down to the slope to create a permanent erosion control feature, and how to specify where different types of vegetation are best sited to provide the appropriate control."

"I see many schemes where remedial work is required, for example where the toe is poorly anchored with the wrong materials or placed insufficiently deep so that it is subject to scour. Often they have to be stripped out and replaced. Just grabbing netting off the shelf, throwing over topsoil and seeding it will not provide a stable surface which will resist the sort of rain we've had this summer."

Use of poor quality or poor sustainability materials is another frequent cause of premature failure. Heavy duty measures such as rock rolls used to stabilise toed-in erosion matting should have aggregate mixtures sized to encourage invertebrate establishment; and coir matting provides welcome protection for establishment of reedbeds and other emergent waterside plants. Staking with untreated chestnut stakes provides long term stability with the strength to preventing movement of the different elements of the design solution.

Meeting development planning requirements

Typical of the problems encountered in private development, was a project on the River Gwenfro, a small watercourse backing onto the gardens of a housing development in Wrexham, North Wales. The bank at the bottom of the gardens was being scoured away when the stream was in flood.

Natural vegetation inherently provides good soil erosion protection, and at a fraction of the cost – less than a third – of the installed cost of rock or concrete. But to help it get properly established, turn to Tensar Technology.

Tensar's RollMax™ range includes VMax® Composite Turf Reinforcement Mats, designed to reinforce vegetation through to maturity and providing permanent protection instantly for stream banks, shorelines, severe slopes and in high to extreme flow channels. Not to mention protecting your budgets.

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The site engineer had favoured replacing the original bank with rock filled gabions, an expensive and low sustainability option which did nothing for aesthetics of the area.

Salix proposed a value engineered solution which used a combination of elements to achieve a natural appearance while the fully established vegetated banks which would easily withstand bank high flood erosion. The banks were covered with Tensar Vmax turf reinforcement matting over seeded topsoil. The erosion control matting was anchored in a trench at the top of the bank, while at the toe it was anchored with a pre-established vegetated coir roll and a rock roll staked into the river bed below the average water level.

As well as the rapid installation, there was less disruption of the gardens by this method than using gabions, and the aesthetics and sustainability met local planning requirements. The new vegetation also reduced sediment from surface water running off the gardens behind the bank.

Stabilising eroding spoil

Reconstruction of water courses in post-industrial Britain often requires stabilisation of soil in locations where storm events can cause significant damage. For example, in South Wales, old mineral spoil dumped at the bottom of small river valleys has frequently been swept away in spates with a heavy environmental impact down stream.

When on the River Ebbw, initial proposals for stabilising 1500 metres of loose colliery shale river bank featured heavy blockstone armouring, engineers sought more cost-effective bio-engineered alternatives. As well as economic advantages offered, two criteria were imposed by the consultants: that any solution had to enhance the location's landscape aesthetics, and the design had to demonstrate its stability under the expected water velocities of 4.2m/sec for a 1:100 year storm event.

The adopted solution used Tensar Vmax matting over the steep 1 in 1.5 slopes, with a length of up to 13 metres and a water depth of up to 4 metres. The slopes were prepared with preseeded and fertilised topsoil to ensure rapid vegetation establishment; erosion protection from the day of installation was provided by pinning back the matting into the slope at 0.5m intervals.

The key area at the toe of the slope was protected by rock roll trenched into the river bed and staked; next, live willow bundles (fascines) secured the wet margins next to the bank. Rapid growth of the willow ensured mitigation of the scour effects of water at these margins, while grass germination of the slopes occurred within a week and established full cover to the bank before the end of the summer.

"The value of this approach becomes more and more evident with time," concludes David. "Five years after the project was completed, this is now a valued riverside landscape by the side of a popular sewin (sea trout) fishery, and the banks prevent the colliery residues threatening the river environment down stream."



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Aquatic weed control boats

The latest addition

CHRIS PETT, MASTENBROEKS

Mastenbrook Environmental is pleased to launch the new Conver C420 workboat for aquatic weed control. Manufactured by Conver in Holland, their range of work boats is supplied and serviced by Mastenbrook Environmental throughout the UK and Ireland.

The larger Conver model C485 weed cutting boat is operated extensively by various IDB's, the Environment Agency, Waterways Ireland and specialist contractors. Incorporating the design and build strengths of the larger Conver workboats, the new C420 offers versatile performance, and operator safety & comfort, in a competitively priced and compact package, making it ideal for operating in and transporting between lakes and canals.

A Yanmar 27kw diesel engine, with a hull integrated keel-cooler, provides hydraulic

power to a powerful anti-coiling propulsion auger, together with the various weed cutting attachments. The standard C420 is equipped with all necessary mounting points, hydraulic connections and control levers for fitment of the optional attachments. The European drainage industry has for many years operated the Conver T-cutter, side cutter bar, trailing knife and collector weed rake, all of which can be fitted to the new boat. However, new to the C420 is a combination side cutter bar with integral weed rake, which enables effective weed cutting and collection, but at reduced capital cost.

The C420 is not only more compact than existing boats, but weighing 1400kgs it can be transported and launched / recovered with a conventional road going boat trailer towed by a regular 4WD vehicle.

The independent operators compartment is

comfortable and quiet, which combined with a generous freeboard makes for a safe and ergonomic workboat.

The photos show the C420 performing both embankment maintenance and also submerged vegetation with the T-cutter. The operator was particularly impressed with the boats ability to handle the fast flowing river, and its stability for manicuring the embankment vegetation.

Visit YouTube and search for Mastenbrook TV to see the Conver C420 in action.

This summer Mastenbrook Environmental is organising working demonstrations. So if you would like to see how the new Conver C420 could compliment your existing weed boats, or open up applications where previously Conver boats have not been viable, then please call Mastenbrook on 01205 311313 or email info@mastenbrook.com



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DERRICK SIMPKIN

Aquaclear Water Management's amphibious Truxor DM4700 B machines are used to manage some of Britain's most delicate wildlife sites. The machine's amazing versatility and its ability to get to the most inaccessible places means that Aquaclear Truxors are being increasingly specified for work on the UK's National Nature Reserves and Sites of Special Scientific Interest.

Its hydraulically driven attachments, (weed cutters, rakes, grabs, silt pumps, oil skimmers, and excavators) and its ability to get to places inaccessible to conventional machines mean that there are few jobs that the Truxor can't do. Conscious of the environmental impact any leakage from the equipment may cause, Aquaclear chose PANOLIN HLP SYNTH to fill the Truxor's hydraulic system and CHAIN SYNTH 220 to lubricate the drive chain thus providing the environmental safeguard and machine reliability required wherever they are operating.

Recently they were asked to reopen a ditch around a national nature reserve, which involved tracking over floating fen vegetation to the work site, a job last performed by prisoners of war! The machine has even been used to get site managers to places they have previously been unable to visit, so that they could see what work might need doing.

As well as this specialised work, the Truxor's capabilities and light weight

give special reassurance to managers of golf courses, fisheries, lakes and waterways, that not only can their work be done efficiently and reliably, but the risk of «collateral and environmental damage» will be minimal.



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CW take the high road to Rannoch hydro scheme

MIKE HUMPHREY

CW Engineering have completed a purpose built weed screen cleaning system at the new hydro scheme on the Rannoch River in Morvern, part of Scotland's North West Highlands, a scheme that will power 750 homes when it is fully operational.

When the scheme was approved in 2009, Energy Minister Jim Mather said *"Renewable energy developments will help Scotland's economic recovery. Working in harmony with the environment, this scheme will generate clean, green energy, reduce emissions and create 12 new construction jobs - a model of the low carbon opportunities that exist the length and breadth of Scotland."*

"We will continue to support sustainable hydro power developments to tackle climate change and help increase sustainable economic growth."

Scottish Government targets are to meet 50 per cent of electricity demand from renewables by 2020, and an interim target of 31 per cent by 2011.

Main contractors Donald MacDonald Contractors Ltd and engineering consultants Hydroplan UK are working on

behalf of Ardtornish Estate Company Ltd on the construction of the Rannoch River hydro electric station with a generating capacity of up to 1.5 megawatts. They approached CW Engineering to design, manufacture and install a weed screen cleaner to keep the turbine intake screen clear of trash. This has been installed directly above the intake screen on the dam upper platform.

The Weed Screen Cleaner is fully programmable and has drawn compliments from the Ardtornish Estate Manager regarding its robust construction which will

"withstand the local weather conditions".

CW Engineering will be exhibiting at the Energy Now Expo Scotland 2012 exhibition in September.

CW Engineering is probably the industry's leading designer and manufacturer of weed screen cleaners. In recent years their innovative designs have solved numerous site challenges. Their services encompass design, engineering, controls, installation and maintenance. They also specialise in the refurbishment of weed screen cleaners and lock gates/slucices.



New 'Snipe Billy' needs no mates



Engineering for flood control.

CW Engineering have developed a stand alone version of their 'dipping' Snipe weed screen cleaner for remote sites with no available power supply, meeting the needs of HSE officers and forward planners.

Installation is easy and could be retrofitted into existing site situations without the need for civil modifications which makes it very cost effective. The machine can operate fully automatically and is started by timer, differential level, external signal or manual.

The machine is especially suitable for gravity intakes where no power supply is at hand. It can turn 180 degrees to dump into containers without further transport applications.

The tilting extending arm design which lowers the weed cleaning grab head into the watercourse before vertically clearing any debris from the weed screen (max 4m high). Grab widths are available up to 3m with a safe working load of 250kg.

Snipe Billy eliminates the need for 'lone working' in remote locations or at night and removes the need for regular inspection visits.

Snipe 'Billy' has been developed as a totally self-contained and automatic unit monitored by telemetry (SMS text) and camera for up to 3 months unattended use. Billy is fitted with a 5.5 Kva 3 phase 'silent' diesel generator and two 24v battery packs powered by solar panel and wind turbine.



For further details please contact
CW Engineering on 01553 775565
or visit www.cwengineering.co.uk



quality & service

Fish friendly pumps fulfil dual purpose for kempsey

LUCY OGDEN, BEDFORD PUMPS

The village of Kempsey, just South of Worcester, has hit the headlines on many an occasion over the years as a consequence of its extreme misfortune to be the casualty of repeated flooding.

The Environment Agency has just completed a Flood Risk Management Scheme at a cost of £1.7M to reduce the risk of flooding to over 150 properties in the village that have been affected by floods 23 times in the past 30 years.

A 180m long earth retention embankment has been constructed downstream of the village to stop flood water from the River Severn. A large penstock will allow the Hatfield Brook to flow freely into the river during periods of low flood risk. During high risk periods the penstock will close to prevent flows backing up the Hatfield Brook into the village. A new pumping station has been constructed by Galliford Try and Bedford Pumps was awarded the subcontract to supply the pumps which will discharge water from the brook to the other side of the embankment, thus reducing the risk of flooding to the village of Kempsey.

The pumps however, manufactured by Bedford Pumps Ltd, the UK's leading manufacturers of large submersible and conventional pumps to

Aquatic Control Engineering

Aquatic Control Engineering are leading UK suppliers of water flow control devices, as well as waterway maintenance machinery.



Fish friendly



Bedford Pumps' new
SAF Range of Fish
Friendly pumps

the land drainage industry, are not the typical axial flow pumpsets traditionally used in flood defence applications. Hatfield Brook is home to an eel population and under the new EU Eel

regulations the pumps must be certified as being **"fish and eel friendly"** in order to preserve the life of the aquatic inhabitants.

EU legislation brought into effect in 2007, "EU Eel Regulations", states that each Member State shall implement appropriate measures to reduce eel mortality. In 2009 UK legislation empowered the Environment Agency to undertake activity to satisfy the EU regulations. To this effect the Environment Agency can serve notice where the safe passage of eels is impeded and enforce a resolution to preserve the lives of eels and fish.

Bedford Pumps' new SAF Range of Fish Friendly pumps have undergone rigorous tests by VisAdvies BV, an independent research consultancy in the field of water management focusing on the environment of fish in all types of inland waterways. The tests have proven that Bedford Pumps new hydraulic design will pump pass eels without mortality thereby complying with the EU legislation introduced to tackle the rapid decline in global populations of the common eel. This legislation is specific to the eel population but it is generally accepted by all concerned that protecting fish stocks is an added bonus of utilising this type of pump. Eel and fish friendly pumping solutions will shortly become a requirement at the majority of

pumping stations and water extraction points where eel populations have been identified. In addition to protecting the fish, the new design demonstrates a significant improvement in hydraulic efficiency resulting in an 8% reduction in power absorbed. Consequently the new range will satisfy two of the Environment Agency's objectives of eel protection and carbon reduction.

Bedford Pumps has supplied two Submersible Canister Pumps complete with fabricated steel canisters, cables, lifting chains and Pump Condition Monitors to Galliford Try, for the Environment Agency. These will operate at a duty of 2100 l/s at 4.5m head. Each pump will be fitted with Bedford Pumps' innovative Fish Friendly impeller, to enable the eels to pass through the hydraulic passages unimpeded. Bedford Pumps' standard SAF range of Fish Friendly pumps cover from 400 to 7,000 l/s at 2 to 6m head and are ideally suited for Land Drainage, Flood Defence and Fish Farm applications. Larger capacity pumps can also be designed to meet specific requirements.

For further information please contact Lucy Ogden at
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Beaver Reintroduction

an opinion from the Welsh Beaver Project

Adrian Lloyd Jones,
Project Coordinator
Welsh Beaver Project
c/o North Wales Wildlife Trust

The Welsh Beaver Project is investigating the feasibility of undertaking a managed reintroduction of beavers to Wales for the multi-fold benefits their presence can afford to wildlife, the environment and the economy.

There are many myths surrounding beavers and their impacts, and this often stifles rational debate about their reintroduction, so knowing the facts is crucial to making decisions about this 'keystone' species.

Beavers are natural managers of rivers and wetlands, performing 'ecosystem services' that can assist many other species including humans. They are herbivores, eating only vegetation, coppicing bankside trees, creating glades and enabling woodland and aquatic

plants to flourish. These habitats provide enhanced living space for insects, fish, birds, amphibians and mammals.

Beavers only dam smaller streams, and tend to do so only when the more favourable territories (which do not require damming) have been occupied. The resulting pool mosaics provide a complexity of wildlife habitats. The significantly greater population of aquatic invertebrates these promote can provide a restorative resource for impoverished riparian systems. Evidence from Europe and elsewhere shows that beaver dams pose little problem to migratory fish stocks. Many of the micro-environments they create - large submerged dead wood, branch bundles, bank-side burrows and clefts - provide lays for large game fish such as Atlantic salmon and refugia for fry.

Their dam structures can be managed or removed by humans as required using a range of established techniques. These environments function as natural sponges which retain water during prolonged dry periods when instream levels are low. They can dissipate and absorb the sudden flows associated with flood events. This function helps to reduce bank erosion, trap sediment and capture nutrients. It naturally cleans rivers. In 2009 South West Water developed a project to utilise this natural process to capture nutrient rich silts leaching through tributaries from the surrounding agricultural landscapes into their strategically important Roadford Reservoir. Although supported by their board this venture failed as a result of opposition from local protest groups.

Beavers tend to stay close to water, and dislike wandering far from it, with 95% of activity occurring within 10m of the water's edge, so any adverse impact on land-use is limited. They do not readily move between catchments. Beavers are a highly territorial species. Their populations are also naturally capped by habitat availability with many dispersing 2 year olds dying as a result of fights with territorial holders. This process ensures that their numbers are limited by the availability of suitable living environment and cannot develop in an uncontrollable fashion.

Beavers sometimes cause localised problems that require management. Dams can be built in the 'wrong' place causing ponds to develop and unwanted tree felling can occur. There are, however, well established, low-cost solutions to these issues so



Photo by: Duncan Halley.



Photo by: Rob Parry

Photo by: Allard Martinus



landholders need not be significantly affected by beaver presence on stretches of river passing through their land. Dams can be modified or removed to reduce or negate flooding effects, and deciduous trees can be effectively protected from beaver coppicing by wire grills placed around their trunks. Coniferous trees are generally ignored by beavers.

Beavers can feed on arable crops if they are present within a territory, but damage is usually financially insignificant, highly localised and can be prevented by standard stock or electric fencing. The proposals for a beaver reintroduction in Wales include the establishment of a network of trained beaver managers that would be available to deal with beaver related problems. This would include provision for the trapping and relocation or humane dispatch of 'rogue' beavers.

Under normal conditions flood embankments further than 10m from watercourses tend not be vulnerable to beaver burrowing, but beavers can create burrows in flood defences closer than this or during prolonged periods of flooding where embankments are the only dry land available. It is however recognized that other burrowing animals such as rabbits and badgers pose a greater threat as they are not constrained to suitable stretches of water nearby. Measures can be taken to protect flood embankments from animal burrowing, and although this can be costly the need for it would generally be restricted to a very small proportion of a catchment.

Any reintroduction of beavers to Wales would include a comprehensive plan for their future management. Through natural recolonisation and reintroduction programmes beavers have returned to 24 European states within their former natural range and no reintroduction has been reversed.

For more information and to download reports on these issues visit welshbeaverproject.org.

New Fish Passes on the Derwent



Our rivers are the healthiest for over 20 years allowing otters, salmon and other wildlife to return to these improving waters for the first time since the industrial revolution. In the past the salmon, known as the King of Fish, and its smaller cousin, the sea trout, were unable to travel very far up the River Derwent because of a man-made weir near Swalwell, Gateshead, built during the Industrial Revolution.

The new fish pass on the Derwent will allow salmon, sea trout and eels swim up the river to spawn for the first time in more than 300 years. The fish pass will be closely monitored by underwater cameras to see how many fish are using it.

We are also busy revitalising 9,000 miles of rivers by 2015 which will include habitat creation for endangered species such as water voles and fish passes to help fish navigate man-made obstacles like locks and weirs.

The project is funded by a partnership between the Environment Agency and Gateshead Council and includes the potential for a hydropower scheme in the future, should funds become available.

Over the past 25 years baby eel stocks in our rivers have fallen by 95 per cent. One reason for this is that man-made structures such as weirs and dams are stopping glass eels - young eels a few centimetres long - reaching the freshwater habitats where they mature. The Environment Agency has launched schemes - such as building fish passes - across England and Wales to help fish travel to their spawning grounds, including glass eels.

Natural Environment Minister Richard Benyon said "I'm delighted to be opening this fish pass and would like to thank all those involved for their hard work in making it happen. Our rivers are vital for our environment and we've all got a role to play in making sure they are as healthy as they can be.

"By allowing salmon and sea trout to return this fish pass will create exciting new opportunities for fishing in the area and benefit the local economy. It shows that by working together we can make a difference and restore our rivers so they can be enjoyed by people everywhere."

Jon Shelley, project manager for the Environment Agency, said: "We're delighted to have completed the fish pass and hope it brings significant benefits to the local economy.

"By building this fish pass we are creating an affordable salmon and sea trout fishery within easy reach of Newcastle and Gateshead, and we hope local anglers will enjoy this."

"We also hope that by including a special eel section in the fish pass we will help boost the number of eels in our rivers after a dramatic decline over the last 25 years."

Gateshead Council cabinet member for transport and environment Cllr John McElroy said: "The River Derwent is at the centre of our plans to grow Gateshead's rural economy. People think of Gateshead as being about The Sage Gateshead, Angel of the North or Metrocentre, but actually we've got some fantastic countryside teeming with wildlife. "This fish pass will not only be the latest in a long line of major improvements for wildlife, it also opens up exciting new opportunities for fishing in the upper reaches of the Derwent."

The River Derwent upstream of the weir currently achieves 'moderate' ecological standards under the Water Framework Directive - EU legislation governing the water quality in rivers. By enabling fish to pass upstream, the fish pass is expected to improve the river to 'good', which is a target of the directive.

The fish pass was officially opened by Minister Richard Benyon on the 17th July 2012.

Fish are vital for maintaining a rivers ecosystem

a look into Calverton Fish Farm

ALAN HENSHAW

Fish re-stocking is a vital element in the restoration of a rivers ecosystem, it restores the aquatic and wildlife habitats and can bring nature back into balance.

Fish numbers can decline for any number of reasons - it could be the effects of spillages, the adverse effects of water control structures, such as weirs and dams or naturally occurring events such as drought or floods. As the fish numbers decline so too can the natural ecosystem causing a knock on effect for wildlife and plants alongside the channels.

Calverton plays an essential role in the well being of our rivers and lakes. In England and Wales, as many as half a million fish are stocked into rivers and still waters, each year from the Environment Agency's national coarse fish rearing unit at Calverton.



about Calverton

Calverton fish farm is based a few miles North of Nottingham and is funded by the anglers rod licence duty. The service provided is all part of the the Agency's work to protect and improve fisheries throughout England and Wales.

It has been under the control of several operating authorities, starting life under the control of the Trent River Board, which later became the Severn Trent Water Authority. It then came under the control of the National Rivers Authority (NRA) before the role of the the NRA was brought under the Environment Agency, created in 1996.

1939 - Calverton began life as a trout farm supplying Brown and Rainbow trout to rivers and still waters throughout the midlands.

1975 - half of the site was converted into a coarse fish experimental unit and techniques were developed for producing cyprinids in larger numbers.

1985 - the whole site was converted to coarse fish production.

1992 - the NRA, doubled the size of the farm giving the space needed for future developments that included, new ponds, extensive pond reconstruction, purpose-built recirculation systems, holding facilities and a warm water hatchery.

1996 - Calverton came under the operating control of the newly created Environment Agency

Present day - The farm now covers 4 Hectares, has 32 mature ponds ranging in size from 250m² to 5000m² and is recognised a national and international centre of excellence in rearing Cyprinids. They also provide R&D support to various Universities, Colleges and research institutes.

The fish farming process

Firstly, for a fish farm..you need fish, or more specifically fish eggs. Calverton does not keep adult fish so all brood stock are collected from the wild – this is because egg quality is usually poorer when captive brood fish are used and there would be no genetic variation if the same adult fish were repetitively spawned.



Brood female Barbel from the River Trent.

Carefully selected adults in spawning condition are taken by electric fishing from carefully chosen sites. They are quarantined in holding tanks and injected with various hormone preparations that mimics the natural hormone surge, which happens naturally in the fish at spawning time.

Close up of Barbel eggs.

The eggs are taken and 2 to 3 days later the adults are returned to their native river in tip-top condition.



The fertilised eggs are placed inside incubation troughs for between 7 and 30 days depending upon on species and incubation temperature. When they hatch, the larvae then spend up to 7 days absorbing their yolk sacs before swimming up to commence feeding, at which point the larvae must be fed or stocked out.



Newly hatched Barbel Larvae with yolk sac.

When the larvae have been stocked into the growing ponds, the surplus fry are reared for 2 to 3 more weeks before being stocked back into the same stretch of river that the adults came from. This ensures that there is no impact on the population from the brood stock collection activities.

Two essential ingredients that we all rely upon are water and oxygen, fish require the same – a good supply supply of oxygenated water. Water to the farm is supplied via of a borehole. The borehole is capable of supplying 1 million galls/day and provides all the water that the farm requires, the advantage being that no "second hand" water is used and the risk of parasitic, bacterial and viral infection is removed. The quality of the water is very good, but the low oxygen content at 65% saturation, means that oxygen is added to bring the saturation level up to 100%. The ponds are using large diameter porous pipe linked to an underground air supply, for the smaller ponds (up to 350m²) and single or multiple "air



The farm covers 4 Hectares, has 32 mature ponds ranging in size from 250m² to 5000m²



Air injector aerator.

injectors" aerators for the larger ponds. These units also provide a substantial horizontal flow, which increases the "fitness" of the fish and helps them to adapt to life in rivers.

Into the Ponds

The ponds have to be prepared in readiness for the fish larvae. They are filled 2 to 4 weeks before the predicted stock-out date of the larvae, allowing time for the natural food to develop and are often enclosed in polythene tunnels to increase the water temperature.



Dried poultry waste is used to promote the growth of algae, which is in turn preyed upon by zooplankton which are eaten by the larvae. Survival rates up to the end of the first summer usually range between 80% and 95% depending on species.



Into the second year and the ponds are larger and deeper, up to 5000m² in size, but prepared in much the same way. The ponds are emptied over the winter, excessive silt build up is removed and the remaining silt deposits are raked either by hand or machine to a depth 5cm to 10cm. This also helps to oxidise the deposits and release nutrients locked up in the mud. 2 to 3 weeks before the ponds are filled, quicklime is added, which further improves the mud and ensures that all pathogens and invertebrate predators are killed off.

Early spring and dried poultry waste is once again added to encourage the growth of a zooplankton culture over the following 8 - 10 weeks. Once the zooplankton bloom has matured the fish are introduced for the start of their second growing season. At the end of growing season, the total weight of fish can typically have increased 10 fold.

To maximise the pond production, a technique called 'polyculture' is used, which involves stocking the pond with a mixture of bottom, mid-water and top feeding fish. Typically, ponds are stocked with Barbel, Crucian Carp or Tench (bottom feeders), Chub, Dace, Roach or Bream (mid-water feeders) and Rudd (top-water feeders). This mix of species at three different levels ensures that all the available natural food such as Bloodworm (midge larvae) and Daphnia (water fleas) are eaten and production is maximised.

Harvesting

The ponds are harvested during the autumn, using a seine net specifically designed for the purpose. This catches the majority of fish and the remainder are caught as the ponds are drained.



Seine nets are used to harvest the fish

They are then transported to the holding tanks using, trailer mounted, aerated tanks which hold up to 5,000 fish. The holding tanks hold up to 10,000 fish and have clean water flowing through them. They are left undisturbed for at least 24 hours to remove any silt and mud which has clogged the gills, and to evacuate the gut of any ingested mud or food.

cont....

10,000 fish stocks for the North East

In July, Calverton supplied rivers in the north east with 10,000 grayling in a bid to boost natural populations of the species.

The grayling are one year old and will continue to grow in the river and some of them will begin to spawn in the spring of 2013. It is hoped that by stocking these young fish over the next few years, the population of grayling in the river will return to healthy numbers.

The Environment Agency releases fish into our waterways annually. Fisheries officers target fish stocking activity using data from local fish surveys to identify where there are problems with poor breeding and survival.

These rivers, like many, have suffered from poor water quality and habitat degradation in the past, but a concerted effort by the Environment Agency is helping to turn these watercourses around.

The Clow Beck flows into the River Tees near Darlington and has recently had two fish passes constructed and 2km of habitat improvement for grayling, created by the Environment Agency and the Tees Rivers Trust.

The EA are busy revitalising 9,000 miles of rivers by 2015 which will include habitat creation for endangered species such as water voles and fish passes to help fish navigate man-made obstacles like locks and weirs.

Environment Agency Fisheries Officers Paul Frear and Chris Carter will be introducing the grayling to their new homes.

Chris said: "We are pleased with the way the restoration of these watercourses have gone and it is now time to help fish stocks recover. It is good news for local anglers as there should be a wider variety of healthy adult fish to catch in coming years."

Ben Lamb, from the Tees Rivers Trust said: "The introduction of the grayling into Clow Beck is great and the work by both ourselves and the Environment Agency will give this species a kick start in the watercourse. Over the next three years we will be monitoring fish populations and invertebrates in the beck and we will be able to track the success of the grayling and their subsequent generations."



Holding tanks

The fish are then sorted by species and an accurate fork length/weight sample taken. All fish are graded according to size using a mechanical grader and accurately counted via computerised fish counters. These greatly reduce handling stress and damage enabling the counting and grading of up to 40,000 fish/hour.



Fish grading

Delivery

The fish are now ready for re-stocking and are transported using a purpose built 6x6 Land Rover on which are mounted a number of 300



litre tanks. Each tank has its own oxygen and air supply and on occasions, a large trailer

may also be used. This provides the capacity to carry more than one order at a time and to introduce accurate numbers of fish at multiple stocking sites with the minimum of netting and handling. End

If you would like more information about the fish farm at Calverton please email Alan Henshaw: alan.henshaw@environment-agency.gov.uk or write to the following address:- Calverton Fish Farm Moor Lane Calverton Nottingham NG14 6FZ

4,000 Fish stock boosts the River Colne

Last month the Environment Agency restocked the River Colne with 4,000 grayling as part of efforts to return it to one of the best grayling rivers in the country.

Fish stocks in the Huddersfield river were hit two years ago following a pollution incident, which damaged fish populations. Important species

Peter Mischenko, fisheries technical officer at the Environment Agency, said: "Grayling are an important species in a watercourse. They require water with a high oxygen content, and so their presence is usually a sign of good water quality. "Anglers have come from as far afield as Holland to fish for them in the River Colne. This stocking should help to boost numbers

in the river as part of an exercise that was started the year after the pollution incident."

The young grayling are nearly five months old and have been bred and grown at Calverton. The eggs came from adults caught from West Yorkshire's River Calder back in March 2012, and the young fish, known as fry, have been grown in a specially designed system that ensures they can thrive in the River Colne.

The fry will continue to grow in the river and some of them will begin to spawn in the spring of 2014. It is hoped that by stocking these young fish over the next few years, the population of grayling in the river will return to healthy numbers.

River life could be profoundly harmed by droughts new study warns

Critically low water levels in many rivers could lead to the partial collapse of food chains that support aquatic life, according to research led by the University of Birmingham published in the journal Nature Climate Change. This is the conclusion of one of the longest experiments on drought ever conducted in freshwaters.

The research was funded by the Natural Environment Research Council and the Freshwater Biological Association and included scientists from Queen Mary University of London (Dr Guy Woodward), the University of Leeds (Dr Lee Brown), and the Centre for Ecology and Hydrology (Dr Francois Edwards).

The team periodically lowered water flow in artificial streams, mimicking severe drought conditions in natural running waters. They looked at all species in the river, studying the whole food chain, measuring the growth rate of the animals in all populations.

Dr Mark Ledger from the University of Birmingham's School of Geography, Earth and Environmental Sciences, and lead author of the study, said

'We found that drought changed the make-up of the invertebrate life in the stream community and reduced its diversity by around 25%.'

Dr Ledger added many insects, such as mayflies, were severely affected by drought, as were many large predatory invertebrates, *which could not escape. He continued: 'Our study demonstrates that the loss of invertebrates limits the flow of food energy through the food chain, with potentially profound consequences for the health of river ecosystems.'*

'We discovered that, in particular, drought had negative effects on large bodied invertebrates, an important food source for fish, which has significant implications for fisheries.'

Co-author, Professor Alexander Milner, from the University of Birmingham, added: *'These findings demonstrate that the future intensification of drought, similar to that seen in the UK earlier this year and ongoing in the central and midwestern states of America, can be expected to have major effects on both biodiversity and ecosystem processes in streams and rivers.'*

Endangered newts rescued

An endangered species of amphibian was



Environment Agency staff were quick to respond when they discovered an endangered species of amphibian during routine works in Market Rasen, Lincolnshire.

A team from South Ferriby was carrying out maintenance work at Market Rasen Flood Storage Reservoir when they saw what they believed to be a newt - six feet down a manhole.

They called colleagues with expertise in fisheries and biodiversity who quickly arrived on site. The newt was rescued from the manhole using a pond net and it was confirmed that it was a great crested newt.

After checking other manholes and the surrounding area and confirming that the 'pot holing' newt was the only one around, it was released into suitable, safe habitat close by.

An American Invasion

American signal crayfish invade Northumberland

ENVIRONMENT AGENCY

A joint appeal by the Environment Agency, Natural England, Northumberland Rivers Trust and Northumberland Wildlife Trust has been made for help to stop the spread of invasive American signal crayfish in Northumberland.

A large population of American signal crayfish have been confirmed in the River Blyth - a blow for our internationally important population of native white-clawed crayfish on the neighbouring River Wansbeck.

To safeguard our native crayfish, anglers and other river users are being urged to stop the spread of the signal crayfish, and the plague it carries, by following three simple steps: Check, Clean and Dry.

The American species of crayfish is bigger,



more aggressive and out-competes our native crayfish. More importantly it also carries a fungal disease known as crayfish plague that has wiped out our native crayfish from most rivers in the south of England.

Because they are larger than our native species, signal crayfish can have a significant impact on fisheries by eating fish eggs and also increasing the erosion of river banks through their burrowing.

Fiona Morris, fisheries and biodiversity team leader at the Environment Agency, said: "We don't yet know how far the signal crayfish have spread, but the numbers we have found recently are not good news. It is impossible to totally eradicate populations of signal crayfish. All we can do now is try our best to contain them and stop them from spreading, to help protect our native crayfish."

"We're calling on all river users and anglers who fish the River Blyth to help us by Checking, Cleaning and Drying all their fishing tackle and footwear thoroughly, so that we can halt the spread of the disease that the signal crayfish carry."

"In the North East we still have native populations which are holding out against the invasion, and we want to keep it that way."

Peter Kerr from the Northumberland Rivers Trust said: "We must do all we can to stop signal crayfish getting into the Wansbeck, where their effect will be devastating on the native population. We would ask all anglers and river users to follow the Check, Clean Dry Campaign."

Although it is legal to catch crayfish with a licence in other parts of the country, requests for a licence in the North East are rejected to protect vulnerable native crayfish populations.

Scientific evidence has shown that small scale trapping can make the situation worse for our native crayfish. Large male signal crayfish tend to be caught in the traps and, because they also cannibalise young crayfish, larger males can help to control the population size. In some areas where trapping has occurred there has been an increase in the numbers of signal crayfish over subsequent years. Trapping can also increase the risk of spreading signal crayfish and the plague they carry. A byelaw for trapping crayfish in England and Wales came into force in 2005, which restricted the accidental or deliberate movement of alien crayfish and 'crayfish plague', whilst still allowing the legitimate trapping of the crustaceans in some postcode areas. None of these are in the north of England.

Rescued & Rare Dragonfly discovered

Great crested newts discovered during routine works in Market Rasen, Lincolnshire and a rare dragonfly has been discovered on the River Nene

ENVIRONMENT AGENCY

Phil Smith, fisheries and biodiversity officer, said: "Great crested newt numbers have fallen dramatically over the last century mainly as a result of a loss of ponds and intensive agriculture. They are now strictly protected and the Market Rasen Flood Storage Reservoir area has now been recorded as being home to these endangered amphibians."

"This discovery provides important information about the species' distribution and all future works on the site will be subject to approval by Natural England."

Great crested newts are the largest of the UK's three native species, which also include smooth and palmate newts. The great crested newt is significantly larger than the other two species and grows up to 15cm in length. It also has a much heavier looking body.

The newts are dark brown or black and have 'warty' skin. Their underside is bright orange with irregular black blotches and males develop an impressive jagged crest along their back and a white 'flash' along the tail during the spring breeding season.

Their protected status makes it an offence to intentionally or recklessly kill, injure, capture or disturb them and to damage or destroy their habitat.



The rare dragonfly was been discovered on the River Nene following Environment Agency work to improve habitat.

The scarce chaser dragonfly (*Libellula fulva*) was discovered on Castor Backwater, near to the villages of Castor and Ailsworth, during a survey to assess how effective a restoration project there had been.

Chris Extence, Environment Monitoring Team Leader, said: "We are monitoring our river restoration project on Castor Backwater to see how successful it has been. We have already received good feedback from local anglers about

fish using the area to spawn. Now, we have also noted the appearance of the scarce chaser dragonfly."

"This is great news and shows that the project is already helping to improve this stretch of the River Nene."

The scarce chaser dragonfly is native to the UK. It is officially recognised as being rare and the species is deemed to be of national importance.

Chris said: "We have only found this species once before on the Nene, a single specimen being found at Lilford Bridge in 2007. This new finding is of considerable importance as it shows that other parts of the river, with suitable habitat, are capable of supporting breeding populations of this rare and very attractive dragonfly."

The Castor Backwater restoration project was carried out by the Environment Agency with support from the Nene Park Trust. It aimed to protect and improve important wildlife and coarse fish habitat and included repairing and re-profiling the river's banks, installing fencing and cattle-drinkers and creating two fish-refuge ponds. The ponds provide areas for fish to shelter from high flows. Newly installed gravel on the river bed has provided much needed spawning habitat for fish.



— — — *Call for abstracts - deadline 15th Oct* — — —

RRC 14th Annual Network Conference

Scaling up our aspirations for river restoration and management

River restoration, as an overarching concept to provide catchment-wide improvements, in the context of designated rivers and WFD is now firmly on the agenda. Key questions arising from this include: how are projects being delivered on-the-ground?; how can techniques interface with flood risk management requirements?; can we demonstrate early success?; how are local stakeholders engaging with the river restoration process? This conference aims to provide an opportunity to discuss how we are meeting the current challenge of implementation. We encourage the submission of abstracts from the UK and Overseas under the following themes:

- **Catchment restoration and management**
- **River restoration techniques**
- **Flood risk management and Water Framework Directive**
- **Structures in rivers**

Who should attend to join the discussion?

This conference will be of interest to a wide range of people engaged in river restoration and management from policy and planning to engagement and delivery, as well as those working to assess benefits for ecology and ecosystem services. This annual event attracts:

Statutory Agencies	Trusts (e.g. River, Fisheries, Wildlife, etc)
Local Government	Flood Risk Managers
Planners and Landscape Architects	Contractors and Product Developers
Consultants	River Engineers and Modellers
Environmental Economists	NGOs and Landowners
Researchers (social and physical science)	Graduates

Conference format

The conference will mix standard 15-minute papers with workshops and poster presentations (with a two-minute oral introduction). There will also be a prize for the best poster as judged by the audience.

For further details of the topics and to submit an abstract, [open the submission form](#)

Abstracts must be received by Monday 15th October 2012

30th April — 1st May 2013

[Whittlebury Hall, Northamptonshire, England](#)