

# River Restoration



## NEWS

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*Newsletter of the RIVER RESTORATION CENTRE*

# Re-wilding Britain's Rivers

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# Re-wilding British Rivers

**Murray Thompson**, (Natural History Museum)  
& **Claire Graves** (National Trust)

Rivers have lost their voice after having been meticulously tidied and straightened so that there is no longer the sound of rushing water or a sense of what a natural river really is. In an attempt to reverse ecological declines, a pioneering plan based on scientific theories was constructed to recreate natural tree-fall and re-wild the River Bure in Norfolk.

*A naturally fallen tree in the Bure, the target conditions of the restoration. This structure is extremely complex, creating slow flowing and plant rich habitat (or refugia) instream among the network of branches, in between fast flowing, clean gravel channels either side.*

*Another angle of the naturally fallen tree shows how marginal plants develop behind the structure in the eddies where branches lie*

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## Low-tech but efficient solutions

Like many other British rivers, the River Bure has long been engineered and cleared of trees for flood prevention and navigation which has led to a perceived decline in habitat quality and catch reports by anglers. Reduced flows have caused a build up of silt deposits, suffocating natural gravel habitats for fish and many of the insects they feed on, such as mayflies. Natural British rivers would have been full of collapsed river bank trees. They act as “river architects”, engineering many of the features we recognise in “pristine” rivers, such as pools, riffles and meanders. Trees also provide critical refuge from predators and high flows for a myriad of stream fauna, including juvenile fish and insects.

The river restoration approach at the Bure has been distinctly low-tech and low cost: felling entire trees into the river to diversify the flow and restore habitat lost through long-term river engineering and tree removal. The only equipment required was an old boat, a hand winch and a chainsaw. Water now flows faster in areas, moving silt and sediment to clean and expose gravel providing perfect spawning grounds for wild brown trout that now thrive at the site. The silt is trapped in the slack pools behind the woody debris and now provides opportunities for colonisation by plants and habitat for a diverse variety of invertebrates and fish.

## Partnership working brings monitoring funding

River restoration schemes often allocate very little (if any) funding to critically analysing and understanding the perceived problems, making it impossible to develop techniques and critically evaluate success. However, the project at Blickling captured the imagination of academics Carl Sayer (University College London), Guy Woodward (Queen Mary University of London) and Steve Brooks from the Natural History Museum, which subsequently paved the way for PhD student, Murray Thompson, to undertake extensive sampling at the site. Furthermore, after fishermen raised concerns of riverfly decline on the Test in Hampshire, trustees of The John Spedan Lewis Trust agreed to fund the research to demonstrate that monitoring can be cost-free to the practitioner.

### The future...

The monitoring continues with Murray's work complemented by that of Gemma Harvey (Queen Mary University of London) who is evaluating the geomorphological and sediment aspects together with the flow rates to help understand changes to the physical nature of the Bure. It is hoped that final conclusions drawn from on-going scientific studies will be presented in a future issue of the RRC newsletter so that they can provide vital information to inform restoration projects on other similar rivers in Britain. Meanwhile the River Bure is going wild again and river ecology is benefiting. It may be the end of an era and a start of a new wilder time for British rivers.

### Acknowledgements

*In addition to those mentioned in the text the partnership team included Ian Patmore and the sampling team Doris Pichler, James Humphries, Jonathan Clarke and co.*



© Murray Thompson

*Two trees in the restored section of the Bure. One is almost completely submerged while the other is held mostly out of the water*

## Simplicity and enthusiasm reap rewards

Within a few months of putting the woody debris into the river, vegetation was establishing, and eighteen months on, major changes to the river habitat and obvious benefits for wildlife can now be seen. These rapid results together with the scientific monitoring being undertaken have attracted much wider interest than first imagined. It has led to the project winning The Wild Trout Trust's Amateur Award. As well as a trophy and certificate, the project team were awarded £1000, which will be used to continue the good work along the River Bure. There are ambitious plans for a major project downstream where the aim will be to introduce trees to an area of river without them.

The restoration project on the Bure has also been used as a template for others to recreate the effects elsewhere and test the success across multiple systems. Through the research, considerable time has been spent surveying not only the habitat, invertebrates and fish in the Bure, but also in 14 other sites spanning 5 rivers with and without large woody debris, including the Wensum in Norfolk and the Lyde, Loddon and the River Test – the ancestral home of fly-fishing – in Hampshire.



© Murray Thompson

*Three of the National Trust Team winning LWD in place in the most recent restoration, early November 2010*

# A Cool Response to Climate Change

Steve Ormerod and Isabelle Durance  
(Cardiff University)

**Writing about global warming might seem misguided after one of the coldest British winters on record. Sceptics argue that our recent weather only serves to reinforce the notion that climate change scientists are either fraudulent or bonkers.**

European climatologists, on the other hand, are evaluating the serious possibility that continued heating over the arctic has altered melting patterns of sea-ice so profoundly that cold, northerly air-flows replaced the 'norm' of warm, winter westerlies over the British Isles both last year and this. If this is correct, the near future could see us facing deeper winter frosts in some years alongside a pattern of increasingly hotter summers. In other words, exact winter conditions will be determined by the interplay between sea-surface temperatures, associated North Atlantic pressure systems and longer-term trends.



*Now you see it, now you don't.*

*Contrasting bank vegetation along two of the streams at Llyn Brianne studied by Steve Ormerod and Isabelle Durance for over 30 years*



## The background

As for rivers, data from the last 20-30+ years reveal long-term river warming throughout large parts of the world. In Europe, river temperatures have increased in Scotland, in southern English chalk streams, the upper Rhone, the Swiss Alps and Austria by up to 1°C per decade<sup>1</sup>. In the USA, Sujay Kaushal's recent analysis of 41 historical

data sets also showed clear warming of 0.1-1.0°C per decade in about half of the cases<sup>2</sup>. In our own Welsh rivers, summers have warmed, while winter temperatures increased by 1.7 °C between 1981 and 2005, accompanied by a range of ecological changes among salmonids and invertebrates<sup>3,4</sup>. There has been at least one local extinction<sup>5</sup>.

## Suggestions from the data

Intriguingly, our data suggest that not all river types have been equally affected either by heating or long-term ecological change: catchment and riparian land use appears to have effects that over-ride not only warming, but also other trends. We're investigating these effects further using our experimental catchments around Llyn Brienne but, if confirmed, there is an important lesson: the management of riparian land-use, specifically by encouraging the regeneration of riparian broadleaves, might offer a major tool for adapting rivers to reduce climate-change effects, at least in headwaters. Our investigations are looking beyond the thermal influence of summer shade to other mechanisms, for example energy inputs from leaf fall, effects on total invertebrate production, nutrient and sediment retention, carbon uptake, and effects on the population stability of stream organisms.

Other arguments, such as those about the benefits of woody debris, are already well rehearsed. This is not to say we have all the answers. Firstly, the effects of trees on stream temperatures in winter, when factors other than sunlight affect heat budgets, are not yet fully understood. Secondly, we recognise that those with interests in agriculture, landscape, angling, or the specific conservation of some 'gap-loving' organisms do not wish to see trees proliferate everywhere along rivers. At the same time, we're keen to examine how upland rivers could gain from an expansion in native tree cover as part of a wider link between climate change adaptation and the restoration of natural river function with a range of potential benefits. Adaptive restoration just might be cool!

## References

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# THE RRC'S ANNUAL NETWORK CONFERENCE

## "Managing Rivers at the Local and Catchment Scale"

The 12th RRC Annual Network Conference is being held at the University of Nottingham on **Thursday 14th April 2011** (with additional site visit to Croxall Lakes Nature Reserve and Tuckers Holt Farm on **Friday 15th April**).

**It promises to be another fantastic opportunity to network, share ideas and hear from speakers, with a multitude of thematic sessions to choose from.**



To date over 150 people have booked to attend the conference and the RRC would like to thank the event sponsors:

Alaska Environmental Contracting, APEM, Atkins, Cain Bio-Engineering, Halcrow, Penny Anderson Associates, Salix and Willowbank Erosion & Conservation Services.

Booking is still open for the conference with flexible options covering the day, extended day and evening only attendance at the event. Full details can be found on the RRC website, together with the programme for the 14th April and details of the optional site visit the following day. You can also download the booking form and make a payment by credit card at:

[www.therrc.co.uk/rrc\\_conferences.php](http://www.therrc.co.uk/rrc_conferences.php)

# Sediments in streams and rivers

## Ecological status and the conundrum of community structure and biogeochemical processes

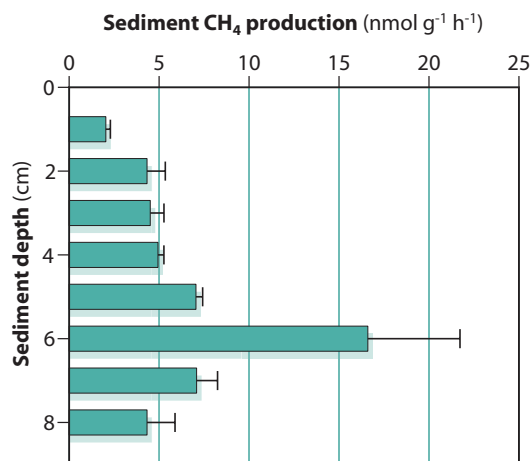
There has been a steeply rising interest in what are apparently increasing amounts of inorganic and organic sediment in our rivers and streams, and what its effects on ecological status might be. Two recent projects on sediments (one here at Queen Mary, University of London, the other at Cardiff University) dealt with different systems and took different approaches, but it is interesting to compare their results, which have important implications for the way we assess the condition of sediment-affected rivers.

**Alan Hildrew** (Queen Mary, University of London)

### Project 1 Geochemical impacts

At Queen Mary, and under the auspices of the NERC LOCAR programme, we found that in both the Rivers Lambourn and Frome (both essentially chalk streams) there was a narrow zone of sediment, a few centimetres below the bed, that was geochemically highly active and with very low oxygen concentration, sufficient to generate significant amounts of the greenhouse gases nitrous oxide and methane <sup>1,2</sup>, (**Graph - right**). Indeed, sediments at our research site on the Frome produced methane at a rate similar to that of peat bogs. This appears to be attributable to organic matter eroded from surrounding fields (there have apparently been changes in land-use from permanent pasture to arable) clogging the sediments and acting as a source of carbon.

Routine ecological assessments of sites on both the Lambourn and Frome, however, put almost all in the excellent or good quality classes, thus raising the issue of why an apparent 'pathology' in biogeochemical processes (do English chalk streams normally produce methane at such a rate?), was not matched by assessments based on community structure (macroinvertebrates).



*Incubation of sediment cores from the River Frome shows there is a shallow zone of methanogenesis some cm below the surface <sup>2</sup>*

### References

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- 2 Sanders, I.A., et al. (2007) *Freshwater Biol.*, 52, 1176-1186
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## Project 2 Ecological impacts

The second project, carried out in Steve Ormerod's group in Cardiff<sup>3,4,5</sup>, looked explicitly at effects of sediment on the bottom-dwelling invertebrates of the River Usk and its tributaries, and was based both on surveys and field experiments in this system where sediment problems have been arising.

Perhaps not surprisingly, they found that both the incidence of eroding banks and sediment on the stream-bed was related to a decline in riparian woodland. Observations on small patches of the bed showed some decline in the diversity of mayflies, stoneflies and caddisflies (the groups most often used as 'status' indicators) but this effect disappeared when analysed at the reach scale. When they looked at invertebrate drift (the movement of creatures downstream in the current) in response to experimental additions of sediments, they did find some increase, though fairly modest and short lived. The clearest effects were on so called 'trait composition' – characteristics of the life-history and biology of the invertebrates found – and they showed that some species and trait groups were particularly intolerant.

At the catchment scale, it was clear that species with longer life cycles (often of particular conservational interest) were scarce in tributaries subject to more intense land use, and that filter feeders also declined. Further analysis found that the fauna of the more disturbed catchments was an impoverished subset of that in more 'pristine' catchments. These are all fairly subtle effects and may be difficult to detect using conventional operational assessments.

## Are we looking in the right place?

Overall, our research suggests that 'process based' assessments may be particularly useful in detecting sediment effects - presumably because clogging of sediments has particularly strong effects on chemical processes and microbiological activity in streams and rivers - or that methods based on species traits may be effective. One might speculate that, since the ecological impacts of sediments is often clearest in the interstices (the spaces between the sediment grains), processes that occur there or species that use this part of the habitat, may provide the best basis to assess ecological status.



# RRC Message Board

## MEMBERS SECTION

### Site Visits:

Write-ups of many of the 2010 RRC members site visits, including the Braid Burn in Scotland, Longwater Lawn in the New Forest and the River Calder in the Ribble catchment, are online.

[www.therrc.co.uk/rrc\\_case\\_studies\\_list.php](http://www.therrc.co.uk/rrc_case_studies_list.php)

### What would you like to see?:

If you would like to see the RRC run a themed event/seminar or host a site visit, please get in touch with us by email or through Facebook.

## SOCIAL MEDIA

For the latest news, events and multimedia links; follow us on **Facebook** by searching for 'River Restoration Centre' and please post your links and stories to share with the community. RRC now also has a **LinkedIn** profile, and you are able to join our professional network.



## RESTORE

**Rivers: Engaging, Supporting and Transferring knOwledge for Restoration in Europe** is a new and exciting EU LIFE+ project that will support river restoration implementation across Europe, develop existing networks and promote effective knowledge transfer to establish a platform for knowledge sharing in the long-term. Martin Janes will talk more about this at the RRC's Annual Network Conference, and we'll keep you informed of developments.

## PRACTITIONER LISTING

### Need to find a Consultant or Contractor?

If you are a Consultant or Contractor and would like to be added to the listing then please contact Ian Brown at the RRC.

# Events

## **CIWEM Water & Environment 2011 conference:**

6th to 7th April – London.

Latest info at:

<http://www.ciwem.org/events/annual-conference.aspx>

## **Peter Wolf Early Career Hydrologists' Event – Adapting water management to climate change: Putting our science in practice:**

12th to 13th April – Loughborough.

Register at :

<http://www.bris.ac.uk/water/events/2011/5.html>

## **Advances in River Science International workshop:**

18th to 21st April – Swansea.

Latest info at:

<http://riverscience.wikidot.com/workshop>

## **3rd International Multidisciplinary Conference on Hydrology and Ecology, Ecosystems, Groundwater & Surface Water – Pressures and Options:**

2nd to 5th May – Vienna, Austria.

Latest info at:

<http://web.natur.cuni.cz/hydroeco2011/>

## **ART / RAFTS Invasive Non Native Species Biosecurity conference:**

7th June – London.

Latest info at:

<http://www.associationofriverstrusts.org.uk/calendar.php?area=listevents>

# Recent News

## **International Year of Biodiversity comes to an end**

### **– What did we learn?**

2010 was the International Year of Biodiversity. The European Environment Agency (EEA) has produced a number of reports to provide an indication as to the progress made in attempts across Europe to halt biodiversity loss.

A key message is that the global nature of environmental problems makes finding solutions complex, and that a complete shift to a resource-efficient green economy which fully considers all environmental resources in production, consumption and global trade decisions must be made. The reports range from detailed Biodiversity baseline studies to summary documents such as one which outlines 10 messages for 2010. A further report incorporates the strategic plan for the long-term in regards the state and outlook post-2010.

These can be obtained from the European Environment Agency's website :

<http://www.eea.europa.eu/highlights/biodiversity-year-comes-to-end>



North American Signal Crayfish are among the 296 invasive invertebrates alien to Europe cited as a pressure in the Key Messages for freshwater ecosystems

## **River Science Network established**

The River Science Network is a brand new web resource and moderated email distribution list that aims to encourage knowledge exchange and networking amongst individuals who share a common interest in river science.

For details of news, events, current discussion topics and a full listing of current members and how to join, please visit:

<http://riverscience.wikidot.com/>

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

**The following statutory organisations provide core funding for the River Restoration Centre and their representatives form the Advisory Board, who, together with RRC's Directors, make up the RRC Management Board.**



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