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Integrated River Restoration in the UK: Past, Present and Future

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ABSTRACT: River restoration in the UK has until now tended to be based at the reach-scale and driven by a range of reasons from fisheries interests to flood alleviation. Most projects, however, have been small scale and have rarely taken into account the catchment needs as a whole. Recently there has been a surge of interest in sustainable catchment management and to this end there is a growing scientific knowledge about this subject. There is now the need to put this understanding into practice and thus the next step forward is to demonstrate this understanding on-the-ground. The River Restoration Centre is an independent non-profit making organisation well placed to advise on such a project and to disseminate information both during and after completion. As such the Centre is now advises on two potential catchment projects one of which is based in the north-east of England and encompasses the importance of sustainable Flood Alleviation, whilst the second focuses on improving habitat for cSAC species along the River Avon, located in the south of the country. Both aim to provide an integrated approach to river restoration and management.

KEYWORDS: river restoration, rehabilitation, sustainable management, flood alleviation, habitat Diversity.

Introduction

Since the completion of the River Restoration Centre's (RRC) reach-scale demonstration sites in the mid 1990's on the Skerne (near Darlington) and the Cole (near Swindon) there has been a growing acceptance within the United Kingdom, that river restoration is a key factor towards improving biodiversity, aiding sustainable design in alleviating flood risk, and enhancing public spaces. So much so that the UK's Department for Environment Food and Rural Affairs (DEFRA) issued its 'Directing the Flow' document in 2002 outlining policy areas that should be embraced to preserve this žprecious (water) resource' primarily in terms of water quality but also to support and enhance the associated natural ecology. In addition recent statements by the Government indicate that working with nature and allowing rivers, where possible, to meander in their floodplains, provides hope that sustainable flood management is now actively being encouraged.

Background

River Restoration in the UK has tended to be piecemeal and whilst much has been underpinned by good scientific methodology, yet others have been inappropriately restored without expert guidance or understanding. The RRC's aim is to promote good practice river restoration across the UK and to ensure that a more co-ordinated ap-

proach to restoration is ultimately achieved within the context of the catchment. This is particularly poignant now, given the high profile of the Water Framework Directive (WFD), which provides a sound basis for improving the UK's and other member states watercourse stating that there is a need to protect, enhance and restore all bodies of surface water with the aim of achieving good ecological status (Chave 2000). Eleven river basins have been adopted in England and Wales, with variations in biological quality divided into 6 categories. Furthermore, DEFRA/Environment Agency have independently set up Catchment Flood Management Plans (CFMP) with the equivalent in Scotland being Flood Appraisal Groups (FAGs). These are aimed specifically at promoting sustainable flood management across a catchment which, for example, should implement measures that avoid flashy run-off, reduce soil erosion and diffuse pollution, as well as addressing flood risk. Recently English Nature identified that these CFMPs should encourage innovative and visionary policies and practices which both achieve sustainable flood defence outcomes and focus on the goals set out in the UK Biodiversity Action Plan 1994 (see www.ukbap.org.uk) that promote the enhancement and creation of habitats for protected species.

Therefore, whilst there are still hurdles to be overcome, policy is now in place that has begun to recognise the importance of understanding catchment scale processes to achieve sustainable restoration at the reach scale. The RRC now believes that there is a an urgent need to promote integrated river restoration best practice from river source to mouth both for flooding issues and biodiversity enhancement. Therefore, exemplifying the žon-the-ground' benefits of adopting a catchment-wide approach to river restoration as opposed to just concentrating on opportunistic improvements to isolated river reaches is now highly relevant.

Reach Scale projects to date and their relevance to catchment scale initiatives

The selection of the Cole and the Skerne demonstration sites in the early 1990s was a lengthy process even though it only sought to demonstrate different techniques (revolving primarily, although not exclusively, around re-meandering and backwater enhancement) over short reaches in single ownership where local support was good (see Vivash et al (1998)). Since then flood management has begun to embrace habitat enhancement and river rehabilitation/restoration as part of implementing defence works affecting river channels and subsequently techniques such as de-culverting, and establishing wetlands as part of flood attenuation schemes have been demonstrated (see for example Vivash and Janes 1999**;** 2002 and Ward et al 1993).

The example of the Long Eau, Lincolnshire is unusual in that a floodplain was 'restored' as a cost-effective flood alleviation option, with part of the economics of the scheme being related to the local farmer converting arable land to pasture (Figure 1). Nevertheless, despite its success such options remain rare in the UK since concerns remain that the payments do not address the financial need to adapt agricultural practices even though the Currie report (2002) recommended that an incentive payment scheme should be developed to encourage landowners to allow their land to be flooded.

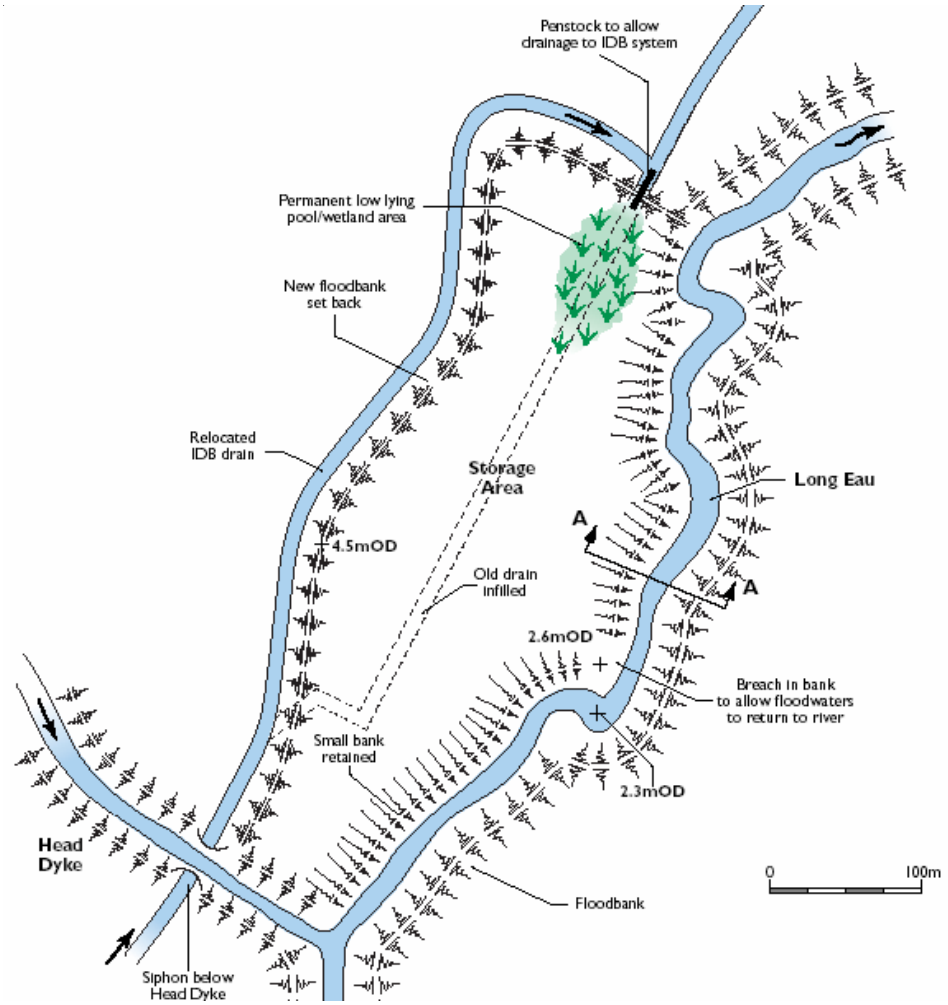

Figure 1 Removing and setting back floodbanks on the Long Eau, Lincolnshire

Catchment Scale Projects

The RRC is now advising on the early stages of two river projects aimed at implementing integrated approaches to catchment management and restoration. The input for the River Restoration Centre is fourfold:

- to ensure that žbest practice', innovative restoration options are considered;
- to help provide a greater appreciation and acceptance of the need to implement sustainable river restoration practices;
- to encourage improvements of all aspects of the river corridor including sympathetic flood defence options, biodiversity enhancements and improved aesthetic value for society;
- to disseminate the lesson learnt from these innovative initiatives.

Catchment Scale River Restoration in the UK – new approaches

Over the last year or so DEFRA has held two high-level workshops on land-use and flood management. The second in April 2003, recommended that a catchment-scale demonstration project should be developed. The objective of such a project would be to show how flood risk could be reduced, and biodiversity increased, by less intensive land-use to reduce run-off and re-connection of rivers with their floodplains. The initial product has been a joint statement on žWetlands, Land Use and Flood Management' in October 2003 signed by Defra, the Environment Agency, English Nature and the Forestry Commission which acknowledged the need to encourage a more integrated approach to flood management and help reverse the decline in wet habitats. These Government bodies, together with a group of Non-Government Organisations (NGOs) advised by the River Restoration Centre have now formed a steering group to oversee a catchment pilot project which should reflect the progress that has been made to date in developing techniques for assessing environmental impacts and undertaking practical works for a variety of purposes.

Key to the success of any catchment scale venture is to bridge the gap between research and development and practical solutions on-the-ground. Although as stated early in this paper some techniques have been piloted in different localities, there has been no attempt to date to demonstrate these through an integrated catchment scale project.

The main emphasis and perceived outcomes of two proposed catchment scale projects within the UK and the role of the River Restoration Centre within them is now discussed.

DEFRA's Multi-Integrated Catchment Pilot Study

The initial specification of this project was that it must have a flood risk problem plus nature conservation objectives which could be addressed through the implementation of BAP target delivery measures. Furthermore it should seek to be truly multi-objective by integrating wider issues. These should include at least some of the following: agri-environment schemes, changes in catchment land-use that benefit flood management, pollution control, amenity improvement to urban and rural corridors and adjacent floodplain areas, effective delivery of the Water level management planning; wet woodland creation, sustainable forestry for run-off control, washland storage enhancement and river channel/floodplain restoration. Critically, it was accepted that a cost-effective means of testing and demonstrating new techniques should also be included in the scheme. This is especially important since existing flood defence schemes may no-longer be viable to maintain on economic grounds alone and hence the justification for more ecologically friendly, cost-effective, sustainable options are likely to be considered more seriously (Mant and Janes 2004).

Three sites were short listed as having potential as demonstration areas all of which included flood alleviation as a priority. A series of questions were addressed and a simple scoring system applied to each of the potential sites (see Table 1). On the basis of a site visit, attended by experts from DEFRA, Environment Agency, Forestry Commission, English Nature, and the River Restoration Centre, these question were considered and it was identified that the River Laver and Skell Flood Alleviation scheme had the greatest potential to incorporate a range of options for more natural, imaginative and sustainable attenuation of flood waters over a greater length of the river valley (Figure 2). The creation of wetland areas in the upper parts of the catchment, wet woodlands, enhanced hedgerows and blocking moorland grips at the headwaters were identified as ideas that could be fruitfully demonstrated within this catchment under the umbrella of such an integrated project.

Table 1 Application of a simple scoring system to establish which of the three short listed sites could deliver the most highly integrated catchment pilot study site

	Lower Don Flood Alleviation Strategy (near Doncaster, NE UK)	*Upper River Rother Flood Alleviation, (near Chesterfield NE UK)*	*Rivers Laver and Skell, Flood Alleviation (near Ripon NE UK)*
Range of potential opportunities?	***	**	****
Clarity of linkage to flood problem?	****	****	****
Size appropriate for demonstration?	**	***	****
Relevant catchment level modelling?	***	**	**
Links with on going, catchment initiatives?	***	***	****
Potential to apply recent research?	**	**	****

Figure 2 Identified area of floodplain for potential River Laver flood attenuation site (courtesy of Halcrow)

The River Avon and Avon Valley Initiative

In contrast the River Avon and Avon Valley Initiative (RAAVI) is an ambitious new partnership project including English Nature, Environment Agency and various NGOs which encompasses the entire River Avon system and its associated tributaries, from its source in Wiltshire to its mouth at Christchurch in Hampshire located in the South of the UK (see Wheeldon 2000 for further details). The main goal of this project is to restore a mosaic of 'favourable conditions' able to support certain vulnerable in-channel species (Bullhead, Brook and Sea Lamprey and Atlantic Salmon), Demoulin's whorl snail on the floodplain and chalk stream habitat characterised by in-channel vegetation such as *Ranunculus*. To this end a bid to the EU LIFE Nature Programme was submitted in October 2003.

To achieve this, strategic parts of the watercourse will be restored to enhance the physical habitat in this 'candidate Special Area of Conservation' (cSAC) area. In the lower

Avon Valley, an area with Special Protection Area (SPA) designation, increasing wetness by retaining water along some of the ditch network should contribute to the žfavourable conditions' required for the breeding of Gadwall and Bewick Swans.

It has also been recognised that there are both invasive and 'nuisance' species present along parts of this valley. Excessive numbers of Mute swans, for example, are known to devastate River crowfoot (*ranunculus fluuitans)* beds and there is the common UK issue of removing plants such Giant Hogweed *(Heracleum mategazzianum)* , Himalayan Balsam *(Impatiens glandulifera)*, and Japanese Knotweed *(Fallopia Japonic)*. The RAAVI project is proposing to develop a strategic program to assess how best to deal with these species and will include undertaking works to eradicate these key invasive plants on a catchment scale basis.

Between eight to nine sites within the River Avon cSAC will be restored so it can better support the interests listed above. At this stage, three restoration sites have been identified on the River Wylye (Figure 3) and a further 5-6 sites will subsequently be identified along the River Avon and its other tributaries including the Nadder, Bourne and Dockens Water.

The works are due to be carried out over a 4 year period, with their initial success monitored by looking specifically at the impact on the physical diversity of the watercourses.

At the heart of this project lies a good working relationship between all the partners involved and this includes the local communities, many of whom have strong links and interests in the watercourses.

The RRC has been involved with the EU- LIFE project from the outset and has provided information and advice based on its UK-wide role as a Centre for promoting river restoration concepts and best-practice river management. The Centre continues to have an input into the project's management, restoration design and monitoring strategy. This latter involvement will include testing a broad assessment approach designed to provide LIFE with the predicted likelihood of the success or failure of the restoration works; this is a critical element if we are to further our understanding of the impact of restoring our rivers on these cSAC communities.

Figure 3 One of the potential restoration sites on the River Avon at present heavily impounded as a result of historical Mill activities (courtesy of Vaughan Lewis)

Conclusions

Over the last decade river restoration in the UK has gradually become more high profile in terms of its ability to deliver both sustainable flood alleviation options and enhance biodiversity. Within a small intensively-development country such as the UK, both these issues need urgently to be addressed. Whilst research and development on restoration ideas is clearly strong and enthusiasm within the UK to enhance watercourses at the reach scale for a specific end use or interest is greater then ever, there is equally a limited understanding of the collective impact of these individual schemes when they operate within the same catchment. To date there has been a wariness to commit expertise and resources to evaluating these ideas on-the-ground as part of an integrated catchment approach. Only through such demonstration can scientific ideas be confidentially embraced by practitioners as sustainable ways forward. The RRC provides both a proactive starting point through the input of innovative ideas and equally importantly an end point by helping to disseminate the lesson learnt through such projects not only within the UK but to the wider river restoration community though its links with bodies such as the ECRR.

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