River Restoration NEWS

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NEWSLETTER of the RIVER RESTORATION CENTRE

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Community Catchment Management Guidelines

The River Euchar Catchment near Oban, Argyll

Understanding catchment wide issues can help identify river management needs. Promoting biodiversity actions in a way that encourages local communities to be proactive, is often overlooked.

Marina Curran-Colthart (local biodiversity officer) shows how appropiate guidelines can encourage community engagement.

Argyll and Bute Local Biodiversity Partnership have completed a set of Catchment Management Guidelines which were initiated through the Community Action for Biodiversity scheme as a demonstration project.

The guidelines are intended to be used as a tool to help in the development of local catchment management plans that will support a range of habitats and species identified in the Argyll & Bute Local Biodiversity Action Plan. These plans are seen as a way of focussing on the relationship between biodiversity and habitat management in a local area.

The guidelines are divided into two parts: part 1 is a general discussion of local catchment management planning in Argyll and Bute; part 2 is a case study of the catchment of the River Euchar. The Euchar was chosen because it is typical of the small to medium-sized catchments within Argyll and Bute.

In this project, catchment management planning looked at how water and land are

Golden-ringed dragonfly

INSIDE THIS ISSUE

Bookings now being taken for the RRC 2006 Conference, see p8 for details

For further information on the RRC please visit our website on:
www.theRRC.co.uk

managed by stakeholders within an area drained by a river system or series of systems. It is an approach that stems from the European Union's Water Framework Directive (WFD) and associated national legislation. The Partnership felt that the WFD provided a steer for agencies at a strategic level, but so far little was being done in terms of engaging with those people who live in and influence the quality of the land, freshwater and biodiversity in their catchment.

The Euchar case study

This example endeavours to integrate water-related management issues with the management of the land, through a process of consultation with all the catchments stakeholders. A set of proposals for actions to address these issues was developed. The approach was to consider general catchment issues and place them under one or more of the following seven broad headings, namely: water quality; river water management; fisheries management; habitats and species; farming; forestry and woodlands; and recreation, access and community.

The Euchar catchment is a rural area with a low population, a small number of hill farms and extensive areas of commercial forestry, and exhibits many of the management issues seen under similar conditions. Using the criteria above, the project was able to highlight the main management concerns.

- Water quality is high in this catchment, though there are still some low levels of pollution from a number of sources.
- River water management has occurred in the past with localised flood control measures, drainage of wetlands and abstraction of water from catchment headwaters.
- In common with other catchments there has been a significant drop in fish populations throughout the catchment.
- Our knowledge of habitats and species within the catchment is patchy, with much information readily available for some species whilst very little is known about others.
- Farming and forestry are the key activities in the catchment and management of both activities is in the process of becoming more focussed on environmental concerns.
- Recreation is low key, primarily fishing with some recreational walking.

ISSUE 4: HABITATS AND SPECIES

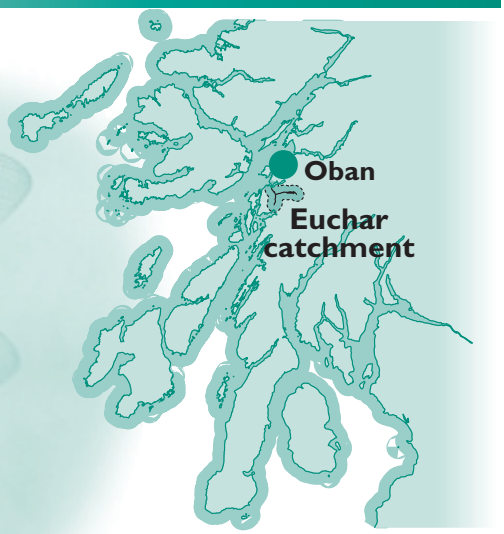
Knowledge of habitat and species distribution in the catchment is patchy and unco-ordinated. Lack of knowledge hinders optimal habitat management.

MANAGEMENT OBJECTIVE
Extend knowledge of species status and distribution throughout the catchment and develop habitat management plans to optimise habitat condition for key species.

No.	Action	By whom	Timescale
4.1	Co-ordinate existing knowledge of species on at least a catchment-wide basis.	SNH, LBAP, local species interest groups	Short
4.2	Conduct surveys to extend knowledge of key species where existing knowledge is slight or non-existent.	SNH, local species interest groups	Short/medium
4.3	Consider catchment-wide surveys of habitat condition for key species.	SNH, LBAP, local species interest groups	Medium
4.4	Maximise opportunities for wetland creation or enhancement.	SEERAD, FWAG, land managers	Ongoing
4.5	Encourage the take up of agri-environmental schemes that include farm-wide habitat surveys.	SEERAD, FWAG, A&BAF, SAC	Short/medium
4.6	Encourage the control of non-native plant regeneration through SFGS grants and agri-environmental schemes.	SEERAD, FCS	Short/medium
4.7	Continue the local programme of mink control.	Local volunteers, FWAG	Ongoing
4.8	Prioritise the harvesting of conifer stands in plantation forests and shelterbelts where the trees are suppressing the aquatic ecosystem and riparian habitat.	FCS, SEPA, local forest managers	Short/medium

Management objectives with several actions, linked to organisations who have responsibility for delivery, were clearly identified, as shown in the example output shown above.

The idea of this approach is to engage a number of organisations and promote local community involvement and key to its success is the clear, concise design of the guidelines.



Argyll & Bute, showing the location of the Euchar catchment

The Argyll & Bute Local Biodiversity Partnership have a strong emphasis on community engagement through a number of projects. The Euchar Catchment Management Guide will help promote biodiversity activity and encourage the local community to be proactive.

A copy of the Catchment Management Guidelines is available at: www.argyll-bute.gov.uk/biodiversity

For further information please contact Marina via email: Marina.Curran-Colthart@argyll-bute.gov.uk

Water vole

Sinderland Brook River and Floodplain Restoration

Post-construction geomorphological monitoring

Whilst the merits of post-project monitoring are now widely acknowledged, the opportunity to carry out detailed assessments remains limited. The following article highlights the findings of one such monitoring scheme.

The Sinderland Brook river and floodplain restoration project is located near Broadheath, Altrincham and was largely funded by the National Trust. The design concepts and background information on the scheme are detailed in a previous RRC newsletter (Issue 20, March 2005) that included details of all partners for the project. The scheme involved restoring 1.3 km of a previously channelised watercourse to a fully self-adjusting river with a new 30-60 m wide floodplain. It was completed in July 2005.

A baseline geomorphological survey was completed prior to re-connection and a further 4 surveys undertaken subsequently, between 16th June and 26th August 2005 as part of a MSc thesis at the University of Nottingham (Sally-Beth Kelday, 2005).

Key findings

One of the fundamental criteria of the project was to design a scheme where the river had room to adjust freely. Evidence of such adjustment was observed over the 3 month period immediately after project completion. Erosion and slumping was observed at several bend apexes particularly on the first upstream bend where 30 cm of bank erosion was recorded. The start of a cut-off formed at the second bend and sediment was being deposited on the designed point bars.

Another feature of the scheme was to replicate the size and shape of the gravels found in the floodplain during construction for placement in the riffles. The 9 riffles monitored in phase 1 largely remained in place. During the course of the survey period the rounded gravels (20-50 mm) moved around locally but the main structure of the riffles remained intact. Early indications on the riffles' stability have implications for other restoration projects. Gravels are often oversized and angular to ensure that the riffles do not move. The work undertaken on Sinderland Brook suggests that you can achieve more natural river dynamics through the incorporation of sediment of a more natural size and shape.

Macro-invertebrate monitoring (Charles Perfect, University of Stirling) and water quality monitoring (Karen Hughes, Mersey Basin Campaign/Manchester Metropolitan University) are now also being performed. Further geomorphological monitoring is also planned (Haycock Associates Limited).

For details of this monitoring, visit the RRC website: www.theRRC.co.uk/case_studies.php

Future appraisal work will be updated periodically on this site.

For general scheme information visit: www.haycock-associates.co.uk or contact the authors: Kevin Skinner at kskinner@haycock-associates.co.uk and Nick Haycock (Haycock Associates) or Sally-Beth Kelday (Jacobs Babtie) at sally.kelday@jacobs.com

(Photo left) Channelised course Phase 1 - July 2004

(Photo right) Restored course Phase 1 - Sept 2005

River Dulais Enh

Ben Wilson (Environment Agency Wales) and David Holland (Salix River & Wetland Services Ltd) discuss innovative bank protection techniques in mobile gravel bed rivers.

Project Overview

In January 2003, Environment Agency Wales (EAW) commenced a three-year project, entitled "Fishing Wales", developing angling tourism in rural Wales. This £5.2 million Objective 1 funded project was made possible through the Sustainable Fisheries Programme of the Welsh Assembly Government. In order to guarantee the sustainability of fish stocks in Wales, most of this project value was prioritised to address habitat restoration (£2.6m) and improvements to fish passage (£0.9m). Habitat restoration projects have mostly focused on overgrazing issues in the rural catchments of N and SW Wales, though work has also been undertaken to address forestry and water quality. The River Dulais, near Llandeilo is typical of many rivers locally, where unrestricted grazing, mostly by sheep, has resulted in a loss of bankside vegetation, reduced cover for fish, bank/bed instability and increased erosion. During the last three years EAW has worked with local landowners to fence off 4.9 km of the river. Some sections however, required extensive revetment in order to prevent further erosion before bankside vegetation could recover naturally.

EAW were keen to demonstrate that softer bioengineering methods could be used to control the extensive erosion, whilst maintaining geomorphological processes, and enhancing the physical habitat of the river. The aim of the demonstration was to show that bioengineering techniques can be used as an alternative to blockstone in mobile gravel bed rivers to control erosion whilst restoring physical habitat to degraded channels.

The River Dulais before and one year after completion of works

Project Objectives

- Stabilise reaches of highly mobile channels using diverse bioengineering/soft revetments.
- Enhance physical habitat structure.
- Allow subsequent natural channel readjustment (e.g. natural narrowing of over wide reaches and self cleansing of gravel bed).
- Demonstrate that soft engineering methods could be used to control erosion in mobile gravel bed rivers as direct alternatives to blockstone revetments.

After a reach scale geomorphological survey several bioengineering techniques were selected based on the local reach scale erosion process, water depth and stream power. For example, in reaches with slack bed gradients and therefore reduced stream power simple low cost techniques were used, such as bank grading and toe protection using live willow bundles (faggots/fascines). The entire reach was fenced to keep livestock off the banks. In order to maintain and

Typical bank erosion on the Dulais

ancement Project

enhance local biodiversity all living plant material was harvested from the Dulais catchment, this also reduced project costs significantly. In deeper areas, outer meander bends and in reaches with steeper bed gradients and therefore more erosive energy, more robust techniques were used. Whole upturned tree roots with 2 metres of trunk still attached were installed to act as physical revetments and also deflect flow away from eroding banks. In total some 40 large tree roots were installed in the deepest and most unstable reaches. All the trees used were willow (*Salix cinerea* and *fragilis*) and as such the tree roots and stems have started to generate new growth providing excellent habitat and cover.

All involved have been surprised by the rate of establishment of the bioengineering revetments and also the diverse range of bankside grasses and other species which have colonised around the tree roots. The extremely positive results on the Dulais demonstrate the use of such sustainable river management techniques. One year on and the reaches have diverse bankside cover, cleaner gravels with less fine sediment, early stages of tree cover and the channel geometry is much closer to adjacent stable reaches of river.

The ultimate aim of these schemes is to restore/enhance river habitat for the benefit of fish, primarily migratory salmonids. The EA is also keen to demonstrate the (cost) effectiveness of these works and as such is monitoring both fish populations (using fully quantitative electrofishing surveys) and habitat (HABSCORE) at these survey sites. Prior to commencement of the restoration work, three 50 m sites were monitored within the affected reach, and another three were surveyed upstream to act as controls. This baseline data will be followed with subsequent surveys in the spring/summer of 2006. Given the obvious improvements to in-river and bankside habitat, it is expected that these surveys will reveal an increase in fish populations at the site.

Summary of Techniques Used

Bed Gradient (m/m)	Average Bankfull Velocity (m/s)	Technique Used
0.011 – 0.014	2.1	Pre-planted Coir Rolls
0.015 – 0.018	2.5	Willow Faggots
0.019 – 0.022	2.95	Live Brush Packing
0.023 – 0.026	3.3	Rootwads & Brush Packing

Live willow tree roots (rootwads) during installation

Managing Gravel Rivers

Stuart Lane from the University of Durham, outlines how delivering a management plan on the River Wharfe, Yorkshire, could lead to a new approach to managing gravel-bed rivers.

Introduction

In the summer of 2000 I was asked to advise the Environment Agency on a river management problem, with a view to a river restoration scheme, in Wharfedale in the Yorkshire Dales National Park. This scheme fell within the remit of the Upper Wharfedale Best Practice Project. The problem was, on the surface, simple. A series of river management measures had been adopted in the 1980s to deal with the problems of coarse sediment aggradation (i.e. increase in stream gradient due to sediment deposition), which was linked to both bank erosion and frequent floodplain inundation. The solution involved a gravel trap. High rates of sediment delivery, coupled to changing legislation on gravel removal and an increased concern over the ecological impacts of emptying the trap, meant it had not been emptied for over 10 years. The 'Buckden Reach' had become controversial because of the perceived failure of past river management which seemed at odds with what the local community knew about how their river worked. The result of this was a community-centred, scientifically-informed river restoration scheme, with two components: a local-scale restoration of the gravel trap and the development of a long-term management plan to work out how to deal with the problem of high rates of gravel delivery. In this article, I explore how we delivered a gravel management plan.

The problem: an overview

When I became involved in the project, the Upper Wharfedale Best Practice Project had gone a considerable way to identifying the major river management problems in Wharfedale. These included: flood inundation on the meadow lands in the valley bottom; river bank erosion and loss of river-adjacent land; and the gravel trap described above. There was a general perception amongst the local community that these problems were getting worse. What could be causing this?

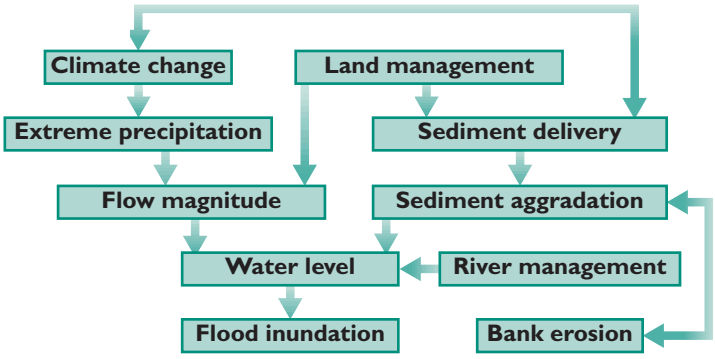


Figure 1. Possible explanations of worsening flood inundation and bank erosion in Upper Wharfedale

Possible explanations (see Figure 1) include:
(1) Climate is changing leading to wetter catchments and more extreme events, leading to higher peak flows, more flooding, and sediment delivery;
(2) Land management practices (e.g. moorland gripping) are delivering rain more quickly to rivers, causing more extreme flows;
(3) Land management causes more sediment to be delivered to the river, raises river bed levels, making water levels rise and worsening bank erosion;
(4) River management (e.g. bank protection) are making things better/worse; and…finally…
(5) Things are not actually getting worse, rather legislation is changing what we can and cannot do in rivers, which makes us think the problem is worse.
Our research project set out to answer these questions. This article, focuses on (3), (4) and (5).

Floods and sediment delivery

One of the most striking results of our research was the discovery that, for this system, the prime control on the flood inundation signal was not changes in peak flow magnitude but changes in river bed elevation. In relation to flood inundation, we found that the effects of river channel change may dwarf those of climate change in this case study site. Figure 2 shows our model of a flood that occurred on the 4th February 2004, which we used to show that our model was working correctly by comparison with measured inundation extent. We used the model to compare the effects of coarse sediment deposition with the effects of climate change upon flood characteristics. We found that only 16 months of deposition and channel change caused a similar increase in flooded area to projected climate change effects up to the 2050s. In this valley, at least, sediment delivery is the major issue.

Where does all the sediment come from?

Given the importance of the coarse sediment delivery problem in relation to flooding, we set out to find where it is all coming from. We put in sediment sensors to tell us when and where sediment moves and developed a model to show where the sediment is coming from, and checked this by surveying sediment sources in extreme rainfall events, as well as river response.

The forested area at the top of the catchment (Greenfield) was found to be producing no sediment and Oughtershaw was producing a little. However, most sediment was coming from where tributary gills were cutting down into old sediment deposits. This was shown in our model results and emphasises that high rates of sediment delivery to this river are due to the legacy of glacial deposits, formed over the last 20,000 years. The model also showed that we can expect

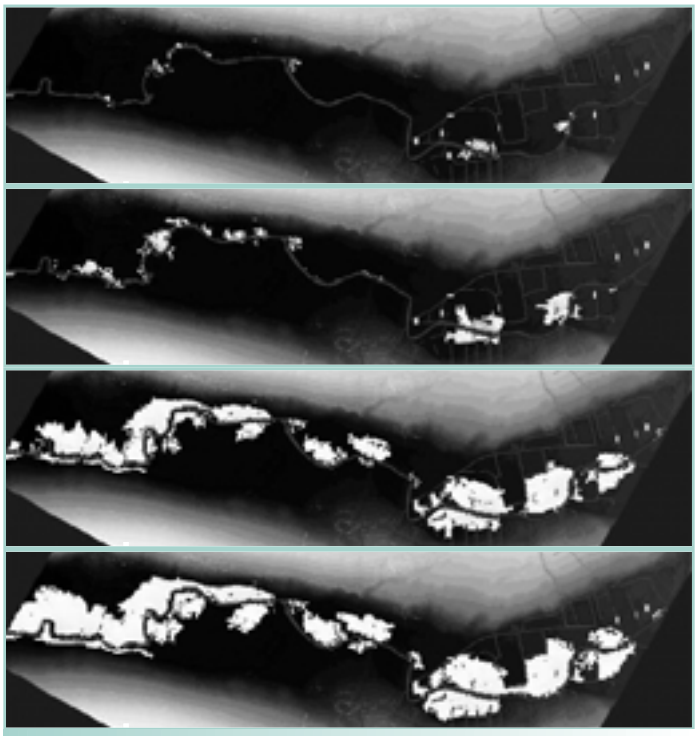


Figure 2. Predictions of flood inundation for the reach from Hubberholme (right) to Starbotton (left)

dramatically more sediment to be delivered per year under climate change scenarios for the 2050s and 2080s, expressed in Figure 3 as estimated annual average aggradation rates.

Rivers, management and gravel traps

So, what do we do about all this delivered sediment? Traditionally, we have tried to engineer the river to move the sediment downstream. Our sediment sensors showed that almost no sediment gets beyond Starbotton, largely due to the legacy of a major land slip in the 1600s, that effectively blocks the valley. This means that the reach between Hubberholme and Wharfedale is a bit like a sedimentary bath tub, slowly filling up. Engineering the river to move sediment downstream simply won't work. However, it also represents a problem. If a river is receiving sediment, it will adjust by eroding one bank (which puts fine sediment into the river) and depositing on the other (which puts coarse sediment into store). If we put in bank protection measures, the river can't erode any more, it can only deposit. It will fill up with sediment, causing bed levels to rise and more flooding. The gravel trap was designed to manage this, but our research

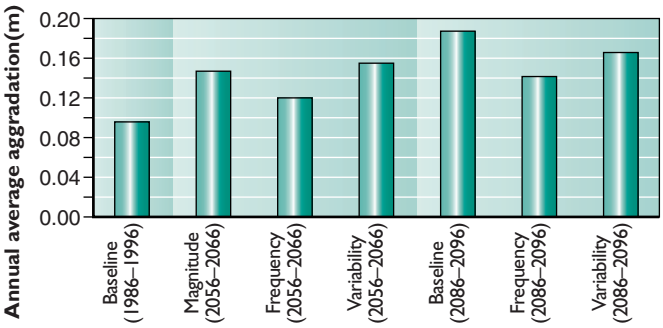


Figure 3. Future predictions of climate change impacts upon coarse sediment delivery rates

showed that it was not a sustainable gravel management solution. The replacement solution for the gravel trap itself can only be sustainable if the rate of sediment delivery can be reduced. So, research results suggest source control instead.

Looking towards the headwaters

Given that gravel traps don't appear to solve sediment delivery problems, what is the alternative? Our sediment model showed that most sediment came from a very small part of the catchment. We explored what happened if we simulated introducing native woodland to those areas. Trees introduce roots which makes the land surface more resistant to failure. They can also act as blockages to smaller and shallower failures. Our model showed that very restricted planting in tributary gills could reduce the sediment delivered per year by up to 85%. This is probably the most sustainable option for managing river gravels and opens up a fundamentally different approach to managing coarse sediment problems: reconceptualising river management at the catchment-scale and as a diffuse problem, and focusing on land management activities in the locations most likely to be coarse sediment sources.

A concluding reflection

Ultimately, this work implies that high rates of sediment delivery may probably be traced back to deforestation in the Dale, many centuries before present. This fits with the general idea that historical land management has sensitised our catchments to climate change and, at least in terms of managing sediment delivery, land management should be an integral part of catchment management in general and river restoration in particular. In this case, and from talking to the local community, the gravel problem has probably been with us for most of our living memory. Why did it become a problem? Much of the answer may well be nothing to do with the river, but related to the way in which society in the Dale and further afield has changed. This includes introducing new authorities (e.g. the Environment Agency) that give new responsibilities, new restrictions (e.g. on aggregate removal) and new priorities (e.g. protection of long distance footpaths, target species). All of this takes place on a canvas of a changing environment. Our results provide a scientific basis for managing problems of coarse sediment delivery through an analysis of possible sediment source areas upstream and along tributaries. We are currently testing the methodology in other catchments. In practice, how we deliver these new management practices remains a challenge at the interface of science and society, that will require coarse sediment to be seen as an integral component of catchment sensitive land management, in addition to the traditional emphases on nutrients like nitrogen and phosphorus.

For references, affiliations and an extended article visit: www.therrc.co.uk/references.php ('Reference' header) or email Stuart: s.n.lane@durham.ac.uk

News and Events

Conferences

EGU: General Assembly

Environmental Flow and River Restoration (HS19)
April 2nd–7th – Vienna, Austria

For more information visit
http://meetings.copernicus.org/egu2006/

FBA: Annual Scientific Meeting

Restoration and Recovery of Fresh Waters
July 18th–19th – University of Plymouth

For more information visit
http://www.fba.org.uk/pdf/ASM2006_FirstNotice.pdf

the RRC 7th ANNUAL NETWORK CONFERENCE

Heriot -Watt University, Edinburgh
26th & 27th (Site visit 28th) April, 2006

Ecological River Restoration: Combining Ecology and Engineering

We are now taking bookings for this year's RRC conference.

Included in the programme are:

- A wide range of presentations from home and abroad
- Representatives from SEPA will be outlining the new Controlled Activity Regulations.
- Workshops on how to apply river restoration to the challenge of meeting WFD requirements, SUDS as part of river restoration, learning from past projects, and managing partnerships.
- Site visit to the River Tummel: restoration of the river after years of engineered flood defence.

Residential Registration Fee: £250 members, £325 non-members (accommodation for the 26th included). Day rates also available. Accommodation is limited, so we suggest booking early.
A late booking fee will apply after the 31st of March.

Visit **www.theRRC.co.uk/conferences.htm** for the booking form and draft programme, alternatively contact the Centre.

Thanks to kind sponsorship from SEPA and WWF, small discretionary discounts are available to individuals, small NGOs, Charities and Trusts. Please contact the Centre to discuss.

CROCUS

(Channel Restoration in Contaminated Urban Settings)

The aim of CROCUS is to bring together social and physical science researchers and practitioners though a series of seminars over 2 years. The aim is to address the specific issues relating to urban river restoration schemes as part of urban regeneration programmes. For key findings of the first seminar visit: www.therrc.co.uk/case_studies.php

A New Staff Member for the RRC

The River Restoration Centre bids a sad farewell to our Centre Administrator, Judith Steele, who has been with us for just over 5 years, but moved on to new ventures in January. In her stead we would like to welcome Joanne Evason (left) to the RRC, to carry on the sterling work.

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

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

Environment Agency · ENGLISH NATURE · SEPA Scottish Environment Protection Agency · RIVERS Agency · SCOTTISH NATURAL HERITAGE