



River Restoration NEWS

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NEWSLETTER of the RIVER RESTORATION CENTRE

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Learning from Post-Project Appraisals of California Urban Stream Restoration Projects

Shannah Anderson, University of California, demonstrates new cost effective measures for addressing post-project appraisal.

In the United States, the number of restoration projects continues to grow annually. The Pacific coast has the largest number of projects and greatest investment overall¹. Yet despite the vast number of river restoration projects implemented in California since 1980 (over 4,000)², the effectiveness of the restoration investment has been largely unevaluated^{2, 3}.

Currently, there are few means for interested scientists and practitioners to gain insights from existing river restoration projects and to improve understanding of science and field practice issues that need to be considered within the design. Furthermore, access to relevant new scientific information as it emerges remains fragmented. The University of California at Berkeley is conducting 40 post-project appraisals of river restoration projects (PPAs) as part of the National River Restoration Science Synthesis (NRRSS). NRRSS is a national collaboration that aims to analyse the scientific

basis and success of stream river restoration projects to date, and disseminate lessons learned from the data to the greater restoration community.

A post-project appraisal is an evaluation of the effectiveness of restoration projects based on systematic data collection that responds to the following questions⁴:

- 1) Was the project built as designed?
- 2) Did it achieve its objectives?
- 3) Should steps be taken to address unanticipated effects?
- 4) How can we improve future restoration design?

Ideally, baseline surveys, design rationale, design drawings and post-project monitoring surveys are required to carry out PPA and analyse success criteria.



Lower Codornices Creek in urbanised Berkeley, California - a 300m reach restored from a concrete-lined ditch in 2004.

(Photograph taken from a kite by Cris Benton)

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Post Project Appraisal Surveys

Of the 40 PPAs in progress as part of the California NRRSS effort, more than half are focused on urban stream restoration projects. Over 130,000 km of streams and rivers in the United States are impaired by urbanisation⁵. Yet, urban waterways can still provide habitat for potentially diverse and productive species, provide materials and water conveyance, mitigate for the heat island effect of cities, and provide recreational and educational opportunities for citizens^{6, 7, 8, 9}.

Ten of the urban stream PPAs were, in part, conducted by the University of California at Berkeley (UCB) graduate students enrolled in the *Hydrology for Planners* (LA222) and *Restoration of Rivers and Streams* (LA227) courses in the Department of Landscape Architecture and Environmental Planning. Students were encouraged to adopt a potential restoration case study as their term project and were provided with field and logistical support for the studies by NRRSS staff.

All of the urban stream case studies researched by UCB graduate students were constructed in 2006 and earlier, (the majority in the

University of California at Berkeley graduate student testing water quality in a San Francisco Bay area urban stream

1990s), and ranged in length from 61-343m. None of the projects had success criteria (defined as measurable project objectives): only two projects had pre-project surveys, which made evaluation challenging. To fill in data gaps, all of the PPAs included interviews with relevant restoration designers or project managers, as well as cross-section and long-profile surveys and photo documentation. Depending on the objectives of the projects – top goals being bank stabilisation, channel reconfiguration, and stormwater management – students developed maps of channel features, surveyed vegetation cover or composition, interpreted historic aerial photographs and/or topographic maps, and analysed flow and/or water quality metrics.

Positive outcomes of the restoration projects documented in the PPAs included successful vegetation establishment, stable channel geometry, and an increase of site use by residents. Common issues with the projects include banks not as stable as desired by the designers or landowners, a lack of maintenance, and upstream constraints (like sediment supply and urban runoff).

For all of the PPAs, the premise is not to determine whether a given project has been a “success” or “failure”, but rather ask what lessons can we glean to inform future practice? Based on the preliminary results of the 10 urban PPAs, we have learned that most projects do not have comprehensive documentation and monitoring data, making appraisal a challenging process. Those projects that do have clearly defined proposals often have incompatible objectives (such as an improvement of habitat in conjunction with an increase in public access). Many of the projects did not consider site selection or objectives within the context of an altered watershed, neither were they informed by a watershed assessment or plan. More research is needed on urban stream channel geometry and flow regime to determine



Water quality, public safety, and long-term maintenance must be factored into urban stream restoration planning - trash accumulation is common

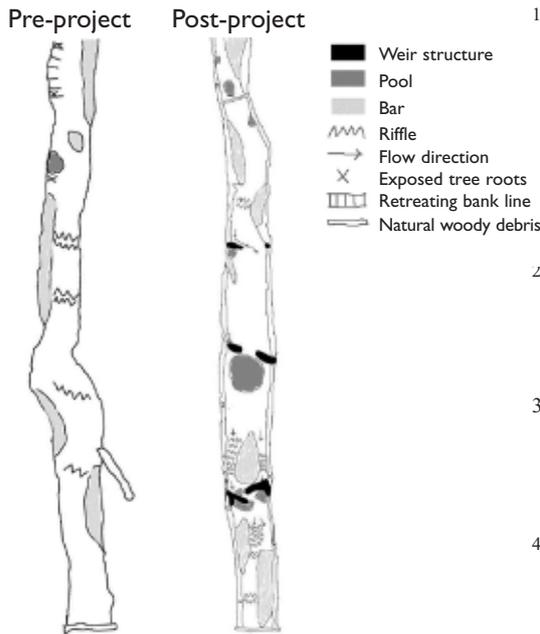
appropriate design features¹⁰. Finally, stakeholder involvement (and education) in the design process is crucial for project accountability as well as community support.

Data collection and storage

The urban stream restoration PPAs have become part of the University of California’s library collection (<http://repositories.cdlib.org/wrca/>). The student term projects constitute one of the largest collections of restoration-related studies currently available for any United States region, with over 80 post-project appraisals (many of which are multi-year studies of individual projects). As part of the greater NRRSS study, they will be compiled, reformatted for consistency, and where necessary, followed up with additional data collection/analysis. These 10 PPAs (and the broader scope of 40 being conducted as part of the NRRSS program) are not considered “full PPAs,” which would include and incorporate at least 10 years of post-project monitoring⁴.

The 40 PPAs will be submitted to the CALFED Bay-Delta Ecosystem Restoration Program, the largest single funder of restoration in California, with an investment of over \$500 million in restoration projects from 1996-2005. Results and analysis of post-project appraisals and further detail on the NRRSS will be updated on the River Restoration at Berkeley website: restoration.ced.berkeley.edu or <http://lib.berkeley.edu/WRCA/restoration/nrrss.html>.





Post-restoration features map, developed as part of a PPA, compared with pre-project map to determine changes in channel complexity

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For more information on the California NRRSS effort, contact Shannah Anderson at shannah@berkeley.edu

A date for your diary! RRC's Annual Network Conference 2008

Venue:

The RRC's 2008 Annual Conference will be held on 16th-18th April at Exeter University which has won a hospitality award for delivering service and business excellence and is situated within walking distance of the City Centre.

Ideas for next year's conference?

The feedback forms from this year's conference highlighted a number of topics which delegates felt could be included in the next programme. These included:

- *Restoration projects from inception to completion:* how best to implement projects and what are the new techniques.
- *Monitoring and project appraisal:* should we design for habitat improvement, should geomorphological processes come first, and where and what is the evidence for restoration success?
- *Social and economic indicators for river restoration:* do urban schemes improve well being factors and how do we encourage developers to embrace river restoration?
- *Climate change and river restoration:* do we need to adapt our approach to river restoration to take account of predicted changes in flow patterns?

The above list is not conclusive. If you have any other topics you would like to raise at next year's

conference or views on the mentioned suggestions then we want to hear from you.

Register your interest?

An official call for papers will follow later this year. However, if you already have an idea for a paper please feel free to contact the Centre to discuss in advance.

Thank you to our 2007 sponsors:

Sponsors this year included: **Alaska, Halcrow, Jacobs, Penny Anderson Associates and Salix.**

Their support is much appreciated, it enabled us to provide discounted places to students and individuals working for small NGOs, and some much needed welcome drinks at the conference dinner.

Invite to sponsor next year's event:

If you would like to sponsor next year's event please contact the Centre for further details and to find out how it would benefit you.

As always the main aim of this conference is to provide a forum where ideas can be discussed across disciplines and between those charged with implementing policy, designing schemes, carrying out on-the-ground work or assessing the results for habitat improvements, economic and social gain.

2007 RRC Ann

This year the RRC's Annual Network Conference was held in Chester. Janine Castro, the Program Coordinator for River Restoration Northwest, Portland, Oregon, USA, attended this meeting and kindly offered to write the following article which compares the aims of the two organisations and how we approach restoration projects.



(Figure 1) Janine Castro and Jenny Mant at Sinderland Brook during the RRC Conference site visit

The RRC and RRNW: Sister Organisations

River Restoration Northwest (RRNW) is a rather small non-profit making organisation in the Pacific Northwest (PNW) region of the US and Canada. Founded in 2001, the mission of RRNW is to improve the science and practice of river restoration through education, training, awareness, and professional exchange. Sound familiar? It is because of these similarities that the RRC and RRNW embarked on an exchange programme in the spring of 2007. Jenny Mant was invited to attend the RRNW's 6th Annual Stream Restoration Design Symposium in February 2007 (see *River Restoration News, Issue 26, March 2007*), and in return I was invited to attend the RRC Conference in April 2007 (Figure 1). The experience was extremely beneficial to both of our organisations because while we are doing many things well, there is always room for improvement...and just as importantly, the need for fresh ideas and new perspectives.

So what do the two organisations have in common? From my view, the respective purposes of the organisations are nearly identical. We both have annual meetings, membership, boards of directors, and maintain a member website. Both the RRC and RRNW annual meetings range in size from 200 to 350 delegates, and are predominately composed of restoration practitioners and those involved in the reviewing, permitting, and funding of restoration projects. However, even with all of the similarities, there are a variety of important differences as well. RRNW is a completely volunteer organisation, which at times hampers our ability to take on larger, long-term projects, but also means that the Board is composed of extremely dedicated, generous individuals. During our conference we have an entirely plenary session, while the RRC has intermittent parallel sessions and workshops. Our annual symposium is held at

the same location every year, in the beautiful Columbia Gorge, and we do not include field trips as a part of our programme, but we do offer a day of optional short courses just prior to the meeting. I see neither approach as being superior, as there are advantages and disadvantages to any format; however it is very helpful as a comparison tool to assist with the development of future meetings.

Projects for ecology and people

Moving beyond the structural functions of our sister organisations, it is also interesting to compare the types of projects that are undertaken in the Pacific Northwest (PNW) and the UK. To elucidate this point, I would like to compare a few of the projects mentioned at the RRC conference to some similar projects in the PNW.

(Figure 3) Chester Creek in Anchorage, Alaska (a) before development (pre 1960), (b) with (c) immediately following restoration (post 2000)



ual Conference

"Hydrogeomorphology and flood risk management in Ireland focusing on rock ramps as a sustainable solution" by Nathy Gilligan.

Many fish species in the PNW are considered either at threat or in danger of extinction. One of the primary limiting factors for their survival is fish passage at artificial structures, which often blocks their migration to historic spawning areas. The Irish example of constructing a rock ramp at an existing concrete structure to provide aquatic species passage is very similar to many aquatic passage projects in the States. It is at times necessary to leave concrete structures in place while addressing aquatic passage, which has led to the development of a similar rock ramp approach. When this design approach is used in smaller systems, it is generally referred to as a "roughened chute" (Figure 2). Our emphasis is slowly shifting from fish passage to aquatic species passage to address as many species and life history stages as possible. Past reliance on more traditional weir structures resulted in improved passage for some target species, but neglected our weaker swimming aquatic species, such as lamprey.

development (1960-2000),



"Appraising urban river restoration projects: the Quaggy River at Sutcliffe Park, Southeast London" by Geraldene Wharton.

The restoration scheme for the River Quaggy included liberation of the channel from the confines of a culvert and reconstruction of a meandering channel through a city park. Throughout the world, channelisation (including culverting) of streams in urbanised areas is ubiquitous. In Portland, Oregon, it is estimated that 20% of our smaller tributary streams are flowing through culverts in unidentified locations - we can't even find them! Hence, restoration of urbanised streams through 'daylighting' and reconstruction of meanders has become quite common in the States.

Imagine the great state of Alaska and you will probably not picture urbanised streams, but a recent project on Chester Creek in the city of Anchorage is very reminiscent of the River Quaggy. Chester Creek was channelised in 1960 to allow urban development within the city. Subsequently the land was identified for redevelopment. The focus of the redevelopment plan was the town centre, with Chester Creek viewed as an amenity rather than a liability. The aim was to create an interface between the community and the Creek. During the early phases of this project the stream was restored to its former nature, providing fish and wildlife habitat along with a linear park that bisects the future town centre (Figure 3).

(Figure 2) Undersized culvert replaced with bridge. Roughened chute constructed to stabilise channel grade and provide aquatic species passage



A learning process

It is clear from the similarities in our respective restoration projects that there is much we can learn from one another. Because of our geographic, historical, and cultural differences, we can offer each other new perspectives, different techniques, and modifications of existing technology, which can tremendously benefit both of our organisations, our members, and hopefully our river systems.

Restoration of river systems is a huge challenge facing all nations, and we have a responsibility as river restoration practitioners to share our knowledge and learn from others to improve our science and practice. And what better way than through collaboration of two closely aligned and dedicated organisations.

Acknowledgements:

I would like to thank the RRC, Jenny Mant, RRNW, Colin Thorne, Nick Clifford, and Alex Henshaw for funding and/or support during my visit to the RRC.

River Sediments and Habitats and the Impact of Capital Works and Maintenance

In the past channel maintenance and capital works schemes have been carried out with the objective of maintaining conveyance and providing land drainage. The impact of such works on habitats, either directly or indirectly by impacting on sediments, has received little attention. An EA/DEFRA R&D project on Sediments and Habitats is being carried out to investigate these issues. Valerie Bain from HR Wallingford reports on the aspirations for this project

Project aims

A view is held that if more were understood about the effects of maintenance activities on habitats and sediments then the objectives of maintaining conveyance and flood defence could be achieved with environmental benefit or reduced impacts on habitats and conservation.

Thus, the aim of this project is to improve our understanding of the interactions between sediments, habitats and conveyance as affected by maintenance operations and capital works. The primary task is to carry out field trials whose results can be interpreted to provide information on the self-regulatory nature of conveyance response, effective river management and new approaches to maintenance and channel design, including adaptive management for flood control. The project is addressing the objectives through a programme of data collection and analysis on different rivers. A monitoring programme at the sites is underway, collecting data on geomorphology, habitats, macrophytes, invertebrates, topography and river geometry.

The case studies

Five case study sites have been identified for data collection to enable an investigation of the river management issues highlighted above.

These include:

- a. The Long Eau, Lincolnshire** which is being used to assess the impact of different approaches to vegetation management on river sediments and habitats.
- b. The River Dearne, South Yorkshire** that demonstrates the impact of capital works and investigates the issue of self-regulation.
- c. The River Eden, Kent** that provides a good example of the temporal variations of recovery from periodic



River Eden, Kent

dredging over different reaches. Consideration is also being given as to whether dredging is required at all, as there appears to be little flood risk.

d. The River Harbourne, Devon which investigates the recovery of sediments and habitats following a capital works scheme and the success of the scheme in terms of whether it is self-regulating.

e. The River Kent, Cumbria where gravel accumulation and the incremental impact on flood risk through Kendal is the main concern to investigate.

Deliverables

Initial findings are demonstrating the importance of understanding how the different river types, represented by the case studies, respond to maintenance and capital works. Conclusions will be drawn from the analyses that will help river managers to achieve flood risk management as well as environmental and ecological objectives that are based on scientific evidence.

Final outputs from this three year project will be available after completion in March 2008.



River Harbourne, Devon



River Kent, Cumbria

For further information, please contact Roger Bettess: roger@hrwallingford.co.uk

Note: The project is led by HR Wallingford. The team comprises RRC, Nigel Holmes, Karen Fisher, Angela Walker, The University of Nottingham and Royal Haskoning

Floodplain Forest Milton Keynes New Beginnings

The combination of a large area of open land and the need to extract gravels has led to a rare opportunity for an aggregate company to join forces with the Milton Keynes Parks Trust (the land owners) with the vision of creating a new wet woodland landscape. Mike Street from the Trust gives us an insight into the aspirations of this project as the first phase of the on-the-ground work starts.



Why restore floodplain forest ?

Historical forest clearance, past agriculture practices, river realignment and dredging have virtually eliminated wet woodlands and their associated characteristically rich wildlife from Britain's floodplains. The combination of a perceived increase in flood events and current river and floodplain management methods to reduce flood risk, has led society to look for more sustainable management options that also enable new habitats to be created to mitigate for past damage and degradation.

Over the last decade river restoration schemes have sought to achieve this balance. Very few, however, include the floodplain which is a critical element of a watercourse's dynamics.

This is where the Parks Trust's project, in Milton Keynes, is different. It aims to deliver the

development of a topographically and ecologically diverse habitat mosaic 'floodplain forest' on a large area of the Great Ouse floodplain in the north of the city (*see map*).

The project vision and partnership

The Parks Trust manages 1800ha of parkland in Milton Keynes including a 50ha site alongside the River Great Ouse. This site provides ideal conditions for the creation of a variety of floodplain habitats.

A feasibility study showed that the removal of alluvial sands and gravels at the site by an aggregate company could provide the opportunity to restore a floodplain by changing the hydrological regime though lowering the level of the park and thus reconnecting it to the river. The vision is for multiple river channels and a topographically diverse landscape within which a mosaic of floodplain geomorphology and habitats (such

as wet woodland, fen, reedbed, wet grassland, marsh, carr, river shingles, earth cliffs, sand bars, debris dams, seasonal and permanent pools) will develop over time. Furthermore, the value of the gravel deposits has been estimated to be sufficient to fund the exercise and long-term site management.

And so the new creation of a 'Floodplain Forest Park' began. A partnership with Hanson Quarry Products (Europe) and the Parks Trust was formed and planning consent, the first for 'the creation of floodplain forest by means of mineral extraction' has been obtained. Work started on the project at the end of May 2007.

Project phases

Hanson will excavate the sand and gravels over a 7 to 8 year period. The extraction will be completed in phases. For each phase the new landform will be created by extracting the gravel, as shown on

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the plan, followed by the development of the woodland element (about 35% of the area) through planting and direct seeding of a patchwork of mixed tree stands, varied to suit the different soils and hydrology across the site (*see table*), interspersed with reedbeds, meadows, and fen-type vegetation and a complex of new streams.

Aspirations

When complete it is hoped that the project will provide a demonstration site of how the process of quarrying alluvial sands and gravels and subsequent site restoration can

Hydrological characteristics

Infrequent winter flooding

More winter flooding

Winter wet/summer dry

Frequently flooded, permanently wet

Trees & Scrub

Dominant species

Other

Ash, Oak, Field Maple

Aspen, Small-leaved Lime, Hazel, Hawthorn, Blackthorn

Ash, Oak, Field Maple

Alder, Downy Birch, White Willow, Crack Willow, Black Poplar

Alder, White Willow, Crack Willow

Ash, Grey Poplar, Black Poplar, Downy Birch, Goat Willow, Almond Willow

Black Poplars

White, Crack, Osier and Goat Willows and Sallow

be used positively to rectify the damage to floodplains and re-create some of their former natural features and functions and habitat richness and diversity. The restored site will be a unique park for Milton Keynes, with full access and interpretation which in

time should become a valuable educational resource.

*Further details from:
www.theparkstrust.com
or Mike Street
m.street@theparkstrust.com*

Conferences

Reintroduction of Atlantic salmon in rivers: a new approach

27th – 29th November 2007 - The Netherlands

For more information visit: www.iass.nl/

Courses

Urban Water Technology SUDS short courses

26th – 27th September 2007 – Dundee

For more information visit:

www.uwtc.tay.ac.uk/Site/SUDSshortcourse.htm

Launch of a Flood Alleviation Scheme in Lewisham

Tuesday 5th June, World Environment Day, marked the Environment Agency's official launch of the River Quaggy Flood Alleviation Scheme. The launch event, held in the newly-renovated Manor Park, Lewisham, celebrated the completion of the last phase of the £18M scheme. The event included presentations by key partners and Government representatives, unveiling of the new Manor Park sculpture and guided tours of the channel improvements and habitat enhancement measures between Weigall Road and Lewisham Town Centre. New flood defences and existing defences have been upgraded over this 3km stretch. Live music and a community event followed in the afternoon.

Other components of the scheme include:

- A conversion of flat parkland into a multifunctional Flood Storage Area at Sutcliffe Park with a maximum capacity of 85,000m³ (enough to fill 35 Olympic sized swimming pools).
- A second Flood Storage Area with a maximum capacity of 34,000m³ at Weigall Road.



The Environment Agency has worked with a number of partners on this project including Halcrow Group Limited, McAlpine, Breheny, London Borough of Greenwich, London Borough of Lewisham, Quaggy Waterways Action Group, Ferrier Residents Action Group, MENCAP, local schools and businesses.

For more information on the project contact: simonne.baker@environment-agency.gov.uk

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.

