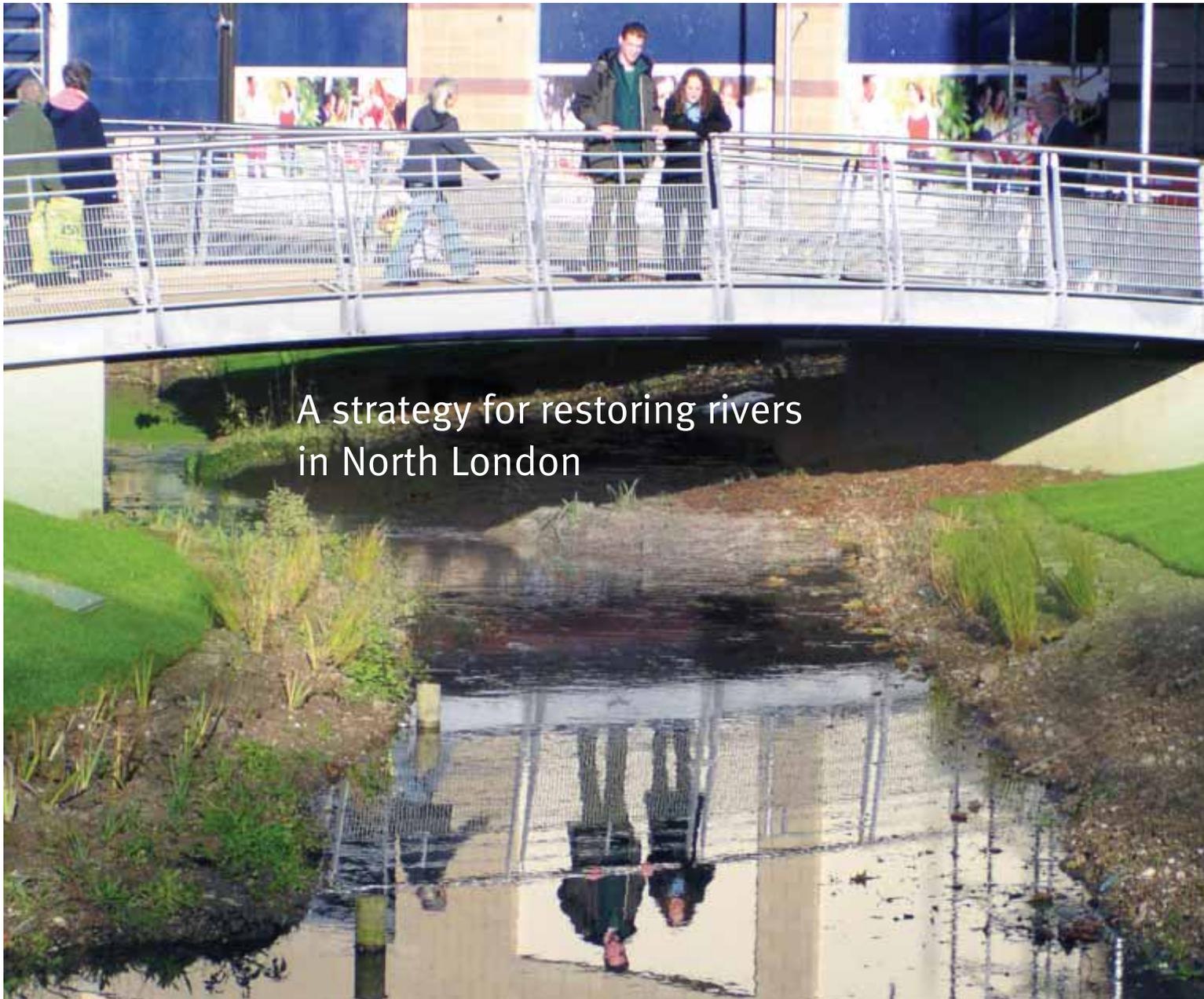


bringing your rivers back to life



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Published by:

Environment Agency
Rio House
Waterside Drive, Aztec West
Almondsbury, Bristol BS32 4UD
Tel: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

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1. Introduction

Gentle Brent – I used to know you
Wandering Wembley-wards at will,
Now what change your waters show you
In the meadowlands you fill!

(Extract from *Middlesex* by John Betjeman.)



River restoration can transform urban landscapes. All of London's urban rivers were once attractive wildlife havens that were rich in fish and other aquatic life. Over the centuries, many rivers have been degraded due to pollution and the impact of development – some are encased in concrete or even buried underground. River restoration offers an opportunity to return to a more sustainable approach to managing urban rivers. This is in keeping with the Mayor of London's vision for developing the capital as an exemplary, sustainable world city (Mayor of London, 2004).

The quality of our urban rivers should be used as an important yardstick in measuring our progress towards becoming a sustainable city. In many areas it is now possible to manage flood risk at the same time as restoring rivers back to a more natural form. The Environment Agency and its partners strongly believe that incorporating river restoration into regeneration schemes can promote a more environmentally sound approach to the development of sustainable communities.

This guide highlights locations in North London where specific reaches of river could benefit from restoration. Maps of the following river catchments are provided in Section 8:

1. Rivers Brent, Crane and Colne
2. Rivers Roding, Beam and Ingrebourne
3. River Lee and its tributaries.

We have marked areas of opportunity for river restoration on these maps and have indicated the type of restoration that may be needed. The maps are not designed to be prescriptive – they are simply a guide for those considering a river restoration project in North London.

Aims of this guide

The aims of this guide are to:

- Show the potential for river restoration in North London by identifying areas of immediate opportunity for individual river catchments.
- Highlight the environmental, social and economic benefits that can accompany river restoration.
- Promote the role that river restoration can play in sustainable urban regeneration.
- Develop the river restoration proposals in the *Mayor's Biodiversity Strategy* and *The London Plan*.
- Encourage and inform groups who already have an interest in river restoration.
- Explain the concept of river restoration and present the options that are available using a range of case studies.

The drive for urban regeneration and renewal is gathering pace and is now well supported by political commitment and financial assistance from the UK Government and the European Union. This is a real opportunity to realise a true urban renaissance. By returning our rivers to their rightful place, we can bring them back to the heart of our urban fabric and make a huge contribution to improving the quality of city life for people and wildlife.

Mayor's endorsement

Foreword from the Mayor of London

London is one of the greenest of world cities, and the Thames has improved dramatically in the past fifty years, following changes to sewage treatment in the last century. However, the condition of many of its tributary streams lags well behind. The engineers' solution to water quality and flood risk problems in the past was often to encase small rivers in concrete strait-jackets, or even bury them underground. Their value as a part of London's living landscape was lost for local communities.

Recent advances in flood risk management, based on greater use of soft landscaping, now enable some of

these rivers to be restored to their rightful form. My London Plan encourages such initiatives through policies on the Blue Ribbon Network. Some remarkable results have been achieved already, for example the River Brent at Tokyngton Park. Even in regeneration zones, there is scope to celebrate, rather than ignore, London's tributary streams.

Restored rivers can bring new life to parks and green spaces. Improved access to a living waterside brings many benefits for people. I welcome this strategy and hope it will inspire many fine projects across North London.

Ken Livingstone
Mayor of London

MAYOR OF LONDON

2. Rivers and urban areas

Urbanisation in Greater London has put great pressure on our rivers. As urban development moved into the flood plain, rivers were heavily modified to enable maximum use of the land. They were also altered to provide the flood protection that these developments required.

During the past two centuries, many of North London's rivers were channelised – a process that can include river straightening, damming, embanking, diverting, reprofiling and culverting. This was undertaken for a number of reasons, such as enhancing navigation routes or preventing floods. Ironically, this approach has had a negative effect, as rivers that have become disconnected from their original flood plains are no longer able to store the necessary volume of water during times of high flow. This has created an increased flood risk throughout the catchments of North London.

Channelisation also leads to a gradual loss and degradation of natural habitats. Rivers and natural riverbanks act as wildlife corridors, linking habitats and providing routes for animals and plants. When these corridors are lost, the wildlife in surrounding areas is also adversely affected.

Urban rivers can become sterile channels of little ecological or social value with high long-term maintenance costs. Some have become so degraded that they are treated as rubbish dumps. Others, including the Fleet, Tyburn and Effra, have been lost altogether as they have been pushed underground to become part of the city's sewerage system.

Helping our rivers to return to a more natural condition will provide a real opportunity for all of London's city dwellers to re-establish a lost relationship with the natural world.



Rivers and their contribution to city life

In urban areas, rivers have huge potential to provide a place for people to connect with nature. River restoration can transform uninteresting concrete channels into havens for people and wildlife.

As London's population is expected to rise over the next 15 years, access to good quality open space is likely to become an important issue. River restoration can play an important part in achieving this, particularly in areas that are lacking wildlife habitats. Helping our rivers to return to a more natural condition will provide a real opportunity for all of London's city dwellers to re-establish a lost relationship with the natural world.



Restoring rivers is the key

River restoration can play a positive role in urban regeneration by providing a wide range of social and environmental benefits, such as:

- Attractive, safe and accessible green spaces.
- A wide range of natural habitats and landscapes to benefit both wildlife and people.
- A sense of community and environmental awareness.
- Improved walking and cycling routes.
- A dynamic and invigorated area to help attract business and investment.
- A holistic approach to managing flood risk and improving water quality.

River restoration focuses on improving the quality and function of river environments by removing past structures and restoring a more natural channel form. In its most ambitious sense, river restoration can be used to re-connect rivers to their flood plains. This involves removing channel defences and reinstating lost natural features, such as pools, riffles, meanders and green corridors. River restoration can also create wetlands and flood-storage areas in the flood plain (an example of this is given in Case Study 1: River Brent Park Project).

If large-scale restoration is not possible, you may still carry out smaller-scale enhancements. This may include restoring banks using natural alternatives

River restoration focuses on improving the quality and function of river environments by removing past structures and restoring a more natural channel form.

to the existing hard engineering (an example of this is given in Case Study 3: Yeading Brook). This can be achieved by physically altering the profile of the bank, and using geotextiles to reduce erosion (see Case Study 5: River Wey and Case Study 6: Maidenhead Ditch).

In-stream modification can include reducing the channel's width and depth to create a more natural profile, reinstating natural gravels and installing deflectors (see Case Study 4: River Chess and Case Study 8: Wraysbury deflectors). It can also include planting in a deep channel using floating reed rafts (see Case Study 7: River Lee rafts).

On the tidal Thames, enhancement has been achieved by pulling back the original line of the flood defences (see Case Studies 2 and 9). The surrounding area can also be enhanced by planting native trees, shrubs and wild flower meadows.

3. The benefits of river restoration

River restoration schemes can provide numerous benefits to both people and wildlife.

Environmental benefits

Restoring the river's original form allows the natural processes of erosion and deposition which can sustain a rich variety of aquatic life.

Improving the river corridor

Given space, rivers meander across their flood plains to create rich and fertile meadows. Re-creating this lost link between the river channel, its corridor and flood plain allows rivers to be part of a living 'green network'. For example, deep-water refuge areas help to keep fish alive during high and low flows, or when the river is polluted. A healthy river corridor also allows plants and animals to move between different green spaces across the city.

Improving flood storage capacity

Defra's consultation document *Making Space for Water* (2004) emphasises the importance of restoring rivers to manage the risk of flooding (a risk that may be increased by future climate change). Reinstating flood plains provides a natural increase in the flood storage capacity of the whole river, which contributes to flood protection downstream. Slowing down the speed of water during flood events is also important as it reduces the risk of plants and animals being washed away.

Addressing water quality

The water quality of London's rivers used to be so bad that it was the primary reason why wildlife didn't flourish. It also discouraged people from using their rivers for recreation. Over the past 30 years, a lot of time and money has been spent on improving water

quality in urban rivers. Approaches to this have included:

- Promoting sustainable urban drainage systems in new developments.
- Creating green river corridors and buffer zones through urban centres.
- Promoting less-intensive agricultural practices.
- Prosecuting polluters.
- Improving sewage treatment works.

Water quality can still be a major factor in determining the long-term success of a restoration scheme and needs to be tackled at a catchment scale. The European Commission's Water Framework Directive seeks to address this issue at source. The directive states that members should 'protect, enhance and restore all bodies of surface water...with the aim of achieving good surface water status'. The directive also seeks to identify and prioritise 'heavily modified waterbodies' that are in need of enhancement.





Social benefits

Re-establishing natural channel processes

Local communities can benefit from river restoration schemes, especially if they are actively involved in the project from its outset. One of the aims of *The Mayor's Biodiversity Strategy* is that all Londoners should have access to a quality natural place. River restoration certainly offers London's boroughs a chance to create many attractive, accessible, and quality natural areas along river corridors.

Improving wellbeing

Having an attractive and safe place to get away from traffic can encourage people to start exercising more and spend more time outside. For example, when the River Quaggy was restored at Sutcliffe Park in South-East London, visits to the park increased by 73% (see *River Restoration: A stepping stone to urban regeneration*, Environment Agency, 2002).

Balancing community access and the needs of wildlife

River restoration provides spaces for walking, jogging, cycling, playing, picnicking, feeding the ducks and generally connecting with nature. Children love these areas because they provide new and exciting natural environments to explore.

It must be remembered that we need to maintain a balance between allowing access to wildlife and protecting sensitive or uncommon species. It is therefore necessary to preserve sheltered areas that can serve as nesting habitat and refuges for wildlife.

Providing sustainable transport

River corridors connect the countryside beyond London and the inner city, eventually linking to the River Thames. They are therefore ideally placed to provide sustainable transport routes, including footpaths and cycleways, to help people get around safely. A network of green spaces linked by river corridors in East London is promoted through the Green Grid Strategy.

Educating the community

The improved natural environment and its wildlife can provide valuable opportunities for formal and informal learning, helping develop people's appreciation of their local environment and raising their awareness of environmental issues. Signs alongside rivers can provide information about the site and local schools can visit the area on field trips.

Economic benefits

Generating sustainable development and attracting business

Sustainable riverside development has become an integral part of many urban regeneration schemes.

As more people visit a restored river, it begins to provide a focal point for local people. This can then lead to local economic development as businesses are drawn towards the more attractive and newly invigorated environments. The report *Does Money Grow on Trees* (Cabe Space, 2005) states that property values can increase by up to 34% for new developments that have access to parks or green space.

4. The driving forces behind river restoration in London

There are a variety of political drivers that are designed to support Government policy and European Union legislation.

These drivers ensure that there is money to support initiatives that will directly improve the quality of life for local communities and improve the environment.

The following section examines a few of the policy drivers behind river restoration and also looks at the ‘master planning’ process as a means of achieving river restoration. We also consider the Olympic Games site as a good example of master planning.

The London Plan

The London Plan establishes land use planning policies for London for the next 20 years. Its key policies are aimed at achieving sustainable regeneration and

improving people’s quality of life. It also includes policies that aim to protect and improve London’s rivers and other stretches of open water that comprise the Blue Ribbon Network.

The plan identifies a series of areas for ‘regeneration’ and ‘opportunity’, some of which may be suitable locations for river restoration. Areas for regeneration are the areas of greatest social and economic need. They include much of Tower Hamlets, Hackney, and Newham, eastern parts of Haringey and Enfield and smaller areas in several other boroughs. Areas for opportunity are areas that are expected to accommodate large-scale, mixed-use development. The following table lists areas of opportunity in London.

Opportunity areas	Relevant water spaces
Barking Reach	River Thames and its tributaries
Dagenham Riverside	River Thames and its tributaries
Cricklewood/Brent Cross	River Brent
Hayes/West Drayton	Grand Union Canal, Hayes Bypass Channel and Yeading Brook
Heathrow/Feltham/Bedfont Lakes	River Crane, River Colne, Longford River and Duke of Northumberlands River
Kings Cross	Regents Canal
Ilford	River Roding
Isle of Dogs	Docks, River Thames
Lower Lee Valley	Bow Back Rivers, River Lee and its tributaries
Paddington	Grand Union Canal
Park Royal	Grand Union Canal and River Brent
Royal Docks	Docks, River Thames
Stratford	Bow Back Rivers, River Lee and its tributaries
Tottenham Hale	River Lee, Pymmes Brook and Moselle Brook
Upper Lee Valley	River Lee and its tributaries
Wembley	Wealdstone Brook and River Brent
Areas for intensification	
Beckton	River Thames, River Roding
Haringey Heartlands	Moselle Brook, Lee Navigation, Lee New Cut and Pymmes Brook

Other support for river restoration

Several national and regional policy drivers support river restoration. The most relevant of these are summarised below.

Habitats Directive (Article 10)

This directive requires the management of 'features of the landscape, which are of major importance for wild flora and fauna'. The directive places emphasis on linear features such as rivers.

Creating Sustainable Communities: Greening the Gateway

This sets out the core principles that the Government believes should be adopted when planning green spaces in the Thames Gateway.

Defra High Level Target 4

This requires flood defence operating authorities to:

- Avoid environmental damage.
- Ensure no net loss to habitats that are covered by Biodiversity Action Plans.
- Seek opportunities for environmental enhancement when carrying out flood risk management work.

Mayor's Biodiversity Strategy

This strategy aims to improve the biodiversity value of the Blue Ribbon Network. It emphasises access to nature, so that all Londoners are within easy walking distance of a quality natural green space. River restoration is seen as a significant step in this direction.

Planning Policy Statement 9: Biodiversity and Geological Conservation

This statement provides guidance on nature conservation policy. It recognises the value of healthy functioning ecosystems and suggests that local authorities should prioritise areas for restoration of habitats in their Local Development Frameworks.

Regional Planning Guidance 9a: Thames Gateway Planning Framework

This is the Government's framework for economic, social and environmental regeneration in the east Thames area. It advocates the Green Grid approach, with open spaces linked by river corridors. It also encourages people to live, work and play along the waterfront.

UK Biodiversity Action Plan

This is the over-arching Biodiversity Plan for the whole country. The Environment Agency also has its own *Biodiversity Strategy and Action Plan* for the Thames Region (Environment Agency, 2000), which includes 39 species and five habitat action plans. The London Biodiversity Action Plan has a habitat action plan

specifically for rivers and streams, which will promote enhancements to London's rivers.

Water Framework Directive

This directive introduces an integrated approach to water management through the development of river basin management plans. It requires the enhancement of heavily modified waterbodies. This is especially important in London – a city in which the majority of waterbodies have been modified.

Master planning

Master planning is a process that enables large areas being considered for new development to be examined at a strategic level. We recommend that river restoration opportunities are included at the master planning stage as this ensures that new developments are designed to fit with the river environment.

The Olympic Games – a successful master plan

In 2012, London will host the Olympic and Paralympic Games. The events will be based in and around the Bow Backs river system (west of Stratford). The area is crossed by many rivers and canal navigations including the River Lee Navigation, Waterworks River, Prescott Channel, Three Mills Wall River, Channelsea River, City Mill River, Pudding Mill River, Old River Lea and Bow Back River. All of these rivers have been turned into urbanised channels and have been neglected for years, offering little value for people or wildlife.

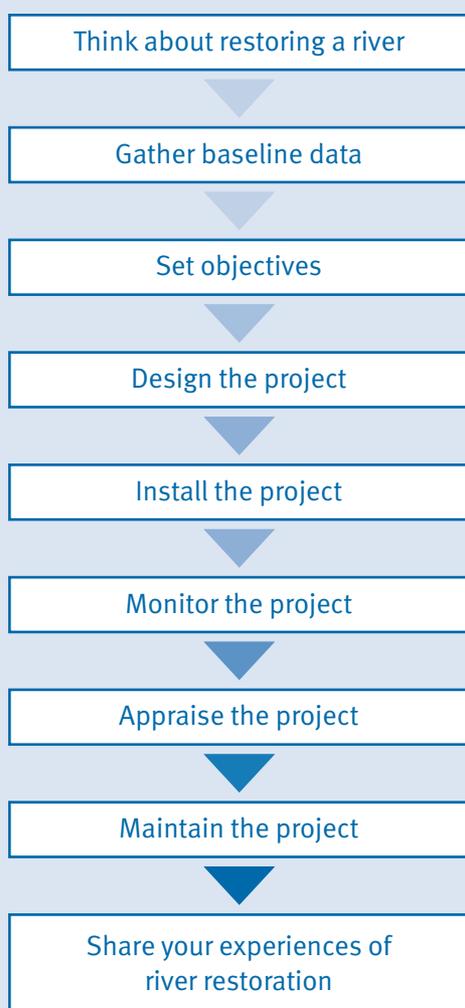
The outline plan for the Olympic and Paralympic Games is to transform many of these degraded river channels into more natural water courses. These proposals could become a world-class example of urban river restoration. The Environment Agency fully supports these proposals and seeks to repeat this example in other areas across North London.



5. How to get started

This guide highlights opportunities for river restoration across North London. It doesn't go into detail about the design and implementation of the project as river restoration is a complex process. However, this section will provide some pointers on how to get started.

The stages of a river restoration project:



Source: Adapted from Skinner, K.S. and Bruce-Burgess, L. (2005)

A good place to start is to look at the case studies in Section 8 of this guide, which look at the techniques that could be used on a range of different scales.

Ideally, local authorities should explore restoration opportunities across the river catchments that fall under their jurisdiction. There is scope, however, for detailed assessment of specific reaches.

Preliminary considerations

- Select a site that provides the greatest environmental and social benefits.
- Undertake a desk study to identify problems and opportunities.
- Clearly define the problem(s) to be tackled during restoration, e.g. poor river structure, landscape degradation, lack of wildlife habitat or pollution.
- Once the problems have been clearly defined then restoration goals and visions can be developed.
- Identify any constraints and opportunities that will determine the scope of the project.

Establish a management team

- Identify key players, and create a multidisciplinary project team. Include a Project Executive, Project Manager, specialists (e.g. engineers, hydrologists, ecologists, geomorphologists, landscape architects), fund-raisers, and public relations representatives.
- Identify partners who can help to deliver the project – Government agencies, voluntary bodies, community groups, for example.

Study your site

- Carry out a pre-feasibility study to identify the purpose and scope of the project. This study should



include information on the habitat, soils, local geology, geomorphology, flood risk areas and designated wildlife sites, as well as social issues such as public access and extent of river use.

- Collect data to provide a good record of the site's pre-project physical and ecological character.
- Identify your aims and objectives, both for the river and the surrounding area.
- Work out rough costs.
- Identify possible sources of funding and support.
- Establish a timetable for each stage of the project.

Design the project

- Carry out a full feasibility study to explore a range of options and to identify the preferred way forward. The project will need to be cost effective and will need to meet its short- and long-term objectives without adverse effects. The project should be designed with input from a multi-disciplinary team. The input of landscape architects, geomorphologists and ecologists is essential when developing a successful, sustainable project. This approach was key to the success of the River Brent and Sutcliffe Park projects.
- Consider whether the site supports important plants and animals.
- Consider river processes – such as erosion and deposition – and the re-creation of lost features.
- Write a brief for engineers, with drawings.
- Incorporate a long-term sustainable management plan for the wider area around the river.
- Obtain necessary legal consents from the landowner, Environment Agency (Land Drainage Consent required), local authorities and English Nature.
- Public involvement throughout the project is

essential. Planning for Real[®] is a useful process for community consultation. For more information, visit: www.nifonline.org.uk

Installing the project

- Select contractors with experience of river restoration work.
- A member of the project team should be on site during construction to make sure everything is correctly installed.



Appraise and maintain the project

- Once complete the project should be appraised to see how successful it is.
- The site will need to be monitored during, immediately after and on a long-term basis.
- Implement a long-term maintenance plan for the site that is sensitive to breeding and spawning seasons.
- Adapt the project if necessary and address any problems.
- Let other people know about the project's successes and problems, so that other teams can learn from your experience.

See Appendix A for more details on the key stages of the project.

6. Where to find funding

This section describes a few of the major sources of funding at the time of writing (February 2006).

Many funding streams support integrated initiatives that look at both social and environmental concerns. River restoration schemes are well placed to exploit these funds because of their ability to deliver a wide range of social, environmental and economic benefits.

The key to getting funding is to emphasise the objectives of the project that match the criteria for each funding stream. The three main sources of funding include the National Lottery, UK Government and European Government.



The key to getting funding is to emphasise the objectives of the project that match the criteria for each funding stream.

National Lottery

The funds appropriate for river restoration are:

Heritage Lottery Fund

This fund aims to safeguard, enhance and give wider public access to natural habitats.
Visit: www.lotterygoodcauses.org.uk/

The Big Lottery Fund

The recently launched Big Lottery Fund is currently developing its funding programme. The fund's overarching goal is to promote quality of life, particularly for those most in need. It will support projects that improve urban and rural environments, with further funding streams to improve urban parks and to involve communities in their local environment.
Visit: www.biglotteryfund.org.uk

Awards For All

This lottery grants programme offers small-scale grants aimed at local communities.
Visit: www.awardsforall.org.uk

UK Government funding

The primary focus of Government funds in London is to support urban regeneration and renewal. Examples of such grants are:

Neighbourhood Renewal Fund

This fund aims to enable England's most deprived authorities to improve their services.
Visit: www.neighbourhood.gov.uk



Landfill Tax Credit Scheme

This scheme offers landfill operators a 90-per-cent tax credit, which is then used to fund various schemes. At the time of writing (February 2006), £500,000 is available for London over the next three years under one scheme, the SITA trust.

Visit: www.ltcs.org.uk and www.sitatrust.org.uk

Single Regeneration Budget

This fund provides resources to support regeneration initiatives in England that are carried out by local regeneration partnerships. Visit: www.odpm.gov.uk

The Community Fund

This organisation aims to improve the physical or social environment of disadvantaged or low-income communities. Visit: www.community-fund.org.uk

Natural Environment Research Council Connect B Grants

Connect B grants are available for research applications if a public sector partner has agreed to commit half of the funds. Visit: www.nerc.ac.uk

European Government funding

There may be some European funding for environmental projects that demonstrate good practice and innovative thinking. River restoration projects can be supported in this way. The process of developing a European application is complex and time consuming, so you may want to liaise with local authority funding specialists or the Government Office for London.

The three most appropriate funds are listed below. For more information on them, visit: www.europa.eu.int/index_en.htm

Interreg

Interreg promotes regional development amongst European Union member states. Projects must be carried out in association with one or more partners from another member state in north-western Europe and the project must have trans-national goals.

Fifth Framework

This framework supports research and technological development. The following themes may be appropriate for river restoration:

- Quality of life and management of living resources.
- Competitive and sustainable growth.
- Energy, environment and sustainable development.

LIFE

The LIFE programme has two themes that are relevant to river restoration in the UK:

- LIFE Environment promotes sustainable development.
- LIFE Nature protects endangered species and habitats, especially if they are also protected by legislation or are important to the community.

Appendix B provides further references, websites and contacts that may help you get started.

7. Case studies



The following nine case studies show the many benefits of river restoration across a range of scales.



The River Brent Park Project Wembley, North West London

History

In order to provide environmental, flood risk and recreational benefits, this degraded river channel was restored as part of a joint initiative between the London Borough of Brent and the Environment Agency.

Phase 1 of this project was initiated in 1999 and completed in 2003. Phase 2 will commence once funding has been secured.

Cost

Phase 1 cost £1.5 million.

Partners

London Borough of Brent, Environment Agency, London Waterways Partnership, London Development Agency, European Regional Development Fund, the local community.

Length

2km (Phases 1 and 2)



The river in 1999, before work began

Why?

- After the war, the river was channelised and placed in a U-shaped concrete channel with no in-channel features and no connection to its flood plain.
- The river had no wildlife.
- The river was prone to flash floods.
- The river was fenced off from the public.



Backwater channel created, 2003

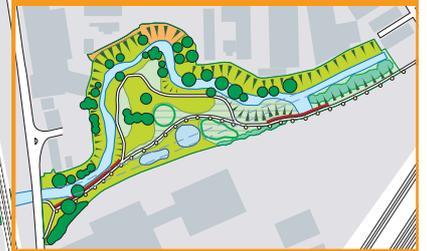
Phase 1 1999 – 2003



Original line of river channel

Phase 2 to start soon

Phase 1 1999 – 2003



River Brent Park Project

Process

Following the formation of a partnership group and a Planning for Real[®] exercise, a masterplan was developed for the whole park. A decision was made to restore the river through the park to provide an improved environment for wildlife and people.

Phase 1 restored two sections of this river by re-meandering the straightened channel along its original route, creating a backwater channel and naturalising the river's banks.

Phase 2 will link up with the earlier restoration work to enhance the entire park.

The project involved a multi-disciplinary input from geomorphologists, ecologists, hydrologists, landscape architects and engineers.



Restored river channel, 2005



During construction, 2003

Benefits

- The original channel line has been restored, along with in-channel features such as pools and riffles. This has created sustainable habitats.
- Restoring the river's structure has improved the diversity of plants and animals.
- The existing level of flood protection is maintained using soft-engineering techniques that can also withstand erosion.
- Green space provided through the installation of new paths and play areas for children.
- Post-project appraisals continue to assess the project's success.

2 River Thames London Yard, Isle of Dogs, London

Partners

Private developer, London Borough of Tower Hamlets (Planning Authority).

Length

Approx 150m

History

As part of a planning application for a new block of riverside apartments, the developer was asked to consider setting the new development back from the river. This was to provide the same level of flood protection whilst re-creating lost habitats.

Process

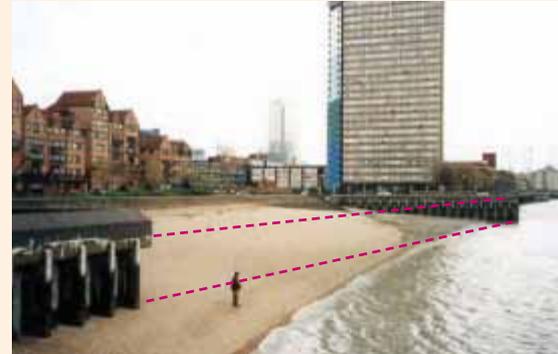
Planning application, external consultation, Land Drainage Consent.

Why?

- The development could affect flood defences.
- The river would have lost its connection with the flood plain.
- There would be very little value for wildlife.
- The river would be isolated from the local community.

Benefits

- Flood defences maintained and set back 15m.
- Beach and inter-tidal habitat created.
- Concrete steps provided to allow access to beach.
- Habitats re-created for birds, invertebrates and fish.



Line of previous defence

- The local community can use the improved space for recreation.
- It is a good example of how private developers, the local authority and other organisations can work together.

3 Yeading Brook Ruislip, London

Partners

Private developer, London Borough of Hillingdon (Planning Authority).

Length

Approx 40m

History

As part of a planning application to re-develop a car showroom, the developer was asked to consider setting the new development back from the river.

Process

Planning application, external consultation, Land Drainage Consent.

Why?

- The river had lost its connection with the flood plain.
- There was little value for wildlife.
- The river was isolated from the local community.



An unappealing drain, 2004

Benefits

- An improved landscape.
- Flood defences are maintained.
- A natural river bank is re-created.



An emerging river, 2005

- Vegetated buffer zone created.
- Native species planted.
- Habitats created for birds, mammals and invertebrates.
- A higher quality environment created for showroom employees and customers.
- A good example to encourage other local developers to undertake river enhancements.

4 River Chess Chesham, Buckinghamshire

Partners

Private owner, Chesham District Council (Planning Authority) and the Environment Agency.

Length

Approx 500m

Cost

£170,000

History

The River Chess, part of the Colne catchment, is a chalk stream, which has been modified to support its use by mills. Chalk streams are important due to their ecological value. However, they have come under threat from human impacts. The national Biodiversity Action Plan seeks to promote activities to restore these streams. This project was part of a catchment-wide scheme to restore sections of river in the Colne catchment.

Why?

- The river was over-widened and over-deepened, resulting in deep silted water with very slack flow.
- There was a loss of wildlife typically associated with chalk streams.
- A large weir blocked fish migration.

Process

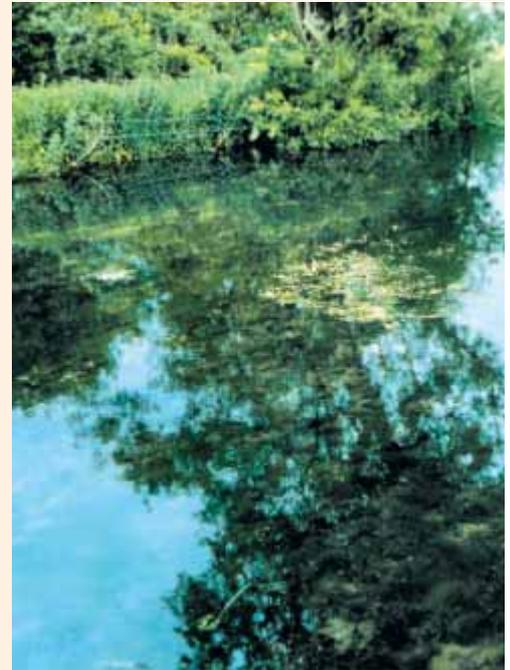
- The channel was narrowed from 15m to 2m.
- The river was regraded from 1:1000 to 1:700.
- Imported gravel was used to restore the river bed, which was narrowed from 2m to approximately 0.3m.
- The large weir was replaced with a fish pass.
- The chalk stream environment was restored, targeting water-crowfoot and water starwort

- Post-project appraisals were undertaken in 1998 and 1999.

Benefits

- Restoration of a nationally important habitat.
- Restored habitat for brown trout population.
- Provides a flood defence benefit.
- Improved recreational benefits.

This project was part of a catchment-wide scheme to restore sections of river in the Colne catchment.



Over-widened river channel (pre-project)



River channel narrowed using faggots (post-project, 1994)

5 River Wey Elstead, Surrey

The eroded river cliff was stabilised using a geotextile membrane to anchor the soil. A vertical 'living wall' was created, which maintained biodiversity whilst being structurally sound.

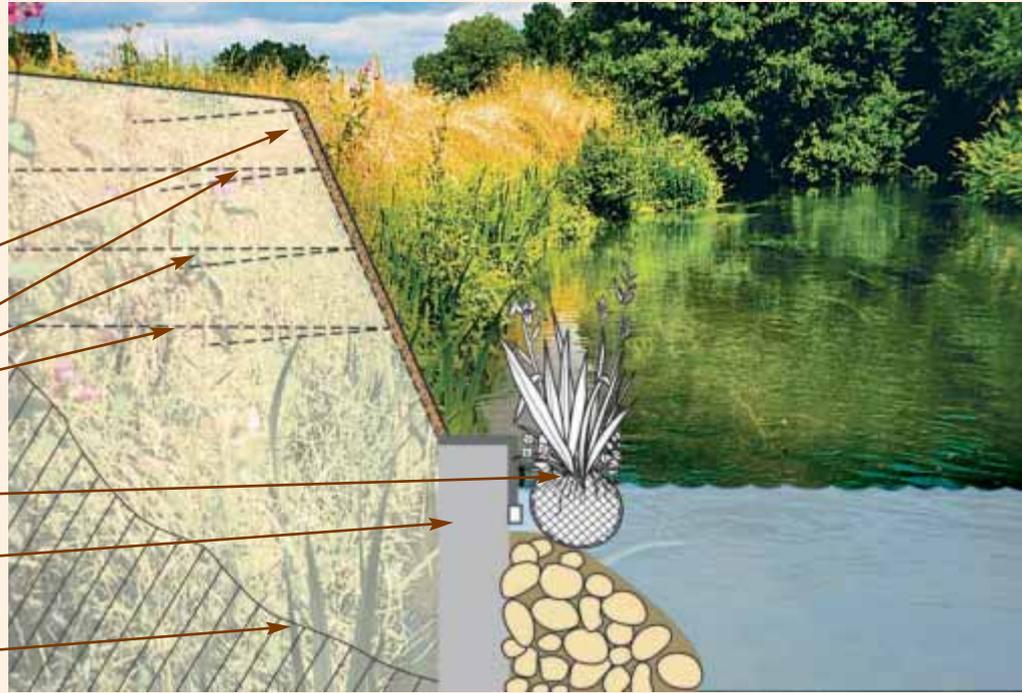
Turf facing installed behind geotextile

Geotextile geogrid used to anchor soil

Planted fibre roll

Sheet piles end at mean water level

Eroded bank



6 Maidenhead Ditch Maidenhead, Berkshire

A steep river bank was stabilised and enhanced by using bio-engineering techniques rather than sheet piles. This maintained biodiversity and prevented bank erosion.

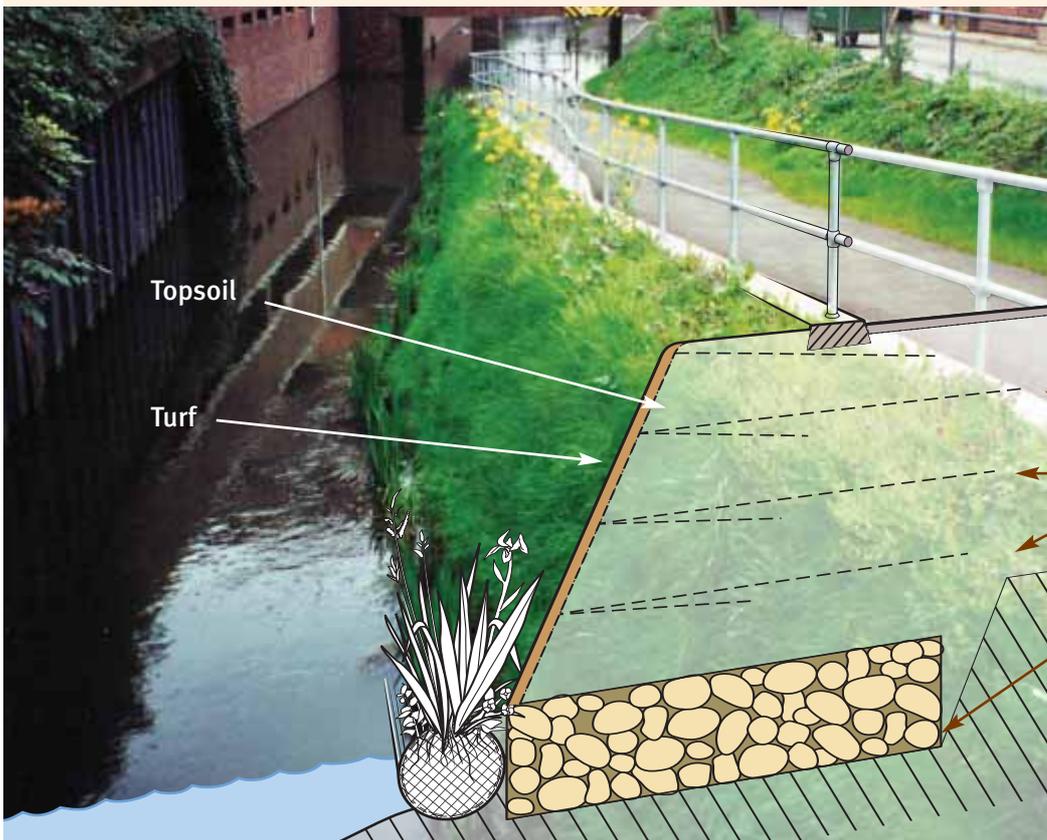
Topsoil

Turf

Footpath

Geotextile membrane to anchor soil

Gabion baskets



7 River Lee rafts

Fish refuges, Enfield lock, Enfield

Floating reed rafts were installed along 1km of the River Lee. These disguised sheet piles and provided spawning and refuge areas for fish. They also provide a habitat for nesting birds.



Fish refuges

8 Wraysbury deflectors

Skyway estate, Wraysbury

Stone deflectors were used to narrow an over-widened, slow-flowing river. This encourages the natural build-up of silts to create a faster flowing, more diverse river.



Location of deflectors

9 River Thames Millennium Terraces

Greenwich Peninsular, South East London

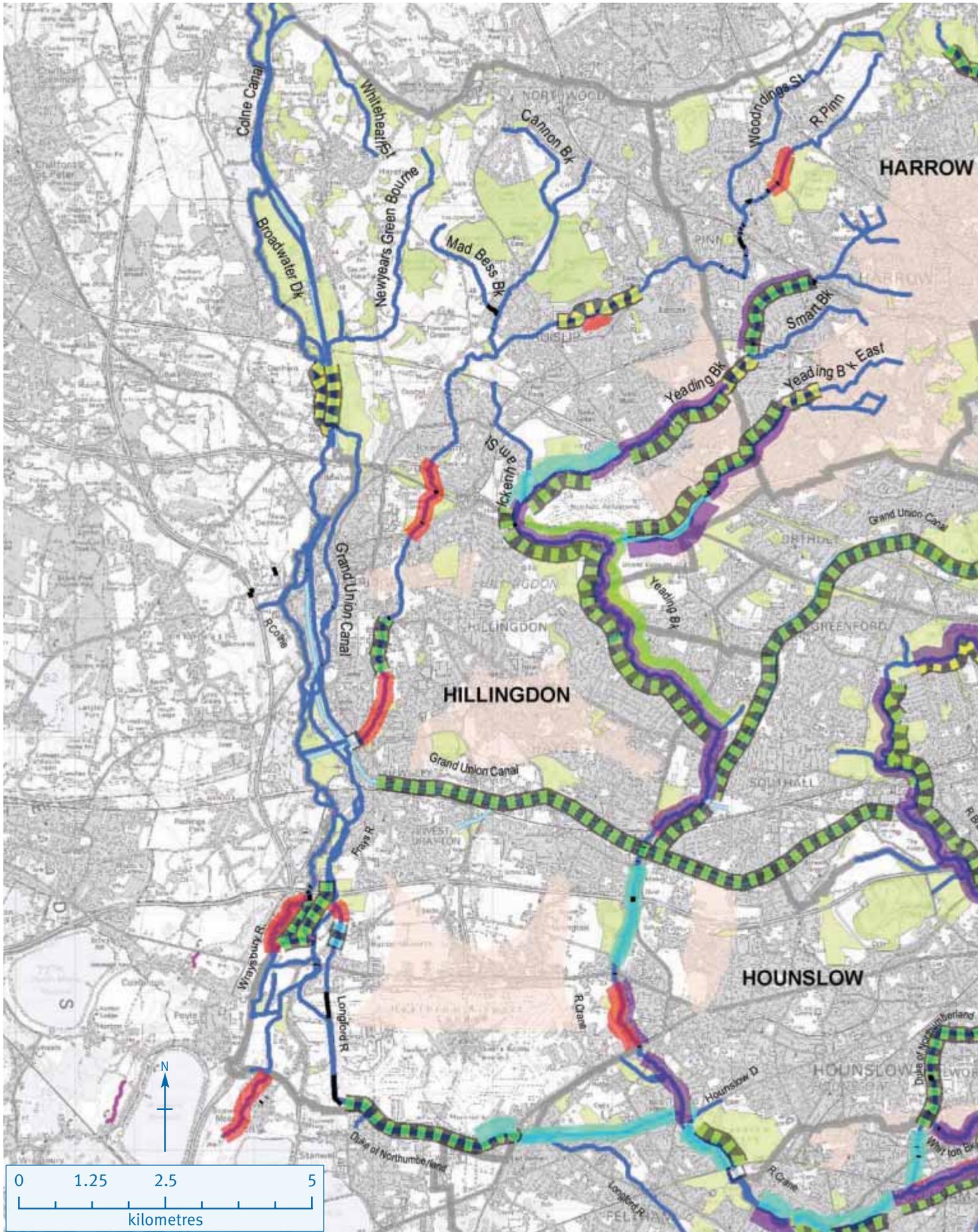


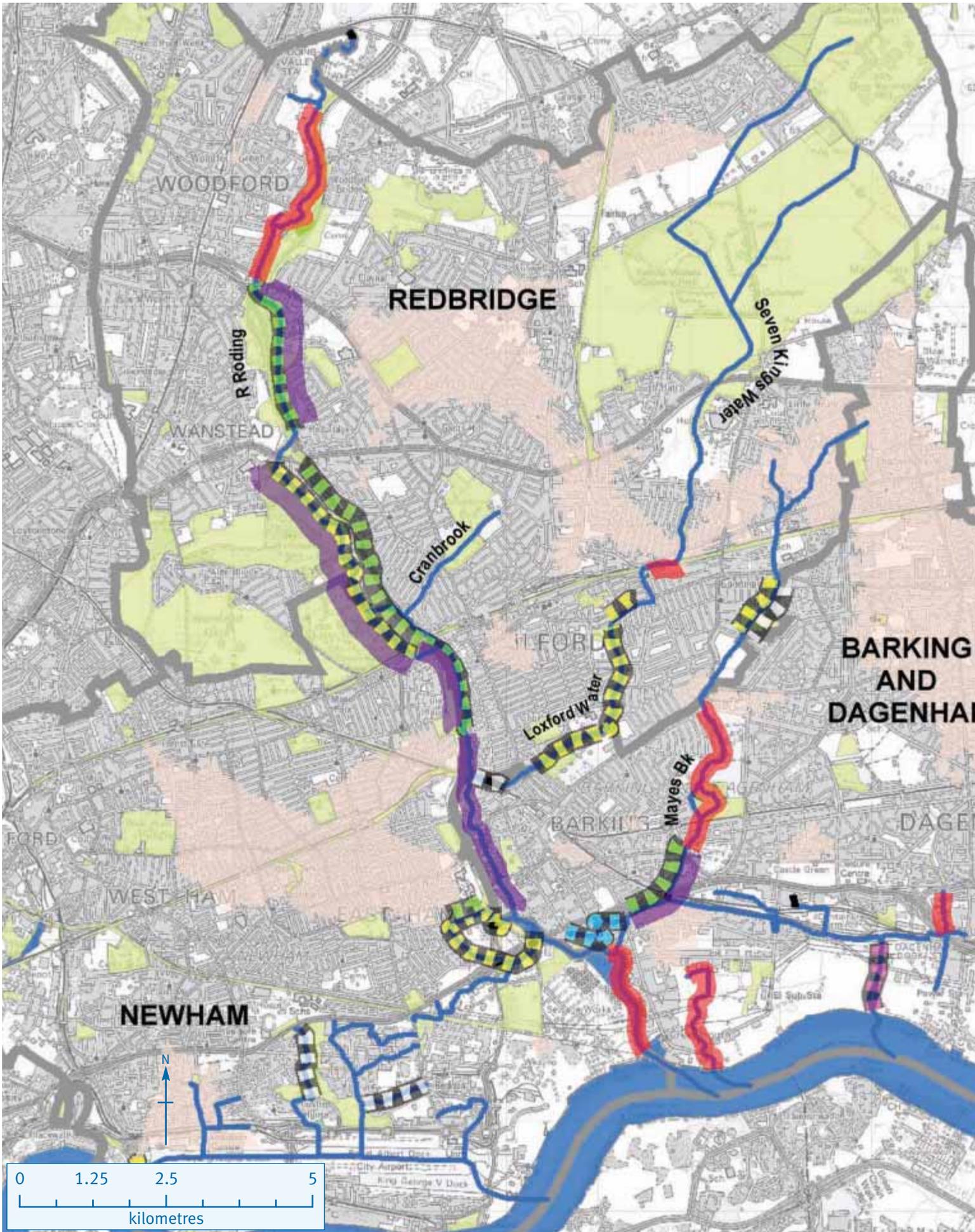
Reed beds

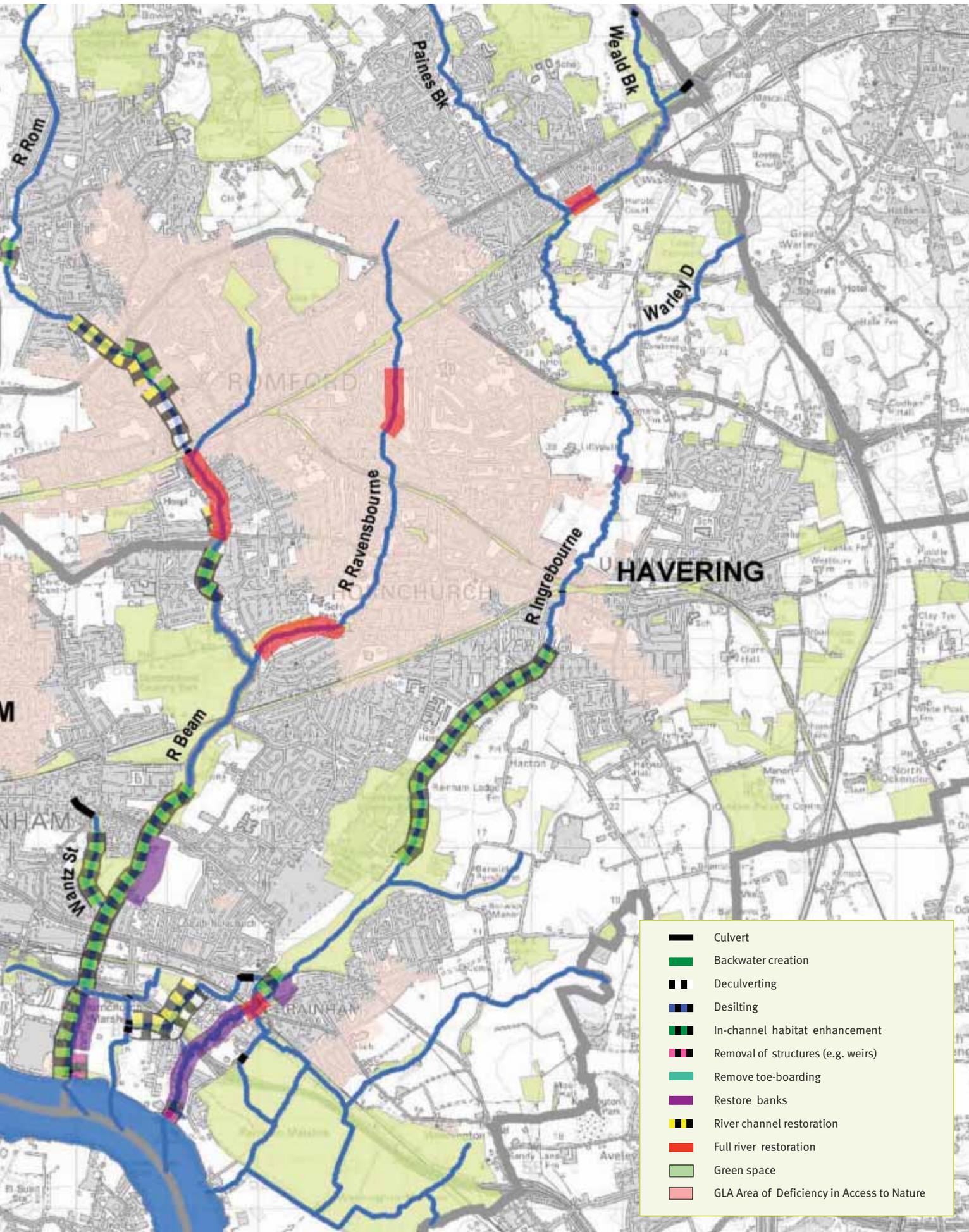
Original line of piled flood defences

Gabion baskets lined with geotextiles and planted with reeds were installed around the peninsular. This provides a salt marsh habitat and reed beds for wildlife and enabled the original line of flood defences to be pulled back.

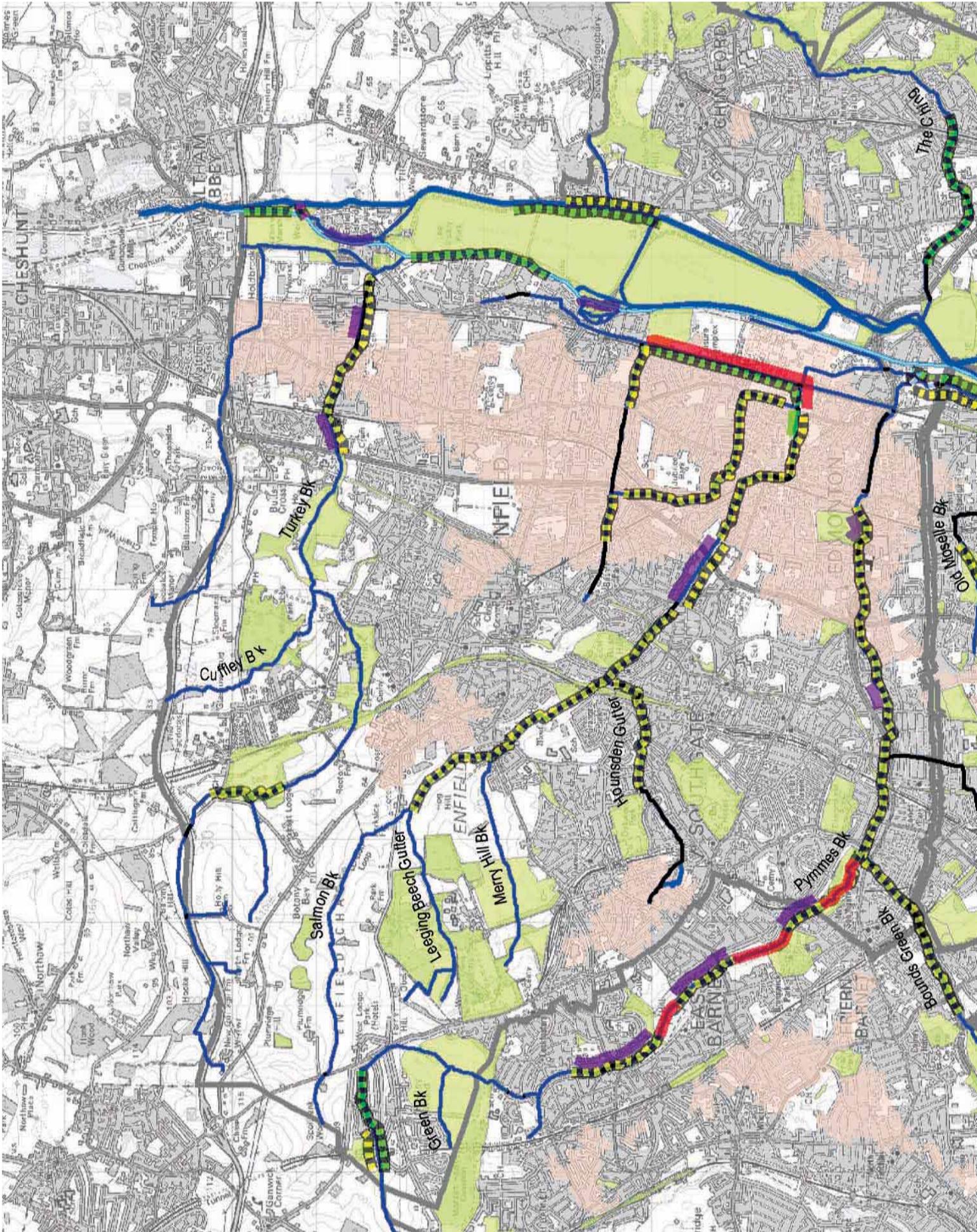
8. Catchment maps



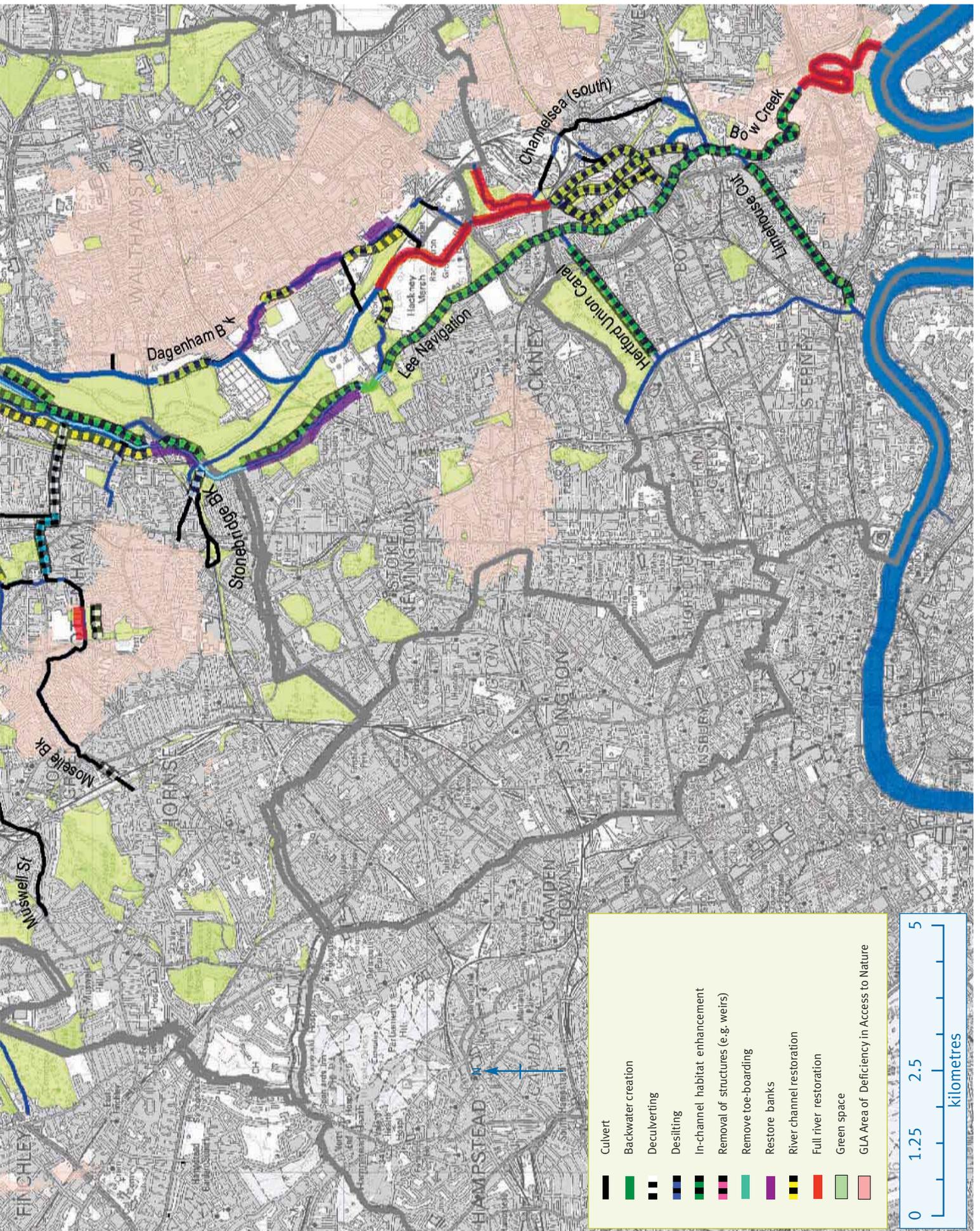




Catchment maps



Where to get started on the River Lee and its tributaries (key on page 29)



Appendix A

The key stages of river restoration

	Looking at the whole catchment	Looking at a specific site	The local authority role
1. Setting aims and objectives	<ul style="list-style-type: none"> Consider the extent of the catchment. Identify key problems and issues (this can be carried out with a local authority or other partnerships with expertise). 	<ul style="list-style-type: none"> Refer to this guide for advice on options for individual sites. Discuss the options with the local planning authority and your Environment Agency local office. 	<ul style="list-style-type: none"> Encourage catchment assessments. Identify river restoration opportunities in planning briefs and pre-application discussions. Identify river restoration opportunities in parks and public open spaces.
2. Study the project area	<ul style="list-style-type: none"> Collect data on the river corridor(s). 	<ul style="list-style-type: none"> Commission a detailed survey of the river corridor, covering hydrology, flood risk management, biodiversity, ground conditions and water quality. 	<ul style="list-style-type: none"> Support and scrutinise the assessments of catchments and sites.
3. Design	Outline the options for restoring the river catchment.	Look at the options for the specific site. Consider existing and future land use and the possibility of future development.	
4. Costing and fund raising		Identify costs and benefits of the options.	Identify possible sources of funding.
5. Consultation	Carry out a general consultation with the public.	Carry out a consultation as part of the planning application process.	Carry out a consultation on the proposals.
6. Post-project appraisal	<ul style="list-style-type: none"> Review the project to reflect any changing circumstances and keep the strategy up to date. 	<ul style="list-style-type: none"> Set in place specific monitoring for at least five years after the project has finished. Remedy any problems. 	<ul style="list-style-type: none"> Ensure that the project is monitored for 5–10 years after it has finished. Assess the value of the project to the local community.

Appendix B

Contact, websites, publications and map key

Contact

The River Restoration Centre

The River Restoration Centre offers technical advice and information on all aspects of river management. Advisers have a wealth of practical experience in river engineering, hydrology, geomorphology, ecology and river management.

Visit: www.therrc.co.uk

Websites

- **Environment Agency** www.environment-agency.gov.uk
- **Defra** www.defra.gov.uk
- **Green Chain Initiative** www.greenchain.com
- **Scottish Environment Protection Agency** www.sepa.org.uk
- **South East England Development Agency** www.seeda.co.uk
- **Office of the Deputy Prime Minister** www.odpm.gov.uk
- **English Nature** www.english-nature.gov.uk

Catchment map key

The catchment maps on pages 22–27 identify areas where there is opportunity to enhance rivers.

Symbol	Feature	Opportunities
	Culvert	Culverts that are greater than 15 metres in length.
	Backwater creation	These can provide refuges for fish and other wildlife during high or low flows.
	Deculverting	Culverts that are not situated under a major infrastructure may be removed and replaced with a natural channel.
	Desilting	Heavily silted channels can benefit from desilting to provide a better habitat for fish.
	In-channel habitat enhancement	Features such as marginal shelves may be established to re-create a more natural flow, which can encourage more plant and animal communities to settle.
	Removal of structures (e.g. weirs)	These may be removed or replaced with more natural structures such as gravel weirs. Hurdles and faggots may be used to mimic natural river flow.
	Remove toe-boarding	There is a lot of toe-boarding along the river in North London. In many cases it is not required and may be removed.
	Restore banks	Hard bank reinforcements can be replaced with alternative materials that are suitable for plants and animals. The Environment Agency requires new developments to be built away from rivers.
	River channel restoration	This can include removing artificial banks and bed material, narrowing the channel if it has been widened, and installing in-channel features such as pools and riffles.
	Full river restoration	The natural channel can be redefined to include meander loops. Banks can be graded to blend into the flood plain.
	Green space	To provide context, areas of green space and water are marked on the map as green and blue respectively
	GLA Area of Deficiency in Access to Nature	Improving access to nature in these areas is a priority for the Mayor's Biodiversity Strategy.



Publications

Cabe Space (2005) *Does Money Grow on Trees*, London: Cabe Space. You can download the pdf at: www.cabe.org.uk/data/pdfs/DoesMoneyGrowonTrees.pdf

Defra (2004) *Making space for water: Developing a new government strategy for flood and coastal defence erosion risk management in England*, London: Defra. You can download the pdf at: www.defra.gov.uk/enviro/fcd/policy/strategy/1stres.pdf

Environment Agency (1998) *Partnership in Planning: Riverbank design guidance for the Tidal Thames*, Bristol: Environment Agency.

Environment Agency (2000) *Biodiversity Strategy and Action Plan*, Bristol: Environment Agency.

Environment Agency (2002) *River Restoration: A stepping stone to urban regeneration (highlighting the opportunities in South London)*, Bristol: Environment Agency.

Hewlett, J. (2000) *London's rivers and wetlands: A broad perspective*, paper presented at the South East Regional Urban Nature Conservation Forum Conference.

London Development Agency (2003) *Design for Biodiversity*, London: LDA. You can download the pdf at: www.lda.gov.uk/upload/pdf/Design_for_Biodiversity.pdf

Mayor of London (2004) *The London Plan*, London: GLA.

Mayor of London (2002) *The Mayor's Biodiversity Strategy*, London: GLA.

Office of the Deputy Prime Minister (2000) *Urban White Paper*, London: ODPM.

Skinner, K.S. and Bruce-Burgess, L. (2005) 'Strategic and project level river restoration protocols: Key components for meeting the requirements of the Water Framework Directive', *Journal of the Chartered Institute of Water and Environmental Management*, Volume 19, No. 2.

Thames Estuary Partnership (2004) *Thames Strategy East: Consultation draft*, London: TEP.

Town and Country Planning Association (2004) *Biodiversity by design: A guide for sustainable communities*, London: TCPA. You can download the pdf at: www.tcpa.org.uk/downloads/TCPA_biodiversity_guide_lowres.pdf

Acknowledgements

Project Manager: Fran Bayley

Project Officer: Lydia Bruce-Burgess

Contributors: Chris Catling, Environment Agency
Daniel Ahern, Environment Agency
David Telford, Environment Agency
Geoff Angell, Environment Agency
Graeme McLaren, Environment Agency
Jan Hewlett, Greater London Authority
Judy England, Environment Agency
Kevin Reid, Greater London Authority
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River Restoration Centre

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Our partners

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