British Waterways

British Waterways and Biodiversity

A framework for waterway wildlife stategies

INTRODUCTION

BiodiversityAction
for waterway wildlife

This document describes the many habitats and species that make up waterway biodiversity and introduces British Waterways' biodiversity action plan (BAP) framework. This framework will help local management teams prepare biodiversity plans for each waterway - together these local plans will make up British Waterways' BAP.

Full information on the habitats and species described, and on implementation at local level, are given in an associated Biodiversity Manual.

The document can be used as an introduction to the Manual, or on its own, as an introduction and explanation of our biodiversity to staff, users and partners. It can also be used by other navigation authorities and canal organisations to help biodiversity planning on their waterways.

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Foreword

"Taking action to promote biodiversity is a key part of what British Waterways is all about."

Dave Fletcher - Chief Executive, British Waterways

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Simon Lyster - Director General, The Wildlife Trusts

Dave Fletcher - Chief Executive, British Waterways

Taking action to promote biodiversity is a key part of what British Waterways is all about. It is part of our remit from government to develop waterways sustainably. Biodiversity is also one of the things that makes our waterways so attractive for people to visit. Our duty is to manage a balance sensitively. This document, the aspirations that underpin it and the actions that will flow from it are key to British Waterways being able to discharge this duty.

As with most of our activities, we cannot work alone: we need partners to help us deliver. I am extremely pleased that Simon Lyster, Director General of the Wildlife Trusts, wanted to contribute the supportive foreword you see below. We are grateful to the Wildlife Trusts and all our other partners for their continuing support and guidance to help us make decisions about our work.

This plan builds on our existing management practices and biodiversity action planning is an integral part of the way we do our job. I commend it to all our staff and those who care for the waterways and their future.

Dave Fletcher

British Waterways

Simon Lyster - Director General, The Wildlife Trusts

This "biodiversity brochure" from British Waterways is tremendously welcome. For the first time, it not only describes the wildlife interest of Britain's inland waterway system - mostly the artificial canals of the 18th and 19th century - but also what needs to be done to protect it. The latter is vital because, with the habitats of so many species in Britain damaged or destroyed over the last century, our canal system is even more important as wildlife habitat now than when it was built.

The Wildlife Trusts have worked closely with British Waterways (and their predecessors) since the 1950s. Several British Waterways' sites are now leased or managed by local Wildlife Trusts. These include Prees Branch Canal Reserve, managed by the Shropshire Wildlife Trust and Wilstone Reservoir managed by the Herts and Middlesex Wildlife Trust. The Wildlife Trusts also manage several sites adjoining canals.

More recently, the Wildlife Trusts and British Waterways have collaborated on projects to help otters and water voles. Currently British Waterways and The Waterways Trust are helping fund the Wildlife Trusts' water policy team.

The relationship has not always been easy. Recreation demands of people have sometimes conflicted with conservation needs. However, greater mutual understanding has helped reduce these problems, and disagreements are now fewer. The water vole banks within the rebuilt Kennet and Avon Canal are just one example where British Waterways has made tremendous efforts to help both the natural and built heritage.

I applaud British Waterways for its commitment to this new biodiversity initiative, and I much look forward to a continuing close relationship with The Wildlife Trusts for many years to come.

Simon Lyster

The Wildlife Trusts

◀ Dave Fletcher and Simon Lyster examining biodiversity at Camley Street Natural Park, a Wildlife Trust nature reserve alongside the Regents Canal in the heart of London

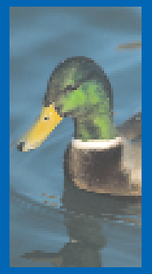
What is biodiversity and what is a BAP?

‘Biodiversity’ is a word that covers all living things and their habitats. It includes mammals, birds, trees, flowers, insects, mosses, lichens and fungi, and their habitats. A ‘Biodiversity Action Plan’ or ‘BAP’ is a strategy for actively conserving biodiversity - it is asset management for wildlife.

The BAP concept began at the 1992 Earth Summit on Biological Diversity. Over 160 countries, including Britain, signed the Biodiversity Convention, encouraging the development of national biodiversity action plans.

The UK BAP has action plans for 45 ‘priority’ habitats and 391 ‘priority’ species. Many other habitats and species are covered, and there is a special section about canals. The principle of each action plan is to take a pro-active approach to conserve and enhance each habitat or species, and to achieve this through partnership with many organisations.

◄ The UK BAP and logo ▲



▲ Local BAPs

Local BAPs will be developed by partnerships between Local Authorities and Wildlife Trusts. Like the national BAP, the local versions describe important habitats and species and produce action plans for each. These plans are being implemented by partnerships of local organisations, including businesses, and local offices of national agencies. Many of these local BAPs are developing special sections about waterways.

At the local level there are close links between Biodiversity Action and Agenda 21, another Earth Summit initiative. Agenda 21, which aims for sustainability in local planning and development, can use biodiversity planning to ensure sustainability for wildlife. This link with sustainability has helped the adoption of biodiversity principles by many businesses, particularly those, like BW, with environmental concerns and a large estate.

▲ Corporate BAPs

Developing a British Waterways BAP

Wildlife began colonising the canal system as soon as it was built and the conservation of this ‘natural heritage’ is now a key part of British Waterways’ policy. We have made much progress with environmental appraisal and wildlife and habitat improvements in recent years. Developing a BAP is our next step in wildlife conservation. It will build on past successes and, with partners, help us develop a strategic approach to waterway wildlife.

A biodiversity approach is an important development of our business, conserving and improving waterway habitats and species, and playing a vital role in partnerships to ensure sustainable development of the waterway network. By setting objectives and targets for particular habitats and species, biodiversity planning will ensure that staff, users and partners continue to enjoy the unique wildlife heritage of our waterways.

This document introduces biodiversity planning to British Waterways’ staff, users and partners, describing the habitats and species important to the waterways at a national level. It is intended to help the development of local waterway BAPs in partnerships with Local Authorities, Wildlife Trusts, Statutory Agencies and other partners. Local waterway BAPs will draw on the ideas in the national framework, and by adding features of local value, will be able to conserve the special character of individual waterways.

This introduction, the accompanying Biodiversity Manual and the local waterways’ BAPs, when produced, will make up the overall British Waterways BAP. Production of this is one of ‘Our Plan for the Future’ pledges. It will become one of our standard setting documents, already listed in the Framework Document for British Waterways issued by the Government in 1999.

A biodiversity approach - using this document

A biodiversity action plan approach means that wildlife improvements can be planned and progressed more confidently. And it will help our environmental appraisals of maintenance and development works. Wildlife impacts and inclusion of remedial measures will become much easier to identify.

This introductory document and the accompanying Biodiversity Manual set out a national biodiversity framework or 'vision' for British Waterways. This framework can be used by waterway management teams and partners to develop biodiversity plans and objectives for local waterway units, or even individual canal sections. Much will be achieved by developing partnerships - our biodiversity objectives overlap with national and local BAPs and we will be able to work jointly with partner organisations.

General aims and principles for our biodiversity are listed on the fold-out flap inside the front cover. Special challenges for individual habitats and species are given in the following pages. More information on the process is given from page 39 and in the accompanying manual.

What sorts of biodiversity should be in our BAP?

There is a great variety of wildlife along the inland waterway network. Choosing which to include will be a challenge, but the habitats and species described in this document and the Biodiversity Manual should help. These have been selected using government guidelines on evaluating biodiversity.

Several rare habitats, species or groups of species are included in the list. Some are well-known, like the water vole and the otter. Others are much less known, such as the freshwater sponges or some of the molluscs. The water plants section includes floating water plantain and grass-wrack pondweed - the two species that BW has special responsibility for under the UK BAP.

The guidelines ensure the inclusion of characteristic, or popular, habitats and species as well as the rare. Many of our habitats and species groups fall into this category and so biodiversity planning will help us conserve the character of our waterways as well as their wildlife. Habitat features like hedges and reedy fringes, and species such as waterbirds and dragonflies, are important part of the waterway experience for users and staff.

Local waterway BAPs will be able to adapt the list of habitats and species - adding locally specialities and features.

Habitats

Canal and river channels

Our longest continuous habitat

This aerial view of the Grand Union Canal shows the waterway channel habitat cutting through the countryside, with other water features, such as rivers and gravel pits, alongside. Side arms and ponds, winding holes and locks, weirs and riverine sections add to the diversity of this linear habitat. The habitat quality of the channel varies, mostly because of different levels of use, management and water quality.

▲ This 1950s photograph of the Grand Union Canal at Saddington was taken at the time it was designated as a Site of Special Scientific Interest (SSSI). Many other canal sections were designated as SSSIs in the 1950's, following the 1949 Countryside Act. In those days this status gave no site protection, but it was the first official confirmation that canals were valuable for wildlife.

Though built for industrial and agricultural freight, our waterway channels are now our most obvious wildlife habitat. They were colonised by many plants and animals soon after construction, with some help from plantings and fish-stocking. Now, 200 years later, despite their artificial origins, many are designated as important Wildlife Sites at local, national and international level. Their slow flows and managed water levels provide a unique environment that has become internationally important for nature conservation.

◀ This channel on the Montgomery Canal is exceptionally rich in insect and plant life. On other waterways in our network aquatic life varies, with many species in lightly-used canals, but fewer, tougher species in canals with more boats. Some hold important populations of nationally and internationally scarce species of insects, molluscs and plants.

▲ Not all aquatic species are good for biodiversity. Canadian Pondweed, seen here in the Lancaster Canal, is one of several invasive species that have colonised our waterways over the years. Canals are ideal for their spread because they often link natural catchments. Recent invaders include swamp stonecrop, least duckweed, signal crayfish and zander, the predatory fish. These invaders are a part of the canal ecosystem, complicating its biodiversity, for better or worse.

▲ Aquatic invertebrates are a special feature of our waterways. The larval stages of dragonflies, damselflies, mayflies and water beetles live in the shallow plant-rich margins, with adult water beetles and water boatmen venturing out into the deeper water. Water snails also abound, with freshwater cockles and mussels sharing the sediments with fly and midge larvae. This range of invertebrates gives many waterways a distinctive and unique biodiversity.

▲ Mute swans are one of the most popular and largest birds on our waterways. Others include mallard ducks, moorhen, and coot, all of which feed and breed on the waterways. Many other animals visit, sometimes simply to cross the water, but more often to feed. Bats commonly visit at dusk to feed on the midges and larvae over the channel and waterway banks.

▲ All our canal and river channels need regular dredging, both to maintain the channel and ensure their value for biodiversity. This dredging operation on the Union Canal in Scotland was designed to maximise wildlife benefit whilst ensuring restoration of a navigable channel. The works took place outside the bird breeding season and, by retaining marginal shelves and vegetation, conserved both species and habitat features. It won the BW Waterway Conservation Award in 1998.

SPECIAL CHALLENGES

- develop our skill in managing channel biodiversity and navigation
- continue research into the effects of waterway recreation and channel restoration on biodiversity

Waterway banks

Where land and water meet

The lush banks of the Union Canal in Scotland are dominated by reed sweet grass and meadowsweet, though many other plant species are present, providing food and habitat for invertebrates and birds. These habitats are similar to pond margins, with vegetation types that include open water plants, tall, fringing emergent plants and land plants higher up the bank.
▼

▲
Bankside vegetation is often shown in early pictures of canals, probably because it was encouraged by the canal companies to combat erosion. Rees' Cyclopaedia of 1820 advises canal engineers: "The banks of the canal will be very apt to continual wear at the surface of the water, and for some height above and below that level, if a proper kind of herbage is not encouraged upon the slope of the bank".

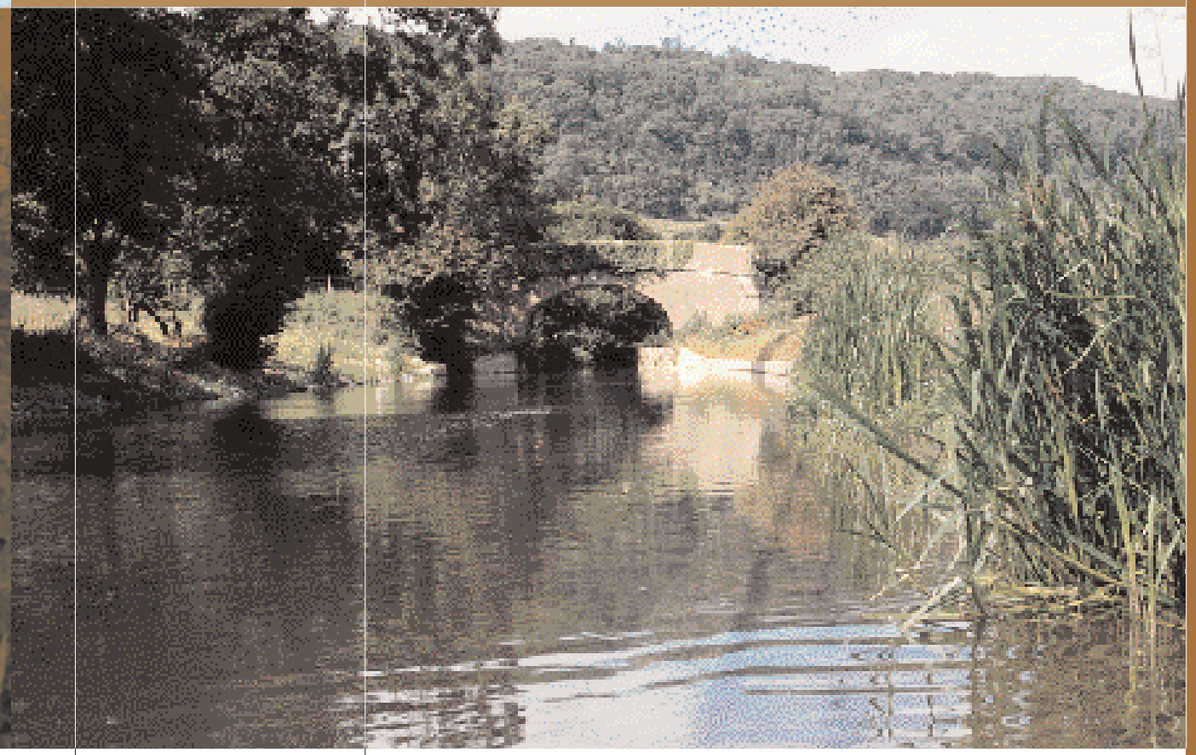
Waterway banks, where land and water meet, are possibly our most 'biodiverse' habitat. Developing since the waterways were built, and colonised from ponds and wetlands that have now vanished, these banks are now particularly valuable for biodiversity. Habitat quality varies, both along the waterway and from bank to bank. Along the waterway the habitat can sometimes be absent, depending on engineering and recreational needs. And it often differs on the offside bank, where 'poaching' by cattle can create wide shallow conditions. Waterway banks are included in many designated Wildlife Sites.

◀ Some canal banks support particularly rare species of plant. This yellow flower is tufted loosestrife, a speciality of the Forth & Clyde Canal. Other local rarities include the protected cut-grass of the Bridgwater & Taunton Canal. This is difficult to distinguish from other grasses and specialist survey work is needed to find it.

▲
Most of our waterbirds use waterway banks for nesting. Coot and moorhen nests like this one are small and often hidden in vegetation. Large birds like mute swans build large nests in the open, usually on the offside bank to avoid disturbance, but they will use towpath banks with good habitat.

▲
Waterway banks are home to water voles and many amphibians and reptiles, including frogs, toads, newts and grass-snakes. These species are usually hidden from view in the taller vegetation of the banks. This vegetation provides them with essential food and cover.

▲
A huge range of invertebrates live in this habitat. This Succinea snail is common on tall grass and reed stems. Rarer snails also occur - the rare Desmoulin's snail can lives in this habitat on the Kennet & Avon Canal. Banks are also very rich in insects - dragonflies, damselflies and other species with aquatic larvae spend their adult lives feeding and breeding here.



▲
Management of waterway bank habitat must be balanced with engineering and recreational needs. On the Kennet & Avon Canal near Bath, the whole canal was recently rebuilt as part of the restoration project. Replacement bank habitat was designed into the engineering project - this picture shows vegetation re-establishing soon after completion. More everyday bank protection schemes are increasingly using a similar approach. The use of reedy plants for bank protection, well-known to the original canal builders, is being re-invented as 'green' engineering.

SPECIAL CHALLENGE

- improve and extend waterway bank habitats as part of bankside repair work

Towpath verges

Wildflower verges alongside the path

These towpath verges on the Staffordshire & Worcestershire Canal are typical of rural canals. Grassy flower-rich margins contrast and complement the waterway bank vegetation and are used by hundreds of insects and larger animals for shelter and food.

Towpath verges can extend many miles along waterways and support a very rich flora and fauna. Their wildlife value has developed over a period when meadows and field margins in the wider countryside have lost many species and today they can be particularly valuable for biodiversity. Even narrow verges can support a range of animals and plants and be important oases for local wildlife in urban areas.

Most of our towpaths only developed wildlife verges when towing declined, or when canals fell out of use. When towpaths were needed for towing, tall vegetation would have been kept down by tow-ropes and surfaces would have been disturbed and regularly repaired and replaced. The flower-rich verges have largely developed over the last 50 years.

Towpath verges support many meadow plants. Close to the waterway bank there are plants of wet meadows, such as gypsywort, bedstraws and skullcap. On the hedgerow side of the towpath there are dry meadow plants such as cow parsley, red campion or this oxeye daisy. At the edge of the trodden path there are more trample-resistant plants such as plantains and dandelions.

Some towpath verges have more unusual plants. Orchids, including early purple orchids, bee orchids and common spotted orchid can be seen in untrodden corners on some waterways. Sometimes plants peculiar to the towpath soil conditions are found - the yellow bartsia recently discovered on the Montgomery Canal was there because of the peat in the local soil.

Invertebrates are a feature of our verges. This cardinal beetle is typical of the many insects that can be seen on plant-rich verges. Others include hoverflies and leaf beetles, millipedes and centipedes, woodlice and snails. Bumblebees are often particularly common, feeding on towpath flowers and nesting in the soil.

Larger animals use our verges for food and shelter. Water voles from the banks, and woodmice and bank voles from the hedge, will venture into verges for food and shelter. Invertebrates are hunted by amphibians and reptiles - slow-worms are quite common on some towpath verges, but they are rarely seen.

SPECIAL CHALLENGES

- retain and protect towpath verges during maintenance work
- conserve and extend verge biodiversity in towpath improvement schemes

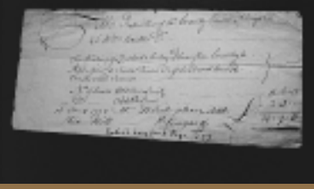
Recognition of narrow verges as a valuable habitat has led to many road and rail verges being managed for wildlife. Though towpaths need to be kept clear for walkers and other canal users the verges can be managed to maximise their wildlife value. Even where there is a need for surfacing there is always scope for conserving and improving biodiversity.

Hedgerows

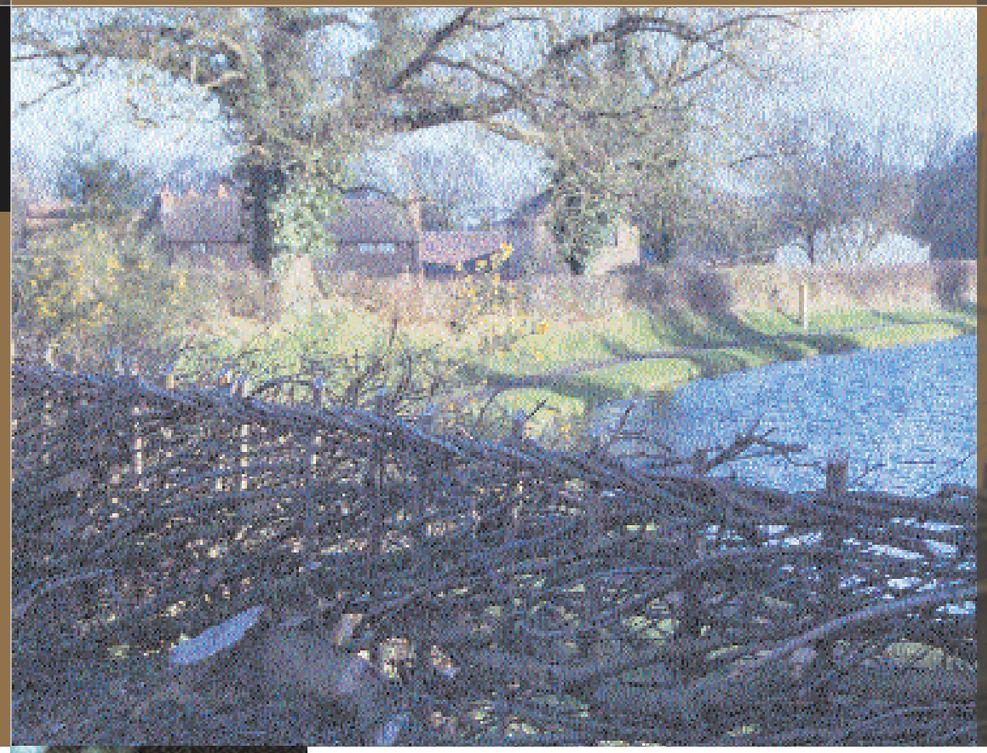
Hedges and other boundary habitats

Canal hedgerows, planted by the original canal companies, are our oldest established habitat. Today they are a characteristic feature along most of our canals and are important for biodiversity. They provide cover, shelter and food for many animals as well as a refuge for many species of plants. They can also act as corridors between isolated habitats. Because many hedgerows in the wider countryside have been removed, the value of waterway hedgerows has increased over the last few decades.

Canal hedgerows provide habitat for all the birds and animals commonly associated with woodland and hedgerows in the wider countryside. Although originally planted, a great diversity of trees and shrubs can now be found within canal hedges, as well as a range of climbing and herbaceous plants at the hedge base. ▼



▲ The original canal companies needed their new hedges to protect the towpath and become stockproof quickly. This invoice, to the Proprietors of the Coventry Canal in 1772, is for weeding over 2000 Rods (nearly 7 miles) of newly-planted hawthorn 'quicks'. Contemporary accounts describe the need for ongoing maintenance, as well as the problems of overgrown hedges.



◀ Hawthorn was the species used for most canal hedgerows. It grows quickly and its thorns help provide a good stock-proof hedge. In the years since canal hedges were planted many other shrubs and herbs have colonised, significantly increasing their wildlife and biodiversity value.

▲ The birds that nest and feed in our hedges are very different to the types associated with our channel and bankside habitats. Regular nesting species include blackbirds, song thrushes and robins. Whitethroats, wren and willow warbler can often be heard singing in the hedge, setting up territories along its length.

▲ Hedgehogs, bank-voles, shrews and wood-mice all occur commonly in our hedgerows, but they are seldom seen. The hedge provides more than shelter for these small mammals - they feed on the worms, beetles and caterpillars found here and the adjoining verges. Hedges also provide hibernating sites for reptiles and amphibians.

▲ The gatekeeper, or "hedge brown" is one of the commonest hedgerow butterflies. Its names derive from its habit of patrolling hedgerows, where adults feed on flowers such as bramble and caterpillars feed on grasses in the verges. Hedge-bases often provide sunny sheltered spots where a range of butterflies can be seen basking.

▲ Management of hedges is essential if their biodiversity is to be retained. But with less need to keep hedges stockproof, and a decline in traditional hedge-laying, many have become gappy or turned into a line of trees. This project on the Aire & Calder Navigation, working with schools to replace hedges, is one of many initiatives around the network to improve hedgerow management and replace lost hedges.

SPECIAL CHALLENGES

- increase the length of waterway hedgerow
- use traditional hedgerow management methods to increase biodiversity value

Cuttings and Embankments

Wildlife on engineered slopes

Cuttings and embankments are essential parts of canal and reservoir structures. Even our river navigations have them where locks and docks were built. Though a major part of the waterways estate, they have little commercial value and are important only in engineering, landscape and wildlife terms. The habitats on their slopes vary and can include rock exposures, grassland, woodland and scrub. Many have been designated as Wildlife Sites for their wildlife or geological interest and all help broaden each waterway's wildlife corridor and link with habitats on adjacent land.

The most dramatic cutting on our network is the long and deep cutting at Tyrley on the Shropshire Union Canal. This has a wealth of wildlife interest, with unusual geological exposures of SSSI quality, scrub on the steep slopes, and wooded spoil heaps with extensive badger colonies along the tops.
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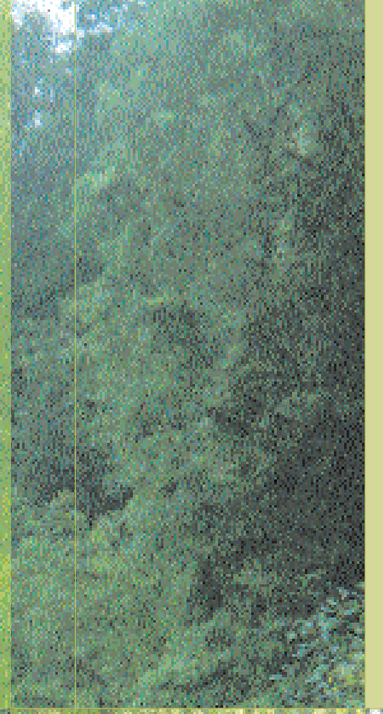
Construction of our cuttings and embankments would have been a major disturbance to wildlife, creating huge amounts of spoil and scarring the landscape. But once built, these structures were soon colonised by wildlife communities taking advantage of the new slopes.



▲
The barn owl is a species that has declined in numbers as farmland management has intensified. Grassy embankments of linear structures, particularly canals but also railways and motorways, have become particularly important to them, providing habitat for the many small mammals they hunt for at dusk. The mixture of habitats alongside canals means our embankments can be particularly rich in prey species.

▲
Badgers have probably been taking advantage of our embankments and cuttings since they were first built - the slopes are ideal for sett construction. Indeed badgers found today may be direct descendants of the original ones, as badger families can remain in one location for centuries. Wooded embankments often have extensive colonies whose setts can complicate, or create, maintenance work.

▲
Geological exposures, like this one at Aust Cliff on the Staffordshire & Worcestershire Canal, support unusual wildlife - this one is sometimes used by nesting kingfishers and sand martins. Some exposures, including Tyrley and Shrewley are designated as SSSI because of their geological importance.

◀ Grassy embankment slopes are particularly suitable for wildflowers, including some, like these cowslips, that are now scarce on pastureland. Other flowers of embankment slopes can include a range of orchid species. There is usually a rich insect fauna associated with this variety of grassland vegetation. Bumblebees are often a common sight in spring and early summer.

SPECIAL CHALLENGE

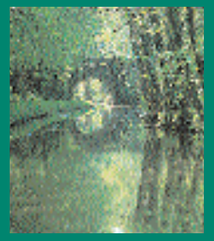
- integrate biodiversity with engineering maintenance of these slopes

▲
Major engineering work along cuttings and embankments tends to be occasional, with long periods of routine maintenance in-between. The routine work can often help with biodiversity. On wooded sites tree management plans help maintain habitat and reduce maintenance problems. And on grassland sites scrub management to help engineering inspections can enhance the biodiversity. Special enhancements can often be included – grassy embankments of the Aire & Calder Navigation now have Barn Owl boxes.

Built structures

Biodiversity of bridges and buildings

Our historic structures, like this bridge on the Monmouth & Brecon Canal, have blended into wildlife habitats and landscapes of our waterways. Bridges, locks, tunnels and buildings have become integral parts of the habitats available to wildlife on waterways and are a characteristic and unique contribution to our biodiversity. ▼



▲ Lichens, which can grow as slowly as one millimetre per year, are probably the oldest species to live on our built structures. A mosaic of lichens like these, on the coping stones of the towpath wall at Sharpness, are part of our waterway heritage. They would take many decades to recreate.

Our many built structures play an important, but often overlooked, role in biodiversity. Bridges, tunnels, locks and weirs and cottages, warehouses and offices all provide some habitat for wildlife - sometimes they can be very important wildlife sites. Bats are the best-known animals of our buildings but many other animals and plants can be found. In general it is the older structures, built of stone and with lime mortar, that have the greatest value. And, because of their proximity to water, our structures often support unusually diverse wildlife communities.

◀ Old walls can support a unique variety of plant species. This drystone wall at Llanymynech on the Montgomery Canal has many different species of wall ferns and mosses. Small plants like these rarely cause structural damage and so can usually be retained. Larger, woody plants need to be controlled, as they will damage the structure and, ultimately, reduce the biodiversity value.

▲ Even large urban buildings can contribute to biodiversity. This house martin nest is one of many that are constructed under the 6th floor eaves of Llanthony Warehouse in Gloucester Docks. Many other birds such as dippers, wagtails, and swallows nest in our built structures. Important features include eaves for house martins, and access to roof and wall crevices for other species.

▲ Walls are valuable habitats for invertebrates but the species vary according to construction and aspect. In tunnels the dominant species will usually be the cave spider, with its distinctive webs covering every tiny crevice. On walls in the open there are many more species, particularly where they are south-facing, warm and dry. The commonest spider on sunny walls is the zebra spider, which, by jumping on its prey, manages without a web.

▲ Bats, seen here clustered in the roof of Saltersford Tunnel on the Trent & Mersey Canal, are usually better hidden, squeezing into tiny crevices. Some structures are simply used for roosting, but larger voids within or behind retaining structures are used for hibernating and for nursery roosts.

▲ Management of biodiversity in structures needs careful planning. Recent repair work on Brynich Aqueduct, a Scheduled Ancient Monument carrying the Monmouth & Brecon Canal over the River Usk, needed to consider the bats roosting in the crevices, the dippers nesting under the arches and the crayfish in the side-weir. By working with the local Wildlife Trust and Bat Group, successful solutions were reached for all these species.

SPECIAL CHALLENGE

- integrate biodiversity with maintenance and development of our structures

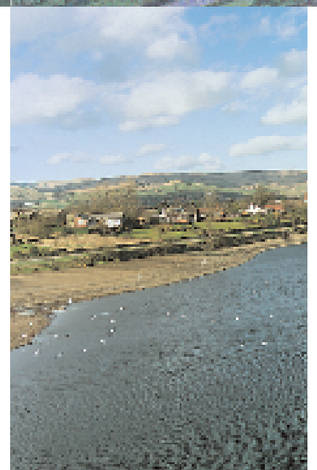
Reservoirs, lakes and ponds

Our standing open waters

This view of part of the Tring Reservoir complex on the Grand Union Canal emphasises the extent of our open water habitats. Many associated habitats are visible on the margins, including reedbeds and wet woodland fringes. This site was one of our earliest reservoir SSSIs, notified in the 1950s, and it was also a National Nature Reserve for many years. Part of the site is now managed in partnership with the local Wildlife Trust. ▼

With over 100 supply reservoirs and many other lakes and ponds associated with our waterways, we have a significant 'open water' habitat. Like the canals they serve, many of the reservoirs are now 200 years old, and have the benefit of being colonised soon after construction. Today many are designated as Wildlife Sites at local, national and international level, often because of their importance for over-wintering wildfowl.

▲ The potential of canal reservoirs for wildlife was recognised by landowners as soon as they were planned. Some adjoining estates still own the fishing and shooting rights. Today they are valued more for their biodiversity value. This book, published in 1949, is one of the earliest about their conservation value, describing how the first Little Ringed Plover nest in Britain was discovered at Tring Reservoirs.



◀ A key element of our reservoirs is the 'draw-down zone'. As water is used in the summer months an unusual habitat, valuable for plants and invertebrates, is created on the exposed shoreline. At Bittell Reservoirs, on the Worcester & Birmingham Canal, this draw-down zone supports a rare shoreline plant community that contributes to the site's SSSI status.

▲ Over-wintering wildfowl are characteristic of many of our reservoirs, even those in urban locations. This is Rotton Park Reservoir in Birmingham. Wildfowl arrive in autumn, mostly from north-eastern Europe. Pochard, tufted duck, mallard and teal are regular visitors, along with many rarer species. In spring they return to summer breeding grounds abroad. Some of our reservoirs have SSSI or other wildlife site designations because of their importance for these birds.

▲ Though most of our reservoirs have good water quality, some suffer nutrient enrichment (eutrophication) and a reduction in biodiversity value. One of the symptoms of a nutrient problem is a 'bloom' of blue-green algae, like this one at Rudyard Lake in Staffordshire. These algae can also produce a toxic scum. Eutrophication is usually caused by pollution and agricultural run-off, though other factors, including intensive fisheries, can complicate the problem.

▲ The undisturbed margins of our reservoirs can support unusual insect communities. At Saddington Reservoir on the Grand Union Canal the margins have been studied by insect specialists, and the site is now known to be very important for wetland beetles. This reservoir is now one of our newest SSSIs, designated because of its invertebrate interest.

▲ Management of our reservoirs often involves a large amount of adjoining land, feeders and earthworks. At Bosley reservoir on the Macclesfield Canal a management plan covering hedgerow, scrub and ditch maintenance has won financial support from MAFF through their Countryside Stewardship Scheme. The management undertaken at this site won the BW Waterway Conservation Award in 1999.

SPECIAL CHALLENGE

- develop our knowledge and skill in managing reservoir biodiversity, angling and boating

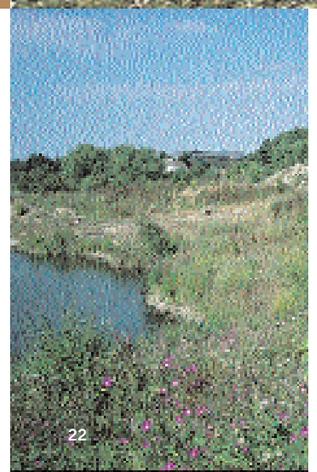
Tips

Dredging tips and historic spoil tips

Our waterways have two types of tips, historic spoil heaps, created when the waterways were first constructed, and more recent dredging tips. Historic tips are often next to cuttings or tunnels and are undisturbed wilderness sites, sometimes covered in trees. Some dredging tips, where waterway dredgings are deposited, can also be old, though many are modern and in regular use. These have a variety of habitats, depending on the stage in their development and whether they are still in use. Some are part of SSSIs, and others have local Wildlife Site designations of their own.

The spoil heaps left by the original canal engineers are often visible from the horse paths over the tops of tunnels. These two tree covered mounds mark the line of Sapperton Canal Tunnel in the Cotswolds and form 'islands' of biodiversity in an arable landscape . Not all tunnel spoil-heaps are wooded - above Standedge Tunnel on the Huddersfield Narrow Canal they have a distinctive scree-type habitat that is included within the South Pennine Moors SSSI. ▼

▲
Waterway construction and maintenance has always produced mineral waste. This archive photo shows maintenance work on a tunnel shaft - though called 'air' shafts many of these were originally constructed to remove waste material during construction. The resulting spoil heaps are often situated nearby. Sometimes heaps became the subject of argument with adjoining landowners, who felt they reduced the agricultural value of the land. Most remain uncultivated today.



◄ As dredging tips 'mature' many different habitats appear. This site, on the Grand Union Canal near Hillingdon, has dry slopes and uneven ground suitable for burrowing insects and basking reptiles. Flatter damp areas with a rich vegetation are used by other insects and amphibians. These habitats will gradually change as the tip matures, and if the tip is used again in the next dredging operation, each habitat's development will begin again.

▲
New or recently-created tips have an unusual ecology, with many specialist colonising or invasive species appearing in the first few years. The attractive rose-bay willow-herb, one of the first to colonise, has become a classic tip plant. Before the industrial revolution it was a scarce species of woodland, but it found a new niche in the disturbed ground around factories, canals and railways.

▲
Some tip colonisers are alien species, giving an exotic feel to some sites. One of the most notorious is giant hogweed, a native of Asia originally introduced into Britain for gardens. It often grows on the drier edges of dredging tips and other waste ground. Though an impressive sight it needs to be controlled as its sap can cause serious blistering after skin contact.

▲
The insect-life of tips varies enormously, but butterflies are a constant feature. A critical factor is the presence of the right larval and adult food-plants. Nettles, found on virtually every tip site, are the larval food-plant for a surprising number of butterflies, including comma, small tortoiseshell, peacock and red admiral. This red admiral adult is feeding on buddleia, a favourite adult food-plant and another tip regular.

▲
Management of tips can be complicated - they need to be licensed and have restoration plans for when they are closed. This is Pollington Tip on the Aire & Calder Navigation, with BW Waste Team Manager Nick Smith working its management plan. Despite the large scale nature of tip management much can be done for biodiversity. Most have margins which can be left for wildlife, and many are large enough to have areas left undisturbed on a cyclical basis. Many remain in our ownership after closure, and can be managed for wildlife in the long-term – as wetland, grassland, scrub or even planted up as small woodlands.

SPECIAL CHALLENGES

- manage disused tips to maximise biodiversity
- build skills in managing biodiversity on operational tips

Feeders and streams

Our fast-flowing waters

This is the Peasey Beck, the main feeder for the Lancaster Canal. It carries water from the canal reservoir at Killington. As it nears the canal the Beck splits into two streams; a controlled level leat takes water to the canal whilst the lower stream continues downhill. The corridor created by the two parallel streams provides an excellent wildlife habitat.

Many species, including floating water plantain, are thought to have colonised canals via feeders. This species, once only found in upland lakes, lowland pools and slow rivers, began to be found in some canals as early as the mid-nineteenth century. Recent genetic tests on these plants in the Montgomery Canal show a link with those in Snowdonia. The plant probably colonised via the River Dee feeder of the Llangollen Canal about 150 years ago.

The wildlife habitats provided by canal feeder streams are very different to those of navigation channels. Feeders tend to be narrow, shallow and fast-flowing, and often have a stony bed, more like natural streams. But being man-made, feeders are more uniform than most natural streams, with engineered banks and controlled flows. This mixture of fast flow and uniform structure means that they can support an unusual range of species. Our many more natural streams, running alongside canals or around reservoirs, also provide good habitat.

The plantlife in our feeders and streams has to be well-rooted to withstand fast-flows. This is Water Crowfoot, whose thin submerged leaves are a familiar sight in many feeders. Other specialist plants of feeders include fontinalis moss.

The insect life of feeders is also different. Mayflies like this one are regular sights along feeder streams in early summer. Their larvae have adapted to life in fast-flowing streams, often living under stones on the bed. Other faster flow specialists include flatworms, freshwater limpets, and stone-cased caddisfly larvae.

SPECIAL CHALLENGES

- increase our knowledge of the biodiversity in our feeders and streams
- develop opportunities for biodiversity conservation and improvement

The management of feeders varies according to their situation. The Diggle feeder, one of many moorland feeders on the Huddersfield Narrow Canal, is cleared annually, with spoil left on the sheep-grazed banks. The side-channel stream at Hilltop Reservoir, on the same canal, is dredged on a cyclical basis and has new vegetative bank-protection, installed in partnership with the Local Authority and with grant-aid from English Nature.

Reedbeds

Stands of common reed

True reedbeds, extensive stands of common or thatching reed, are not a common feature of our waterways. They are restricted to sites where there is enough waterspace for their development - mainly reservoirs, though some channels have reedbeds in wides and side-arms. These reedbeds are extremely important for wildlife, particularly birds and invertebrates and they support several nationally rare and threatened species.

The uniformity of reedbeds can give the impression that they are poor for wildlife. But though they support few plant species, reedbeds hide a wealth of animal life, particularly birds, invertebrates, water voles and otters. Many of our reservoir margins support reedbeds like this one, though the best known are at Tring and Weston Turville Reservoirs on the Grand Union Canal.

Where large reedbeds occur along canal channels they are usually in historic side arms and basins. This site, on the Gloucester & Sharpness Canal at Purton, next to the Severn estuary, is one of our largest reedbeds, almost entirely filling the old timber storage ponds. The pond edges, outlined in white on the photo, now mark the boundary of the largest reedbed in Gloucestershire.

The most characteristic birds of reedbeds are reed warblers, and they breed in most of our reedbed sites. Herons, normally breeding in trees, sometimes nest in reedbeds. Here at Tring Reservoirs, there is a long-established breeding colony in the reed-beds along the water's edge.

Establishment of new reedbeds is often possible when channel maintenance works require the cutting back of existing stands. On the Montgomery Canal, when a reedbed needed to be cut back, the material was been used to plant a new one in a winding hole downstream. Another new reedbed has recently been created in a canalside nature reserve on adjoining land.

SPECIAL CHALLENGE

- retain and increase existing reedbeds and create new reedbeds

Heather moorland surrounds March Haigh Reservoir, high above the Huddersfield Narrow Canal. This moorland is part of the South Pennine Moors SSSI, and is also designated a Special Protection Area (SPA) under the EU Birds Directive. It is a very important area for upland birds such as merlin, golden plover, curlew and twite. The reservoir, which is isolated without access or recreational activity, helps increase the biodiversity of the surrounding SSSI.

Many industrial sites adjoining waterways and docks have a peculiar botanical history. Imported materials often held seeds from foreign plant seeds which began growing alongside warehouses and factories. These sites became favourites with botanists, and many papers and articles were published about dock 'aliens'. Despite the reduction in imported materials many sites still support many alien plants - this site at Sharpness is now designated as a Wildlife Site because of them.

Adjoining land

A wide range of UK habitats

The waterway network passes through almost every wildlife habitat available in the UK. Some, like field margins and woodlands, are regular features and have their own special place in our biodiversity plans. Other habitats occur more sporadically and range from industrial land, parks and gardens to meadows, heaths and moorland. The biodiversity of these adjoining habitats can often enhance, and be enhanced, by the biodiversity of the waterway itself. Adjoining land may not be owned by British Waterways but a partnership approach with landowners can help meet biodiversity targets.

The inland waterway network eventually reaches the sea, where there are great contrasts in habitats. Here at Ardrishaig on the Crinan Canal, there is a brackish influence on the freshwater of the canal above the sea lock and a very different group of animals and plants below. Not all canal ports are actually on the coast - some, like Brentford Docks in London, are located up tidal rivers, but all have marine influences on their biodiversity.

Gardens can be the most important adjoining habitat where our waterways pass through suburban parts of towns and cities. These gardens, backing onto the Huddersfield Narrow Canal at Golcar provide the garden equivalents of scrub, grassland and wetland and are home to many birds, insects and amphibians. The canal's habitats and species combine with the gardens to create a corridor of biodiversity.

SPECIAL CHALLENGES

- develop new partnerships to help improve biodiversity on adjoining land
- enhance adjoining habitat along urban waterways

Where adjoining land is owned by British Waterways, it can be managed to maximise its biodiversity value. This flowery meadow adjoins the Grand Union Canal at Hatton, and is managed as a picnic site. The management of the areas surrounding the picnic tables is designed to encourage wildflowers, including these Bee Orchids.

This aerial view of the Trent & Mersey Canal near Fradley shows a narrow field margin alongside the towpath hedge but an unusually wide and diverse field margin on the offside bank. This wide margin has a range of wood, scrub and grassland habitats that significantly increase the waterway corridor's biodiversity. Such wide field margins, though unusual on canals, could become more common through biodiversity action planning.

Field margins

The land just over the boundary

Field margins, the strips of uncultivated land along field boundaries, can be very valuable for wildlife. During the years of agricultural intensification this habitat has decreased but there is now recognition of its value, both for biodiversity and for field sports. It might seem to be outside the influence of British Waterways, but some field margin habitat is often in canal ownership, especially where there are slight embankments and cuttings. And even where field margins lie outside the waterway boundary maintenance work, such as dredging disposal, bank protection and hedgerow work will influence their biodiversity.

Arable fields, now mostly plant mono-cultures, would once have had many arable weeds within the crop and a rich diversity around the margins. The species-rich margins had more than wildlife value - they were traditional features of fields and important landscape features. Common species included perennial grasses and small annual plants, tolerant of occasional disturbance, like this scarlet pimpernel.

SPECIAL CHALLENGE

- develop partnerships to increase the amount and quality of field margin habitat alongside waterways

Many farmland birds, including gamebirds, rely on field margins for nesting and to find seeds and invertebrates for food. Some, such as this once common grey partridge, have become quite rare in recent decades, mainly due to changes in farming, particularly loss of hedgerows and margins through intensification and use of chemicals. The grey partridge has now become an indicator of the need for better field margin habitat.

Recent research has shown that field margins are important for a wide range of species, including game birds, but also invertebrates, other birds, hares and harvest mice. The concept of 'conservation headlands' managed especially for wildlife is becoming established. And 'beetle banks' to encourage predatory invertebrates and reduce farmland pests, are also gaining popularity. This lockside field margin is typical of the type of scheme now being promoted in partnership with local farmers, sometimes with grant-aid.

Woodlands and scrub

Small woodlands alongside waterways

Many woodlands occur in strips alongside canals and river navigations. This site on the Macclesfield Canal is a typical example. At the water's edge there are alders, with trees of drier conditions, including birch and hazel, on the slope behind. In this case there is a fine show of bluebells, indicating that this site has been wooded for many years, perhaps before the canal was built.

▲ Sometimes waterways cut through large woodlands that pre-date the canal by hundreds of years. This is Hopwas and Hays Wood on the Birmingham & Fazeley Canal, an ancient woodland that has existed for at least 400 years. Ancient woodlands like this have a special biodiversity with plants, invertebrates, mosses and lichens that do not occur in more recent woodlands. Other ancient woodlands on canals include Perivale Wood on the Grand Union. Established as a nature reserve in the 1880s, this is probably the oldest canalside nature reserve.

The waterway network is not usually associated with woodland and scrub, though most waterways have small areas of wood or scrub alongside. Often these sites are pockets of land bought by the original canal companies and kept for access, dredging tips, or simply because they were corners of once larger fields isolated by canal construction. Sometimes waterways pass through larger woodlands. Woodlands and scrub provide habitats for species that would not normally find suitable conditions along waterways, increasing our biodiversity.

◀ Scrub adds more variety to waterway biodiversity - offering different habitats to woodland. This disused and dry canal channel has mainly elder and hawthorn scrub and has a rather limited biodiversity, but can be valuable for birds and small mammals. The scrub that has developed on our embankments, or on towpath banks, is generally more diverse, providing habitats for insects such as butterflies, as well as for birds and badgers.

SPECIAL CHALLENGES

- manage waterway woodlands and scrub to maximise biodiversity
- create new woodlands and scrub areas

◀ Small hazel woods on the Lock Islands in the River Severn Navigation used to be coppiced - providing a supply of straight poles useful for fencing. This site, on Holt Lock Island, will soon be coppiced again, after an interval of 10 years. The new management is part of a local biodiversity scheme and will help conserve special plants such as toothwort, which depend on traditional woodland management.

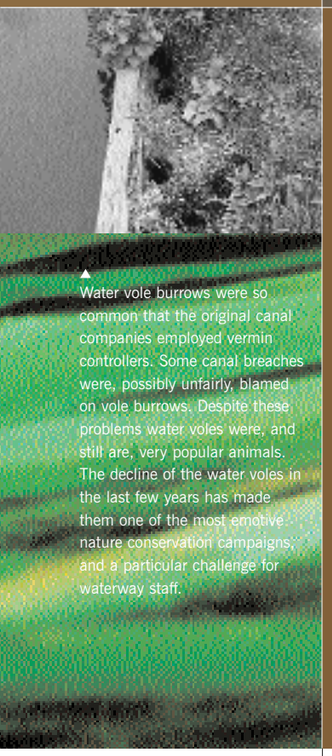
Species

Water voles

The best-known waterway mammal

Though once common and widespread, water vole populations have declined in recent years, largely as a result of habitat loss and predation by mink. The loss of these once familiar and much-loved animals, best known as the water 'rat' of Wind in the Willows, has led to many projects to help reverse the trend. They are now a protected species and although still found on our waterways, most vole colonies have become small and isolated. Canals with soft banks and fringing vegetation provide the best habitats, but water voles also live in gaps and crevices in waterway walls. Because they live at the water's edge, many maintenance and recreational activities can affect them.

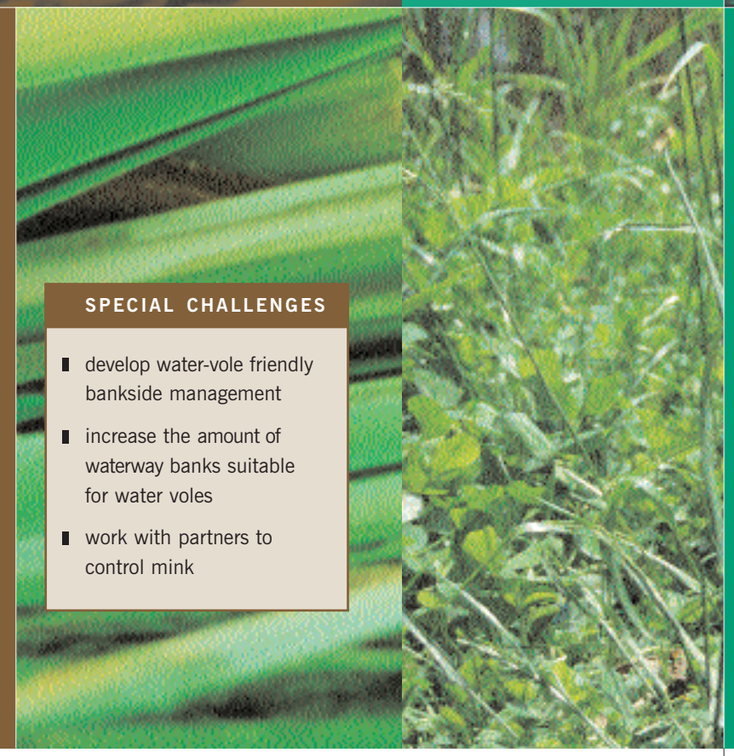
Water voles, sometimes called water rats, are our largest species of vole and usually live along waterway margins. Though similar in size to rats, they are very different in appearance. Water voles have much darker fur, a rounder body, a shorter tail, less obvious ears and a shorter, blunter head with small eyes.



▲ Water vole burrows were so common that the original canal companies employed vermin controllers. Some canal breaches were, possibly unfairly, blamed on vole burrows. Despite these problems water voles were, and still are, very popular animals. The decline of the water voles in the last few years has made them one of the most emotive nature conservation campaigns, and a particular challenge for waterway staff.

▲ Lush vegetation along waterway banks is essential for water vole feeding and breeding. They feed on the tall grasses, sedges and rushes of the banks and burrow to create residential burrows and bolt holes. Drystone waterway walls and rip-rap bank protection sometimes support colonies, but hard vertical bank protection systems cannot support viable populations.

▲ The loss of water voles is closely linked to the introduction of predatory American mink. Control of the now naturalised mink would help water voles but is difficult because mink readily re-colonise - successful local control is usually followed by new arrivals from neighbouring territories. On a positive note, the return of otters to some areas seems to be linked to mink reduction and so the situation may improve as otters return.



SPECIAL CHALLENGES

- develop water-vole friendly bankside management
- increase the amount of waterway banks suitable for water voles
- work with partners to control mink

◀ Careful planning of bank protection work is the best way we can help water voles. Most vertical systems, such as trench-sheeting, are not 'vole-friendly' as they prevent burrowing and discourage bankside vegetation. 'Softer' methods using geotextiles or hard methods that incorporate soft banks and vegetation, have been successfully installed on many canals in recent years. These systems can help conserve remaining populations, and encourage the return of water voles to other lengths.

Otters

Encouraging their return

Otters were once widespread throughout the UK but their numbers declined rapidly from the 1950s and they are now absent from many areas. Intensive conservation work over the last 15 years has started to reverse the trend and numbers are now increasing in many parts of England as well as in Wales and Scotland. Although otters prefer natural watercourses, they also use canal and river navigations and our waterways may have an important role in helping them to return.

Otters are often confused with mink, which live in the same habitats and have a similar body shape. They are actually twice as big as mink, are always brown and have spiky fur when wet. And they are very shy - most 'otters' seen in daylight on canals in England are actually mink, which are characteristically very bold.

▲ Otters use a variety of waterside habitats, but prefer relatively undisturbed watercourses with thick vegetation along the banks. Canals alongside rivers are ideal, as there are often quiet scrubby or wooded areas between the watercourses. Such areas, often used as resting sites, can also be suitable for breeding holts. Otters have large territories, covering as much as 40 km of watercourse, and they need these habitats at frequent intervals.

▲ On some of our waterways in Scotland otters are still a regular sight. This is partly because they are more common, but also because they tend to be rather bolder in Scotland. This picture shows a area of the of the Crinan Canal where there are frequent sightings. In England and Wales otters may never be commonly seen because of their shyness but continued habitat improvements will help recovery of the population.

SPECIAL CHALLENGES

- continue to work with partners to encourage the return of otters
- create waterway corridors and sites attractive to otters

◀ The best way to encourage the return of otters is to provide and extend suitable habitat. Many partnership projects, led by the Wildlife Trusts and mostly based on river catchments, operate across the country. British Waterways have been helping with several of these, including those on the Cherwell, Kennet and Severn rivers, all of which run alongside canals. As well as general habitat retention and improvement these projects encourage the construction of artificial holts, such as this one, shown under construction, alongside the Oxford Canal.

Amphibians

Frogs, toads and newts

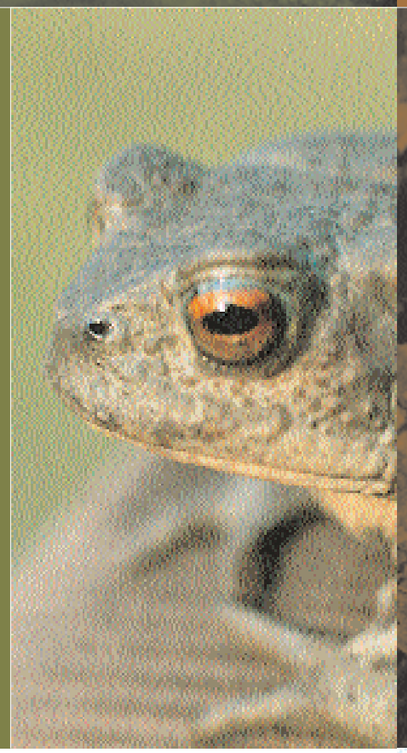
The combination of land and water habitats on our network can provide ideal habitat for amphibians. They can breed in the water, and then spend their adult lives on the land alongside. All the six native British amphibians have declining populations but most still occur on our waterways. Information about rarer species, such as great-crested newts on our waterways is limited, but the commoner species are often seen, particularly as spawn, tadpoles and young adults.

The best-known amphibians of our waterways are the common frog and the common toad. Both breed in the waterway margins, and they are most successful in quiet sidewaters or wides, where aquatic vegetation can give their tadpoles a chance of escape from fish.

▲ Amphibians may be the reason for many people's first visits to our waterways. Most children have been taught about aquatic life using frogspawn and many would have collected their specimens from their local canal in spring. Today over 80% of schools are within 10 miles of a canal and many use their local waterway to demonstrate 'pond-dipping'.

▲ Smooth, great-crested and palmate newts use our waterways. Smooth and palmate newts like these may be present along every waterway, though they are seldom seen. Great-crested newts are much rarer, though even these occur fairly regularly. Newts have a similar life-cycle to frogs and toads, and need shallow margins and easy access to waterway banks to breed successfully.

▲ Amphibians need habitats that merge into each other. Waterways with shallow margins, soft bank protection and diverse towpath verges and adjoining hedges and field margins are ideal for them. Within the channel a mixture of submerged, floating and marginal plants shelter tadpoles and along the banks rough grassland, hedgerows and scrub provide good habitat for the adults to forage for their invertebrate food and hibernate. Old side-arms like this are ideal for them.



SPECIAL CHALLENGES

- keep shallow vegetated margins and soft banks to encourage amphibians
- use special techniques to protect the rare species during works

◀ Because they utilise every waterway habitat, amphibians will be helped by good habitat management in general. Special management for amphibians is needed only where there are special problems, such as a need to exclude them from maintenance or development sites during works. This 'amphibian fence' is part of a project by the Cheshire Wildlife Trust to manage grest-crested newts at Witton Lime beds, close to the Weaver Navigation and the Trent & Mersey Canal.

Reptiles

Snakes, lizards (and terrapins)

The land habitats alongside waterways are used by most of our native reptiles. Grass-snakes and slow-worms are commonly seen on our towpaths, where they bask on the grassy banks. These, and the other British reptiles, are now protected because of their dwindling numbers Being cold-blooded, they all need sunny places to bask and the banks, paths and slopes of canals are often ideal.

Slow-worms, our commonest waterway reptile, look like small snakes but are actually legless lizards. Well-hidden, they hunt invertebrates such as slugs and snails in the evenings and after rain. They hide amongst stones or under piles of cut vegetation during the day and are easily missed. Like other lizards they can shed their tails to confuse predators.

▲ Grass-snakes are at home on land or water. They bask in the open, often along quiet sections of towpath bank, offside bank, or on dried dredgings. Since they can reach over a metre in length, they can be quite startling to find, but they are harmless, and will quickly move away, often into the channel. They are strong swimmers, and will catch small prey, such as young frogs. Because of their liking for water, grass-snakes are commonest on waterways with soft banks that allow easy access in and out.

▲ Terrapins are becoming a regular sight on some waterways. These non-native reptiles are mostly pets, irresponsibly released when they became too large for their owners to keep. The American red-eared terrapin is the commonest but other species including snapper turtles and European pond terrapins are sometimes seen. These animals can live for a long time, and if they breed could become a conservation problem. Their diet of small animals is already causing local problems and they may carry new reptile and amphibian diseases.

◀ Reptiles like a range of vegetation types for hunting, basking and breeding. They can be encouraged with long and short vegetation on the towpath, traditionally-managed hedgerows, soft-waterway banks and cutting and embankment slopes with a mixture of scrub and open ground. Piles of grass cuttings and compost heaps are useful for hibernation and basking. These piles will also be used by grass-snakes for egg-laying if they are left undisturbed. Land can be improved for reptiles by providing features such as banks and mounds (of earth, logs or rubble) for them to burrow into or bask upon.

SPECIAL CHALLENGES

- encourage reptiles with a mixture of vegetation types and soft waterway banks for grass-snakes
- work with terrapin action groups to assess and solve the terrapin problem
- discourage dumping of unwanted terrapins

Fish

Our hidden waterway wildlife

Though they are hidden underwater, fish are a major part of our waterway biodiversity. Indeed the waterway fishery is so large that British Waterways can claim to be Britain's biggest owner of coarse fishing rights. The main canal network is managed as a traditional mixed coarse fishery and is famous for its roach, gudgeon, bream and perch angling. Many other species also occur. Our river navigations, reservoirs and feeder streams support different types of fishery, with some reservoirs managed as specialist fisheries.

The disturbed muddy waters of our navigated canals have a characteristic fishery dominated by medium-sized roach and gudgeon, with bream, rudd, tench and perch in smaller numbers. Species variety is best where there are vegetated margins and some waterside trees. The waters of our quieter side-arms and unboated waterways have a different type of fishery, with a more 'natural' population structure of many different sized fish, often including large pike.

Canals have been popular fishing venues since they were first built, with canal companies and local landowners making extra income from anglers. Then, as now, fish would have been deliberately stocked to increase sporting value. There is a long tradition of letting lengths of canal to fishing clubs. This sign, from an angling club in Chester, once stood on the Guilsfield Arm Canal in Montgomeryshire, shows how far anglers would (and still do) travel for the pleasure of canal fishing.

As well as the species prized by anglers, our waterways have many other fish species. Some, like minnows or this stickleback, are well-known and common. Others are rarer, or even protected, adding to the fishery's biodiversity value. Special biodiversity species include allis and twaite shad, spined loach, bullhead and lampreys. These only occur in certain waterways, and are often limited to lengths with particular conditions, such as a combined river and canal channel.

Introduced into some midland canals in the 1970s, the zander, native to continental Europe, is now spreading rapidly. As a predator of small and medium-sized fish, zander have seriously affected the angling value of many canal fisheries. They are particularly well-adapted to the muddy waters of navigated canals. Electro-fishing and seine-netting operations to remove zander are expensive and labour intensive, and have only been partially successful in controlling this invader.

SPECIAL CHALLENGES

- integrate biodiversity into our angling strategy
- increase our knowledge of canal and reservoir fishery ecology, including ecological impacts of zander
- work with partners to develop a zander control strategy

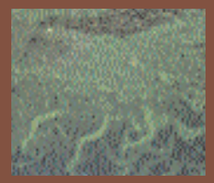
Fish rescues, undertaken when canals are drained for maintenance work, are just one part of fishery management. Fish stocks often need to be supplemented, usually in partnership with local angling clubs. Many general habitat improvements also help - vegetated margins in channels and soft waterway banks help provide breeding and spawning habitat, and overhanging vegetation provides shelter for adult fish. Where rare species occur, special management may be needed - the spined loach of the Grantham Canal have a part in the canal's ecological action plan.

Freshwater sponges

Mystery animals in locks and under bridges

Sponges are colonies of microscopic animals - and most are marine. Very little is known about the freshwater types, but they have been reported from many canals in the last few years. They can grow in a variety of shapes and colours, and are usually only noticed when canals are drained down for repairs. There are so few studies of these animals that we don't even know exactly how many species exist in Britain. They are considered to be fairly rare, though regular canal sightings suggest some sponge species may be common, certainly in disused canals.

The colour of freshwater sponges seems to depend on their position - in full sun an algal association turns them green. But this specimen, in a shaded spot on the Huddersfield Narrow Canal, is creamy white. All freshwater sponges belong to the Spongillidae family - and there may be as many as 16 species in Britain.



Freshwater sponges prefer to grow on a solid substrate, and are most often seen on lock sides and on masonry in bridge-holes. Sometimes they grow on debris in the canal, or on submerged alder roots. They seem to grow in one of two main shapes - either flat lichen-like encrustations or large branching finger-like growths. They can grow quite large - flat ones 500mm diameter have been seen, and these finger growths, in a culvert on the Montgomery Canal, are each about 100mm long.

Our knowledge of national distribution of freshwater sponges is rather poor. Specimens in museums include several from canals - this one was collected in the Basingstoke Canal in 1955. But more seems to be known about the distribution of sponge-loving insects such as spongeflies. These have larvae that live within sponges and their lacewing-like adults are known from many places across Britain.

Little is known about the habitat and management requirements of freshwater sponges. Where they are affected by repair works, such as the restoration schemes on the Forth & Clyde, Huddersfield Narrow, Kennet & Avon, Montgomery and Union Canals, experimental translocation may have helped them survive. Research may help find out exactly what these strange animals need. This picture shows Clare Valentine, Keeper of Porifera (sponges) at the Natural History Museum in London, studying some canal sponges as part of a new partnership project.

SPECIAL CHALLENGES

- work with partners to determine the conservation importance of sponges in canals
- ensure sponges are conserved during maintenance work

Molluscs

Slugs, snails and mussels

The shells of both land and freshwater molluscs are easily found along the waterway system. The towpath verges, hedge and adjoining habitats provide home for all sorts of terrestrial snails and slugs, and in the waterway channel and banks there are water-snails, winkles, mussels and tiny cockles. This great diversity of molluscs is increased further by feeders and side-weirs, where there may be tiny freshwater limpets. The full list includes some rarer species, but our mollusc fauna is perhaps more important for its characteristic diversity than for any individual species.

Freshwater snails like these ramshorn snails are familiar to most children from pond-dipping expeditions. This particular species is common in almost every canal, along with the true pondsnails and the freshwater winkle. They are easy to catch where there are shallow margins, particularly if there are some marginal and aquatic plants to provide shelter and food.

This section of the Grand Union Canal, close to Marsworth Church, is where a new species of freshwater cockle was discovered in 1916. The fine-lined pea cockle (which is only 2 mm long!) was discovered by a Mr Stelfox, one of many 19th and early 20th century 'conchologists' who visited canals and wrote numerous papers about their molluscs. This cockle may be extinct at the original site, though it does occur in other canals.

Land snails and slugs may remind people of garden pests, but there are many other species, mostly small and rather pretty. This collection is typical of towpath verges and hedgerow bases, where there are plants and leaf litter to feed on and many crevices to hide in. On dry banks or in stone walls there may be a huge variety of species. On one canal towpath over 35 species of land snail have been found.

One of the biggest invertebrate species of our waterways is the swan mussel, rivalled only by crayfish for size. Like the familiar seaside mussels, these are bivalves (two-shelled) but they grow much bigger, reaching over 150 mm in length. Though their larvae are fish parasites, the adults live in the muddy sediment at the bottom of the canal, feeding by filtering canal water through the shell and removing food particles. They can live for many years - indicated by the growth rings on the shells. These two are about ten years old.

SPECIAL CHALLENGES

- research the types and distribution of molluscs on our waterways
- help ensure survival during works, particularly dewaterings, by leaving some water in bed

Management for molluscs is dependent on the retention of good habitat - if this exists then so do the molluscs. Many require some special attention. Rarer species like Desmoulin's snail (which held up the Newbury Bypass) are found on some waterways, and these need expert survey before disturbance. A more common problem is the survival of Swan Mussels during dewatering work. If they are stranded like this one they may die, though they will move into a central pool if this can be left. This particular swan mussel has colonial zebra mussels (an introduced eurasian species) attached.

Butterflies and moths

Representing the land insects

Land insects - bugs, bees and beetles - are plentiful in the habitats alongside the water channel. They probably make up the bulk of our biodiversity - some surveys have found over 350 species in the towpath verges alone. But because it is difficult to plan for all these insect groups, butterflies and moths can be used to represent the others. These are the largest and best-known insects, and they have specialist species living and using every type of waterside habitat.

This common blue is just one of the many butterflies of a rich towpath verge and hedgerow. It is on the wing all summer, accompanied in spring by speckled woods, commas and overwintered (and often rather worn-out) brimstones and small tortoiseshells. In the summer these are joined by red admirals, large skippers, meadow browns, peacocks and gatekeepers.

There are many more moths than butterflies and they use virtually every habitat available. Even the water channel supports some species. This brown china mark moth, resting on the edge of a water lily leaf, may have recently emerged as an adult. This species has aquatic caterpillars, that live just under waterlily and other floating leaves, cutting distinctive oval holes in them.

Not all butterflies are colourful. This is a large skipper, on the Oxford Canal towpath. Its caterpillars feed on grasses. Even the 'glamorous' species have caterpillars that need fairly 'ordinary' plants. Grasses are also the foodplant for speckled woods and gatekeepers, docks are essential for small coppers, thistles for painted ladies and nettles for peacocks, small tortoiseshells, commas and red admirals. Every towpath verge should be able to support some butterflies.

This wide towpath margin, on the Grand Union Canal, is ideal for butterflies, moths and other land insects. The habitats here - verge, grassland, hedgerow and scrub - are the main habitats used by butterflies and moths along waterway corridors. Towpath verges and grassland on embankments ensure a range of caterpillar food-plants and flowers for adults to visit. Hedgerows and scrub provide shelter as well as additional plants and flowers, including some particularly good butterfly flowers such as bramble.

SPECIAL CHALLENGE

- conserve and encourage butterflies, moths and other land insects through retention of towpath verges and hedgerows

British bats feed on insects, locating them during flight using an echolocation system. This echolocation, which also allows them to avoid obstacles at night, is too high-pitched for the human ear. Many bat species can be found along canals. This picture is of a Daubenton's Bat, a species that has adapted to feeding on the midges and gnats that gather over water.

Bats

Nocturnal users of canal corridors

Though waterway bats are usually associated with our bridges and tunnels they really use the whole canal corridor to hunt for their insect prey. The combination of open water, verges, hedgerows, trees and adjoining pastures provide a plentiful source of the insects they feed on at dusk. And of course waterside bridges, aqueducts, culverts, walls, buildings and tunnels are used as roosts, nursery and hibernating sites. All our species of bat have become scarcer during the last 50 years and bats and their roosts are now protected.

▲ Many canal structures have a long history of use by bats. This archive picture shows Saddington Tunnel on the Grand Union Canal, a site used as a roost and hibernating site for at least 40 years. Canals are now known to provide roosting and feeding sites for significant numbers of bats. Greywell Tunnel, on the Basingstoke Canal in Hampshire, is one of the biggest bat hibernating sites in northern Europe.

▲ Bats are seldom seen in daylight, despite frequenting many waterway structures. Their roosts are often hidden behind apparently impossibly small crevices and experts need to be called in to check before repair works. One clue to look for is the presence of droppings under bridges and aqueducts. About the size of mouse droppings, they are characteristically dry and crumbly.

▲ Bats also roost in trees, particularly old ones with crevices and hollows. But natural roosts like these have become scarcer and built structures are becoming increasingly important. Almost every waterway structure can be used, but tunnels, bridges and the underside of aqueducts are particular favourites. Larger structures, where internal temperatures can remain constant, are often used as hibernating sites.

SPECIAL CHALLENGES

- ensure bat roosts are retained during maintenance of structures and trees
- maintain and extend feeding habitats and flyways

◀ Disturbance to bat colonies may be unavoidable during maintenance work on waterway structures, though it can be kept to a minimum by phasing works to seasons when the bats are absent. Where bats are disturbed, formal licensing and expert help is needed to ensure no damage is done and that roosts are retained after the works. A variety of artificial roosts like these 'bat-bricks' have been incorporated into bridges, tunnels and aqueducts in recent years.

The white-clawed crayfish, (sometimes called the atlantic stream crayfish) looks like a miniature lobster, growing to about 100mm. They are a grey-brown colour, with a pale (never really white) underside to the front claws. Once widespread across Europe and formerly commonly harvested for food, they have suffered major population crashes since the 1970s, due to disease and competition with alien species.

White-clawed crayfish

The freshwater mini 'lobster'

There are now several species of crayfish in our waterways, but only one, the white-clawed crayfish, is native to Britain. The others are introductions from abroad, and their spread, and a fungal disease known as crayfish plague, has led to a dramatic fall in the native population. The white-clawed crayfish, once common, is now a protected species. Populations survive throughout the waterway network, particularly where there is traditional drystone bank protection.

▲ Several unwelcome crayfish newcomers are now common in most canals. The most widespread is the signal crayfish from America but others include the red swamp, noble, and narrow-clawed (or Turkish) crayfish. All have escaped from crayfish farms, where they are grown to meet increasing demand from delicatessens and restaurants. Some alien species, particularly the signal crayfish, burrow and may cause structural damage. The Chinese mitten crab, another alien and a distant cousin of the crayfish, can also cause structural damage. These have colonised parts of the Thames catchment and some north-east waterways.

▲ The white-clawed crayfish thrives where there are many underwater crevices to shelter. Traditional drystone washwalls and fringes of reedy vegetation are ideal. This liking for crevices (which is the origin of word crayfish) is due to their need to defend themselves from the front and to protect them during moults. Good water quality is essential, as crayfish rely on a range of snails, larvae, detritus and fish for food.

SPECIAL CHALLENGES

- ensure crayfish populations and habitats are conserved or restored during channel maintenance work
- working with partners, help control or limit the spread of non-native crayfish species and mitten crabs

◀ The most direct way to help native crayfish is to ensure their survival during and after repair works. Several recent projects have included expert crayfish surveys, rescue and translocation prior to works. Inclusion of crayfish habitats - crevices and reedy fringes will also help. This picture shows almost completed re-lining works on the on the Grand Union Canal at Long Itchington. Survey and rescue took place before the works and the rip-rap offside bank will provide suitable habitat after rewatering. The towpath wall, built with procupine blocks, also has special crayfish crevices.

Water plants

Submerged, floating, and emergent plants

With such a great variety of species, including many rare ones, our water plants are one of our greatest biodiversity assets. They come in all shapes and sizes with feathery submerged types, flat-leaved floating ones and broad-leaved and reedy emergent species. Sizes range from the tiniest duckweed, a few millimetres across, to the huge water lilies. Most of our canal SSSIs are designated because of water plants - having either an unusual variety of species, or special rare ones. Some are designated for both reasons and their biodiversity importance can often complicate restoration projects.

The varying forms of our water plants are illustrated by these four commonly-found species. The broad-leaved pondweed has mostly floating oval leaves - its submerged leaves are long and filamentous. Its cousin the curled pondweed is very different, only having submerged leaves, each with a characteristic scalloped edge. Arrowhead is one of the emergent broad-leaved types, and its unmistakable leaves are often seen along canal margins. Branched bur-reed is one of the reedy types, with characteristic 'burr' flowers. ▶

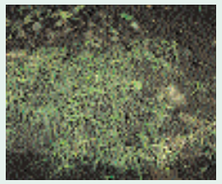
◀ The greatest variety of water plants is found in canals with relatively clear and undisturbed water - usually those with only a few boats, or even no boats at all. These are often the unrestored waterways. Many, like the Pocklington or the Montgomery Canal, have SSSI or even international wildlife site status because of their plant communities. Since most are undergoing restoration, with an expectation of increased boat traffic, the conservation of the water plants is becoming a major management challenge on these waterways.

◀ In canals with regular boat traffic the amount and variety of water plant vegetation is more limited except in wides and side-arms. In the main channel submerged water plants are mostly found at the margins, with tough disturbance tolerant species such as fennel-leaved and broad-leaved pondweeds. The emergent plants of the margins are also different - often dominated by reed-sweet grass. Though this vegetation is less diverse for plants it is still an important habitat for a wide variety of aquatic invertebrates.

Our special water plants

Some water plants on the waterway network are especially important. A few of these special species are restricted to just one or two canals. They include the 'American' pondweed, known in the Rochdale Canal and the Calder & Hebble Navigation since 1907, but usually only found in Hebridean lochs. And Bennett's pondweed, a hybrid species known in the Forth & Clyde Canal since the 1890s, which has never been seen anywhere else in the world.

Other special species are occur more widely. Two of the most important are floating water-plantain and grass-wrack pondweed, both 'priority' species of the UK BAP. BW have been appointed 'Lead Partner' for the UK Species Action Plans for these plants. Both species have become extinct in many areas and their Action Plans aim to prevent further loss.



▲ **Floating water-plantain (floating and submerged forms)**

Once confined to heathland pools and upland lakes, this plant was found in canals as early as the 1860s. Today it is extinct at most of the original sites and so the canal populations have great biodiversity importance, in both UK and international terms. Despite its name it is a rooted plant, though it does have two growth forms - a submerged grassy form and, in suitable conditions, a form with floating leaves and flowers. The submerged form is found in lightly-boated canals, including the Ashton, Cannock Extension and Wyrley & Essington Canals, but the floating-leaved form seems to thrive only in very lightly-boated or unboated waterways - particularly the Montgomery and Rochdale Canals.

▲ **Grass-wrack pondweed**

This plant is one of the rarest 'true' pondweeds. It is a submerged species, with long thin leaves and tiny green-brown flowers. Though less attractive than floating water plantain, this species is even rarer, becoming extinct at most of its non-canal sites in recent years. Like the plantain, it seems to thrive only in lightly boated or boat-free canals - this picture is of a thriving colony in a disused sidearm of the Ashton Canal in Manchester. Other populations survive in the Grantham and Montgomery Canals, though there are historical records from a number of other canals.

◀ Management for water plants often involves retention of undisturbed channel margins and side arms. On the Montgomery Canal, where many sensitive species survive, a variety of techniques have been pioneered. The original offline reserves concept, established in the 1980s, involved the provision of boat-free areas. More recently trials to protect the offside edge of the channel with fendering have been tried and there are proposals to manage boat traffic in the main channel. This level of water plant management is not needed on most other waterways, but smaller scale projects, perhaps encouraging water plants in wides or disused side-arms, are possible on most lengths.

SPECIAL CHALLENGES

- research distribution, genetic origins and disturbance tolerance of rare and unusual water plants
- continue to develop our lead partner role for floating water plantain and grass-wrack pondweed
- reconcile conflicts between water plant conservation and canal restoration and recreation
- determine methods of sustainable management and development where sensitive or important species occur

Birds

The most popular waterway wildlife

Waterway birds are probably the most visible and popular wildlife of the canal network. Swans, moorhens, coots and ducks are easy to spot from the towpath. But there are also many other birds along the waterways - there are the smaller birds of the reed-fringes, towpath hedge, and of the woods, scrub and other land habitats in the wider corridor. And many of our reservoirs are important wildfowl sites, many with SSSI status. Some have special protection under the EU Birds Directive. Overall the waterway network provides a home for a great diversity of resident, breeding and overwintering bird species.

Mallard ducks are probably the most familiar bird on our waterways, being common on both rural and urban lengths. Other familiar species are mute swan, moorhen and coot, often breeding in offside vegetation or in quiet sidewaters. Pied wagtails, reed buntings and sedge warblers are also often seen along the water's edge.

Waterways have a long association with birds, particularly at reservoirs, where the shooting rights were often reserved by local landowners. At Gailey Reservoir, on the Staffordshire and Worcestershire Canal, there is a long-established heronry in the trees on the small central island. Herons have been using this site since the 1930s.

Hedgerows, towpath verges and woods and scrub on cutting and embankment slopes can provide valuable habitat for birds. As well as nesting sites there is range of seeds, shoots and insects for adults and young to feed upon. This chaffinch is a typical of our hedgerow birds. We have larger land birds too - kestrels, buzzards and sparrowhawks may be seen alongside waterways with wooded and scrubby margins.

All birds and their nests, whether on land or water are legally protected during the breeding season. In the spring and early summer, nests are usually hidden in the vegetation of hedges, towpath verges and waterway banks, or like these moorhen chicks, positioned in the base of trees. The rather large nests of mute swans are an exception, always very visible and sometimes constructed on the towpath itself.

SPECIAL CHALLENGES

- ensure breeding birds are unaffected by maintenance work
- retain and enhance breeding habitat along waterways

Most habitat improvements will help birds. These 'reed rafts' on the Lea Navigation' are part of a project to enhance the habitat value of piled banks - they provide shelter and nesting habitat for waterway birds. The scheme, shown during judging for the Waterway Conservation Award in 1999, is a partnership project with the Environment Agency. Individual species can be helped through special projects. Barn owls have been encouraged on the Shropshire Union Canal, Monmouth & Brecon Canal and the Aire & Calder Navigation through partnership projects to install owl nest boxes. Exit ramps can help ducklings in urban areas, and in London Docklands special rafts enable terns to breed without disturbance.

Dragonflies and damselflies

Characteristic insects of our waterways

Over fifteen species of dragonflies and damselflies can be seen on our waterways. Their life cycle, starting in the channel margins and finishing flying amongst bankside vegetation, is particularly suited to canals. Common species include the brown hawker dragonfly and blue-tailed damselfly, and rarer ones like the club-tailed dragonfly and white-legged damselfly are found on some waterways. The value of our waterways for these insects has increased in recent years - they have vanished from many other habitats because of the loss of wetlands, land drainage and pollution.

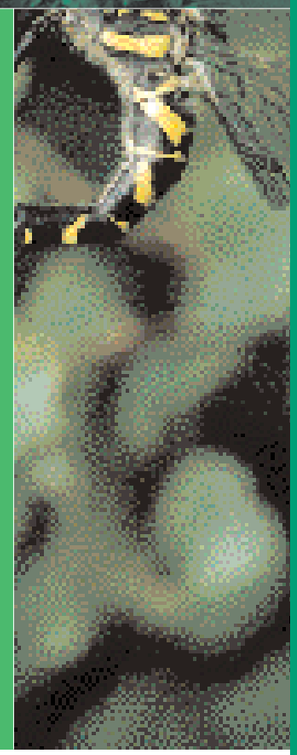
The size, and sometimes ferocious appearance, of dragonflies accounts for old names like horse-stinger or devil's darning-needle. But despite names and appearance, they have no sting, and are completely harmless. This species, pictured during mating in the 'wheel' formation, is the golden-ringed dragonfly. One of the largest and most attractive species of our waterways, these can be seen along canals and rivers in the west and north of the network.

SPECIAL CHALLENGES

- develop integrated habitat management to encourage dragonfly and damselfly populations
- work with partners to find out the distribution and ecological needs of dragonflies and damselflies on our waterways

Damselflies are smaller than dragonflies, with slender bodies and wings that fold over their backs when resting. This species, the banded demoiselle, is regularly seen along canals. The distinctive purple-banded wings show that this one is a male - the female has green wings. Damselflies can occur in large numbers where there is particularly good habitat. On some waterways the numbers of blue-tailed, azure and common blue damselflies can be countless in May and June.

The larvae, or nymphs, live underwater - and some can take several years to mature. They are quite voracious hunters of other aquatic invertebrates and large species will even eat tadpoles. Because of this carnivorous habit, they prefer channel margins with aquatic vegetation, which will provide abundant prey. In the final larval stage they also need reedy vegetation to help them climb out into the air. The adult, after emerging from larval skin, will use waterway banks, towpath verges and hedgerows for feeding and courtship.



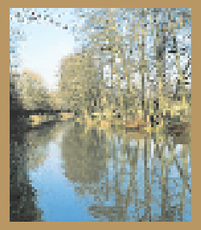
Management to encourage dragonflies and damselflies needs to cover many habitats - channel margins, waterway banks, towpath verges and hedgerows. Waterways with all these habitats will have many species. Away from the main channel, disused wides and side arms like this one are ideal, as long as they are managed to keep a variety of habitats. Specialist surveys can help to expand the range of species present, both by finding out which dragonflies and damselflies already occur and by identifying suitable lengths for habitat improvements. Such surveys have been completed on many canals as part of restoration planning.

Trees

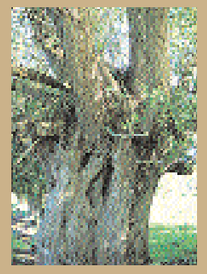
Individual trees on the waterway banks and hedges

Individual trees are an important part of waterway ecology. Each tree species, by providing habitats for other plants and animals, has its own special biodiversity community. Some trees were deliberately planted along waterways, serving as distance markers and windbreaks or simply as bank stabilisation or canal company timber and withy production. But most waterway trees have simply grown naturally, along the banks, in cuttings or within the hedgerow. Willows and alder are the most common trees on waterway banks, with hawthorn, oak and ash in the hedgerows. Fruit trees, particularly plums, damsons and apples are often found in the hedge near canal settlements or lock-keepers' cottages.

Alders are probably the commonest trees along waterway banks. They have fibrous roots that help bind banks together. A row like this, on the offside bank, can help prevent erosion, and by providing shade and shelter, add to the fishery and bird fauna of the length. However they do need to be managed - if this row grew to be fully mature trees they could damage, rather than protect the canal banks.



▲ The original canal companies and engineers often planted trees. These beeches on the Caledonian Canal were originally planted by Thomas Telford, about 1820. Others were planted as living "mileposts" - the Grand Union Leicester Line had elm trees at mile intervals and black poplars at the half miles. The GU mile trees are being replanted by the Old Union Canal Society, though with hornbeams instead of elms.



▲ Many waterway willows and alders, and sometimes other trees, have been managed by pollarding or coppicing. This enables trees to be kept to a manageable size, and can provide a useful product for fencing and other maintenance. This canal-side willow is typical of a pollarded tree - many decades old, but kept small by management. These old trees are a characteristic feature of our waterways and are home to many other species - they are used by nesting birds, a large number of invertebrates, as well as other plants and lichens.

▲ This tree, on the banks of the Caldon Canal, is typical of the many isolated trees around our network. These are important habitats and refuges for many bird species, and are home to numerous invertebrates. They also influence waterway bank and channel species, creating conditions for shade-tolerant bankside plants and shelter and breeding habitat for fish. Some of these isolated trees have become established through planting schemes but many have developed naturally.

SPECIAL CHALLENGES

- retain and plant individual trees and groups of trees
- develop more waterway tree management plans

◀ All our trees need management - particularly where they are growing on waterway structures. This picture shows a line of offside bank alders about two years after coppicing. On many waterways, including the Staffordshire & Worcestershire Canal, Lancaster Canal and the Severn Navigation, tree management plans are now being developed. These plans set out a programme of phased tree maintenance over several years and can take account of both biodiversity and landscape issues.

Action

Biodiversity in practice

At first glance, putting biodiversity into practice might seem to need major change and significant funding. But BW is in a strong position to take biodiversity action already - simply because we manage our own estate and have a commitment to nature conservation. Implementation of the UK and Local BAPs relies on persuasion of landowners to adopt nature conservation and to undertake new or extra management. Our biodiversity approach will build on our existing nature conservation policies, and, for the most part, can be implemented by modifying the way we already manage our land.

In some cases biodiversity management will give us an extra and renewed purpose for our work - tasks like hedgerow and towpath verge management can sometimes be seen as onerous and costly, - but with a biodiversity approach they become positive contributions to waterway management. Use of 'green' bank protection can sometimes seem unnecessarily fussy - exposed steel piling will do the basic job adequately. But if we recognise that our task covers both bank protection and bankside habitat conservation the extra effort and the high quality result is easier to understand and justify. It becomes something we can be proud of.

Implementation of the BW BAP will also help the UK and Local BAPs and lead to the development of stronger or new partnerships with environmental organisations and users. And, unlike many other organisations, our biodiversity is accessible. With over 50% of the population living within 5 miles of a BW waterway we can demonstrate biodiversity management and provide added enjoyment for millions.

Our 'biodiversity challenge' is to implement our biodiversity plans alongside our normal management tasks, in partnership with others, and with better results for all - our staff, users, partners as well as our waterways and the wider environment.

The implementation process

There will be several stages and ways to implement biodiversity planning within BW. Integration of biodiversity actions into existing Environmental Code of Practice procedures is a good first step. Fuller implementation, by development of a biodiversity approach for each waterway management unit, will follow. New partnerships with users, conservation organisations, and funding bodies will aid this process.

We are aiming for full implementation of a biodiversity plan on all our waterways by the end of 2005. Each waterway will start in 2000, on particular lengths or sites or perhaps particular habitats and species. Each waterway is different, and will 'adapt and adopt' the habitats and species proposals outlined in this document to suit local circumstances and partners.

There's a lot going on already - by now many waterways have taken a biodiversity approach for certain sites and lengths. And every waterway is carrying out biodiversity management of some sort - usually without realising it: Active hedgerow management and 'green' bank protection schemes are just two examples of existing but often unacknowledged biodiversity management. The integration and further development of this type of management will help make up our overall biodiversity plan.

The Biodiversity Manual that accompanies this document gives more detailed advice to our management teams. It describes how to progress biodiversity management at a local level and has details of current biodiversity initiatives by partner organisations in their areas. Appendices give fuller information on the species and habitats described in this document, and set out information on important wildlife sites. The following notes summarise the implementation process.

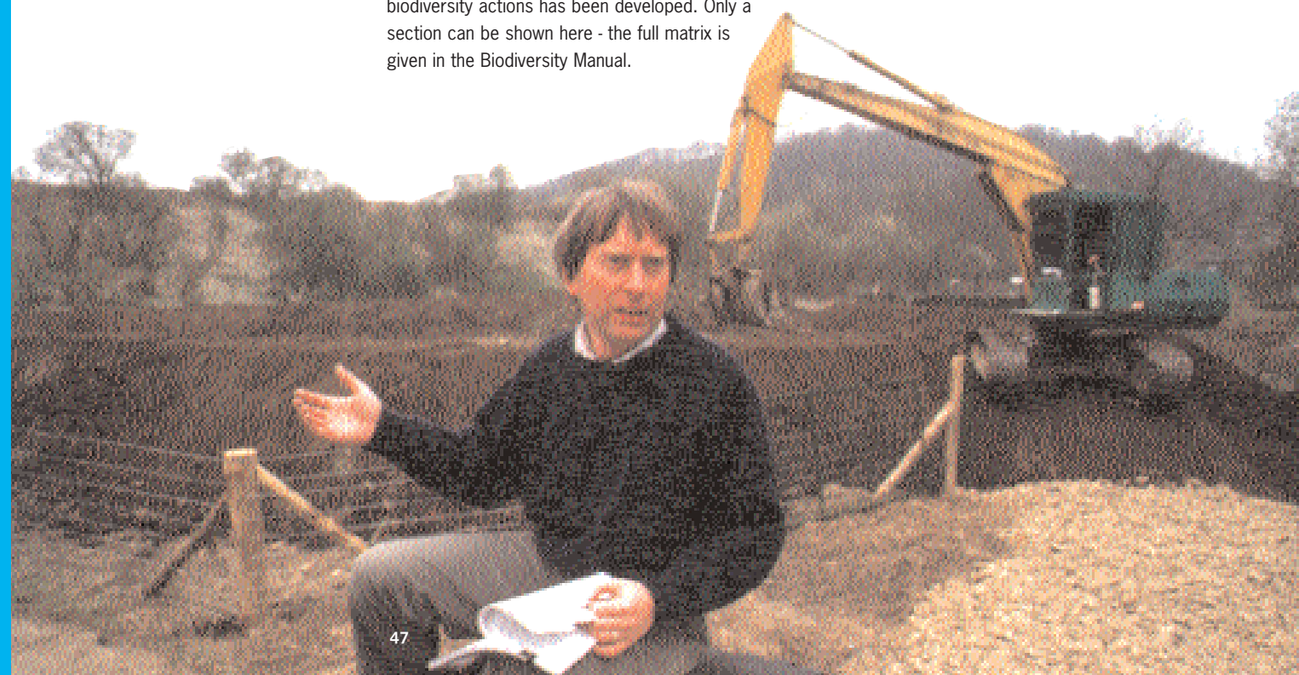
First steps - biodiversity and our Environmental Code of Practice

Each of our waterway and other management units can start biodiversity action planning by using our Environmental Code of Practice - the environmental appraisal system now used for all our activities.

The assessment of 'flora and fauna', listed in each ECP activity schedule, has become much easier now that we have identified our biodiversity habitats and species. Many staff are already using a basic version of the habitats and species list to help appraisal, but the biodiversity document develops the list further. By setting biodiversity objectives and special challenges for each habitat or species group it provides a new focus for each appraisal - setting a target to aim for.

BIODIVERSITY ACTIONS	HABITATS: Canal & River Channels	Waterway Banks	Towpath verges	Hedgerows	↔	Woods and scrub	SPECIES: Water voles	Otters	Amphibians	Reptiles	↔	Trees
Create channel profiles with shallow, sloping water margins or stepped margins to provide for good fringes of emergent vegetation	✔	✔					✔		✔	✔		
↕												
Specify and use native seed mixes, trees and shrubs of local provenance and suited to local site conditions			✔	✔		✔						✔

To help link ECP processes to biodiversity planning, a matrix setting habitats and species against biodiversity actions has been developed. Only a section can be shown here - the full matrix is given in the Biodiversity Manual.



Developing biodiversity plans for local waterways

Biodiversity Planning Process

STAGE ONE
What biodiversity is present?

STAGE TWO
How important is it?

STAGE THREE
What are our objectives, challenges and targets?

STAGE FOUR
How can we deliver them?

STAGE FIVE
Delivering results and monitoring progress

Preparation of biodiversity plans on a waterway by waterway basis will start in 2000 with biodiversity management of particular lengths and sites. In many cases this will simply be a development of existing management programmes. From these beginnings a full 'Waterway BAP' will be built up gradually during the next five years.

Our associated Biodiversity Manual gives detailed advice on how to develop a waterway BAP. During the first year of the process, progress may be fairly modest, concentrating on particular species, habitats or projects - most of the initiatives already started are based on particular sites or lengths. Whatever the scale of the first stages the same biodiversity planning process needs to be followed. This five point plan includes assessment of the biodiversity present, its importance, our objectives for it, means of delivery and monitoring of progress.

Once the initial schemes are in place, the process can be expanded, ultimately covering the habitats and species of the whole waterway management unit. The progression to a full waterway BAP will involve linking the process into our business and work planning procedures. This will be helped if we can develop new partnerships, both to share expertise and reduce or share costs.

Costs and the importance of partnerships

Implementation of biodiversity action planning will mean some extra costs, but these may be offset by other savings or access to new external funding. For general works programme tasks, such as hedgerow management, there may be no extra costs, simply a change of specification or timing.

Additional costs are more likely with special projects such as biodiversity-friendly better bank protection. In these cases external funding may be available - perhaps more readily than if the works were not linked to biodiversity. The Biodiversity Manual gives more information and advice on the types of external funding available.

There could also be costs associated with data gathering, provision of specialist advice and physical production of local waterway plans. These are not immediate costs, and many can be reduced or eliminated by developing partnerships. External funding may be available in many instances.

Developing partnerships is critical to the success of a biodiversity approach and can significantly reduce costs. Every nature conservation organisation and wildlife group, and all local authorities are also developing a biodiversity approach, and their plans have many overlaps with ours. The local Wildlife Trust, for example, will have biodiversity targets for water voles, otters and species-rich hedgerows. They will be seeking landowners who want to help achieve these targets, and we, as a landowner will be seeking their advice on the best way to manage for these species and habitats. Partnership helps achieve mutual objectives at minimal cost.

Key biodiversity partners for British Waterways

Partners who can help us deliver biodiversity objectives include:

The Wildlife Trusts

The network of 46 local Wildlife Trusts around the country, each of which is playing a major part in production of Local BAPs. The Wildlife Trusts are also Lead Partner in the UK BAP for several species.

Nature Conservation and Countryside Agencies

English Nature, Countryside Council for Wales, Scottish Natural Heritage and the Countryside Agency. These agencies can help and advise on protected sites and species issues, and they are closely involved in implementing Habitat and Species Action Plans of the UK BAP.

Local Authorities

Every local authority is working towards a Local BAP, usually in partnership with the local Wildlife Trusts and nature conservation agencies. Each Local BAP sets objectives and targets for key species and habitats in the local area, and each need the support of partner organisations from all sectors.

The Environment Agency (EA) and Scottish Environment Protection Agency (SEPA)

The EA and SEPA are involved in delivering many of the Habitat and Species Action Plans of the UK and Local BAPs. They are Lead Partners for some species, including water voles. EA and SEPA national and local offices can help develop and implement biodiversity action planning.

Other Nature Conservation Organisations

Many national wildlife charities are helping develop biodiversity action plans at a UK and local level. They include the Royal Society for the Protection of Birds, the People's Trust for Endangered Species, and Plantlife - the wild plant conservation charity.

Department of the Environment, Transport and the Regions

The DETR promotes the UK BAP through its Biodiversity Secretariat, with support from the Joint Nature Conservation Committee. The Secretariat provide a service to implement and promote the integration of biodiversity into policies, projects and programmes in all sectors.

More information about partner organisations, including contact details, are given in our Biodiversity Manual.

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For general biodiversity enquiries, please contact:

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Principles

- All of British Waterways' network of waterways and land is, or has potential to be, valuable for biodiversity.
- Biodiversity is a key measure of sustainability and should be considered part of every activity - operational, engineering and commercial.
- This document focuses on the main habitats and species of our network - additional habitats and species may be added at a local level.
- The proposals in each habitat and species account are not prescriptive and should be adapted for local waterways.
- Our biodiversity objectives will be best achieved in partnership with other environmental bodies - and we can help partners deliver their biodiversity objectives.

Objectives

- Integrate biodiversity management into all our business activities.
- Use a range of biodiversity friendly techniques, including using sustainable materials and native stock, to conserve and enhance the species and habitats of our waterways.
- Increase our knowledge of the biodiversity value of our waterways by researching and maintaining records of species and habitats.
- Raise and maintain awareness of the value and conservation requirements of our habitats and species with staff, users and partners.
- Research and control invasive species such as mink, non-native crayfish, and waterweeds.
- Communicate and publicise our biodiversity work to partners, users and the general public.

Special challenges

"Special Challenges" for individual habitats and species are listed on the habitat and species pages.

Photography

British Waterways Photo Library

British Waterways Archive

Arthur Watts Collection

Francis Farr-Cox
bluebell wood p28

Nick Giles
roach p34, stickleback p34

Andrew Graham
otter p31

Frank Greenaway
daubenton's bat p38

Roger Key
water beetle p9, frog p11, gatekeeper p15, mayfly p24, frog, toad, newts p32, slow-worm p33, common blue, china mark moth p37, golden-ringed dragonflies, banded demoiselle p43

Mike Read
water vole p30, terrapin p33

Nigel Willby
submerged floating water-plantain p41

Wildfowl & Wetlands Trust
ox-eye daisy p12, robin p15, arrowhead, burr-reed p40, mallard, chaffinch p42, dragonfly nymph case p43

Sarah Whild
grass-wrack pondweed p41

Woodfall Wild Images
woodmouse p15, barn owl, badger sett p17, bridge p18, overwintering wildfowl p21, rosebay willowherb p23, heron p25, grey partridge p27, mink p30, native crayfish, signal crayfish p39

UK Biodiversity Group, London
Biodiversity Partnership, Cheshire
Wildlife Trust, Worcestershire Biodiversity
Partnership, North West Water,
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