Waterways & Standing Water

Headlines

- Sheffield's rivers and the quality of their waters have undergone vast improvements in recent decades, resulting in a substantial increase in biodiversity.
- The current ecological status of Sheffield's rivers is variable; assessments conducted by the Environment Agency show that most stretches are of an overall moderate status. Quality improves with increasing distance from central industrialised areas.
- Otter and several fish species have now returned to the Don as a result of improving water quality and the installation of fish passes. Twenty-six out of 31 species of fish historically found on the Don have now recolonised the river.
- Reservoirs, such as Redmires, have proved hugely important for many species of breeding birds including curlew, golden plover and snipe.
- Local ponds provide important habitats for species such as great crested newts and dragonflies and many have benefitted from recent restoration work. Dragonfly diversity has significantly increased, partly due to improvements in water quality and associated emergent waterside vegetation.
- Threats to Sheffield's waterways and wetlands include pollution, physical modification of the river and invasive species. Non-native invasive species which have a stronghold on Sheffield's river systems include Japanese knotweed, Himalayan balsam, signal crayfish and American mink.
- Several organisations are involved in the ownership and management of the waterways and there are successful examples of partnership working. Key non-native invasive plants are the focus of ongoing conservation management aimed to control their spread.

European otter © Andy Rouse/2020VISION

Introduction

As a historically industrial city, Sheffield has always been known as a City of Rivers[1]. Sheffield's diverse rivers and waterways have helped shape its rich industrial history, which in turn has influenced their suitability for wildlife and their role in healthy ecosystem functioning. Clearly, Sheffield's rivers are places of transition and ongoing change. Despite being heavily industrialised in the past, waterways within densely populated areas still provide valuable green corridors for wildlife, and following the improvement of Sheffield's river systems, now support a plethora of species including breeding birds, fish and top predator mammals. Five main rivers: the Don; Sheaf; Rivelin; Loxley and Porter, plus the Sheffield and Tinsley Canal, pass through parts of urban Sheffield. The riparian areas surrounding the main rivers also support a network of streams. Naturally occurring standing waters are rarer, but there are many man-made notable standing water habitats, including many reservoirs, particularly to the west of the city. These large reservoirs (see case study) are host to several bird species both in the spring and summer – such as common sandpiper and little ringed plover – and over winter – such as lapwing and golden plover. Sheffield is part of the larger Don and Rother catchment which in its entirety extends over 1,800km^2. Several documents and reports detail the past and present state of Sheffield's rivers and standing waters. Of note is the Don Catchment Flood Management Plan[2], The Sheffield Wetland Habitat Action Plan[3], and the Sheffield Waterways Strategy[4].

What running and standing water does Sheffield have?

Figure 1 shows the composition of Sheffield's running and standing water habitats. There are a number of open waters and canals including several reservoirs, but no large, naturally occurring waterbodies or any priority standing water habitats besides ponds; see case study. Rivers range from upland tributaries to fast flowing main waterbodies, and Ordnance Survey data identifies 258km of linear waterways (including distances from inflow to outflows in lakes and reservoirs). However, this figure does not include many small, incompletely mapped watercourses. Figure 2 shows how these broad habitat types are distributed across the district.

Not all 'wet' habitats are included here: wetland areas such as bogs and fens are considered in the Moorland, Upland & Heathland chapter reflecting the landscapes in which they are mostly found. Wet woodland is considered in the Woodland & Trees chapter.

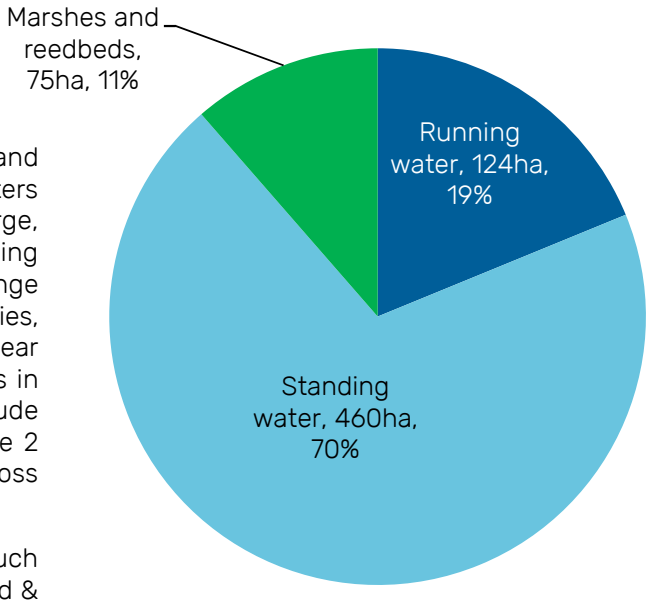


Figure 1 (above): percentage coverage and area (hectares) of broad water habitats within the Sheffield district.

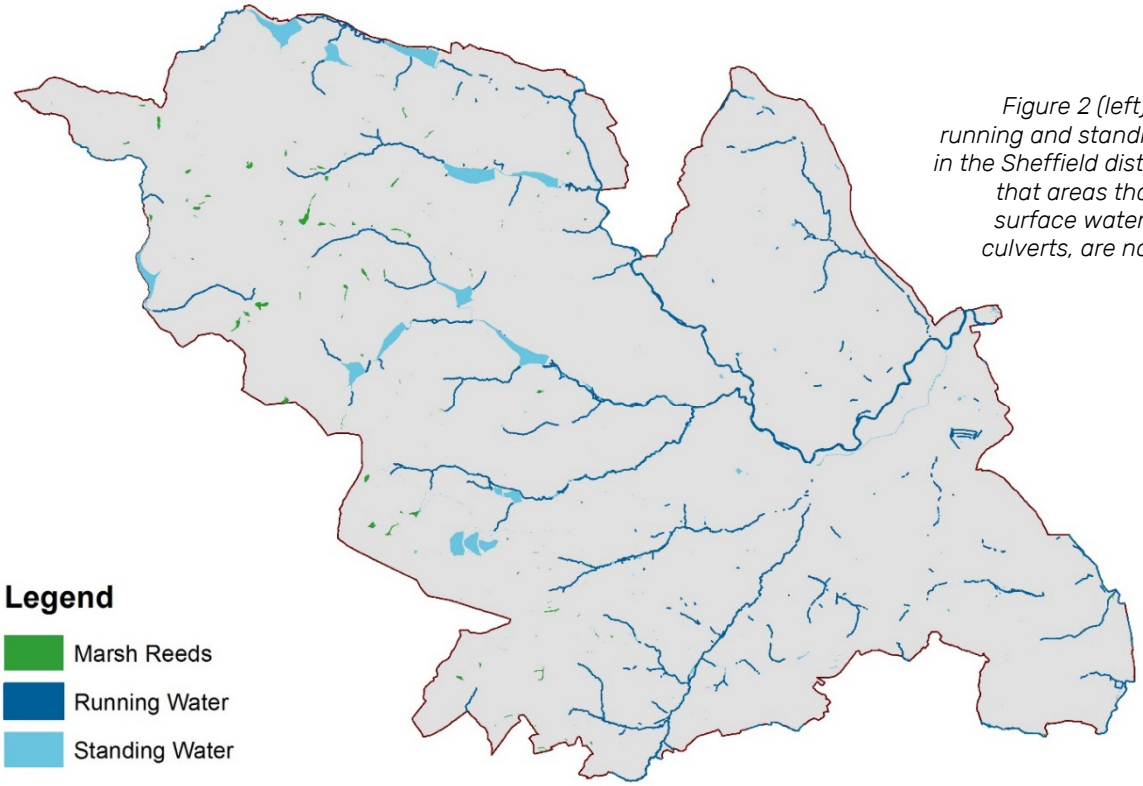
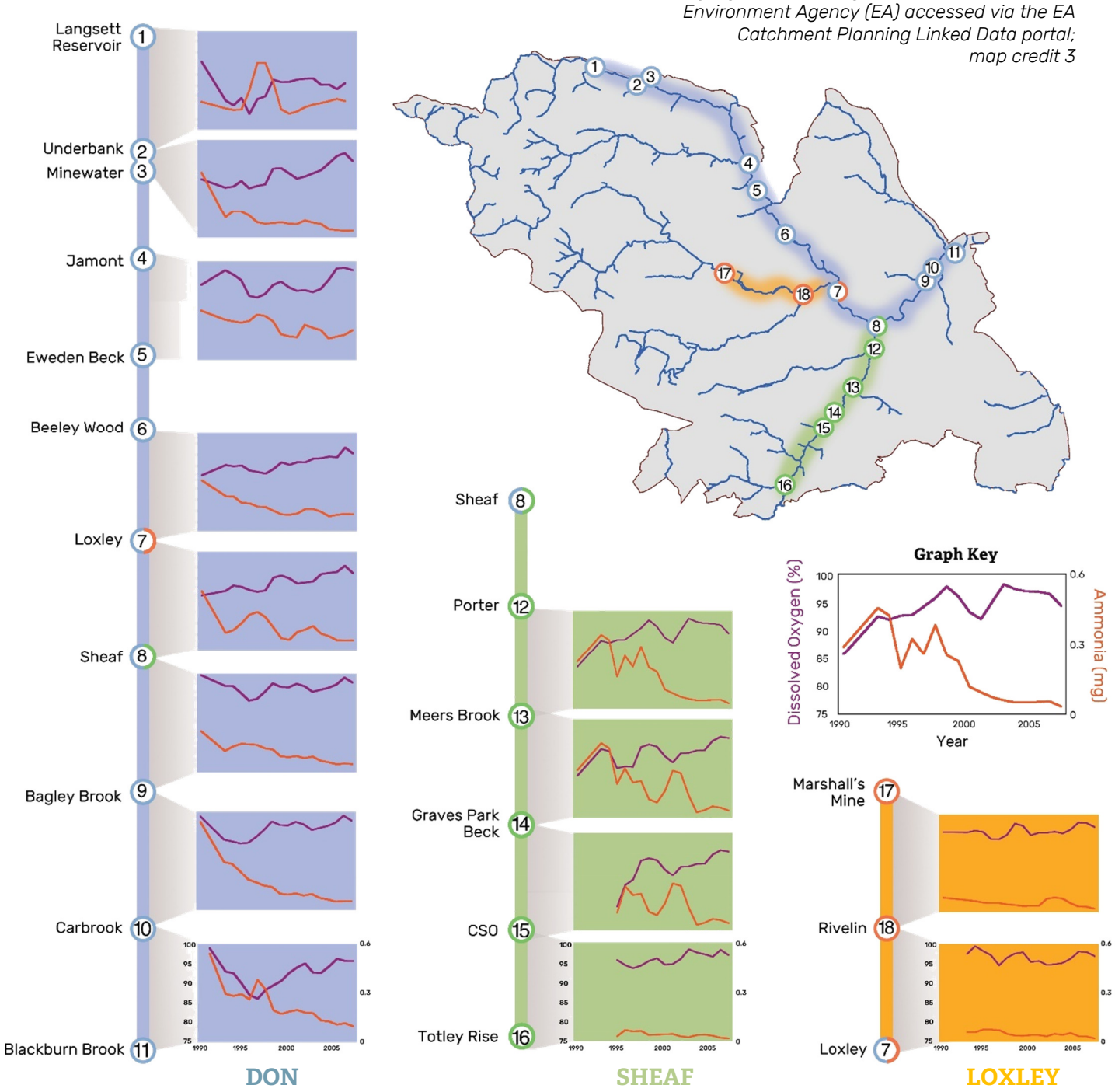


Figure 2 (left): surface running and standing water in the Sheffield district. Note that areas that are not surface water, such as culverts, are not shown.

UK Biodiversity Indicator Focus

B7: Water Quality

Figure 3: levels of dissolved oxygen levels (purple; left axis) and ammonia (orange; right axis – see graph key below) as recorded along the Don (blue), Sheaf (green) and Loxley (yellow) rivers between 1990 and 2009. Explanation of ammonia and dissolved oxygen levels are given below. Each river is divided between set monitoring points with single graphs showing data for each. Data from Environment Agency (EA) accessed via the EA Catchment Planning Linked Data portal; map credit 3

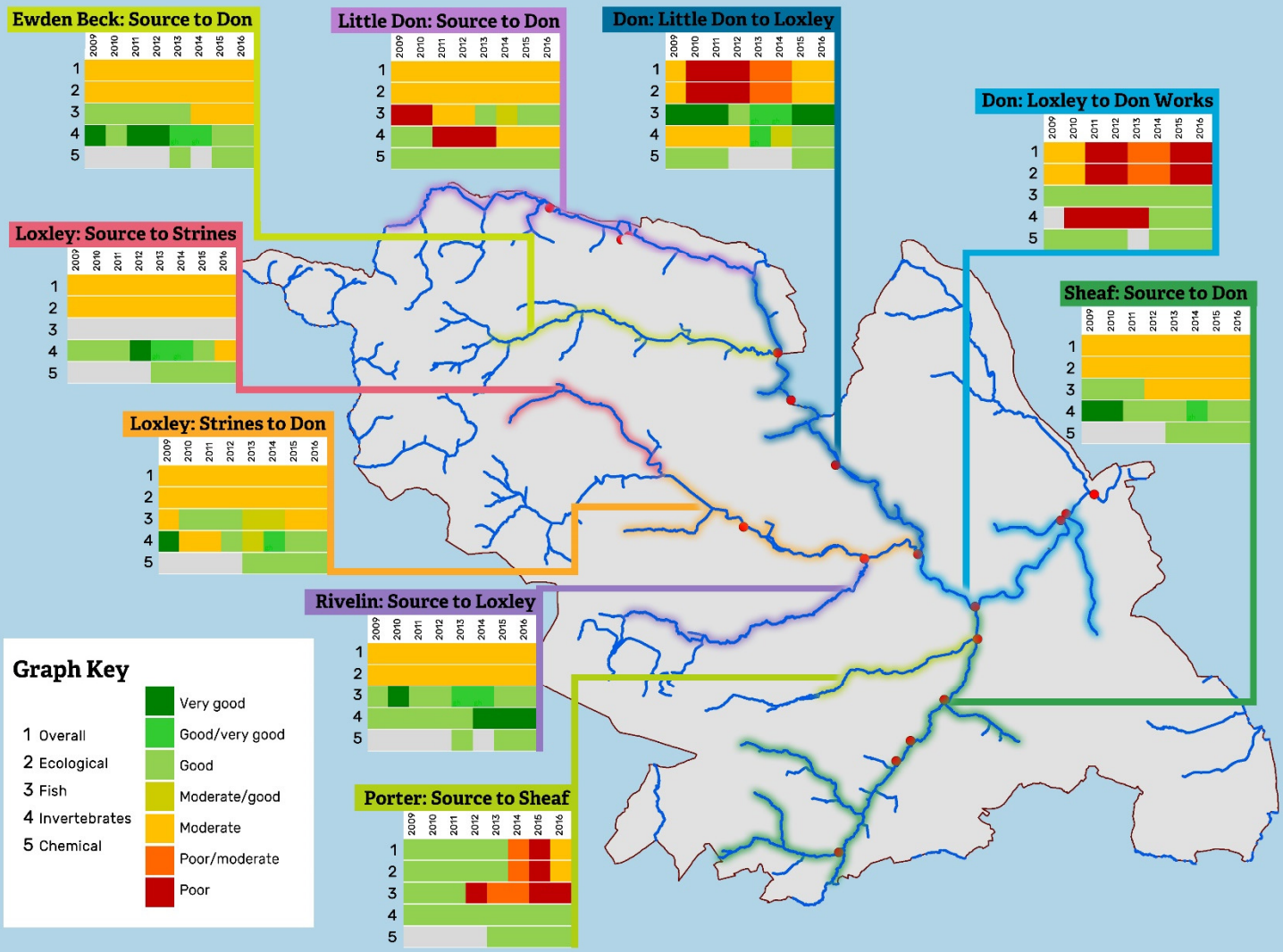


Water quality 1990-2009

Tests carried out by the Environment Agency (EA) show that water quality has improved in recent decades. Figure 3 details changes in ammonia (orange line; right axis) and dissolved oxygen (purple line; left axis) between 1990 and 2009 along key stretches of the River Don, Sheaf and Loxley as indicated on the map. High levels of ammonia are indicative of pollution from industrial waste and sewage, whilst dissolved oxygen levels that are too low can harm aquatic life. Following efforts from industries to control the release of waste into rivers, ammonia levels had significantly reduced along all monitored waterways by 2009. Coupled with higher levels of dissolved oxygen, this indicates that the ecological state of these water bodies has shown important improvements over the last 25 years.

Tinsley Sewage Farm Lagoon
© Sorby Natural History Society

Figure 4 (below): status of river systems across the Sheffield District, recorded by the EA from 2009-2016 between key points (red dots). Data © Environment Agency accessed via the EA Catchment Planning Linked Data portal.



River quality 2009-2016

Figure 4 (above) details several measures of the health of water bodies between 2009 and 2016: overall status; ecology; fish; invertebrates; and chemical status. Most tributaries are in overall moderate status, apart from the Porter, which at least in its lowest reaches, has fluctuated over the past eight years. However, the Don has shown poor to poor/moderate overall condition over the monitored period, indicating that there is still work to be done to improve this river system particularly within industrial stretches. Elsewhere on the Don, fish populations are improving, most likely driven by similar improving trends in the status of invertebrate communities. However, the Porter shows a worrying decline in overall quality, particularly reflecting the status of the river for fish. Further details on the surveys can be found in the relevant river basin management plan for the Humber accessed via:

www.environment.data.gov.uk/catchment-planning
www.catchmentbasedapproach.org/deliver/use-data

Redmires Reservoirs – A body of water with more depth than you may think...
Richard Hill, Honorary Secretary – Sheffield Bird Study Group

I can still vividly recall my first visit to Redmires in the somewhat vain attempt to look for birds in the winter of 1981, where I withstood the gales long enough to identify my first ever goldeneye – a winter-visiting duck which in those days was often the only species found on the upland reservoirs west of Sheffield at that time of year.

Even back then, Redmires had earned itself a reputation of ornithological repute on account of a long history of documented bird records, some dating as far back as 1941, when notable sightings by luminaries like Ralph Chislett (a pioneer of Yorkshire ornithology), were published in the Yorkshire Naturalists Union bulletins. These early beginnings inspired a new generation of birdwatchers after the formation of the Sheffield Bird Study Group (SBSG) in 1972 when 'observatory-style' systematic visits recorded both breeding birds and passage migrants on the open water, surrounding farmland, moorland and woodlands. This recording has largely continued up to the present day, and Redmires remains one of the best-watched sites in the Sheffield area. It boasts a list of well over 200 species, including rare visitors such as buff-breasted sandpiper from North America, Sabine's gull from the High Arctic, black-throated thrush from Central Asia and hoopoe from the Mediterranean. A total of over 80 species have also bred in the immediate surrounding area, which includes the first breeding pair of wigeon recorded in the Sheffield area, the last pair of red-breasted mergansers to breed in South Yorkshire and one of Yorkshire's first-ever pair of firecrests – still one of the most northerly breeding records ever recorded in the UK.

Redmires are, at 350 metres above sea level, the highest reservoirs in the Sheffield area and thus visible to any passing birds from a considerable distance. They sit directly on the flight line for migrants during the autumn months, when birds from northern Britain and the continent travel to warmer climes for the winter. Despite appearing rather bleak in nature on account of their acidic, peat-stained waters, the margins of all three reservoirs prove attractive to ducks, waders, gulls and the occasional tern, particularly from late summer onwards, when lower water levels reveal an inviting shoreline of mud and gritstone shale. When combined with adjacent open heather moorland, bracken dominant cloughs, upland pasture and both coniferous and deciduous woodland, it's no surprise that Redmires proved to be one of the most ornithological-rich parts of the Sheffield area in the breeding atlas survey carried out by the SBSG between 2003-08.

Redmires is arguably of regional importance for numerous breeding species of wading birds. Curlew can be seen from the conduit path, together with displaying oystercatcher, lapwing, golden plover and snipe. The reservoir margins also hold an important local population of common sandpiper, as well as little ringed, and more recently, ringed plover. Sadly, the number of people recently walking the shoreline, particularly with dogs off lead, has increased significantly, to these vulnerable species' detriment. Despite this, the reservoirs themselves remain utilised by both Canada and greylag geese, mallard and the now locally scarce tufted duck. Nearby heather moors hold significant populations of red grouse and meadow pipit, as well as scarce nocturnal species such as nightjar and long-eared owl. The adjacent moorland cloughs and upland pasture support skylark, stonechat, whinchat, grasshopper warbler and reed bunting, with migrant-breeders such as willow warbler, redstart, and spotted flycatcher plus scarce residents such as lesser redpoll, siskin and crossbill found within the plantations.

If all that's not enough, then this remarkable feat of Victorian engineering also plays host to nationally declining water voles, badgers, brown and mountain hares and red deer, plus numerous insects (including over 20 species of butterfly) and a wide variety of plants.

Redmires may still often seem a bleak and desolate place, but its history and birds make it a body of water with more depth than perhaps meets the eye.

Golden plover © Andrew Parkinson/2020VISION

Case study: Otters return to the River Don
Sara Blackburn, Sheffield & Rotherham Wildlife Trust (SRWT) & Dr Deborah Dawson, the University of Sheffield

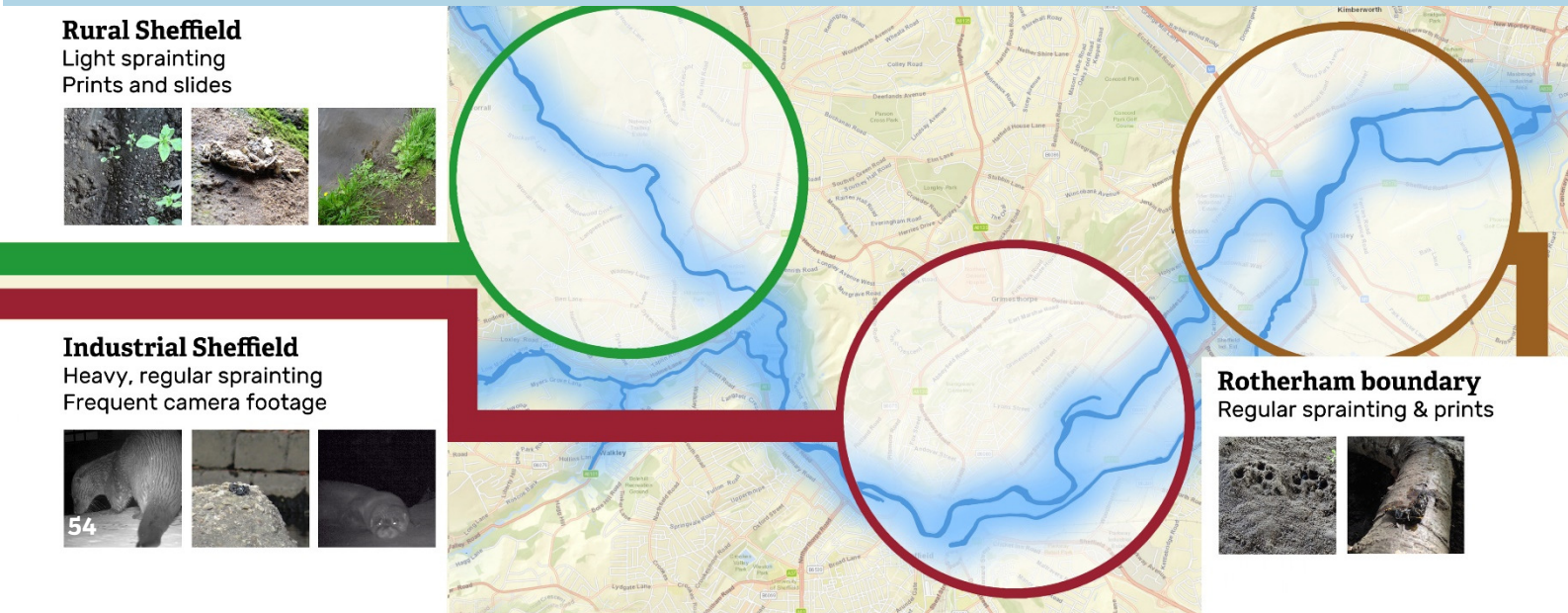
In May 2016 SRWT initiated the Otterly Amazing project as part of Nature Counts which sought to identify the current presence of otters along the River Don using citizen scientists, professional surveys and a network of infra-red triggered remote cameras. A total of 120 field signs of otter, comprising of droppings (spraints), footprints and feeding signs, were found across 24km of the Don within the Sheffield district (Figure 5). Additionally, over 40 video shots were captured from five distinct locations – the first time that otters have been filmed locally. Field signs and videos were recorded year-round. The most active camera sites were in central urban areas and captured early evening footage, indicating that Sheffield's urban otters can adapt to some human disturbance. All of the video captures showed individual adults. Evidence of potential resting sites and possible breeding was recorded within developed locations, although no urban holts were confirmed.

As the only way to reliably identify the number and sex of otters in an area, DNA analysis of spraints mostly collected through the Otterly Amazing project (summer 2016 and spring 2017) plus some additional spraints, was performed at the University of Sheffield by a team led by Dr Deborah Dawson, in the Department of Animal and Plant Sciences. Amy Withers, an MSc student at the University of Leeds co-supervised by Dr Hannah Dugdale, completed the lab work in Sheffield from May-September 2017. There are well documented difficulties of using spraints for DNA analysis, and the team developed new methods to increase the amount of data obtained. DNA was extracted and samples were genetically sexed and genotyped to identify individuals. The team found the presence of at least three individuals, and possibly up to seven. At least one of the 2017 spraints was from a male. Additionally, a female was detected at a more rural location, from a spraint collected in 2016.

As males do not rear cubs and otters' territories (typically 20-30km in freshwater systems[5]) do not overlap, it is unlikely that more than one male or a single mother and offspring are present within urban-suburban Sheffield, with other otters likely to be passing through. Further work is being performed at the University of Sheffield to obtain fuller genetic profiles which may be used to estimate territory size for some individuals. This may also help to confirm whether otters are truly resident and breeding on the Don or if they are simply transient.

The banks of the River Don are active sites for development. Current, local information on otter presence is critical to the protection of this European protected species which is fully protected under Schedule 5 of the Wildlife and Countryside Act 1981. These data are now available through the Sheffield Biological Records Centre to be considered alongside future planning within the Don catchment area to help protect this charismatic species.

Figure 5 (below): rough locations of otter evidence recorded (exact locations are protected). Above: camera trap footage from various urban locations in Sheffield.



Waterways within designated sites and protected areas

The linear nature of streams and rivers means that their condition at a particular location is dependent on the upstream environment as well as the environment at that location. This also means that protection of one stretch of a waterway can also have benefits far downstream. Several large waterway stretches are covered by SSSIs, Local Wildlife Sites (LWSs), Local Nature Reserves (LNRs), and Special Protected Areas (SPAs). Figure 6 highlights key LWSs that were selected and managed based largely on their water and wetland habitats.

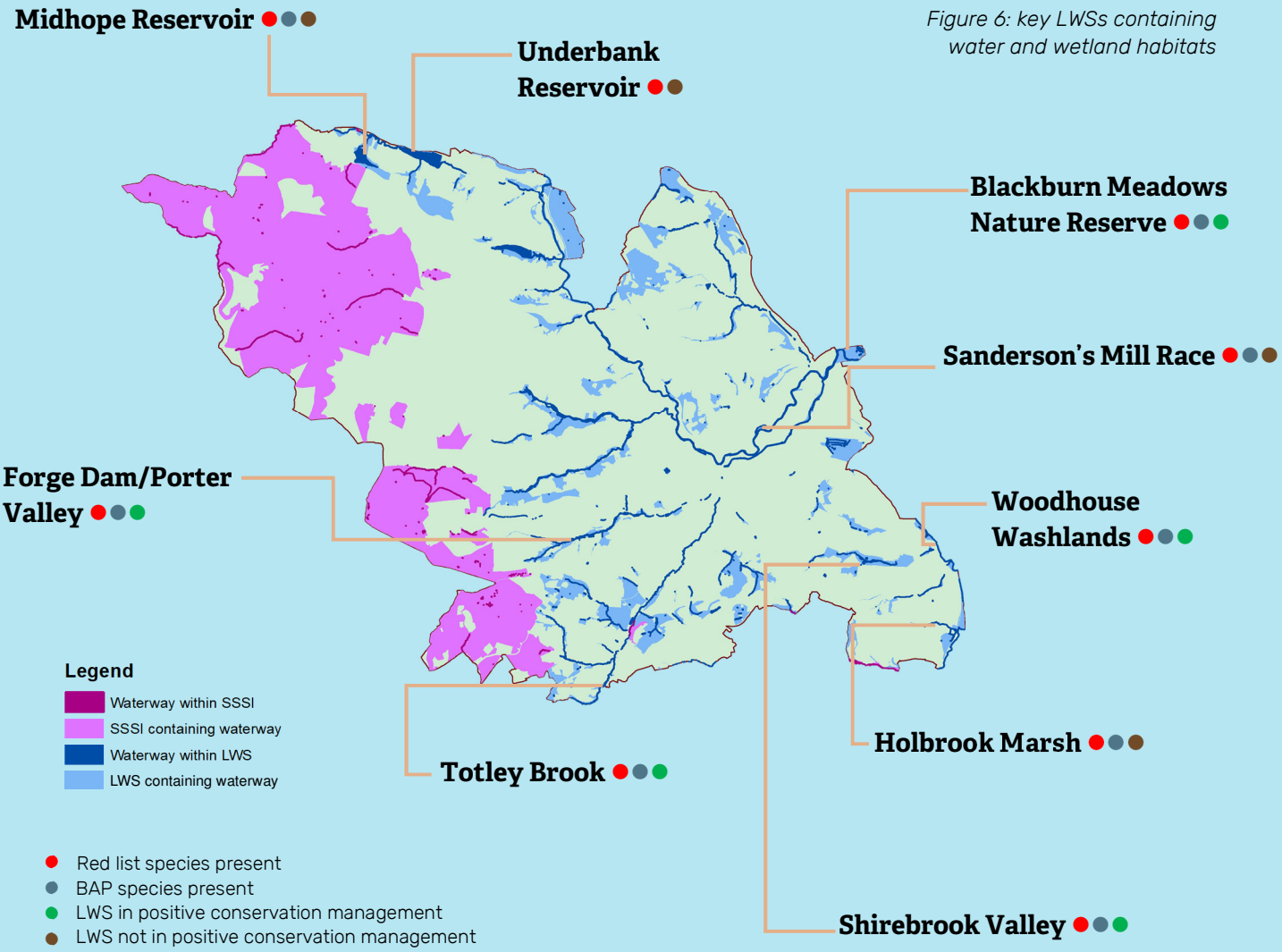


Figure 6: key LWSs containing water and wetland habitats

	Running water	Standing water	Reed beds	Total
Special Areas of Conservation	-	-	-	11%
Sites of Special Scientific Interest	-	-	-	12%
Local Nature Reserves	-	-	-	<1%
Local Wildlife Sites	-	-	-	35%
All designated sites	**46%**	**28%**	**87%**	**47%**

Table 1: Percentage of waterways and wetland habitats found within designated sites (47% of all running water, standing water and reed beds are covered by a site designation).

Autumn river
© Steve Waterhouse

Due to their mostly linear nature, waterways cover a relatively small area within designated sites – the habitat amounts to only 2.3% of all habitats within designated areas. However, the habitat itself is relatively well protected, with 47% of this habitat – or 306ha – covered by designated or protected site status. LWSs protect the largest area of waterways with a total of 24ha (35%) falling under this designation. A further 11% falls under Special Area of Conservation (SAC) or Site of Special Scientific Interest (SSSI) designation. These are mostly upland streams and tributaries that serve as important fish spawning grounds for salmonid species which have recently returned to the River Don[6]. LNRs protect less than 1% of the district's standing and running water.

LWSs are assessed on their positive conservation management status whilst SSSI sites are graded by condition. Figure 7 (below) shows the condition and status of these designated waterways and standing water habitats.

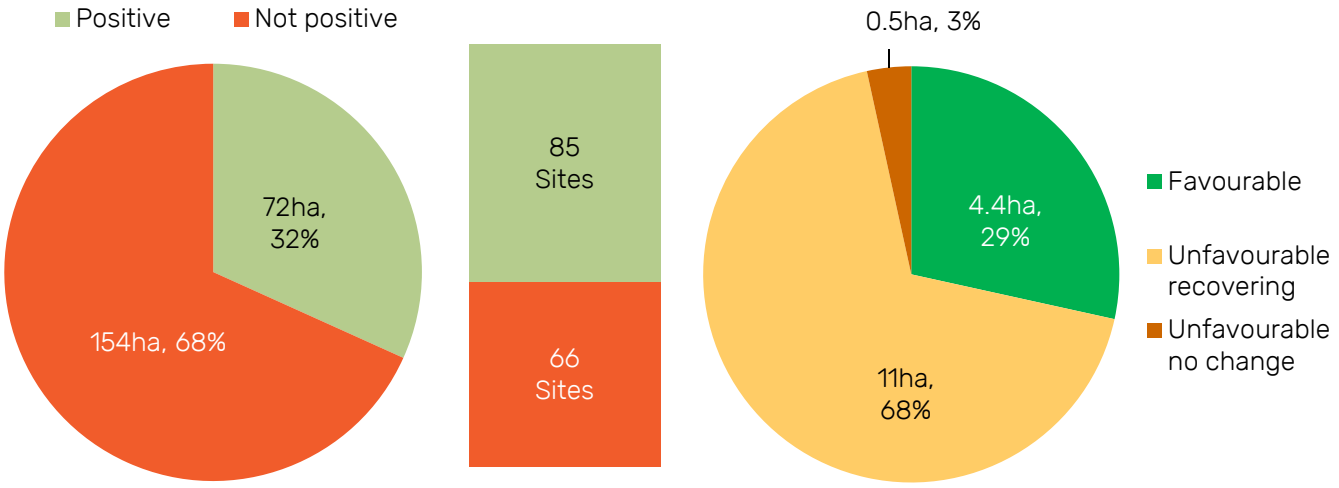


Figure 7: management status of all LWSs containing water and wetland habitats by area (left) and number of sites (middle), plus condition of SSSI units containing water and wetland patches (right). Unlike other chapters, all sites were considered (including those larger than 0.5ha) so as not to exclude sites containing small ponds and reed bed areas.

Case study: Fish return to the Don. Chris Firth, Don Catchment Rivers Trust

Sheffield's industrial history has had a profound impact on the River Don's fish populations. By 1760 there were 161 weirs, serving multiple booming industries, blocking the flow and isolating fish populations. By 1860 industries had expanded significantly and further modifications such as canalisation caused fish populations to completely collapse; only small, isolated populations of brown trout, bullhead and brook lamprey persisted within upland tributaries. The Don remained grossly polluted until the mid-1980s, by which point industries had declined and waste regulations were enforced.

It was not until 1990, following huge investments by water companies to improve water quality, that conditions were thought suitable for fish to be reintroduced. Since the year 2000, another driver for water quality and fish passage improvements has been the Water Framework Directive[7]. Out of the 31 species of fish identified as frequenting the Don prior to its decline, 26 recolonised through natural spread or reintroductions. Species of interest include bullhead – a Habitats Directive Annex II species. Only sturgeon, smelt, river lamprey, spined loach and burbot failed to return. Rainbow trout were also a new species to the river.

Conservation and restoration work has been carried out by the EA, the Canal and Rivers Trust and Yorkshire Water (YW), together with local authorities and many local groups. The Don Catchment Rivers Trust (DCRT) has supported the construction of fish passes on weirs to restore connectivity; salmon are now found in the lower stretches of the river on the eastern side of Rotherham for the first time in 200 years[6]. Pending work being completed on a weir in Rotherham, it is expected that salmon will be able to reach Sheffield as far as the outskirts of Oughtibridge by 2019 and suitable spawning and nursery conditions have been identified.

The next project aims to address the six weirs further upstream of Oughtibridge to allow access to the headwaters. Brown trout and grayling are also present from the headwaters to the lower outskirts of Sheffield.

Pike © Linda Pitkin/2020VISION

Waterways species highlights

Water vole © Terry Whittaker 2020VISION

Kingfisher © James Rogerson

Water vole
Strong declines but isolated populations still present

Kingfisher
New breeding locations along the Don recorded between 2005-08[8]

Sand martin
Severe local declines seen but new observations at Attercliffe

Why are these species important?

Along with other case study species, the presence of these species highlights key issues surrounding conservation of our river systems. Breeding pairs of kingfisher – a key apex predator – are thriving on the Don thanks to improving water quality and fish populations[8]. Small populations of water vole are still prevailing within the Sheffield district, notably within upland streams and tributaries where American mink, first recorded in 2005[9] and a known predator of water voles, have not yet gained a hold. Sand martin have significantly declined within the larger local area, but have established new breeding sites along the Don, possibly due to improvements in water quality[8].

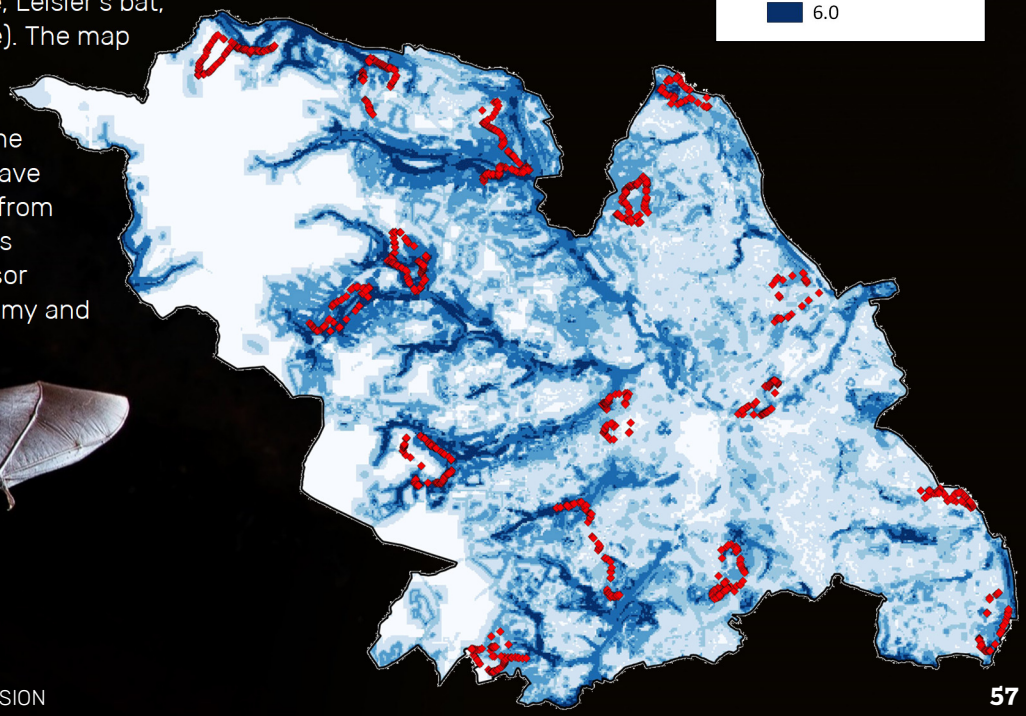
UK Biodiversity Indicator Focus

C8. Mammals of the wider countryside (bats)

Case study: Bat species distribution modelling within Sheffield

Robert Bell, South Yorkshire Bat Group; Paul Liptrot & Andy Geiger, Wildscapes

South Yorkshire Bat Group (SYBG) have been working with Wildscapes CIC and the Sheffield Lakeland Landscape Partnership to develop distribution maps for foraging bat species within the Sheffield area. These maps are being produced using a Habitat Suitability Modelling (HSM) approach, with HSM comprising a statistical technique that predicts the distribution of a species from environmental data and occurrence records[10]. Using 1612 presence records collected across 16 transect routes by SYBG volunteers during the summers of 2014 and 2015, the team are currently refining the models for six bat species (Daubenton's bat, whiskered/Brandt's bat, noctule, Leisler's bat, common and soprano pipistrelle). The map comprising a working draft shows the type of output that will be produced at the end of the project. This project could not have taken place without assistance from several people and organisations including Dr Ebru Ersoy, Professor John Altringham, Dr Chloe Bellamy and Pettersson Electronics.



Daubenton's bat © Dave Sutton/2020VISION

Case study: Crayfish on the brink. Sheffield Crayfish Action Group

The white-clawed crayfish (*Austropotamobius pallipes*) is the UK's largest native freshwater invertebrate and the only native crayfish species. Once widespread and common in English and Welsh rivers, they have declined significantly since the 1970s due to the introduction of non-native crayfish, pollution, habitat degradation and a disease known as 'crayfish plague'. White-clawed crayfish are classified as 'endangered' on the IUCN red list of threatened species and are at risk of global extinction[11]. Sheffield is one of only four locations in the Yorkshire and Humber region that supports populations of white-clawed crayfish[12]. The Sheffield Crayfish Action Group (Sheffield City Council (SCC) Ecology Unit; Sheffield & Rotherham Wildlife Trust (SRWT); the University of Sheffield; EA; local crayfish expert consultants) worked together with other local organisations, from 2008-2014 and again from 2017, to address local crayfish declines. The partners have compiled existing data on crayfish distributions, raised awareness of current threats, shared good practice on reducing spread of crayfish plague, produced a Crayfish Species Action Plan[13] and translocated threatened white-clawed crayfish populations[12]. Data show that the number of local flowing water bodies with white-clawed crayfish has recently decreased, while those supporting non-native American signal crayfish (*Pacifastacus leniusculus*) has increased.

Although undoubtedly affected historically by industrial pollution, the recent local decrease in range of white-clawed crayfish seems most likely to be due to the spread of signal crayfish through the River Don catchment area[12]. The signal crayfish grows faster and to a larger size, produces more offspring and can live at higher densities than the white-clawed crayfish[14]. It also often acts as a vector for the virulent crayfish plague to which it is immune. Consequently, although mixed populations of both species are found, the white-clawed crayfish is usually eliminated within a few years of the arrival of signal crayfish, or after only a few weeks if crayfish plague is introduced[14]. Currently signal crayfish cannot be controlled once they are established[14]. Even so, populations can go extinct even when not in direct contact with signal crayfish. One of the last white-clawed crayfish populations in Sheffield provides a salutary example. The Porter brook had a well-established native population over a roughly 3.5km stretch between Forge Dam and Hunter's Bar. The river flows through woodland and park and is a valued recreational resource. Despite this relatively benign environment, the crayfish population appears to have gone extinct over a period of 5-6 years (see Figure 8).

The evidence, both from analysis of dead crayfish and the lack of other known environmental impacts, points to crayfish plague causing the extinction in two apparent phases – possibly indicating two separate disease introductions. Interestingly, no signal crayfish have yet been recorded in the Porter and how the plague arrived in the river is unknown, although boots and fishing tackle can aid its spread. The apparent loss of this long-standing population indicates the fragility of extant local white-clawed crayfish populations. In the face of such threats, the action group is considering best actions to protect the species. Presently one population has survived a translocation to an 'Ark site' where it is the subject of monitoring. Only one original population survives on a tributary. The group was considering whether this population could be protected by a barrier, however recent unverified reports of suspected plague may mean it is already too late to save this population from extinction.

Figure 8: native crayfish were present in the Porter Brook prior to 2009, at which point many were found dead from plague. Extinction below the weir at Bingham Park occurred from 2010-2012. In 2013, crayfish were only recorded below Forge Dam and in low numbers near Wiremill Dam with the latter eliminated in 2014. In 2015-16 none were found at Forge Dam and the entire population appears to be extinct.

Data from engineering works, Sheffield Biological Records Centre, and surveys carried out by the University of Sheffield field courses.

White-clawed crayfish © LindaPitkin/ 2020VISION

Ownership and management

Ownership of Sheffield's rivers is complicated. Bank owners also own the riverbeds; if landowners are different on each side then the boundary falls in the channel centre. Whilst the EA owns very little waterway in Sheffield, it regulates licences and permissions for various river works or undertakings affecting the river (e.g. abstraction). It also works with others to tackle issues surrounding water quality (including pollution incidents). SCC are a major landowner and work with the EA and YW on strategic flood prevention projects and flood incidents, and with others on fish passage and habitat improvements. Sheffield has recently constructed numerous good examples of multi-functional flood defences which also incorporate enhanced habitat, public access, deculverting and renaturalisation (e.g. Matilda Street Pocket Parks and Porter Head).

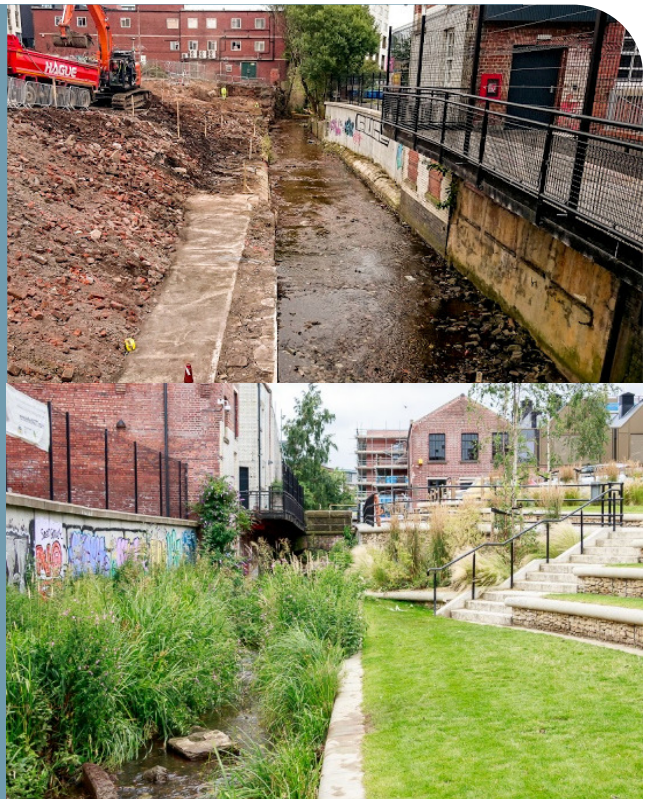
Many river sections and their banks are owned by private individuals, farmers and businesses. Although the EA holds some information on land ownership, identifying landowners is complex, especially as urban land often changes hands. In the urban area, riverside businesses range from large and long-established (e.g. Meadowhall and Forgemasters) to smaller businesses who may not be well informed regarding riparian ownership. SRWT engaged businesses through its Waterways Development, Business & Biodiversity project – an Esmee Fairburn-funded project (2006-08) and the 2012-13 Catchment Walkover Project, run jointly with the River Stewardship Company (RSC) for the EA. RSC offers habitat management services to businesses, and several in the Business Improvement District in the Lower Don have recently signed up to long-term river maintenance, with RSC, through the Sheffield Lower Don Valley Flood Defence Project[15]. Don Catchment Rivers Trust does not own land but works with many partners to improve fish passage and on community engagement projects. Other community engagement work is carried out by RSC (e.g. Blue Loop[16] and Riverlution Projects) and other local organisations. The complex nature of ownership and management of Sheffield's rivers has led to the development of the Sheffield Waterways Partnership and Living Don Partnership, the latter being part of the larger catchment-wide Don Network. These partnerships and networks allow sharing of information and strategic project development.

The Sheffield & Tinsley Canal (the Sheffield stretch is from Victoria Quays to Meadowhall) is owned and managed by the Canal and Rivers Trust (formerly British Waterways). It carries out maintenance and improvement projects and engages volunteers from the community. The canal forms one side of the 'Blue Loop' between the city centre and Meadowhall, with the Don's Five Weirs Walk forming the other[16,17]. This 8-mile walk is a shining example of partnership working with local landowners resulting in a long-term gain for the residents of Sheffield.

The angling community and supporting organisations also play a vital role. The Wild Trout Trust (WTT) supported the formation of Sheffield Partnership for Rivers in Town Environments (SPRITE) in 2009 as a local branch of its 'Trout in the Town project'. SPRITE has been voluntarily collecting riverfly records since 2010, adding more sites in 2014. As a partner organisation for the Riverfly Monitoring Initiative[18] it undertakes a standardised sampling methodology to check water quality. SPRITE acts as the contact point for the EA for any potential pollution incidents, should an alarm level be breached, ensuring that early action can be taken. Data are collected by 12 SPRITE members, 14 trained volunteers and two RSC volunteers. The data feed into EA's data shown in Figure 4.

Case study: Porter Brook - channel habitat improvement in a deculverted city centre stream. Dr Paul Gaskell, Wild Trout Trust

In 2015, SCC undertook a bold project to uncover a section of stream that used to live beneath a factory floor. The aim was to create a 'pocket park' to provide new flood-water storage (when the rivers are in spate) and an improved public park amenity (when the rivers are calm). WTT's role was to design in-channel features and riverbed morphology that would maximise improvements for the ecology of the stream - including for the small and fragmented native population of wild brown trout. A number of features were introduced including boulder clusters and pre-planted coir rolls on new berms. The interventions have created much more physical structural variety plus variation in flow speed and depth, which will benefit fish and their supporting food chains[19].



During deculverting (top) and post-establishment (bottom) © Paul Gaskell

Case study: Recent conservation efforts for ponds
Angus Hunter, Sheffield City Council Ecology Unit &
Dr Nicky Rivers, Sheffield & Rotherham Wildlife Trust

The restoration of ponds – identified as a national priority habitat – has been a key focus in Sheffield. The South Yorkshire Ponds Project ran for three years from May 2008 as a joint initiative between Pond Conservation and the South Yorkshire Biodiversity Forum, with funding from the Heritage Lottery Fund, SITA Trust (now the SUEZ Communities Trust), Biffa Award and the EA. The project created a pond inventory map, contributing to the identification of Important Areas for Ponds (IAPs). Surveys underpinning practical pond restoration and management work were also undertaken at 20 ponds, resulting in work to restore existing ponds and create new ponds at 16 sites. The project team was managed by SRWT and worked with volunteers and local community groups.

More recent work has focussed on Froglife's Living Waters Project developed in partnership with the SCC Ecology Unit. During part one, run from 2013 to 2015, 30 new ponds were built with an additional five restored at key sites including Shire Brook Valley and Perrywood Lane (Figure 9). The project is currently in part one, with 16 new ponds being created together with extensive heathland restoration work for reptiles within seven LWSs including Holbrook marsh and heath. There is an ambition to develop a part three to further benefit Sheffield's great crested newt populations in the south east of the city. Ponds require regular resources for management to maintain their open water component.

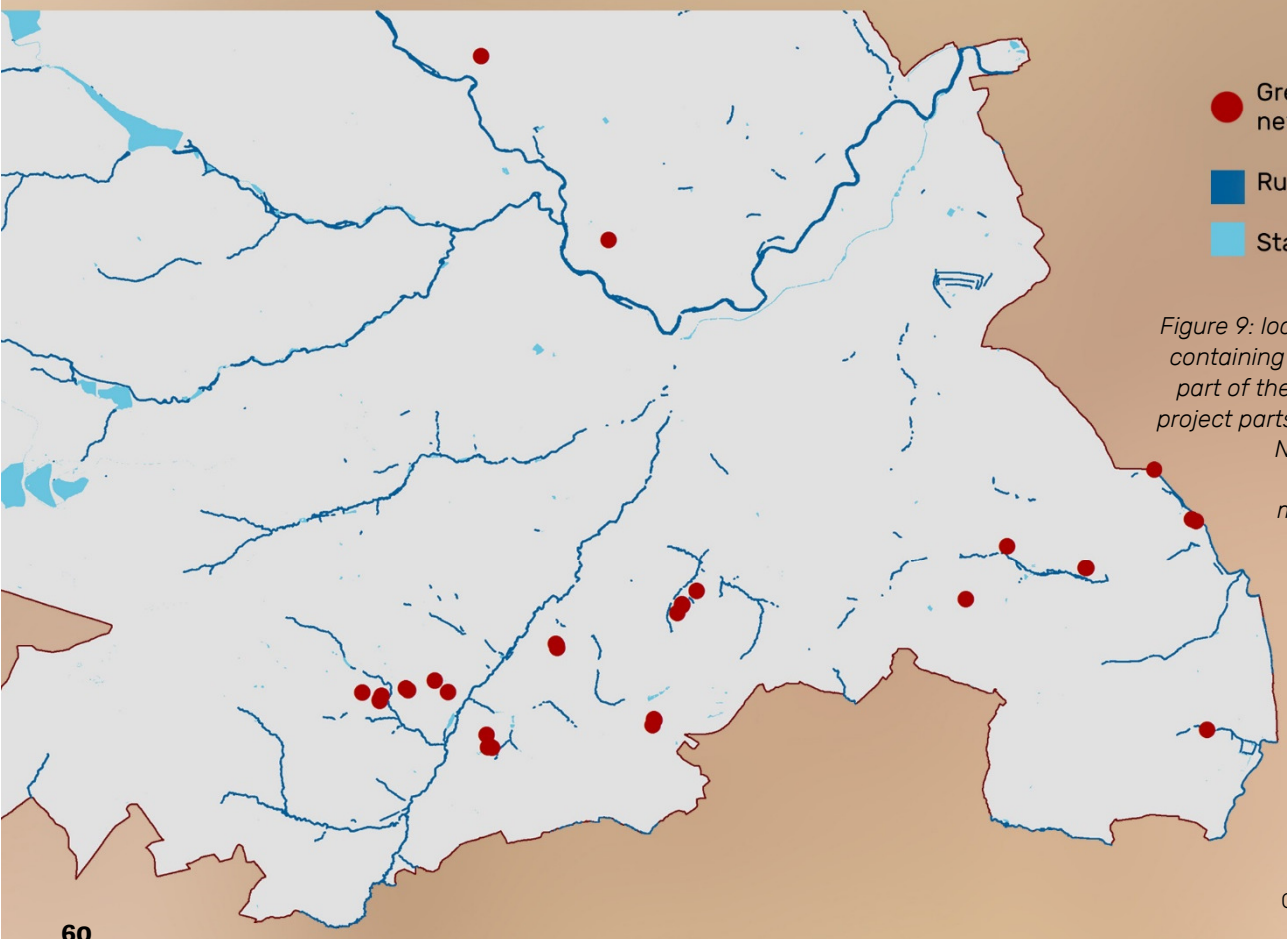


Figure 9: location of areas containing new ponds as part of the Living Waters project parts one and two. Note that some areas contain multiple ponds. Data: SCC; map credit 1

Great crested newt
© Shutterstock

UK Biodiversity Indicator Focus

Birds of the wider countryside: C5c. Wetland Birds

A wide range of birds are supported during at least part of the year by rivers and wetlands in Sheffield which provide either breeding habitats, feeding grounds, or both. However, overall, the picture is not encouraging for Sheffield's breeding wetland birds. Of the 24 species included in the wetland bird indicator (Figure 10; right), 15 (63%) had decreased in occupancy between 1975-80 and 2003-08 with only nine species (37%) showing an increase in occupancy[8]. Of these decreases, the most significant are seen in wet grassland and reed bed areas (Figure 10; c and d). The only habitat in which the balance was tipped in favour of increasing species is fast flowing rivers, adding to the evidence of the increasing health of our waterways.

Comparing these figures to national trends (although it is important to note that national analyses consider abundance as opposed to occupancy), the picture appears less optimistic for Sheffield, with a higher proportion showing a local decline (63% as opposed to a national figure of 27%).[20]

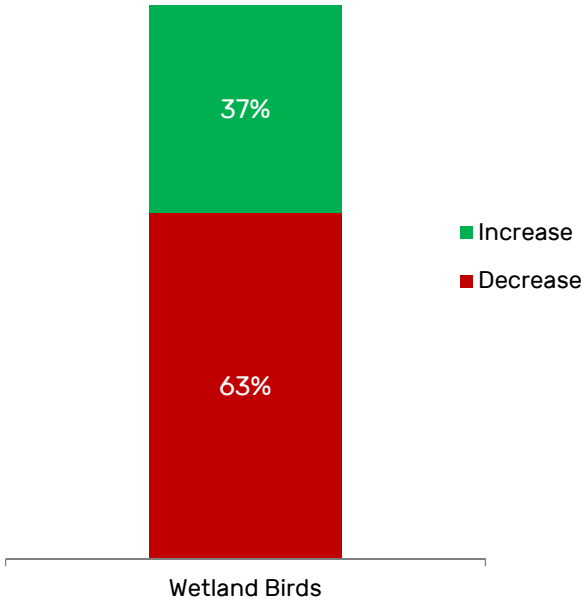
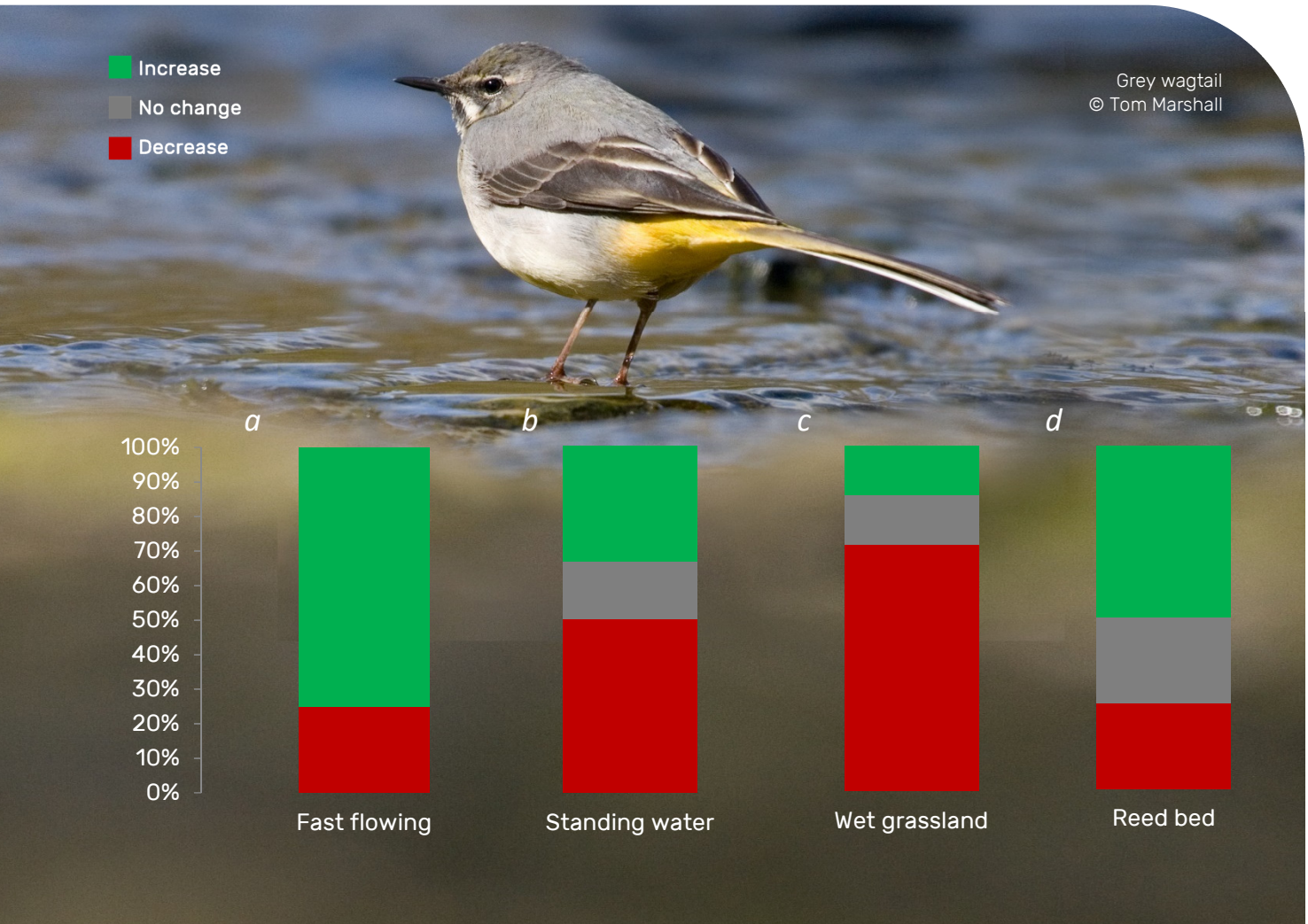


Figure 10: trends of wetland birds (above) included as part of the UK biodiversity indicator C5: birds of the wider countryside, measured as a change in the number of tetrads (2km x 2km) (locations) occupied between 1975-80 and 2003-08. Also shown (below) are the same species divided by their specialist habitats: fast flowing rivers (a); standing water (b); wet grassland (c) and reed beds (d).



Which species are doing well?

Goosander
© Richard Steel/2020VISION

Dipper
© Tom Marshall

Goosander
New to the area in 2003-08 with breeding confirmed.

Grey heron
Breeding population is increasing.

Oystercatcher
6% occupancy. New to the area in 2003-08.

Mallard
Widespread indicator species 72% occupancy.

Grey wagtail
51% increase. Expanding to the north-east.

Curlew
Stronghold to the west with lowland breeding.

Mute swan
100% increase in occupancy.

Dipper
18% increase Expanding to the east.

What are the reasons?

Climate change
Changing climate has helped to bring new species to the Sheffield area.

Habitat restoration
The improvement of our rivers, both in terms of habitat and water quality, has most likely benefited species that favour fast flowing waters such as grey wagtail and dipper, despite these species declining nationally.

Management
Improved management of moorland and unimproved farmland areas (habitats on which some wetland birds depend on for breeding grounds) has helped stem local declines of species such as curlew.

Which species are not doing well?

Sand martin
© Bob Coyle

Reed bunting
© Chris Gomersall /2020VISION

Common sandpiper
37% decrease.

Reed bunting
15% decrease. Declines seen to the east.

Lapwing
22% decrease.

Teal
57% decrease. Declines seen in the north-west.

Redshank
43% decrease. Mostly restricted to the east.

Yellow wagtail
83% decrease. Now absent from Sheffield district.

Snipe
44% decrease, No breeding in the east in 2007-08.

Sand martin
72% decrease. Restricted to the north-east.

What are the reasons?

Climate change
Climate change has affected species such as sand martin possibly due to unpredictable rainfall affecting availability of the flying insects on which they feed[21]

Habitat modification
Drainage and 'improvement' of local pastures, together with the intensification of farming, has negatively impacted breeding birds such as lapwing, redshank and yellow wagtail.

Management
Increased disturbance from recreational activities has impacted species such as common sandpiper. Higher livestock densities on breeding grounds can also affect these wetland birds.

UK Biodiversity Indicator Focus

B6a. Freshwater Invasive Species

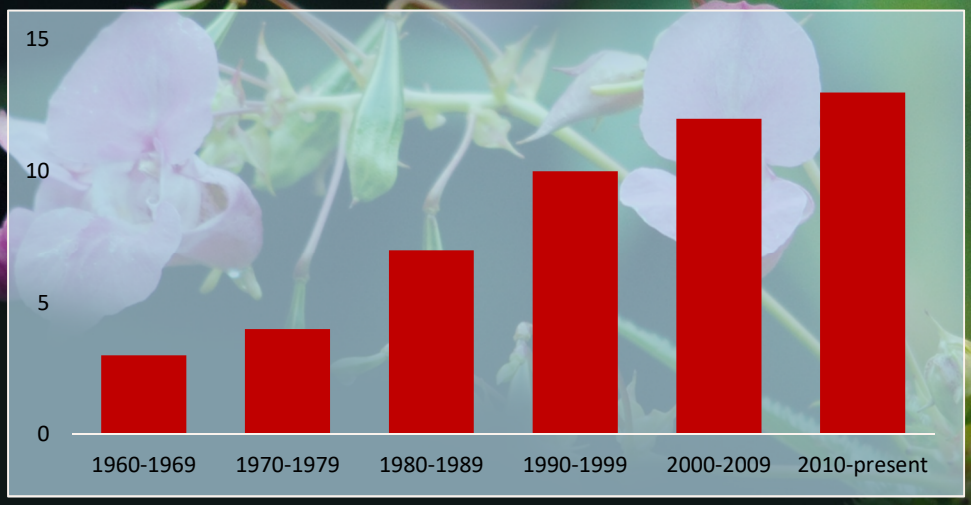


Figure 11: cumulative number of novel freshwater species recorded, in Sheffield, per decade as categorised in 'Non-Native Species in Great Britain: establishment, detection and reporting to inform effective decision making'. Data: NBN Gateway.

Himalayan balsam © Amy Lewis

Invasive Non-Native Species (INNS)

A number of INNS plant species are particularly associated with freshwater and riparian habitats. These species have been extensively mapped by SRWT from 2012 as part of the Yorkshire Invasive Non-Native Species Project[22] using the citizen science mobile phone app 'PlantTracker' (Figure 12a).

Japanese knotweed

This species has had a significant hold across Sheffield's river system, particularly the Don and lower stretches of the Sheaf and Porter, where it continues to spread and cause challenges for riverside developments.

Giant hogweed

As a result of more stringent methods for removal of giant hogweed employed by the RSC and other volunteer organisations, the density and distribution of giant hogweed has significantly reduced since 2013[23] (Figure 12b).

Himalayan balsam

This species is evidently rife across the larger water networks, particularly the Don and Rivelin (Figure 12c). Organisations and volunteers groups frequently 'balsam bash' to remove it.

Other species

The project has also revealed the presence of floating pennywort, American skunk cabbage and New Zealand pigmyweed along Sheffield's waterways.

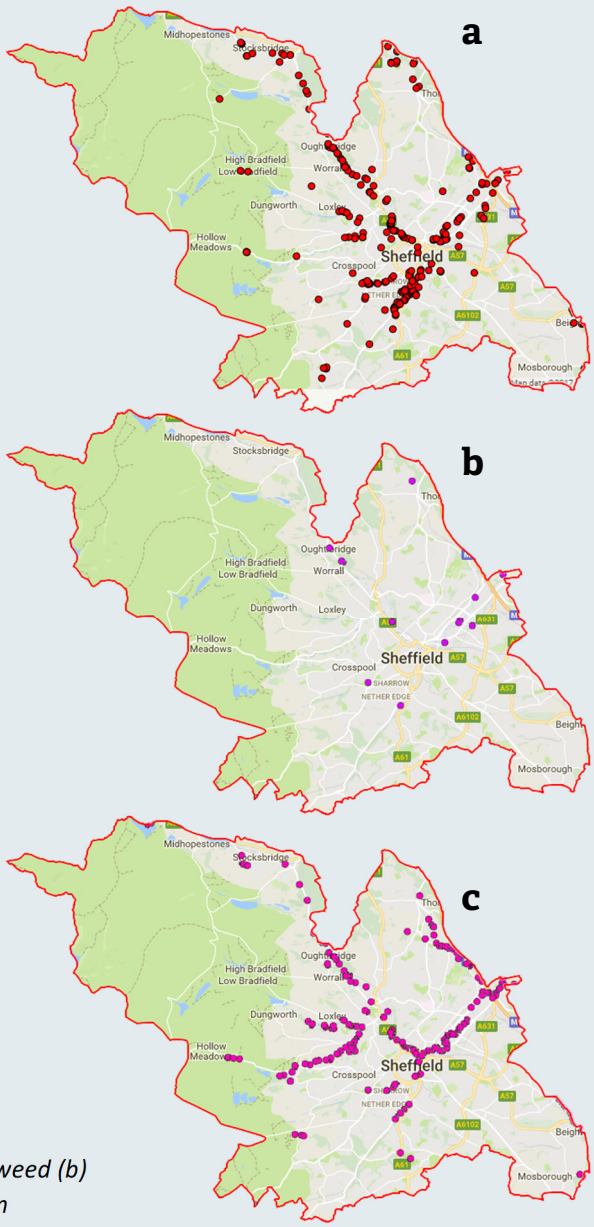


Figure 12 (right): distribution maps of Japanese knotweed (a), giant hogweed (b) and Himalayan balsam (c) across main waterways in Sheffield. Data from PlantTracker: accessed via naturelocator.org and NBN Gateway. Map credit 3

Case study: Dragonflies and damselflies on the up
Alistair McLean, Curator of Natural Science, Museums Sheffield and Sorby Natural History Society Odonata Recorder

In 1981, the Odonata of Sheffield were "relatively poor compared with areas of Southern and Western England" with a likely nine or 10 species present[24]. Within the last 30 years, the situation has clearly improved. There are now 20 regularly occurring species with an extra four occasional migrants. Whilst there are still fewer species recorded within the Sheffield boundary than can be found in southern and western Britain and indeed within the wider Yorkshire area, much of this can be explained by our northern climate and distance from the coast and dragonfly migration routes, rather than human causes. However, previous pollution, loss of habitat and poor water management had contributed to a reduction in species numbers[25], and recent increases in group biodiversity have likely been helped by improvements in these areas. As dragonflies are reliant on periods of warm, settled weather and mild winters, it is possible that climate change may also be having an effect on biodiversity in this area (Figure 13).

Red-eyed damselfly *Erythromma najas*

This distinctive damselfly would appear to have been present near Sheffield since 1978 with records from sites in Rotherham (recorder unknown) and Renishaw Hall in north-east Derbyshire (Dunn, R). There is little in the local literature of the time, presumably as a result of the deficiency of data. It was not until the 1990s that its range expanded to other sites in Rotherham (including Tinsley Dyke) and eventually Sheffield in 2010, colonising multiple spots along the Sheffield & Tinsley Canal - a significant leap from its previous residence. This may show that areas such as Treeton Dyke had a healthy enough population to require dispersal but could equally have been a result of prevailing winds.

Banded demoiselle *Calopteryx splendens*

C. splendens was, until recently, locally scarce. The first records, from the Nottinghamshire side of the Sheffield area, were reported in 1973[26] with other sporadic sightings in the late 1970s and 1980s. Since the mid-1990s, Sheffield appears to have played host to a meeting of two populations of this damsel. Recording in the area throughout the 1990s shows a gradual increase in distribution from the Doncaster area, travelling south west. Meanwhile, recording in Derbyshire has shown a spread of distribution heading north through that county[27]. The result has been a pincer movement of two presumably distinct populations and a dramatic increase in numbers and geographic spread. The species is now seen in good numbers into the heart of Sheffield along both the canal and River Don, as well as occasional random ponds and reservoirs, as high up as Burbage (personal communication; Whiteley, 2015). This species is known for its intolerance of pollution[28] and has almost certainly dispersed in relation to cleaner waters and improvements to emergent waterside vegetation.

Red-eyed damselfly
© Mark Hamblin/2020VISION

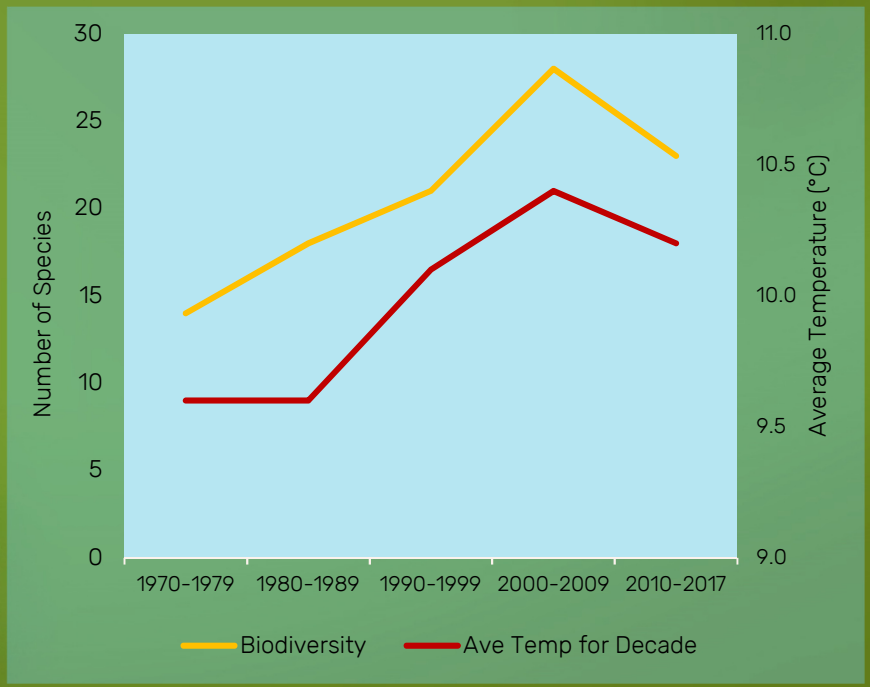


Figure 13: number of dragonfly species recorded in Sheffield since 1970 and correlated changes in average temperature per decade. Temperature measurements from Weston Park Weather Station, Museums Sheffield.

Threats to waterways and standing water habitats

What is the threat?	What does it cause?
Pollution such as industrial waste, sewage and agricultural runoff, especially in storms; atmospheric pollution and release of iron-rich colliery water	Effects can include deoxygenation, nutrient enrichment, direct toxicity, and spread of pathogens, with effects on fish and invertebrate populations with knock-on effects further up the food chain. Nutrient enrichment can cause excessive algal growth with detrimental effects on other aquatic plants.
Alterations of waterflow through construction of weirs, dams, ground and surface water abstraction and water transfer schemes	Periods of low water flow can restrict habitat area and result in low oxygen levels. Both low flow and physical barriers (dams, weirs) can restrict movement of migratory species such as fish. Sensitive river invertebrate communities are also negatively affected by low oxygen levels.
Physical modification of the river for flood defence, drainage, fisheries, management and waterpower. Includes: channelling; culverting; dredging; filling; creation of artificial banks	Removal of banks and reduced stability of retained banks affects breeding birds and other wildlife that require undisturbed bankside vegetation for food or shelter. Also reduces habitat availability and connectivity for riparian species.
Residential and industrial development, agricultural intensification	Loss of riparian habitat leads to a reduction in biodiversity within river sections and a reduction of riverside buffer zones, increasing the risk of pollution and sediments entering the river.
Fisheries management including artificial stocking and vegetation removal	Stocking can spread disease and can also cause conflict between people and wildlife. Potential genetic threat to wild stock.
Invasive plants and animals	Invasive plants outcompete native species leading to a reduction of diversity of bankside vegetation. Species, such as floating pennywort, can clog waterways, reduce light penetration and affect oxygen levels with knock-on effects for invertebrate and fish communities. Also leads to direct or indirect eradication and restriction of native species such as white-clawed crayfish and water vole by predation or disease introduction.
Recreational use of the river	Unsustainable or uncontrolled recreational use can cause bank erosion, trampling as well as disturbance to wildlife.
Lack of management, particularly for small ponds	Progressive loss of open water and depth can occur if vegetation growth and sediment input are not managed[29]. Changes to bank habitat can change water inflow and shading, affecting temperature, turbidity and water quality.

River Don © Paul Richards

Recommendations

1. Develop targeted conservation plans for water vole, white-clawed crayfish, sand martin, kingfisher and otter as key indicator species or local species in severe decline.
2. Continue to deliver conservation actions that support the return and expansion of fish species including salmon.
3. Promote the value of LWSs associated with freshwater habitats and the importance of their protection and ongoing management for wildlife to organisations, private owners, planners and developers.
4. Focus efforts on improving the overall condition of key water and wetland LWSs currently in poor condition or not in positive management for wildlife, for example, Blackburn Meadows.
5. Continue to monitor and improve our knowledge of otters on our waterways and ensure that planners, developers and construction companies are aware of the importance of this protected species and the habitats they rely on along the Don and elsewhere.
6. Continue efforts on improving the overall condition of rivers, particularly parts of the Porter and urban sections of the River Don. This includes: removing restrictions and barriers for wildlife whilst maintaining biosecurity; managing water extraction sensitively; renaturalising rivers by removing modifications; and tackling diffuse pollution from agriculture, industry and other sources.
7. Continue to strategically tackle non-native invasive plant species such as Japanese knotweed and Himalayan balsam.
8. Work with landowners, managers and farmers to provide more habitat for wetland birds such as yellow wagtail and breeding waders such as lapwing, for example, by rewetting grassland areas and by increasing and managing reedbeds.
9. Promote the importance of Redmires (within the PDNP and therefore not designated as a LWS) as a bird breeding and wildlife site and develop coordinated habitat management plans amongst relevant landowners and other stakeholders.
10. Work with Natural England and other stakeholders to support and promote the improvement of water and wetland SSSIs to favourable condition.
11. Promote the importance of ponds for wildlife, encouraging public bodies, developers, landowners and farmers to incorporate ponds in to new schemes. Provide advice to enable the public to include ponds in private gardens or improve the wildlife value of existing garden ponds.
12. Carefully balance recreational demand with undisturbed areas for wildlife.

Kingfisher
© Dawn Monrose