Clouds over Sheffield © Paul Richards

# Sheffield Overview

**"The setting of Sheffield in its 'golden frame', with its hills and valleys and the heritage of trees and parks, continues to be a major asset that is appreciated by residents and visitors alike. The natural environment with its variety of wildlife is valuable in its own right but can also contribute to the economic and social vitality of the city. The green spaces within the built-up areas make an important contribution to the life of the city. The challenge is to protect and enhance the city's natural assets both to support the regeneration of the city and as features of value in their own right."**

Challenge 13: A city that prizes its green environment
Adopted Sheffield Local Plan/Sheffield Development Framework, Core Strategy Sheffield City Council, 2009

## Sheffield in context: landscape and topography

For the purpose of this report, the 'Sheffield district' is the whole Sheffield region, including areas of the Peak District National Park in Sheffield, and is shown below (Figure 1). Sheffield sits within the south-west corner of South Yorkshire with a third of its area falling within the Peak District National Park boundary (shaded area). The district is defined by the Unitary Authority boundary (Sheffield City Council; SCC) but is divided between two planning authorities: SCC and the Peak District National Park Authority (PDNPA) which covers the western area.

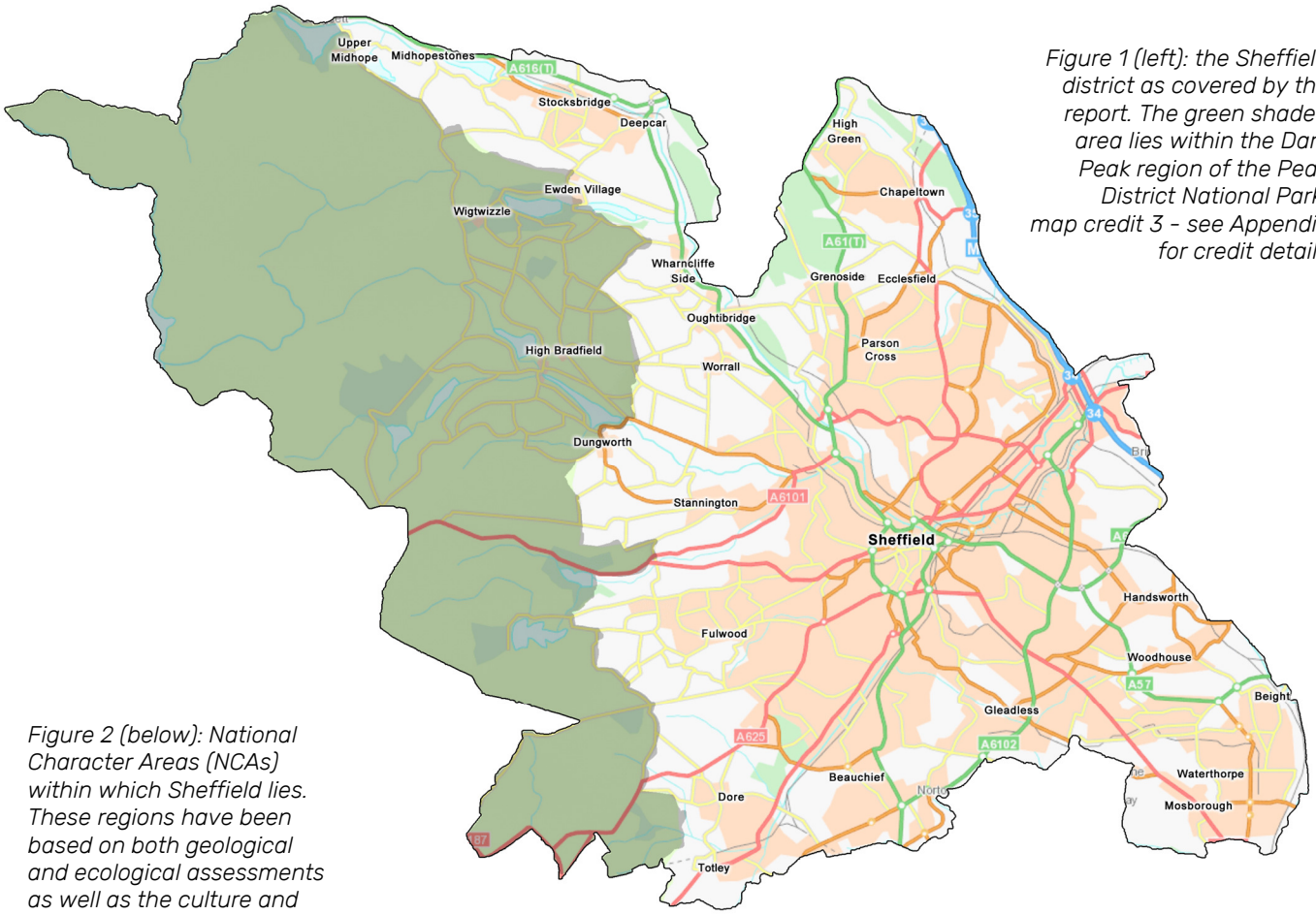
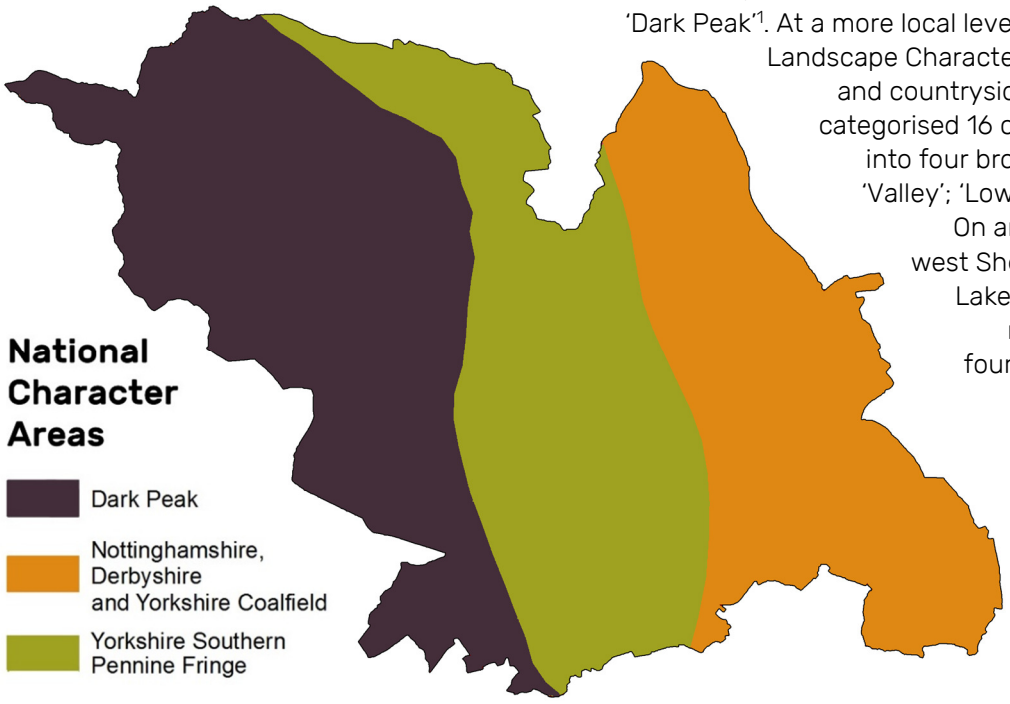



*Figure 1 (left): the Sheffield district as covered by the report. The green shaded area lies within the Dark Peak region of the Peak District National Park; map credit 3 - see Appendix for credit details*

*Figure 2 (below): National Character Areas (NCAs) within which Sheffield lies. These regions have been based on both geological and ecological assessments as well as the culture and heritage that has helped to shape the landscape; map credit 2*




### National and Landscape Character Areas

The district straddles three National Character Areas: 'Nottinghamshire, Derbyshire and Yorkshire Coalfield', 'Yorkshire Southern Pennine Fringe' and part of the 'Dark Peak'[1]. At a more local level, SCC undertook a preliminary Landscape Character Assessment of its green belt and countryside areas[2]. The assessment has categorised 16 character types further divided into four broad 'Character Areas': 'Upland'; 'Valley'; 'Lowland' and 'Highly Maintained'[2]. On an even more local level, north-west Sheffield (known as the Sheffield Lakeland area, see case study) has recently been categorised into four 'Landscape Character Types': 'Enclosed Gritland Uplands'; 'Slopes and Valleys with Woodlands'; 'Moorland, Moorland Slopes & Cloughs'; and 'Developed', with detailed descriptions of each[3].

View from Ringinglow
© Paul Richards

Sheffield contains a huge variety of landscapes for a city, ranging from the dense urban centre, through the built-up housing and industrial areas of the city, to its hills, lakes and moorlands[4]. The countryside in Sheffield ranges from exposed upland heath and moorland fringes, with deep valleys to the west, to gentler rolling wooded farmlands and former marshland in the eastern lowlands. These landscapes have been shaped by variations in geology and landform as well as the city's industrial history[5]. The latter has resulted in a large urban conurbation centred on the meeting of five rivers: the Don; Sheaf (after which the city is named); Porter; Rivelin, and Loxley. A sixth, the Rother, forms the boundary between Sheffield and Rotherham. The underlying geology and deep cut valleys carved by these watercourses create an east-facing amphitheatre formed by the 'seven hills', with a 500m high, western upland backdrop (maximum: High Stones, 550m) sloping down towards the eastern lowlands of around 30m (minimum: Blackburn Meadows, 29m). From every part of Sheffield the hills dominate the skyline; over 12% of the district is above 400m high and over 52% lies above 200m[2]. In Sheffield, 94% of all housing land is over 100m and 15% is over 200m (the normal limit for development in the UK is 200m)[4]. There are strong advantages for wildlife in the way in which these hills and valleys form natural green corridors and help to connect areas of woodland and domestic gardens, reducing urban fragmentation[6].

The varied topography and landscape means that, as a city, Sheffield supports a surprisingly wide range of natural habitats and biodiversity[4], as detailed in this report. Sheffield has often been described as the 'greenest city' in the UK or in Europe and a study undertaken by A. Middleton provided some evidence to support this[6]. A wide range of statistics were used to determine levels of 'greenness' by comparing against population size, wooded areas, open country etc. and the study found that Sheffield did perform well when compared to other major population centres[6]. For more general information about Sheffield and its population, please see the 'State of Sheffield 2018' report[7].

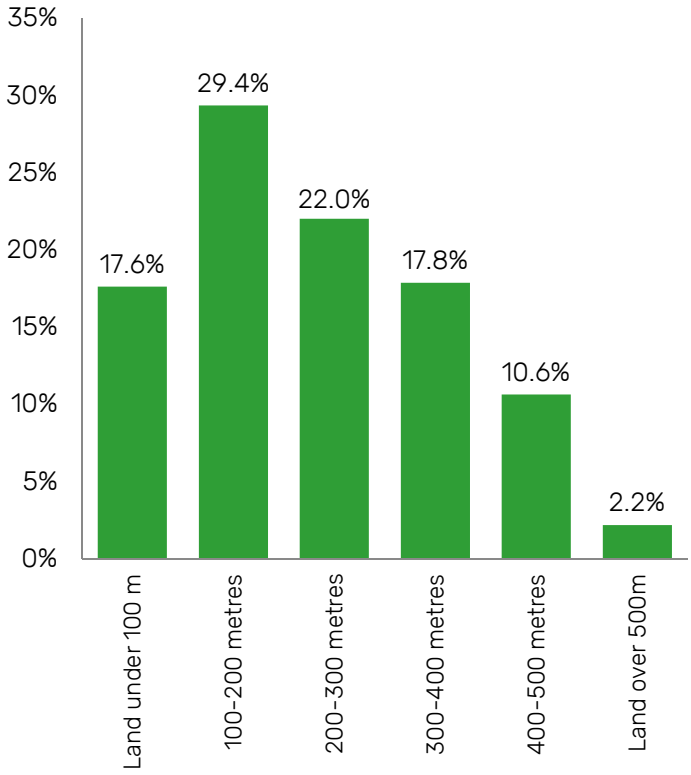



*Figure 3 (right): amount of land at various heights within the Sheffield district. Most land lies between 100-300m.*

## Sheffield in context: geology

The surface geology of the Sheffield area is of Silesian, Upper Carboniferous origin (333-299 million years ago) with some more recent alluvial deposits along the river valleys. Travelling from west to east across the district, the underlying landscape of the Eastern Pennine Anticline consists of the mudstone, shale and coarse sandstone (and minor coal seams) of the Millstone Grit (Namurian) of the Dark Peak, giving way to the more widespread Coal Measures (Westfalian). These also comprise mudstone, shale and sandstone, with rich workable seams of coal. Prominent features of the landscape are the inland cliffs or 'edges', the longest of which is Stanage Edge at 6km in length, part of which forms the western boundary of the district and runs south-east into the Derbyshire Peak District. This is formed by the hard sandstone horizon of the Millstone Grit where the softer shales and mudstones have eroded away. The Lower Coal Measures form the fine sandstone edges of Sky Edge in the heart of the city and Wharncliffe at the northern boundary with Barnsley. The variation in the coarseness of these sandstones offered different grades of abrasive gritstone in recent times for many uses including the grinding of high quality knife blades. The major consequence of the coming together of the geological characteristics of the region is the steel industry upon which Sheffield is built. The combination of coal for heat, multiple fast flowing streams running down from the upland watershed for power generation, locally occurring iron ore and the charcoal provided by the many forests provide the perfect combination for the creation of steel. The seat earths, fire-clay and ganister beneath the coal seams also provided ideal materials for furnaces.

Stanage Edge
© Paul Richards

## Sheffield in context: climate and the effects of climate change on nature

Sheffield's position in the UK, combined with its varied landscape and topography means that the climate across the district varies considerably from the colder, wetter uplands of the western moorland to the relative warmth of the urban heat island within the city centre. The rain shadow that is cast by the Pennines sees the Sheffield area experiencing drier conditions than Manchester, but topography and valley direction deliver variations in temperature that are dramatically different locally depending on altitude, forestation, exposure and aspect[8]. This range has a significant impact on the wildlife that the area can support and the extent to which species can disperse and flourish.

The increase in mean temperature and sun hours per day over time is shown in Figure 4 (right)[8,9]. Vegetation growth and the diversity of plant species within the Sheffield region are strongly linked to climate because of how it influences the growing season. According to the Met Office, in 2016 the national growing season had increased by an average of 29 days from pre-1990 figures[10]. Sheffield figures reflect this and since 1989 there has been a marked extension to the growing season of around a month (Figure 5)[8,9]. This greater local capacity for growth and flowering times has a significant impact further up the food chain as consumers from insects to birds benefit from this extended feeding season. Consequently, there is a longer period for reproduction and dispersal, which may influence the introduction of new species as well as potentially strengthen populations. In recent years long-term changes in climate - such as increased average winter temperatures since around 1989 (Figure 4) - suggest possible effects on overwintering success of species such as dragonflies (see Odonata case study, Waterways & Standing Water chapter)[8,9]. Other factors, including increased rainfall and temperature extremes, can be detrimental to some species.

Non-native species can sometimes flourish in a changing climate. In some urban Sheffield locations some non-native flowering plants are carefully selected to make use of and extend flowering seasons and provide a stable resource for invertebrates (see next case study).

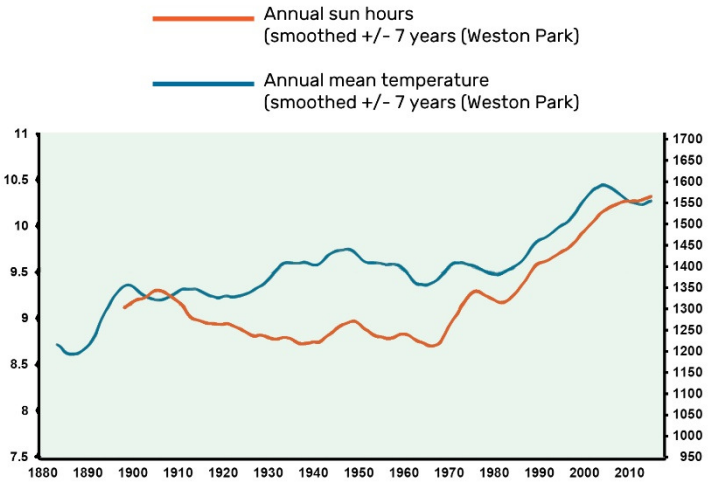



*Figure 4 (above): annual mean temperature and annual number of sun hours recorded at Weston Park between 1880 and 2010. Figures are smoothed +/- 7 years[8,9].*

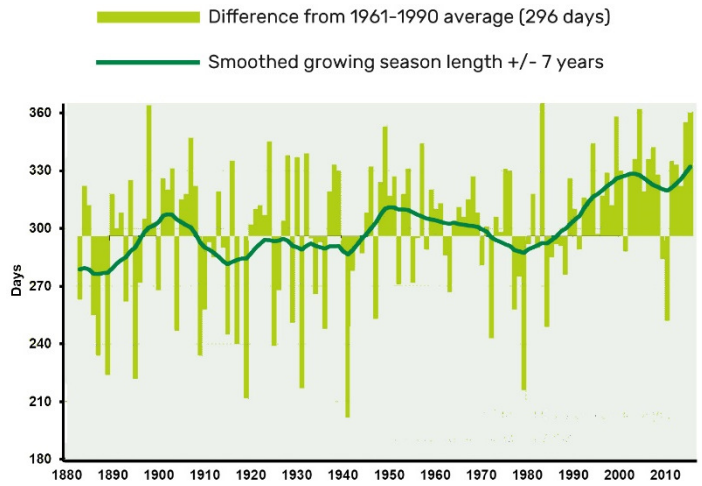



*Figure 5 (above): length of growing season as a smoothed figure (+/- 7 years) and annual variation from the 1961-1990 mean[8,9].*

Wyming Brook
© Sarah Sidgwick

## Case study: Pollinators, flowering seasons and urban meadows
## Jack Brodie and Sue France, Green Estate

The much reported decline in insect pollinators is due to several factors but the single most important is believed to be the greatly reduced number of flowers in the landscape. This is mainly due to the 'green revolution' of intensive agriculture in the 20th century during which many flower-rich habitats – unimproved grassland, hay meadows, fallow fields, leguminous forage and hedgerows – were lost[11]. This greatly reduced both the abundance and diversity of floral resources available in the landscape, creating flower shortages in both space and time[12].

Pollinators may have fared the worst in arable landscapes whilst urban areas have retained surprisingly resilient pollinator populations[13]. One recent study even found greater bee diversity in UK urban areas compared with adjacent farmland[14]. This suggests that designed landscapes can, and do, support pollinators, and that we can help maintain pollinator diversity by creating urban landscapes with abundant and diverse flower assemblages. This includes using both native and non-native plant species, according to a body of scientifically rigorous literature quantifying the relative value of different plant species to UK pollinators[15].

These studies show that value to pollinators is primarily based on certain biological characteristics or traits of plants that do not correlate neatly with their original geographical distribution. Non-native species can have characteristics such as abundant nectar provision and pollen rewards and long flowering seasons. They can also help to make less intensively managed areas (such as urban meadows), that may be viewed negatively in an urban context, to become habitat-rich, attractive naturalistic landscapes. Recent studies have confirmed that non-native plants do indeed potentially provide valuable resources and that native pollinators are just as happy, and sometimes even prefer, to utilise these non-native flowers when available[16,17,18]. In our Sheffield trials, we have found strong evidence for the ecological value of non-native plants and particularly near-natives (Figure 6).

Against this background, trial work by the University of Sheffield Landscape Department, Green Estate and Pictorial Meadows in Sheffield has sought to identify just what assemblages of native, near native and non-native species will best work together as new self-sustaining ecological communities in the UK. Previously, both poor quality seed and a lack of understanding of the dynamics of complex herbaceous communities has hampered successful establishment of new meadows from seed, regardless of origin. Trial work is ongoing but research and development has enabled a new approach to urban naturalistic plantings that benefits people and wildlife. We have now created hundreds of urban meadows in Sheffield and our knowledge and understanding of the complex factors involved in selecting the optimum species mix is still increasing. Complexity, scale and connectivity in a landscape remain the best ways of ensuring rich biodiversity. Any flower-rich meadow is better than no vegetation or mown grass, and a matrix of different types of vegetation is better than any one type.

Tree bumblebee
© Jon Hawkins

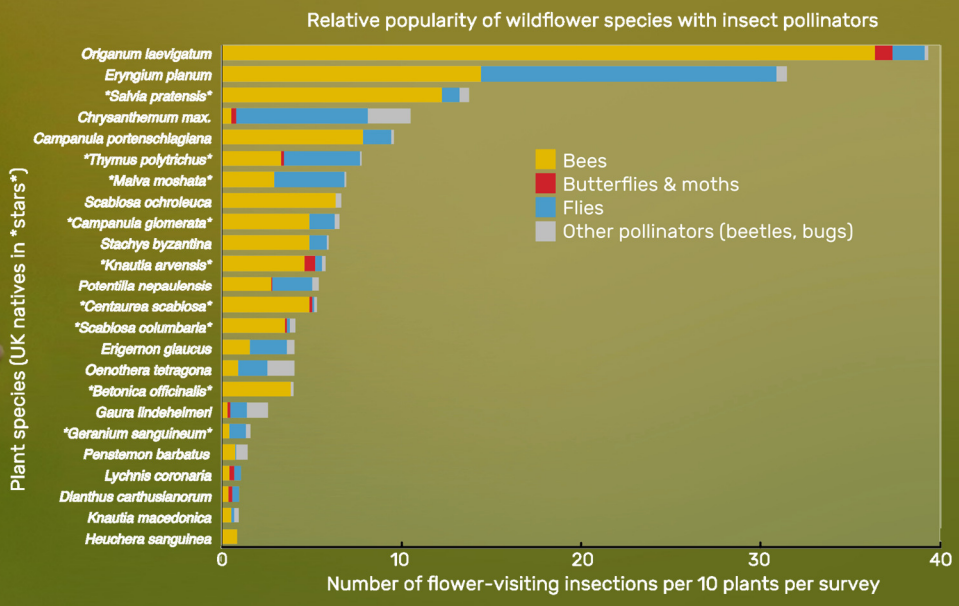



*Figure 6: preference of different pollinator groups for a number of native and non-native plant species (source J Brodie, dissertation for the University of Sheffield and Green Estate).*

Given the combined effects derived from variations in topography and climate, the Sheffield district is drier and warmer in the south and wetter and colder in the north and west. This leaves the city in the 'cross-hairs' of influences that create a rich mosaic of conditions. Sheffield's habitats support a wide variety of fauna and flora as a result. Laid across this can be distributions of species that meet their northern, southern or altitudinal limits here in Sheffield (Figure 7). This places us at a 'leading edge' where small changes in climate, human activity, pollution or policy can have a marked and observable impact on the distribution or behaviour of wildlife. The result is a city where greenspace can be hugely significant for species at the limits of survival and a place where species are established or lost because of extremes or changes across mere seasons.

In an environment already impacted by human activity it is often the more adaptable, generalist species that survive best. Typically, these are the more common, widespread or invasive species that cope well with change. If unique habitats are threatened, rarer species that are habitat specialists are most at risk, and climatic changes may add further stress to their existence. It is therefore critical to monitor the state of habitats, and the wildlife populations that they support, in order to observe and react to such changes where appropriate.

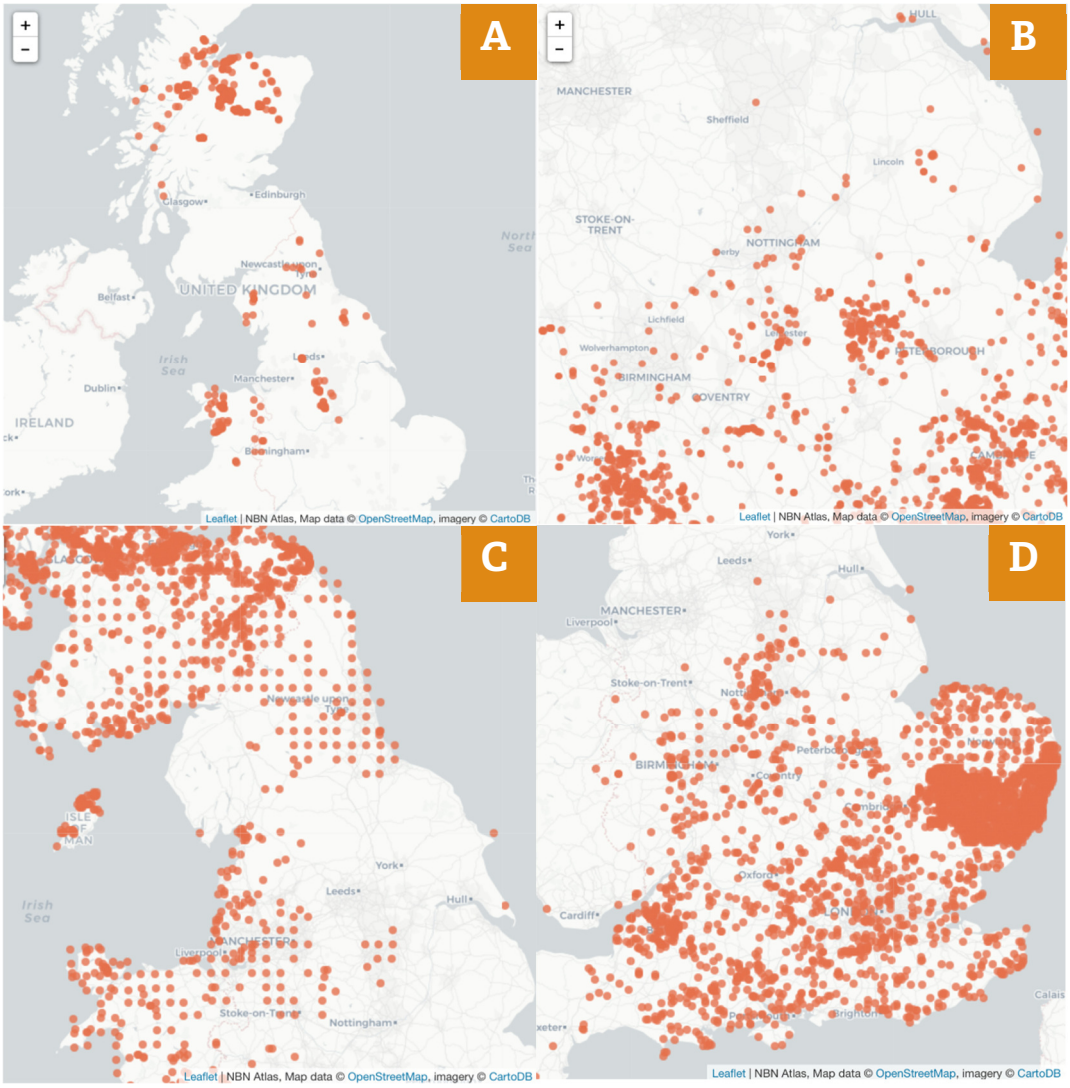



*Figure 7: distribution of species that exhibit some limit of their range within the Sheffield district.*

**A**: *Hairy wood ant,* Formica lugubris. *Commonly seen in Greno Woods and Longshaw Estate.*

**B**: *Roesel's bush cricket,* Metrioptera roeselli *Recorded for the first time at Woodhouse Washlands in 2017*

**C**: *Northern marsh orchid,* Dactylorhiza purpurella

**D**: *Essex skipper,* Thymelicus lineola

*All data: NBN Atlas website accessed on 02/03/2018*

*species.nbnatlas.org/species*

The fluctuation in climatic conditions between one year and the next can also impact wildlife in the short term. The effects of one poor summer (low temperatures, high winds and precipitation) may be felt for two or three years later by species that are dependent on specific conditions for summer reproduction. An easily observed example is the weather impact on first and second brood holly blue butterflies which feed on holly in the spring and ivy in the summer. The effect of weather is often seen in the reduced abundance of the following brood until conditions improve during a subsequent season to enable populations to recover to former levels[19].

## Case study: Butterflies in Sheffield's changing urban climate[20-27]

**Ben Keywood (FRES), Sheffield & Rotherham Wildlife Trust**

Ringlet butterfly
© Ross Hoddinott/
2020VISION

There have been significant changes to the butterfly populations of urban Sheffield over the last two decades. Some species, formerly restricted to a few specialist sites, have expanded their range and become widespread across the city as a whole, but in particular in urban gardens and greenspace. Species particularly associated with the Sheffield moorlands have shown the least change, although there is evidence of species long associated with moorland habitat, such as dark green fritillary, expanding into more urban greenspace with a handful of urban or semi-urban records in recent years.

The reasons for these changes are not always clear. A series of hot summers and mild winters may be one reason behind the expansions of several species from the mid-1990s to mid-2000s. During this period butterflies such as the comma, speckled wood and holly blue showed the largest expansions, but records show these have largely flatlined or shown much smaller increases in recent years.

In the last decade, weather conditions have not followed the same pattern as the previous period, with conditions and seasonal temperatures fluctuating more dramatically from year to year. This has led to strong yearly fluctuations in numbers of many 'common' butterfly species including the orange tip, peacock, small tortoiseshell, small skipper, large skipper and small copper. Future research could potentially show that extreme temperature fluctuations may be partly responsible for an increase in fungal or bacterial infections and parasites that affect the immature stages of butterflies and have a direct impact on populations.

Another area where noticeable changes to butterfly populations have occurred is brownfield sites. Here, the profusion of bird's foot trefoil, the larval foodplant of common blue and dingy skipper, has enabled these species to expand rapidly from their more traditional grassland sites. Both butterflies favour stony sheltered areas where the foodplant grows and they have subsequently formed several small urban colonies across the city. These are now extremely vulnerable as more brownfield sites are being considered for development.

Two species that have shown the largest increases in distribution during the last decade are the ringlet and gatekeeper, following rapid expansion similar to that of the speckled wood the previous decade. All three species are now commonly found in gardens and urban areas where they overwinter as larvae and feed on grasses. Interestingly, the meadow brown and wall brown, which share the same foodplant and lifecycle, have not shown similar increases, with the wall brown suffering a huge decline in Sheffield, reflecting the national pattern.

Although most of our resident species have larvae that feed on low-growing plants, the importance of how ruderal vegetation such as stinging nettle (the singular larval foodplant of the peacock, small tortoiseshell and red admiral) is managed across the city needs to be carefully considered, particularly in an urban context along roadsides and in parks and gardens. In the same context, brambles and thistles are also vital nectar sources for adult butterflies, as well as other insects. The way we manage this vital space can affect a large range of butterfly species reliant on roadsides and other fringe habitats where their foodplants grow and which also provide green corridors for colonies to expand and move.

There are only five species in our area that rely on trees as their larval foodplants: comma and white-letter hairstreak on elms; holly blue on holly (and ivy); brimstone on buckthorns; and purple hairstreak on oaks. In Sheffield, the comma is almost entirely dependent on wych elm as a larval foodplant, rarely choosing its alternative foodplant, stinging nettle. Blackthorn or hawthorn are often chosen to plant in urban parks and hedgerow, but in addition, there is potential to plant buckthorn species to help the brimstone butterfly.

## Case study: Long-tailed tits in the Rivelin Valley: investigating effects of climate change
**Professor Ben Hatchwell, Animal and Plant Sciences, the University of Sheffield**

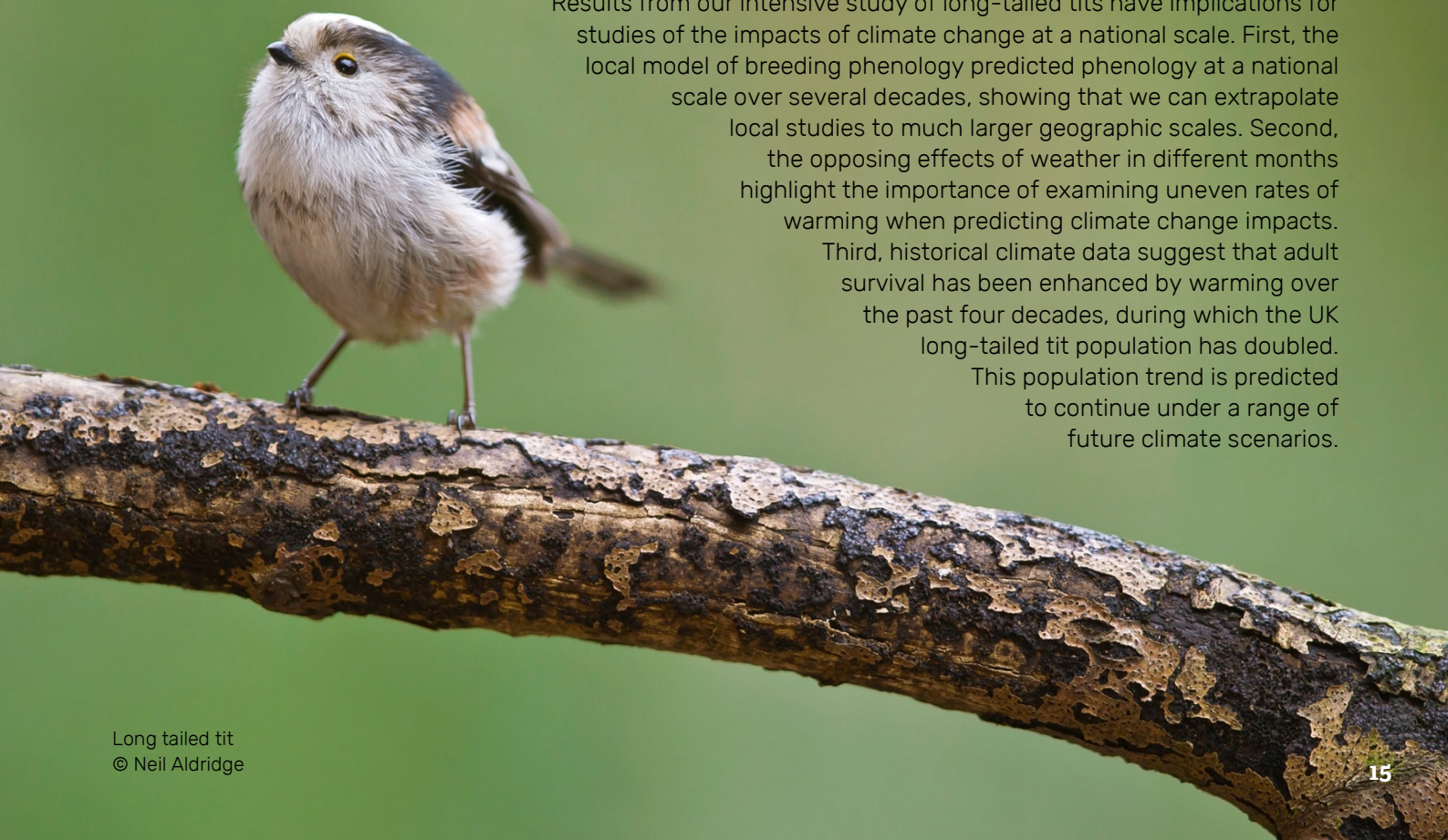
Since 1994, a team of researchers from the University of Sheffield, led by Ben Hatchwell, has been studying long-tailed tits (*Aegithalos caudatus*) in the Rivelin Valley, Sheffield, funded primarily by grants from the Natural Environment Research Council. The initial reason for the study was the co-operative breeding system of long-tailed tits, in which some adults help other pairs to raise their offspring – behaviour that is globally rare and unique among British birds. Since the start of the project the lives of over 3,500 birds have been closely monitored, allowing many questions relating to their extraordinary social system to be answered. These data also allow us to investigate other problems, including the effect of our changing climate on this population of long-tailed tits.

The effect of climate change on biodiversity is typically studied via shifts in the distribution of species and changes in the timing (i.e. phenology) of annual events such as breeding or flowering. National data collected by the British Trust for Ornithology (BTO) over 43 years show that the breeding phenology of long-tailed tits has advanced by 15 days, more than any other UK bird. Using long-term data from the Rivelin Valley, collected over 19 years, Philippa Gullett (PhD student; supervised by Ben Hatchwell and Karl Evans from Sheffield, and Rob Robinson from the BTO) investigated the effects of weather on long-tailed tits in more detail.

The start of egg-laying varies by more than three weeks across years and, as suggested by national data, this variation is related to March temperatures with earlier breeding in warmer years. Similarly, annual variation in the date on which breeding terminated was predicted by April temperatures, with pairs finishing earlier in warmer years. Long-tailed tits prey heavily on defoliating caterpillars when feeding nestlings, so the latter pattern is probably caused by more rapid larval development and hence an earlier peak in caterpillar abundance in warm years; indeed, direct sampling of caterpillars has revealed earlier peak abundance in warmer springs. Importantly, since April temperatures have warmed more rapidly than those in March, the length of the breeding season contracted by about one third between 1995 and 2011[28].

The window of opportunity for reproduction is clearly sensitive to a warming climate, but what about the impact of climate on other stages in the long-tailed tit life history? Offspring survival from fledging to the following breeding season (i.e. recruitment) was affected negatively by warmer March temperatures, and positively by warmer May temperatures. The mechanisms underlying these effects are not completely understood but may be attributable to the effects of weather on food supplies at crucial stages of the season[29]. Much of the annual variation in the survival rate of adult long-tailed tits could also be explained by temperature and rainfall. Specifically, adult survival increased following warm, dry springs and warm autumns, while winter weather had little effect on this key parameter[30]. We speculate that the flocking behaviour of long-tailed tits, and especially their communal roosts, reduces their susceptibility to the adverse effects of harsh weather in winter.

Results from our intensive study of long-tailed tits have implications for studies of the impacts of climate change at a national scale. First, the local model of breeding phenology predicted phenology at a national scale over several decades, showing that we can extrapolate local studies to much larger geographic scales. Second, the opposing effects of weather in different months highlight the importance of examining uneven rates of warming when predicting climate change impacts. Third, historical climate data suggest that adult survival has been enhanced by warming over the past four decades, during which the UK long-tailed tit population has doubled. This population trend is predicted to continue under a range of future climate scenarios.



Long tailed tit

## Case study: Valuing the natural environment in everyday decisions
## Dr Alison Holt, Natural Capital Solutions Ltd

Ensuring the growth and development of Sheffield, its economy, and the well-being of its inhabitants, is a complex task. There are the challenges of social inequality, of providing social care, jobs and affordable housing and managing flood risk, all within the context of austerity. Unfortunately, our usual approaches to dealing with these problems (e.g. denser housing, cutting maintenance of parks, using hard engineering to deal with flooding) will erode Sheffield's natural assets. This is very likely to create further undesirable outcomes. However, if we begin to recognise the full value of the natural environment, and make it central to our solutions to these societal challenges, we are more likely to reach our aspirations for the city.

To achieve this, we need to understand what our natural environment does for us. The Sheffield State of Nature 2018 report sets the scene, documenting the extent and variety of our natural assets. The next step is to reveal the benefits (ecosystem services) that these assets deliver to people. A study[31] completed at the University of Sheffield showed that the greenspaces in the city (woodlands, parks, cemeteries, allotments), and the rural component of the district (moorland, woodland, farmland), were vital for soaking up carbon dioxide and harmful air pollutants, alleviating the severity of flood events, cooling the city in very hot temperatures, providing areas in which people can walk, run, cycle, and appreciate natural vistas, and for supporting habitats for wildlife. Thirty-four percent of the district provides a high level of one or several of these benefits (although only 0.02% of the area provides all six of these benefits) – see Figure 8.

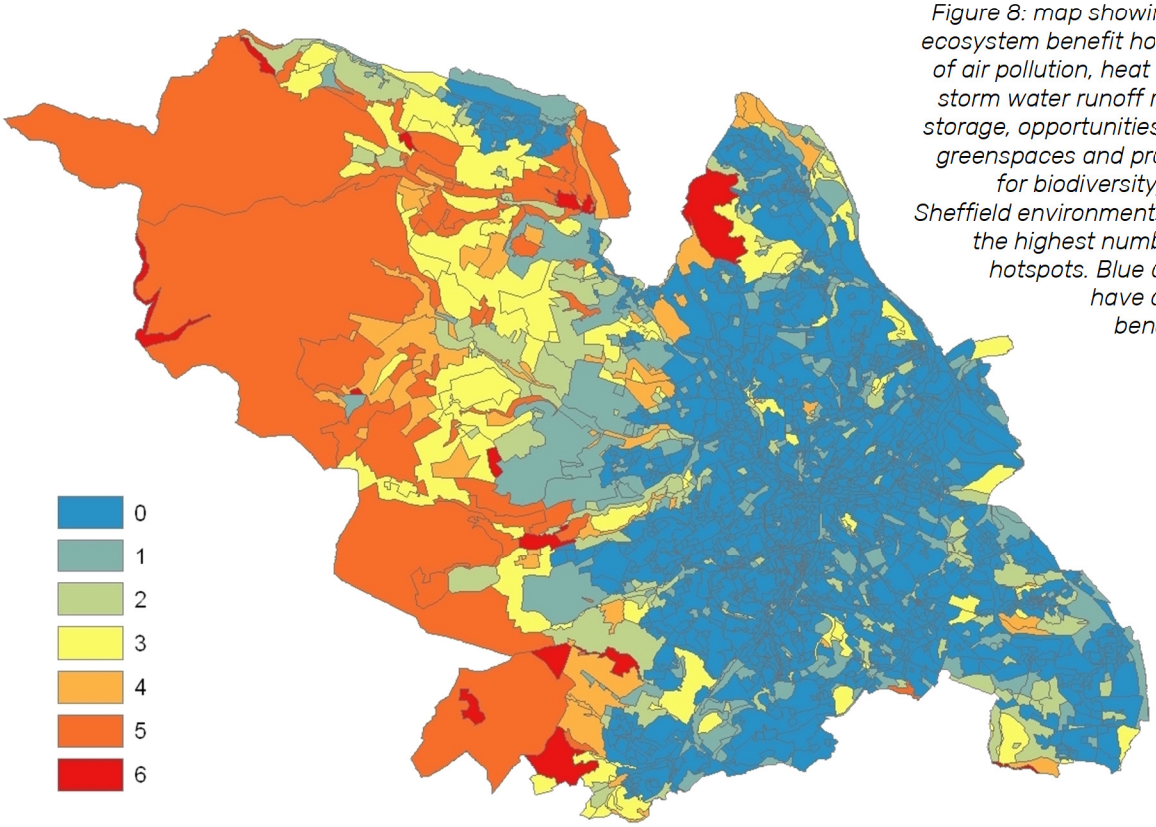



*Figure 8: map showing the number of ecosystem benefit hotspots (reduction of air pollution, heat island mitigation, storm water runoff reduction, carbon storage, opportunities for recreation in greenspaces and provision of habitat for biodiversity) provided by the Sheffield environment. Red areas show the highest number of benefits as hotspots. Blue areas (value of 0) have a low provision of benefits as hotspots. Map credit 3*

A rapidly increasing body of evidence illustrates the benefits we gain from nature, and the money that can be saved by managing to benefit wildlife. For example, public greenspaces in London save the NHS £580 M per year through increased physical health[32]. Urban trees save Glasgow's local economy approximately £4.5 M in services per year[33] (carbon sequestration, pollution, climate, flood and noise regulation). Working with natural processes can effectively reduce flood risk, whilst enhancing biodiversity and other ecosystem benefits, saving money through avoiding the costs of flood damage, and may be cheaper than hard engineering[34]. For instance, in Sheffield, there are numerous sustainable drainage systems (SUDS) emerging, helping to manage flood risk and provide new habitat for wildlife. There are now many case studies of how approaches focussed on understanding and valuing the benefits from nature can work on the ground[35, 36].

Once we recognise the benefits that Sheffield's natural assets provide us, and the consequences our decisions have on these, we can make more informed policies, regulations and decisions. This will reveal tough choices. However, it is our best chance, using all our tools, to ensure a more prosperous, happier and healthier future for us and for wildlife.

## Local Action

Whilst not a definitive history of local voluntary and professional involvement in environmental issues in Sheffield, this section acts as an opportunity to briefly demonstrate that Sheffield has a long history of high quality active involvement in environmental science. There is ongoing academic research from two universities and many local government, non-government, charity and voluntary organisations observing, recording and managing the landscape and its species. Without the commitment and dedication of these people, this report – and many other reports, papers and research – would be much poorer in scope and insight. Much of the data from which statistics are derived and policies made have been painstakingly gathered by passionate professionals and volunteers who, via years of study and time outside in all weathers, engage directly with our outdoor city. Each point on a graph or dot on a map is the result of hours of dedication. The people represented so briefly below and the subjects they embrace are the source and inspiration for this report.

### A history of expertise

There is a prominent history of many eminent Sheffield-based scientists recording and collecting items of natural history interest since the 19th century. In 1822 James Montgomery called for the establishment of a society within the city to represent a growing acknowledgement of the value and importance of philosophy and the sciences. A 'Literary and Philosophical Society' was formed, which by 1875 had established the Sheffield Public Museum (now Weston Park Museum). Much of the natural history of the city was recorded, studied and presented to the public through specialist curators. Today, the museum continues to house important collections of specimens whilst attracting and engaging over one million visitors a year to its exhibitions[1,2]. Weston Park Weather Station was established within the museum in 1882 and daily weather readings have been taken ever since, providing environmentalists with one of the country's longest unbroken runs of meteorological data (Figures 4 and 5).

### Natural history societies and recording

Chief among those studying the nature of Sheffield is the Sorby Natural History Society (SNHS), a proudly amateur society which celebrates its centenary in 2018[3,4]. SNHS continues to organise lectures, field excursions and surveys to identify and record Sheffield's natural history and to enlighten and inspire. SNHS publishes a monthly newsletter, plus the 'Sorby Record' annually, and a 'special series' of species atlases and reports, for example 'A Flora of the Sheffield Area – 200 years of plant records'[5]. Many additional specialist groups also exist, including the Sheffield Bird Study Group (SBSG); other bird groups detailed in the following case study; the South Yorkshire Badger Group, and the South Yorkshire Bat Group.

In 1964, the Sheffield Biological Records Centre (SBRC) was formed, initially in Weston Park Museum, but now housed and managed by the Sheffield City Council (SCC) Ecology Unit[6]. These data, now comprising >440,000 site and species records, can be accessed by ecologists, planners, researchers and commercial consultancies for a variety of research and practical applications[7]. These data have contributed to the production of key documents to assist with nature conservation including Local Habitat and Biodiversity Action Plans and important precursors to this report: 'The Natural History of the Sheffield District' (1968)[8] and 'The Natural History of the Sheffield Area and the Peak District (1985)'[9]. A 'Sheffield Red Data Book' is due for publication in 2018 by SNHS, highlighting the status of rare species across the district. Sheffield continues to be blessed with national authorities from the academic and amateur fields whose publications have had an impact well beyond the city.

Surveying grasses
© Matthew Roberts

## Case study: The history of bird recording in Sheffield
## Bob Croxton, Sorby Natural History Society and Sheffield Bird Study Group

Prior to the second World War there exists only a small number of bird records from Sheffield, usually of rarer bird species. Egg and bird skin collections, along with diaries and notes, were donated to Sheffield Museum and serve as important historical records. In 1861 the Yorkshire Naturalists Union was formed which produced a regular journal – 'The Naturalist' – and, later, annual bird reports detailing some of the rarer birds found in Sheffield.

SNHS has continued bird recording since its formation in 1918. Arthur Whitaker wrote notes on 'Birds of the Sheffield Area (1929)'[10] and Weston Park Museum holds summaries of his diaries. Its Ornithological Section was formed in 1946. Early bird reports in the 'Sorby Record' give intriguing reports providing key insights as to how bird numbers and distributions have changed through Sheffield in the last century. An example includes nuthatch - "absent except for one or two pairs in large gardens in the Endcliffe area" – and hawfinch - "resident, thinly distributed throughout the area including gardens well into the city". Nuthatch are now a fairly common woodland bird whilst hawfinch are extinct within the city. SNHS together with Sheffield Museum published 'The Birds of the Sheffield Area' (1974)[11] which contains distribution maps from the Sheffield district and broader area. From 1964 until fairly recently, the SNHS newsletter contained monthly reports on Sheffield's birds and the society has generated a huge number of bird records for the Sheffield Biological Records Centre (SBRC).

A prominent group in Sheffield is the Sheffield Bird Study Group. SBSG has been systematically recording and surveying the birds of the Sheffield area since 1972. Its annual bird report is the definitive statement in Sheffield bird recording and the importance of its consistent and systematic approach is highlighted in their 'Birds of the Sheffield Area' (1985)[12] and 'Breeding Birds of the Sheffield Area' (2013)[13] upon which most bird data within this report is based. The group has also published a bi-monthly bulletin listing local bird records. SBSG's website supports the facility to receive bird records with these being displayed on a daily basis and collated into the annual report. The group has a digital database collected since 1990 of around 830,000 bird records and paper records pre-dating this. Some 45,000 - 50,000 digital records are added each year.
Five editions of the journal 'The Magpie' have been published since 1973 containing detailed studies on Sheffield birds, including rooks and swifts, and a survey of city parks and woodlands.

Sorby Breck Ringing Group, formed in the 1960s, has ringed around 200,000 birds in the greater Sheffield area and many in the city. Apart from gaining information from recovered ringed birds, regular trapping at 'Constant Effort Sites' has provided year on year population data on many bird species.

The BTO, formed in 1933, is a national organisation that also holds much information about Sheffield's birds. Its surveys include Common Bird Censuses and the Wetland and estuary Bird Survey (WeBS) – taking into account the diversity of birds on Sheffield's reservoirs, and the Waterways Bird Survey which considers Sheffield's rivers. The BTO has collected much information from its Sheffield members for national atlases, and the Birdtrack system collects vast amounts of digital bird data via its website.

Looking to the future, the amount of bird data being collected in Sheffield is as big as ever, especially since the introduction of web-based recording systems. The biggest threat to this going forward is finding people to manage the collection of these data. Both data recorders at SNHS (in role since 1970s) and SBSG (1990) have wished to retire for some time now, but sadly no one has come forward.

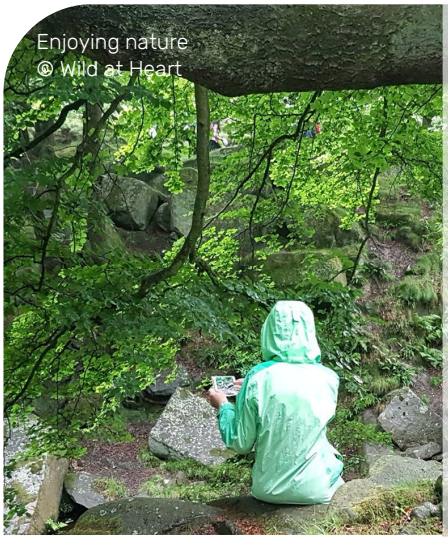
Ringing a wren
© Tom Marshall

## Case study: Well-being and health through connections to nature
## Jenny King and Susan Smith, Sheffield & Rotherham Wildlife Trust & Clare Rishbeth and Jo Birch, IWUN Project, the University of Sheffield

Wild at Heart is coming to the end of a five-year Reaching Communities in Need, Big Lottery funded project to support older adults and vulnerable people in Sheffield to connect with nature for health and well-being. We have been discovering how and why nature helps to support well-being and what the barriers may be that restrict this. We have overlapped and exchanged findings with the Improving Well-being Through Urban Nature project (IWUN)[18] – a three year University research project by the Natural Environment Research Council's Valuing Nature Programme - which is finding out more about how Sheffield's natural environment can improve the health and well-being of the city's residents, and especially those with disproportionately high levels of poor health.

IWUN is finding that people who live in cities are using not only spaces, but experiences of nature to help their sense of mental well-being. People who feel a health benefit are from different socioeconomic areas of the city, from different ethnic and cultural groups and are of different ages[19]. Findings from one strand of IWUN's research, based on 12 in-depth life stories with Sheffield residents aged over 70, reveal that those living in deprived urban areas recounted very few childhood memories of nature and greenspace. This group reported little current engagement with Sheffield's nature and greenspace in their daily lives, either close to home or further afield, indicating a potential need to address inequalities in 'access' to nature. In most interviews, isolation was a recurring theme; social connection and having regular activities or interests was central to people's sense of well-being. Whilst for a few people, involvement in nature-based interests, such as gardening or photography were solo activities, for most it was the support of other people and social networks that facilitated well-being benefits from urban nature.

Wild at Heart nature-based activities and sessions have been based on the five Ways to Well-being – Connect, Be Active, Take Notice, Keep Learning and Give[20], which supports the principles behind Active Ageing. Sessions have been embedded in the local communities to build inclusive and supportive social groups, as well as offering opportunities for individuals to connect, or often reconnect, with nature-based hobbies and interests. It takes time, many small steps and community support to build confidence and trust for people to be able to engage in building a more mentally, physically and socially active lifestyle.



Enjoying nature
© Wild at Heart

***"It is great to visit such an interesting place. I would never have come here before in my previous 60 years of living in Sheffield. It was great to see the views. Coming along to the sessions has increased my confidence to try different challenges."***

In terms of impact, Wild at Heart has, as of December 2017, delivered 679 sessions with 5,061 attendances. As at the end of its fourth year (July 2016) a survey found that 1,762 people were doing more exercise; 1,384 were demonstrating improved health by walking further and doing more energetic activities; 1,648 felt healthier; 1,280 felt happier or less isolated, 1,173 felt less lonely; and 1,623 had made new friends. This demonstrates how much of a positive impact exposure to wildlife and the outdoors can make to peoples' lives.

***"I have enjoyed everything today. I like to be near water as it gives me a sense of peace and happiness. These sessions have given me a life connected with nature. I have done things I have never done before and learnt so much about wildlife."***

Pond dipping
© Wild at Heart

### Local conservation organisations and groups

1912 saw the birth of the Wildlife Trust movement (now a national network of 47 Wildlife Trusts), initiated by Charles Rothschild[14]. The Yorkshire Trust (est. 1946) originally included Sheffield but in 1985 the Sheffield City Wildlife Group (later to become Sheffield & Rotherham Wildlife Trust, SRWT) was formed to raise awareness of the biodiversity value of the urban environment and focus on particular issues surrounding urban greenspaces[15]. Today, SRWT is a registered charity, with over 6,000 members and 100 volunteers, and works with the local community towards creating a network for nature. The Trust manages 15 nature reserves (almost 600ha), across Sheffield and Rotherham, and connects people with the natural world through innovative programmes, helping thousands of local people to improve their lives through natural experiences and outdoor learning. The Trust also campaigns for a better deal for nature and people, both locally and in the wider world, standing up for wildlife and providing expert evidence on issues such as flood protection, as well as inspiring people to take action for wildlife and wild places in their own lives.


Surveying for bumblebees
© Helena Dolby

**A list of active environmental groups (2018) can be found at wildsheffield.com/stateofnature**

There are a number of other conservation organisations also operating in Sheffield: the Steel Valley Project; the Woodland Trust; Sheffield Landscape Trust; North Sheffield Conservation Group; and Sheffield Countryside Conservation Trust operate mainly in the north of the city. Others – including Don Catchment Rivers Trust, River Stewardship Company and the Wild Trout Trust – are connected to the rivers and are detailed in the Waterways and Wetlands chapter. Sheffield Conservation Volunteers, The Conservation Volunteers, Groundwork Sheffield and Sheffield University Conservation Volunteers offer more of a 'flying squad' service across the city.

There are around 50 active environmental groups around Sheffield at any one time. These may be 'Friends of' greenspaces groups, community groups and specialist societies, giving their time to maintain the city's natural environments. Many also submit biological records to the SBRC. Sheffield Green Spaces Forum[16] is a voluntary organisation that brings together and supports many of these local groups. Joining a local group or supporting a city-wide organisation is a readily available way in which every reader of this report can make a difference to Sheffield's natural environment. Even without joining a group, people can still get involved in the many environmentally-related events in the city, in particular through 'Environment Weeks' that has grown from one week in 1984 to over 200 events over a six week period annually in May and June. A group of volunteers administers an online calendar of environmental events throughout the year across the region[17].

### Recommendations

Ensure local volunteer groups have the resources, professional support and encouragement they need to make a lasting and meaningful contribution to the conservation and management of wildlife sites.

Encourage user groups to become actively involved in the conservation and management of the wildlife sites they frequent.

Promote involvement by the public in community science projects, recognising the value they have in encouraging people to get close to nature and in monitoring wildlife. This is of particular significance as climate change increasingly affects our local wildlife.

## Habitat coverage across the Sheffield district

Sheffield has a wealth of natural, semi-natural and modified habitats that support a rich variety of wildlife. These have been mapped using a standard method, outlined in the Appendix, which also applies to the following habitat-specific chapters unless stated otherwise. As a thriving industrial city, 17% of the landscape consists of constructed features such as buildings and paved roads (Figure 9). Figure 10 shows the extent of these natural and man-made habitats and features across the district. By far the most prominent habitat type is grasslands, including pastoral lands and amenity grasslands contained in the urban landscape. Gardens and landscaped areas – including private gardens plus roadside and railway vegetation – can act as vital refuges for wildlife in built up areas of Sheffield and also serve to increase habitat connectivity. Woodlands and shrub, including single trees, are prominent within Sheffield, making up 15% of the total landscape (this does not include more recent iTree calculations; these are detailed in the Woodland chapter). Finally, a large portion of the natural landscape is upland (heathland and bog), which is concentrated to the west of the district within the Peak District National Park.

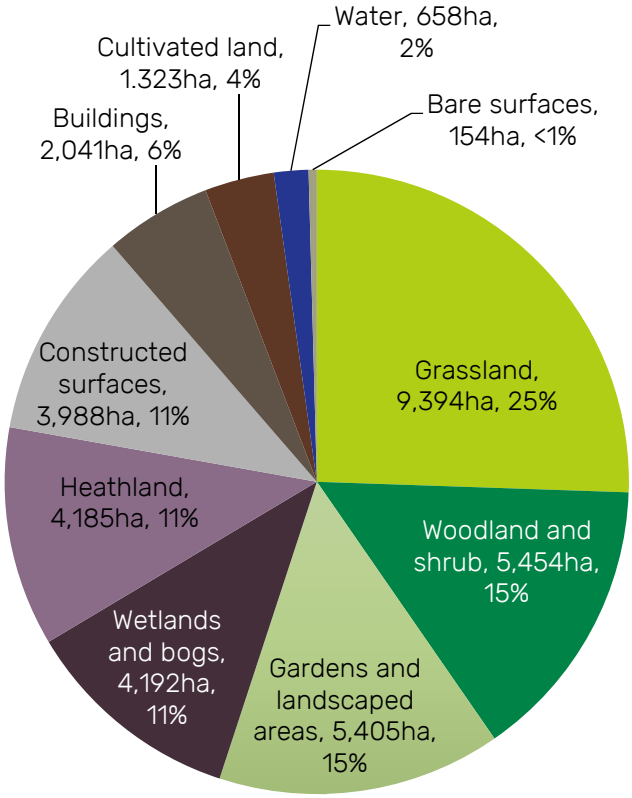



Figure 9 (above): composition of broad habitat types found across the whole of the Sheffield district

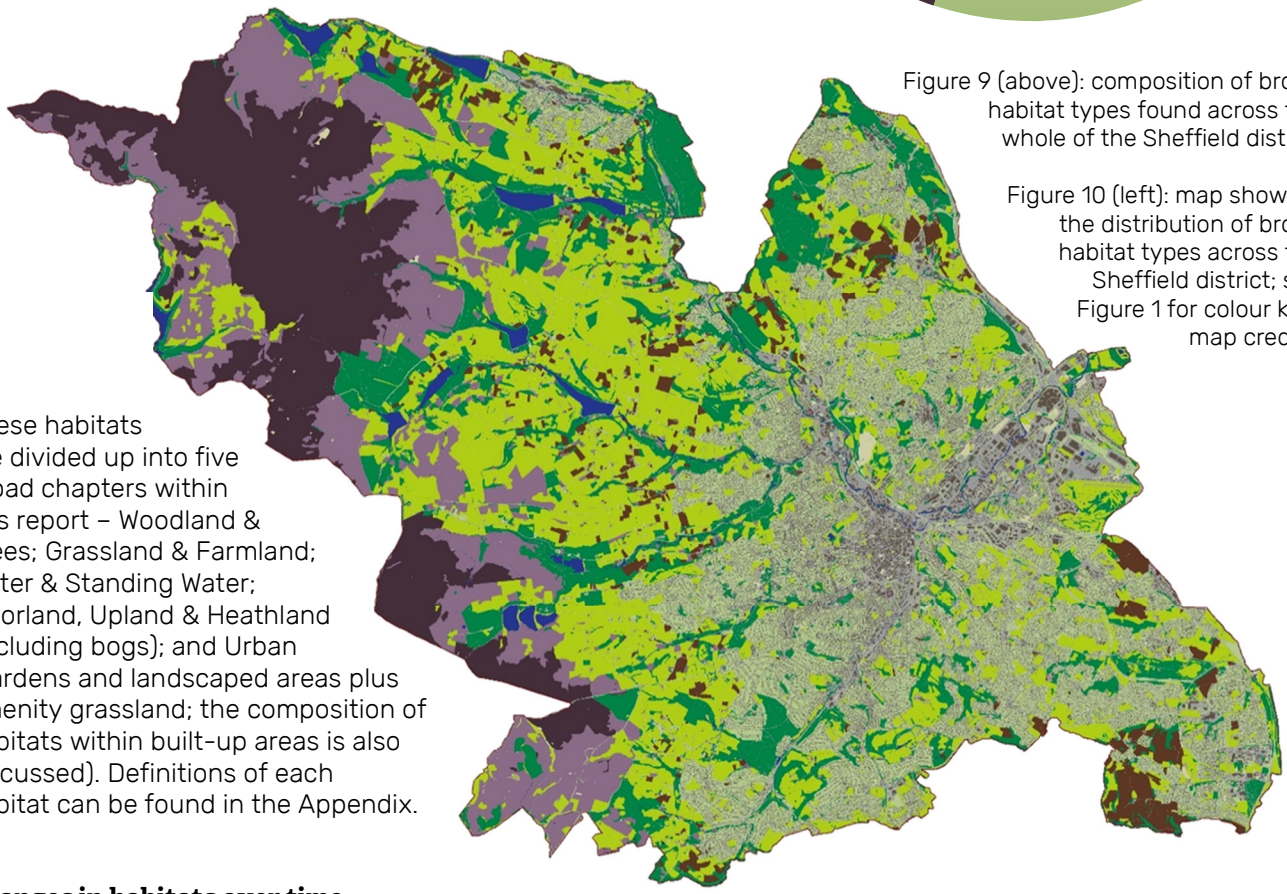


Figure 10 (left): map showing the distribution of broad habitat types across the Sheffield district; see Figure 1 for colour key; map credit 1

These habitats are divided up into five broad chapters within this report – Woodland & Trees; Grassland & Farmland; Water & Standing Water; Moorland, Upland & Heathland (including bogs); and Urban (gardens and landscaped areas plus amenity grassland; the composition of habitats within built-up areas is also discussed). Definitions of each habitat can be found in the Appendix.

### Changes in habitats over time

Accurately estimating changes in habitat coverage over time is difficult and it is further complicated by the availability of equivalent, comparable data over different time periods. From the data we have been able to obtain and analyse (see methods) there is a general indication of an increase in improved and unimproved grasslands, possibly by over 750ha, mostly originating from loss of heathland. Changes are also observed in the distribution of cultivated land, most likely resulting from changes in farming practices, although no change in the total amount is shown. There are also increases in broadleaved woodland, possibly more than 300ha, with similar decreases in mixed woodland and shrub observed. This, plus changes in heathland, could be explained by habitat succession or changes in management practices. Finally, the number of young trees and felled woodland has also possibly increased. Although similar data sources have been used for the different time periods examined, some care should be taken when interpreting these figures due to differences in data resolution.

## Case study: A landscape-scale approach to improving habitats and connectivity
## Keith Tomkins, Sheffield & Rotherham Wildlife Trust

Sheffield Lakeland Landscape Partnership is funded by the Heritage Lottery Fund (HLF) as part of its national Landscape Partnerships programme. The Partnership is managed by SRWT, working with Sheffield City Council (SCC), Bradfield Parish Council, Stocksbridge Town Council, Sheffield United Community Foundation, South Yorkshire Archaeology Service, Yorkshire Water, Natural England and the Environment Agency, and has support from representatives of landowners and local access groups. It offers a unique opportunity to manage the area's natural and built heritage as one, with a common vision, on a landscape scale and for more people to enjoy.

Through some 22 projects, the Partnership aims to achieve four broad outcomes: a more connected and resilient landscape; a bigger, better and more joined-up natural environment for wildlife and people; better-recorded and valued cultural heritage celebrated by local people and visitors; and better understanding of the local heritage with more people helping look after it.

The Landscape Partnership approach concentrates predominantly on habitats and connectivity. The Partnership area of north-west Sheffield is an outstanding example of a 'living landscape', rich in history, with diverse habitats abundant in wildlife, vibrant communities and strong traditions. But now more than ever, wildlife must be given room to move through the countryside and the Partnership is working to restore, recreate and reconnect habitats on a landscape scale.

The area contains UK priority habitats of blanket bog, upland heath and flush, and deciduous and ancient semi-natural woodland. Over half of the area falls within the Peak District National Park and the western margin includes areas designated as Site of Special Scientific Interest, Special Protected Area and Special Area of Conservation. It therefore represents a valuable buffer between protected habitats and Sheffield's urban fringe, which is much more vulnerable to habitat loss.

At a landscape scale the Sheffield Lakeland area includes a wide range of habitats, often in small parcels, set within a varied and attractive mosaic. There is a history of ploughing up heathland, draining wet pasture and other forms of agricultural intensification which has accelerated significantly in recent years. The Partnership will focus on these heathland and grassland mosaics and introduce management practices that can be sustained after investment has been made. Promotion of the area as part of 'The Outdoor City' poses both a potential risk and an opportunity. Appropriate management is needed to improve public access whilst ensuring the area's heritage is enjoyed, understood and protected.

Woodlands and reservoirs form the visual focus of the landscape. SCC and Yorkshire Water are planning to manage their woodland holdings through significant felling and replanting during the project period, encompassing over 200ha of woodland. The Partnership aims to protect woodland species by ensuring a coordinated approach to woodland management, including forestry work, mitigating disturbance and creating a better 'forestry' habitat for wildlife and leisure.

The shaping of the Sheffield Lakeland is a story of water, from the carving of the valleys, through early settlement and industry to the reservoirs that have led to the term 'Sheffield Lakeland'. Water links everything we wish to achieve when working at a landscape scale. Natural flood management, through low-impact habitat creation and management, offers a strong synergy between eco-engineering and wildlife conservation. The Partnership's natural flood management project aims to demonstrate, in a quantitative manner, the potential to conserve species, enhance landscape attractiveness and protect downstream property and infrastructure. Importantly, by focusing on habitats and connectivity, the Partnership aims to protect a number of priority and locally important species.

View from farmland through to Agden, Dale Dike and Strines Reservoirs © Claire Watts