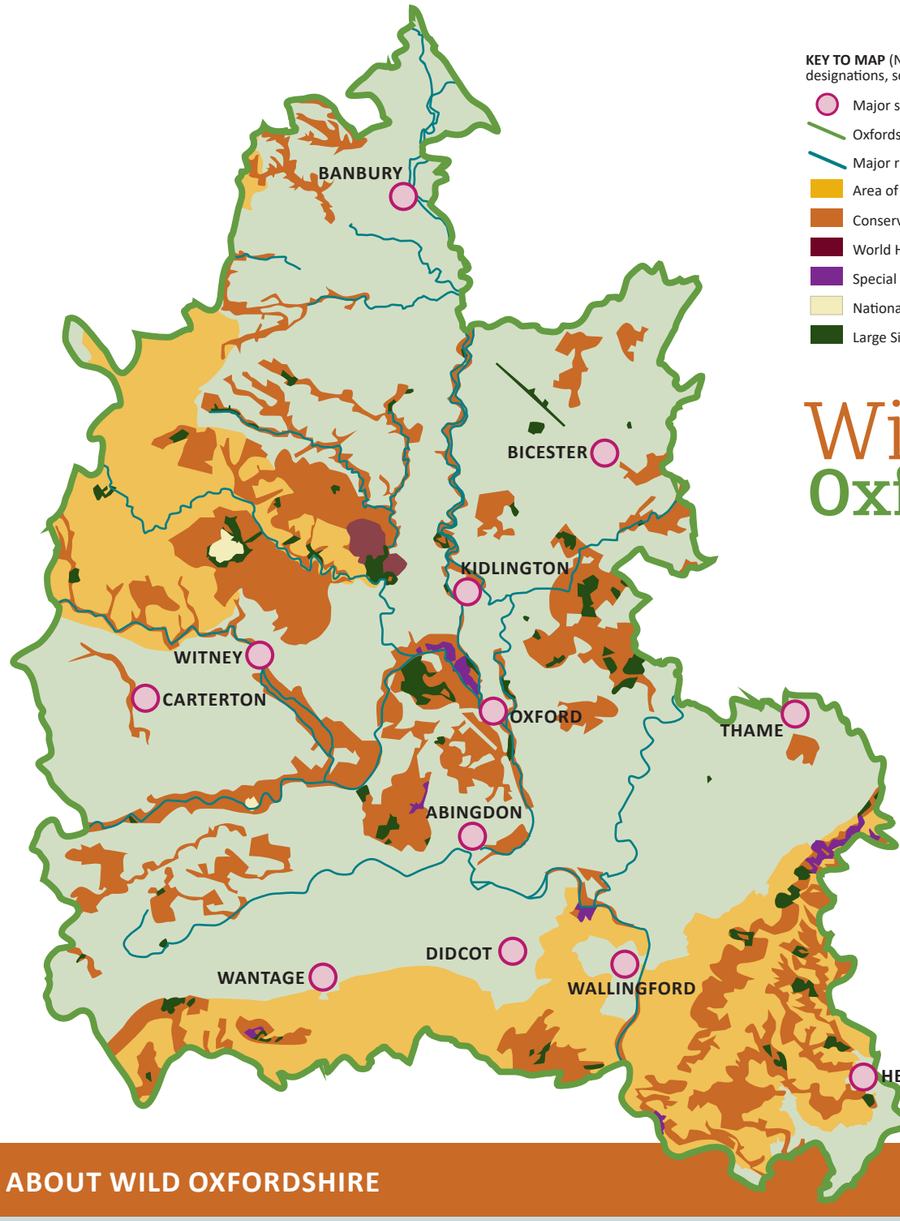
A Wild Oxfordshire Report

STATE OF NATURE

IN OXFORDSHIRE 2017

OXFORDSHIRE'S ASSETS



KEY TO MAP (Note: many sites have multiple designations, so the most appropriate is shown here)

- Major settlement
- Oxfordshire boundary
- Major river
- Area of Outstanding Natural Beauty
- Conservation Target Area
- World Heritage Site
- Special Area of Conservation
- National Nature Reserve
- Large Site of Special Scientific Interest

Wild Oxfordshire

ABOUT WILD OXFORDSHIRE

Wild Oxfordshire is a local conservation charity with a vision for Oxfordshire's environment to be rich in nature, healthy and sustainable for the benefit and enjoyment of all. Our focus is on bringing organisations and community groups together to work collaboratively and make this vision a reality. Wild Oxfordshire has three key aims: to stimulate better land management for nature in Oxfordshire; to increase awareness and interest in enhancing Oxfordshire's nature; and to foster a collaborative and strategic approach to nature conservation in Oxfordshire. We have produced the *State of Nature in Oxfordshire 2017* in order to highlight both the losses and successes across our county, and to encourage increasing engagement with the natural world from all sectors.

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FOREWORD

Ecologists are familiar with the intricacy with which elements of a jigsaw puzzle fit together, and how the parts of the picture can look different from close and far; after all, natural communities are comprised of myriad interacting parts, and the processes that unite them differ between scales, from field to ecosystem. So, it comes as no surprise that plans to understand and conserve nature should also fit, one inside another, like Russian dolls. The big picture took shape in 2013 when the first national *State of Nature* report took stock of the changes in the UK's nature since the 1960s. The losses were shocking. Three years on, and thanks to a remarkable partnership of organisations in Oxfordshire (including my own team at WildCRU), I am thrilled to congratulate the hundreds of volunteers and professionals whose expertise and effort is celebrated in this finer-scale report, the *State of Nature in Oxfordshire 2017* – a quest for the evidence on which to base conservation action and policy.

The national picture may have been a grim documentation of declines, but in this county's stocktaking, we see signs of the supertanker turning. Rejoice, for example, at the return of breeding bitterns and marsh harriers to Otmoor reserve, and the more than trebling of the range of Oxfordshire's water voles. The news, however, is mixed, and the hobnailed imprint of the human footprint sinks deeply into the countryside. The pressures of agricultural intensification, development and transport all now play out against the forbidding backdrop of climate change.

So what does the *State of Nature in Oxfordshire 2017* tell us about the county? And what use is it? It is a compendiously assembled baseline and, in an era when baselines can shift and facts can be alternative, it has huge value: you need to know what you have got to be sure of the losses and gains that follow. Partnership is at the heart of what has already been achieved in Oxfordshire, and what could be to come. For instance, in WildCRU we have worked with water voles for three decades; but while research can tell us what it is that such species need, this is of little use unless it is translated into practice by the combined efforts of farmers, landowners, advisors and volunteers. Thus, when conservation management is joined up across sectors and landscapes, the outcomes can be dramatic.

A report this thorough does not leave the question 'what next?' unanswered. It proposes a list of urgent key actions and concludes that they are not just aimed at the conservation sector. If they were – if the sector simply talked to itself – then future stocktakings will surely tumble dismally down the graphs of decline. On the other hand, if this remarkable document is part of the fuel for societal change and for holistic conservation that engages and transforms an ever-wider constituency, the next edition will hopefully look back from lofty heights as the 2017 baseline recedes happily into history.

David W. Macdonald, CBE, FRSE, DSc
Wildlife Conservation Research Unit (WildCRU); Oxford University

For the full version of this foreword and report, please go to: www.wildoxfordshire.org.uk/stateofnature

Barn owl
(Craig Jones)

MORE, BIGGER, BETTER, JOINED

If we wish to be the first generation to leave the natural environment in a better state than that in which we found it, we must first assess its condition. The *State of Nature in Oxfordshire 2017* draws together a wealth of expertise from the county's professional and volunteer base in biodiversity and nature conservation. The best information currently available has been used to paint a picture of the state of Oxfordshire's natural habitats and species, including long-term trends and more recent losses and gains.

A DIVERSE LANDSCAPE

A diverse and interesting geology, criss-crossed by eight river systems, gives Oxfordshire a gentle, yet complex, landscape. As such, it supports a variety of habitats, from fragrant chalk grasslands scented with wild thyme to fungi-strewn beech woods; from pockets of damp, reedy fen and acid grassland to marshy meadows full of birds. Indeed, it is home to many rare and threatened plants and animals, and has a high proportion of locally, nationally and internationally important sites. Agriculture has a strong influence on the landscape, accounting for 74% of the county's land use. Yet, despite its rural character, more than 66% of the county's population live in urban settings; a number that is expected to rise in the future.

CONSERVING OUR SPECIAL PLACES

Over the decades, the conservation of Oxfordshire's special features has moved away from protecting small pockets of nature in isolated reserves and protected sites, to focusing on landscape-scale initiatives that create a wider network of habitats, benefiting the wildlife, places and people there. This allows species to move about freely, adapt to changing conditions locally and nationally, and enhances genetic diversity. In Oxfordshire, Conservation Target Areas (CTAs) are recognised as the most important places for such groundbreaking work, where direct and focused conservation action will have the greatest benefit.

TRENDS IN HABITATS AND SPECIES

This report details the five broad habitat categories that encompass the diversity of habitats found across the county. For each habitat, headline findings are presented, including their current and historic extent and condition, and recent trends in characteristic species. The causes of such changes – both good and bad – are discussed, while relevant case studies reflect the breadth of conservation work that is underway to address worrying trends.

Data compiled by Wild Oxfordshire, local recording groups, projects and experts has been considered alongside information on the extent and condition of Priority Habitats in the county. Species indicators are used as clear, quantitative assessments of change, focusing on those groups (birds and butterflies) for which data has been consistently collected over a long period of time. Where gaps exist in local data, information from the national *State of Nature 2016* report has been referred to.

vital info

OXFORDSHIRE

146 UK legally protected species

260 species recognised as conservation priorities

Agriculture accounts for **74%** of Oxfordshire's land use

7 Special Areas of Conservation (SACs – European)

111 Sites of Special Scientific Interest (SSSIs – national)

362 Local Wildlife Sites (LWSs – local)

3 **Important Plant Areas:**

- The Chilterns
- The Cotswolds
- Oxford Meadows

26% of Oxfordshire is in an Area of Outstanding Natural Beauty (AONB): **CHILTERNS, NORTH WESSEX DOWNS, COTSWOLDS**

environment groups: **222**

Conservation Target Areas (CTAs) covering **20%** of Oxfordshire and **95%** of its SSSI area **36**

146 nationally listed plant species: **2** European Protected; **138** listed as Endangered

3% OF OXON'S 1700 NATIVE AND LONG-ESTABLISHED PLANTS HAVE NOT BEEN FOUND SINCE 2000

> *The importance of the natural environment must be recognised at a local level to encourage effective policymaking and collaborative conservation*

CALL TO ACTION

Not only does this report outline the losses and gains in Oxfordshire's biodiversity, but it is also a serious call to action. We must encourage a greater, collective ambition for increasing our network of wild spaces, reducing devastating pressures on the environment, and halting the continued loss of biodiversity in the county if we are to secure a 'net positive' direction of travel in the future. The principles highlighted in the 2010 *Making Space for Nature* report are fundamental to achieving this and can be summarised as:

> **MORE** wild spaces
>
> **BIGGER** areas for landscape-scale conservation
>
> **BETTER** management of current reserves
>
> **JOINED** and interconnected wildlife areas

HALTING AND REVERSING DECLINES

This report brings the main environmental pressures in Oxfordshire into sharp focus. It looks at what is currently being done to address these and what we urgently need to do to reverse the worrying trends that have emerged. The importance of the natural environment is widely recognised at national and international levels, but we must ensure that it is also recognised at a local level; as such, this report aims to encourage effective policymaking, collaborative and innovative conservation work, and good communication across different sectors.

Oxfordshire has a wealth of expertise and knowledge held by wildlife-focused community groups, conservation organisations and centres of learning. Collectively, these experts are key to supporting and delivering the aims of this report. Yet, we must also engage those outside of this group – from policymakers to business leaders, planners to the general public – if we are to protect and enhance Oxfordshire's important habitats and species now and for future generations to come.

KEY FINDINGS

- Despite widespread historic loss of species-rich semi-natural grasslands, Oxfordshire still has some of the rarest and finest grasslands in the country.
- Our rivers are much cleaner than they were 30 years ago, and targeted action has helped the recovery of local populations of threatened species, such as water vole and otter.
- Long-term declines in farmland and woodland biodiversity continue, with some associated species at serious risk of extinction, such as the turtle dove. However, the area of woodland recorded in the county over the last 30 years has increased.
- There is continued fragmentation and loss of connectivity across the county's landscapes, effecting the future viability of habitats and species.

KEY ACTIONS

- Urgently create larger and more connected areas of high quality habitats.
- Help farmers to find financially viable ways of managing land to provide greater benefits to nature.
- Improve practical advice and support for communities and landowners.
- Ensure better planning for blue and green infrastructure that benefits nature and people.
- Put sustainable development that invests in nature at the heart of local decision-making.
- Increase access to green space and volunteering opportunities to keep people in touch with the health and well-being benefits of nature.
- Develop more collaborations within our strong and diverse environment sector.
- Continue to improve the methodology for monitoring the state of nature across Oxfordshire.

View of the River Thames from Hartslock Nature Reserve (Peter Creed)

SEMI-NATURAL GRASSLANDS


Oxford Meadows (Judy Webb)

OVERVIEW FOR OXFORDSHIRE

Grasslands peppered with colourful wildflowers are an intrinsic part of Oxfordshire's natural and cultural heritage. They include the nationally important floodplain meadows of Pixey and Yarnton Meads, the exceptional chalk grasslands of the Chilterns, Cotswolds and North Wessex Downs, and the scarce dry acid grasslands of Frilford Heath. Traditional hay meadows are a lifeline for pollinating insects, while the wet grasslands of the Upper Thames are a haven for the endangered curlew. Grassland soils also have the highest carbon stock of any UK habitat. This makes their protection and restoration essential for carbon storage.

Since the 1930s, grasslands have declined by the greatest proportion of all the habitats covered in this report, and species-richness has plummeted. Although the vast majority of grasslands in Oxfordshire have been 'improved' for grazers by fertilisers, herbicides and reseeding, there has been an increase in the restoration and sympathetic management of grasslands in non-agricultural situations.

***44%** of Oxfordshire's **GRASSLAND LOCAL WILDLIFE SITES** have **DECLINED IN CONDITION** since they were first selected.*

*The **MARSH FRITILLARY BUTTERFLY** and **WALL BUTTERFLY**, both grassland specialists, are now considered **EXTINCT** in the county.*

*Apart from at the RSPB's Otmoor reserve, **CURLEW** numbers **DECREASED** by **51%**, **LAPWING** by **21%, SNIPE** by **88%** and **REDSHANK** by **50%** in Oxfordshire between 2005 and 2015.*

*Oxfordshire's **CHALK GRASSLANDS** support nationally important populations of rare plants, including the **LAST SURVIVING COLONY** of **DOWNY WOUNDWORT** in the UK.*

***ACID GRASSLAND** at **SHOTOVER** is home to some of the largest and densest aggregations of **SOLITARY BEES** and **WASPS** in Oxfordshire.*

***OXFORD MEADOWS SPECIAL AREA OF CONSERVATION** is one of the best lowland hay meadow areas in the UK. It includes **UNIQUE PLANT COMMUNITIES** that reflect the long history of farming on the site.*

***ASTON ROWANT** National Nature Reserve and **WATLINGTON HILL** are locally important for their colourful suite of **CHALK** and **ACID GRASSLAND FUNGI**.*

CHALK AND LIMESTONE GRASSLAND

Calcareous grasslands are important sites for butterflies, including two of Oxfordshire's rarest butterfly species, the Adonis blue and silver-spotted skipper. Since 1990, grassland butterflies have declined by 30% in the UK. Data collected in the Upper Thames region shows similar reductions in both those butterflies considered to be habitat generalists, as well as in those that are grassland specialists. Such losses not only reveal the shocking deterioration in the extent and quality of our semi-natural grasslands, but also how climate change is affecting our wildlife. For instance, the once-widespread wall butterfly has not been recorded in the county since 2009 – it is thought to have been badly hit by wet summer weather caused by our changing climate.

Oxfordshire's chalk and limestone grasslands are also nationally important for their plants, supporting the bulk of the UK's meadow clary, Chiltern and early gentian, and downy woundwort populations.

WET GRASSLAND

Wet grassland is periodically flooded pasture or meadow and is an important home for breeding waders, such as lapwing, curlew, redshank and snipe, which rely on damp soils, pools and muddy hollows for feeding and rearing their young. The Upper Thames is a breeding stronghold of the curlew; however, since 2005, its population in this area has declined by 51% as a result of habitat loss and predation. Despite this, such wading birds are thriving at the RSPB's Otmoor reserve thanks to conservation work on site.

Oxfordshire's wet grasslands also support the vast majority of the UK's population of creeping marshwort and is an important habitat for the rare and beautiful fen violet.

While noting past losses, the total area of grassland of nature conservation value in Oxfordshire appears to have remained relatively stable since 1998. Indeed, wet and flower-rich grasslands are increasing as a result of targeted management at sites such as the RSPB's Otmoor reserve and BBOWT's Chimney Meadows nature reserve.

ACID GRASSLAND AND HEATHLAND

The geology of the county means that acid grassland and heathlands, along with the plants and animals they support, have always been relatively scarce. Oxfordshire's largest and best area of acid grassland is at Frilford Heath, which supports a number of rare beetle species. Heathland is under serious threat across the county, affecting species that rely on it, such as the adder. Unfortunately, the adder is all but extinct in the county, the last confirmed record being from the Chilterns in 2015.

ROADSIDE VERGES

Roadside verges are often the last fragments of dry, meadow-like grassland in landscapes dominated by arable farming. Oxfordshire has 35 Road Verge Nature Reserves, which represent the most species-rich parts of a green network that criss-crosses the county. They provide a place for common flowers, such as ox-eye daisy, bird's-foot-trefoil and field scabious, to grow alongside some of Oxfordshire's rarer plants, like Cotswold penny-cress, corn parsley, hare's foot and lizard orchid. In turn, the riot of colour and scents attracts an array of pollinating insects and provides an attractive sight for people, too.

CAUSES OF CHANGE

The dramatic loss of our semi-natural grasslands is mainly due to agricultural intensification from the mid-20th century onwards, further exacerbated by mineral extraction, urban and industrial development, hydrological changes to floodplains, and a lack of appropriate management. Agri-environment schemes have funded the creation of new grasslands that provide some additional habitat, while conservation efforts have delivered restoration successes.

Despite this progress, the fragmentation of our remaining grasslands is isolating habitats and species. Combined with other risk factors, such as changes in temperature and rainfall resulting from climate change, the risk that vulnerable plants and animals will become extinct, both locally and nationally, is increasing.

CASE STUDY

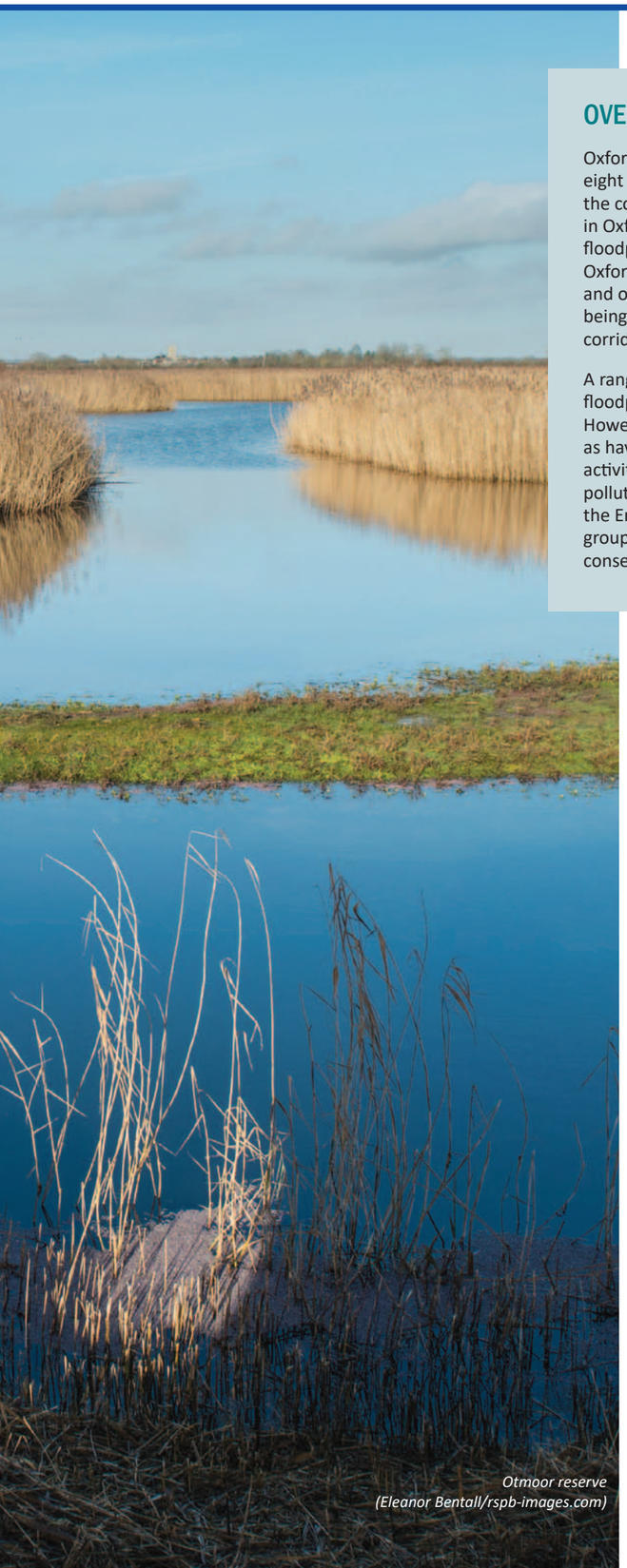
MEADOW CREATION AT BARTON FIELDS

Barton Fields nature reserve is a grassland and marsh area next to the Thames that is owned by the Vale of White Horse District Council and managed by Abingdon Naturalists Society's Green Team. Part of the Radley Gravel Pits Local Wildlife Site, it has not been in agricultural use for decades. In 2008, Lottery funding enabled the Green Team to create a wildflower meadow in the flood-prone area of the site. Half a hectare was harrowed and sown with yellow rattle and 21 herb species. The meadow is now mown in March and August and the hay removed.

Changes in plants have been monitored over a five-year period; to date, 60 herb and 17 grass species have been recorded on site. Counts as part of the UK Butterfly Monitoring Scheme show that butterfly numbers are about three times higher in the newly created meadow areas than in the un-enhanced sections. For more information: www.abnats.org.uk


Making hay at Barton Fields (David Guyencourt)

FRESHWATER AND WETLANDS



Otmoor reserve
(Eleanor Bentall/rspb-images.com)

OVERVIEW FOR OXFORDSHIRE

Oxfordshire's landscape is defined by its river network, including eight major rivers and many smaller tributaries that flow through the county and into the Thames. Since the earliest settlers, people in Oxfordshire have used and enjoyed this network and its rich floodplains, and continue to do so today. As well as its natural rivers, Oxfordshire has two canals – the Oxford Canal, which is navigable and open, and the Wiltshire and Berkshire Canal, which is currently being restored. Both rivers and canals provide valuable wildlife corridors, linking wild spaces across the landscape.

A range of important wetlands can be found in Oxfordshire, such as floodplain meadows, fens, oxbow lakes, ponds and wet woodland. However, of the 101 waterbodies in the county, only 5% are classed as having 'good status'. As a result, there has been an increase in activity to protect our freshwaters and wetlands from threats like pollution, and to manage habitats sensitively. Often working together, the Environment Agency, conservation organisations, anglers, action groups and the wider community are delivering hands-on river conservation and raising public and political awareness.

*Between 1900 and 1998, **WATER VOLES** suffered a **95% REDUCTION** in their range in the UK. Targeted **CONSERVATION** action in **OXFORDSHIRE** has resulted in a **THREE-FOLD INCREASE** in their range.*

*The banning of toxic chemicals, improvements in water quality and legal protection have all helped to bring **OTTERS BACK** to the **THAMES CATCHMENT**, including in urban rivers.*

*After an absence of about 200 years, **BITTERNS** have **RETURNED** to breed in the new reedbed at RSPB's **OTMOOR** reserve*

*Oxfordshire hosts a complex of **CALCAREOUS SPECIES-RICH FENS** that forms the **LARGEST REMAINING GROUP** of such habitats outside East Anglia and North Wales.*

*Oxfordshire holds the **MAJOR UK POPULATION** of the rare **FEN VIOLET**, which is found at only three sites in the country.*

***15 INVASIVE NON-NATIVE SPECIES** of **MOST CONCERN** to the Environment Agency are found in **OXFORDSHIRE**, including the demon shrimp.*

***REEDBEDS** were once a common habitat in the low-lying areas of Oxfordshire, but today, **NO LARGE REMNANTS** remain.*

RIVERS AND FLOWING WATER

Overall, the UK's rivers are much cleaner than they were 30 years ago as a result of increased pollution control, water quality improvements and restoration works. As a result, Oxfordshire's rivers support a wide range of Priority Species, including water vole, depressed river mussel and white-clawed crayfish. The county's fish community is mainly characterised by lowland river species like roach, chub and perch. The two main chalk streams, Letcombe Brook and Ewelme Brook, support important species, such as brown trout, brook lamprey and bullhead.

Despite improvements, threats to plants and animals still continue; one example is the impact of invasive non-native species. Thirty-eight invasive non-native species are found in Oxfordshire, including the American signal crayfish. Since 2000, this species has spread to the majority of watercourses in the county, severely impacting on the native white-clawed crayfish and restricting its range.

PONDS

Oxfordshire has an outstanding pond resource that supports some of our most vulnerable aquatic plants and animals, including amphibians like the common frog, common toad, smooth newt, palmate newt, great crested newt and rare natterjack toad. Little Wittenham is one of three flagship pond sites in Oxfordshire and is protected at European level due to the resident population of great crested newt. Other high quality ponds include the fen ponds at Cothill, the woodland ponds at Wytham Woods, and the ponds at Otmoor. Numerous village ponds occur throughout Oxfordshire; although often degraded by pollution, they provide important habitat for species less sensitive to water quality, such as grass snakes and bats.

FENS AND REEDBEDS

Alkaline fen vegetation has declined dramatically over the past century due to land drainage and agricultural intensification. Cothill Fen is the largest surviving example of alkaline fen in central England, and hosts a high number of rare species, such as the keeled skimmer, southern and small red damselflies, Desmoulin's whorl snail, and the delicate and rare fen violet.

Reedbeds were once common in the low-lying areas of Oxfordshire, but today, the RSPB's Otmoor reserve has the only sizeable remnant in the county. Reedbeds are important habitats for birds, such as the enigmatic bearded tit, rare bittern and threatened marsh harrier – extinct in the UK since the end of the 19th century, it has managed to recolonise due to conservation efforts.

CAUSES OF CHANGE

Many rivers have been heavily modified through historic dredging, canalisation and impoundment, reducing connectivity with their natural floodplains and creating barriers to the movement of species. They suffer from nutrient pollution and, in some locations, low flows due to abstraction. Although much has been done to address many of these impacts over the last two decades, some of these pressures will be exacerbated by climate change. Lack of good, appropriate management has also led to a number of Oxfordshire's calcareous fens, and other wetland habitats, losing value for the more specialist wetland plants and animals they are home to.

There have been some positive changes in our freshwater resource in recent years, such as increases in gravel pit lakes and wetland creation projects presenting new opportunities for wetland species, and water quality improvements in the county. Landowners, farmers, businesses, conservation organisations and government bodies are coming together in Catchment Partnerships to improve the ecological quality and flow, and biodiversity of our freshwater systems.

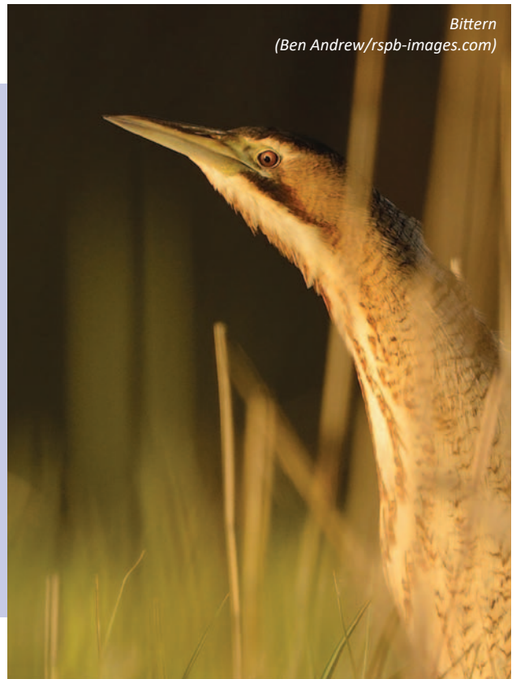
Targeted conservation action has demonstrated large benefits for some of our iconic wetland species. BBOWT's Water Vole Recovery Project has resulted in a continued increase in the known areas of local water vole activity in the county, despite extreme national declines. Work at the RSPB's Otmoor reserve to increase reedbed habitat has also brought common cranes and bitterns back to the area.

CASE STUDY

GILL MILL QUARRY EXTENSION

Mineral sites offer some of the best opportunities to rebuild biodiversity on a large scale. A major new extension by Smiths Bletchington to Gill Mill Quarry, near Witney, will create one of the largest reedbeds in southern England. Water vole, otter and bittern are among the many species that will benefit. The RSPB is providing habitat design and management expertise to help ensure the restoration provides the best conditions for reedbed wildlife to flourish. There will be extensive public access and a number of 'eco-lodges' that will benefit the local economy. The scheme will also make a landscape-scale contribution to the wider Windrush Valley by helping flood management downstream.

In recognition of their vision, Smiths Bletchington won the 'Planned' category at the 2015 Mineral Products Association Biodiversity Awards. For more information: www.mineralproducts.org/documents/Case_Study_1_Gill_Mill.pdf



Bittern
(Ben Andrew/rspb-images.com)

WOODLANDS AND TREES

Woodland with ramsons (Elizabeth Lettman)

OVERVIEW FOR OXFORDSHIRE

From ancient woodlands and Royal Hunting Forests to modern-day plantations, all of Oxfordshire's woodlands have been shaped by human activity to some extent. Woodland cover in the county is approximately 1% less than the national average at just over 23,000 ha, but nearly 9,000 ha of that is ancient woodland. Woodland distribution varies, with the Chilterns AONB the most well-wooded area, its stunning beechwoods being one of its defining features. Yet, only 53% of woodlands in Oxfordshire are actively managed.

Ancient semi-natural woodland is generally the most biodiverse. These woodlands have had continuous cover since 1600 AD and often contain plants rarely found elsewhere, such as herb-Paris. Plantations on Ancient Woodland Sites (PAWS) have also kept their tree cover, but native trees have largely been replaced by felling and replanting. Wet woodland is rare in the county, whereas wood-pasture and parklands are widespread, reflecting a long tradition of land ownership by estates. Orchards are also common, showing just how important they once were to rural communities.

***WILLOW TITS**, which like scrub and wet woodland, are the **MOST RAPIDLY DECLINING WOODLAND BIRD** species locally.*

*Oxfordshire has **LOST 80%** of its **ORCHARDS** since 1911.*

*Despite dramatic national declines, colonies of the **BLACK HAIRSTREAK BUTTERFLY** appear **STABLE** in Oxfordshire.*

***NIGHTINGALES HAVE DISAPPEARED** from Oxfordshire's woodlands; in 2016, only 4 birds and no breeding pairs were reported.*

*Many of Oxfordshire's **WOODLANDS** are small – **38%** are **LESS THAN 10 HA** in size, indicating a scattered and **FRAGMENTED** resource.*

*Approximately **73%** of Oxfordshire's woodland is **BROADLEAVED**, or predominately broadleaved.*

***BLENHEIM PALACE**, Woodstock, hosts one of the greatest collections of **ANCIENT OAK TREES** in Europe, including one that is 1,000 years old.*

***WYTHAM WOODS**, owned by the University of Oxford, is one of the most **WELL-RESEARCHED** woodlands in the world.*

***TREES REMOVE 400 TONNES** of **POLLUTANTS** from the county's **AIR** per year, avoiding **£6.5 MILLION** in associated **HEALTHCARE** costs.*

LOWLAND BEECH AND YEW WOODLAND

The Chilterns' beechwoods are a stronghold for chalk-loving beech and yew woodland in Oxfordshire. The canopy includes a mixture of beech, ash, sycamore, yew and whitebeam. Some of the rarer plants associated with this habitat in the county include hard-fern, white helleborine and the Critically Endangered ghost orchid. The mosaic of habitats at Hartslock reserve includes chalk grassland, protected by mixed yew woodland, which supports the rare monkey orchid – found at only two other sites in the UK. Dead wood within lowland beech and yew woodland is a key habitat for invertebrates, such as hoverflies, stag beetles and moths.

LOWLAND MIXED DECIDUOUS WOODLAND

This broad habitat can be found across Oxfordshire, on a range of soil types. It is important for birds like lesser spotted woodpecker, marsh tit and hawfinch – all species on the UK Red List for Birds. The willow tit is the most rapidly declining woodland bird, possibly due to a reduction in traditional management techniques, such as coppicing. This regularly opens up the canopy, benefiting a range of woodland flowers, such as our native bluebells, which are under threat globally. Studies from Wytham Woods indicate an overall decline in forest floor plant species. Additionally, woodland butterflies are decreasing; in Oxfordshire, the last record of the wood white was in 2008.

WET WOODLAND

Wet woodland is particularly rare in Oxfordshire and occurs on poorly drained or seasonally wet soils, usually with alder, birch and willow. Oxfordshire has two main types of wet woodland – floodplain woodland and bog woodland – which can also host rare fen habitats, such as those at Cothill Fen. All of these are important for rare species of invertebrates, such as soldier flies and the scarlet tiger moth.

WOOD-PASTURE AND PARKLAND

Wood-pasture and parkland is the product of historic land management and is derived from medieval forests, wooded commons, formal parklands and unmanaged wood-pastures. It typically consists of widely spaced, large trees, interspersed with grazed grassland or heathland. Locally, there is a wealth of nationally and internationally important sites, including Blenheim Great Park, Watlington Park, Nettlebed Commons and Ditchley Park. The county's wood-pasture and parkland, and their associated veteran trees, provide habitat for scarce fungi, such as the royal bolete, and bats, such as the noctule.

TRADITIONAL ORCHARDS

The trees in traditional orchards are long-lived, planted at low densities and cultivated using low-intensity methods. This combination offers an invaluable refuge for wildlife – mammals and birds feast on fallen fruit, and rare fungi are associated with the ancient fruit trees. Veteran trees in traditional orchards are home to a range of invertebrates that rely on decaying wood, such as the rare, metallic green, noble chafer. Restricted to orchards, the orchard tooth fungus is found at only 20 sites in England, including in Oxfordshire.

CAUSES OF CHANGE

Neglect is a major threat to Oxfordshire's woodlands, even though certain species rely on areas of older woodland. Sustainable management is crucial to maintain biodiversity, productivity and ecosystem function. Restoring PAWS to native woodland also offers an opportunity to conserve and enhance remnants of ancient woodland.

Other threats include climate change, pests and diseases. The mature beech woodlands of the Chilterns are expected to suffer from the predicted drier, warmer summers. Some woodland specialists, however, are responding positively to increases in temperatures; the brown argus butterfly, for example, has been able to expand its range.

To date, only one of four major woodland pests and diseases has been found in Oxfordshire: Chalara (ash dieback). Additional pressure comes from excessive deer browsing, which contributes to changes in woodland ground flora, in turn, affecting invertebrates, mammals and birds.

CASE STUDY

SUSTAINABLE FORESTRY IN OXFORDSHIRE

During 2015, the Oxfordshire Local Economic Partnership (OxLEP) asked environmental organisations from across the county to contribute to Oxfordshire's Strategic Environmental and Economic Investment Plan. It was clear from the submitted proposals that working together was the best way to progress and an accord was formed to foster partnership working across sectors.

In 2016, the *In a Nutshell* strategy was drafted by more than 12 organisations to make the case for investing in sustainable forestry in Oxfordshire. It demonstrates that by bringing 80% of woodlands into management and supporting forest-based businesses, an estimated £37 million could be added to the county's economy each year. Coordinated action will ensure that woodland ecosystem services, such as recreation, flood alleviation and carbon storage, are protected. For more information: www.wildoxfordshire.org.uk/biodiversity/habitats-and-species

Making charcoal (Andy Hay/rspb-images.com)

AGRICULTURAL LAND

Conservation headland (Mike Dodds)

OVERVIEW FOR OXFORDSHIRE

Farmland accounts for 74% of Oxfordshire's land cover, of which 56% is under cereals farming and 30% under livestock grazing. Farm types vary: drystone walls define the arable land of the Cotswolds; large fields of mixed arable and pasture typify the Midvale Ridge; and hedged livestock farms dominate the Upper Thames Clay Vales.

Farmland can support a wide range of Priority Habitats and species. Hedgerows, with their associated banks and ditches, are home to an amazing array of flowers, birds, butterflies, moths and mammals. Farmland ponds attract amphibians, reptiles and dragonflies, while arable weeds like cornflower and common poppy can grow at field edges. However, the intensification of farming has caused a massive decline in farmland biodiversity, particularly in farmland birds. Thus, the biodiversity value of farmland depends on good stewardship. Even less species-rich, agriculturally improved grasslands can be managed in a way that supports wildlife. Indeed, managing farmland sensitively helps to combat habitat fragmentation, provides vital links between protected sites and creates a more resilient landscape.

*Between the 1980s and 2000s, there was a **27% REDUCTION** in **HEDGEROW LENGTH** within a 1,200 km² study area centred around Banbury.*

***TURTLE DOVE** numbers have **DECREASED** by **93%** since 1994 – the largest decline of any farmland bird.*

***47 SPECIES** of **CONSERVATION CONCERN** use **HEDGEROWS** as their main habitat.*

*Oxfordshire's farmland is home to **11 TYPES** of **PRIORITY HABITAT.** Between 2006 and 2014, more than **4,200 HA** of **PRIORITY HABITAT** were managed in the county under **AGRI-ENVIRONMENT SCHEMES**.*

*Research suggests that up to **50%** of recorded **PONDS** have **DISAPPEARED** from farmland in the **UPPER THAMES REGION** over the last century.*

*Between 2005 and 2015, farmers managed **1,600 HA** in Oxfordshire under **AGRI-ENVIRONMENT SCHEME OPTIONS** designed to help **SUPPORT DECLINING BIRDS**, such as providing winter food, attracting insects and creating nesting places.*

***WILDCRU** has more than **25 YEARS** of **COLLABORATIVE WORKING WITH FARMERS** in the Upper Thames region looking at practical solutions to conservation problems.*

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ARABLE FIELD MARGINS

The variety of habitats and connectivity provided by arable field margins makes them key areas for conservation in farmed landscapes. They can offer food and shelter to birds and mammals, while buffering hedgerows, ponds and ditches from farming operations. They can support arable plants, which are the fastest-declining group of plants in the UK; in Oxfordshire, threatened arable species include broad-leaved cudweed, pheasant's-eye and corn cleavers. They are also incredibly important areas for pollinating insects, such as honeybees, solitary bees, bumblebees and hoverflies – all of which have decreased since the 1950s. England's farmland butterflies have suffered severe declines since 1990. For instance, in the Upper Thames region, populations of the small skipper and Essex skipper have dropped by 14% over the last 20 years.

HEDGEROWS AND SCRUB

Many of the county's hedgerows are truly ancient and have associated banks and ditches of immense archaeological importance. In terms of biodiversity, they are vital for farmland birds, butterflies, moths, bats and dormice. Along with mature hedgerow trees, they can form networks across the landscape, linking up fragmented woodland patches. Farmland scrub, in the form of scattered trees, shrubs and thickets, provides food and shelter for many birds and invertebrates. It also buffers other valuable habitats from farming activities, retaining soil and reducing nutrient run-off.

Despite these benefits, hedgerows and scrub have been lost or left in poor condition due to neglect and bad management. Many farmland birds, such as grey partridge, corn bunting and turtle dove, have suffered as a result.

CROPPED AREAS

If managed sympathetically, cropped areas can provide useful habitat for arable plants, birds and mammals. Conservation headlands, which have reduced inputs from insecticides, herbicides and fertilisers, benefit birds like the grey partridge, a species on the UK Red List for Birds that has undergone serious declines across Oxfordshire. The brown hare, a mammal long associated with farmland, favours a mosaic of arable fields, grassland and hedgerows, and has suffered a huge 80% decline in numbers in the last 100 years.

PONDS AND DITCHES

Farmland often includes a range of non-farmed features, such as ponds and ditches, which have significant benefits for wildlife. Good water quality in these features attracts amphibians, reptiles, birds and dragonflies. Seasonally flooded and permanent ditches provide habitat for a range of rare plants, such as the true fox-sedge (found in the Ray Valley), as well as acting as wildlife corridors. Research shows that 50% of recorded ponds have disappeared from farmland in the Upper Thames region in the last century.

CAUSES OF CHANGE

Since the Second World War, farming policies and practices have rapidly changed and intensified, causing dramatic declines in traditional farmland habitats and species. Changing management methods include decreases in mixed farming, moving from spring to autumn sowing of arable crops, switching from hay to silage production, increases in pesticide and fertiliser use, and removing non-cropped features like hedgerows. Additionally, agricultural pollutants now contribute 50-60% of nitrates, 20-30% of phosphates and 75% of sediment to England's waterways.

Agriculture is very vulnerable to extreme weather events, so climate change will impact heavily on farmland nature. Changes in the frequency of intense rainfall events, particularly following dry weather, could contribute to increased soil loss and nutrient runoff, in turn, affecting water quality.

The Campaign for the Farmed Environment, Farming Futures, Agricology, the Linking Environment and Farming (LEAF) programme and local organisations, such as Cotswold's Seeds, use tools and case studies to show how farms can address issues including sustainable management and conservation.

CASE STUDY

HELPING FARMLAND BIRDS IN WINTER

In West Oxfordshire, a small, family run, mixed farm has been taking part in agri-environment schemes for many years to help farmland wildlife. These schemes include a range of sensitive management options, such as providing birdseed plots and winter stubbles, planting species-rich margins and hedges, creating ponds with reedbeds, and reverting arable crops to traditional Cotswolds meadows.

As a result, there have been measurable increases in plants and insects, such as cowslips and blue butterflies, on site. But the most dramatic effect has been on the winter numbers of farmland birds, including yellowhammers, linnets, reed buntings, tree sparrows, skylarks and bramblings. These increases are directly due to the introduction of winter feeding and year-round millet supplies in hanging feeders. For more information: www.wychwoodproject.org/cms/content/bird-aid

Linnet (David Kjaer)

SETTLEMENTS AND BUILDINGS

Urban fox
(Kyle Moore/Shutterstock.com)

OVERVIEW FOR OXFORDSHIRE

Despite being a largely rural county, more than 66% of Oxfordshire's population lives in an urban setting. Urban green spaces, such as domestic gardens, playing fields, allotments, parks, woodlands, churchyards and cemeteries, not only benefit people, but provide important habitats for wildlife. In Oxfordshire, these spaces range from the centuries old Oxford Meadows to newly created sites. Urban green spaces can act as 'stepping stones' for plants and animals, linking to rural areas and larger ecosystems. This connectivity through the landscape is vital for ensuring the resilience and sustainability of sites and the populations they support, particularly in light of climate change.

Access to nature promotes good physical and mental health, improves well-being, and encourages people to take exercise. Indeed, these benefits increase as the number and diversity of plant and animal species rises. In Oxfordshire, NHS Forest creates green spaces on NHS sites and promotes walking trails to get people active. Initiatives like Green Gyms and Logs for Labour encourage volunteers to take on conservation tasks, while improving their health and well-being.

*Between 1990 and 2007, there was an **11% INCREASE** in **DEVELOPED LAND COVER** in Oxfordshire.*

*Numbers of **SWIFTS**, a bird dependant on accessible nest-sites in urban areas, **DECLINED** by **47%** in the UK between 1994 and 2014.*

*Between 1995 and 2014, **URBAN BUTTERFLY ABUNDANCE FELL** by **69%** compared to a 45% decline in rural areas.*

***URBAN HEDGEHOG POPULATIONS** have **INCREASED** by a third, but rural populations have more than halved.*

*Urban and rural **GARDENS HOLD 86%** of all **PONDS** and nearly a **QUARTER** of the **TOTAL NUMBER OF TREES** outside woodland.*

*In Oxford city, **NATURE RESERVES** like Iffley Meadows have **INTERNATIONALLY IMPORTANT POPULATIONS** of threatened **PLANT SPECIES**, such as snake's-head fritillary.*

***1,000 SPECIES OF BEETLE** – nearly a quarter of all the known beetle species in Britain – have been recorded at **SHOTOVER COUNTRY PARK**.*

*The **OTTER** is making a **COMEBACK** in urban areas, and is regularly spotted in **OXFORD CITY**.*

PARKS AND NATURE RESERVES

Wood-pasture and parkland is usually associated with large country estates, but there are exceptions to this in Oxfordshire, such as Shotover Country Park near the Oxford Eastern bypass. This area has a mixture of Priority Habitats and has been well studied by the Shotover Wildlife Group. Many other parks in, or next to, settlements in Oxfordshire benefit wildlife and people, such as Spiceball Country Park in Banbury, which is being restored by BBOWT, and the planned new country park north of Banbury.

Some of Oxford city's nature reserves are home to nationally and internationally important populations of rare species. The Lye Valley, for instance, contains tufa-forming (calcareous) valley-head alkaline spring-fen, which is the now the rarest natural habitat in England. This fen supports 22 plant species that are rare in Oxfordshire, including grass-of-Parnassus, marsh valerian, marsh helleborine and marsh pennywort.

GARDENS

Typically, one quarter of any city area (and half of its green space) is private gardens. The county's gardens are a haven for a wide range of plants and animals. They are of particular importance for our declining hedgehog population and radio-tracking of red foxes in Wytham showed that gardens provide their richest foraging habitat.

WILDLIFE CORRIDORS

The European hedgehog is increasingly reliant on urban and suburban gardens, but, like many other species, needs safe wildlife corridors so it can cover its 10-20 ha home range. Since 2000, urban populations of hedgehogs have increased by up to a third; but, in the same period, rural populations of hedgehogs have halved. Nationally, we have lost around 30% of our hedgehog population since 2002.

In contrast, vascular plants rarely disperse along wildlife corridors as many of them have seed that needs moving around by animals like grazers. As a result, many plant populations in Oxfordshire's settlements are now 'locked in' to isolated sites, making them vulnerable to extinction.

BUILT ENVIRONMENT

Brownfield sites and elements of the built environment can provide important shelter and food for wildlife. Urban specialists, such as the house sparrow and swift, which depend on accessible cavities in buildings for nesting sites, have declined dramatically. Nationally, numbers of house sparrows have plummeted by more than two-thirds since the 1970s, and swift numbers have halved. Swifts spend most of their life on the wing, but the swift colony at the Oxford University Museum of Natural History has offered an ideal opportunity for long-term research and has been the subject of the Oxford Swift Research Project since 1947.

CAUSES OF CHANGE

The need for more housing has resulted in a decrease in the average size of gardens and green cover. Modern trends for impermeable surfaces like paving are also causing high volumes of water to enter watercourses during storm events, which causes erosion, bank collapse and flash-flooding downstream. Watercourses and waterbodies are being polluted via car products, such as heavy metals, and from sewer leakages, which result in either direct pollution or high concentrations of nitrates in groundwater.

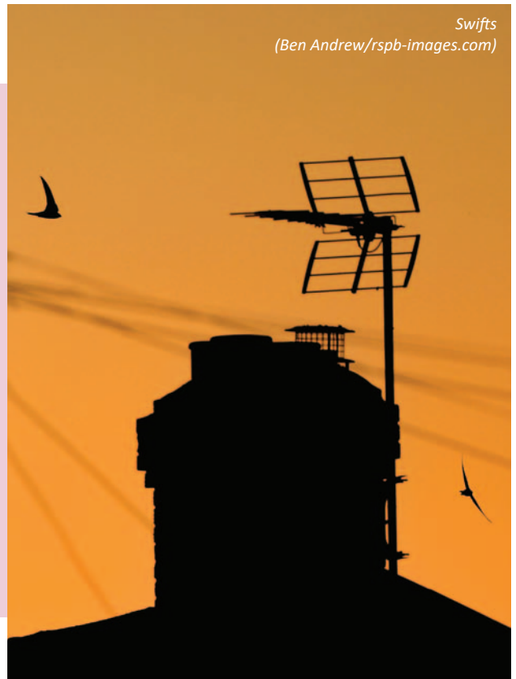
Recent mapping work by CPRE clearly shows light pollution across nearly all of Oxfordshire. Greater light levels severely affect breeding birds, night-flying insects and foraging bats. Additional stresses for wildlife in settlements include noise pollution, human disturbance, predation by domestic pets (in particular, cats who are major predators of wildlife) and poor pest control. Intensive maintenance of buildings, gardens and parks also negatively affects species that rely on unkempt cracks, crevices, long grass and deadwood for nesting, breeding and foraging. The urban heat island effect – where a built-up area is warmer than a rural area – is caused by artificial land surfaces, combined with concentrated energy use. It impacts on wildlife and people – heat-related stress accounting for 1,100 premature deaths per year in the UK.

CASE STUDY

CHERWELL SWIFTS PROJECT

Swifts have dramatically declined in number, partly due to the loss of nesting sites caused by building restorations and alterations. In response, the Kirtlington Wildlife and Conservation Society initiated the Cherwell Swifts Project in 2008, which aims to protect nesting sites, encourage the provision of new nesting places in buildings, and increase awareness of the swift's decline.

Since 2008, more than 300 buildings have been identified as swift nesting sites in the District. Cherwell District Council has made the inclusion of swift bricks and boxes a condition of several new developments and many of its own building projects. It has also asked owners of buildings with nesting swifts to be swift-friendly when undertaking work. Project volunteers have put up nest boxes for homeowners and a swift tower at the Banbury Ornithological Society's reserve in Bicester. For more information: www.cherwell.gov.uk/naturalenvironment



Swifts
(Ben Andrew/rspb-images.com)

IMPROVING NATURE IN OXON

MORE, BIGGER, BETTER, JOINED

There are many individuals, organisations and partnerships working in Oxfordshire to protect and enhance our special places for nature. We need to harness this momentum, capitalise on these successes and find more ways to rebuild biodiversity – especially for those species and habitats under greatest threat. Our ambition should be to achieve a clear net gain in nature.

To achieve real change, we need to invest in our natural assets and become more dynamic and ambitious in what we seek to achieve. The 2010 *Making Space for Nature* report emphasises the need to enhance the resilience and coherence of our ecological network within the landscape and take into account wider environmental pressures. This can be summarised in four words: **MORE**, **BIGGER**, **BETTER** and **JOINED**.

There are five key approaches to creating a more ecological, bigger, better and joined-up network:

1) Improve the quality of current sites through better habitat management.
2) Increase the size of current sites with high quality habitat.
3) Enhance connections between, or join-up, sites either through wildlife corridors, or the creation of 'stepping stones'.
4) Create new wildlife sites.
5) Reduce the pressures on wildlife by improving the wider environment, including by buffering wildlife sites.

TAKING A STRATEGIC APPROACH

In Oxfordshire, there are several strategic approaches that can deliver coherent, landscape-scale improvements for nature and also benefit people:

- **Oxfordshire's Conservation Target Areas (CTAS)** – these are concentrations of Priority Habitats and Priority Species that include surrounding land which could buffer and link these areas, as well as provide opportunities to create new sites should funding become available.
- **BBOWT's Living Landscapes and RSPB's Futurescapes initiatives** – these are both prime examples of landscape-scale projects run by conservation organisations that aim to link up habitats for the benefit of wildlife and people across a wider area.
- **River Catchment Partnerships** – these aim to restore the ecological quality of rivers and reconnect them to their floodplains. Combined with enhanced land management in catchments, particularly along river corridors, they can benefit biodiversity and water quality, as well as regulating flows in times of flood and drought.
- **Areas of Outstanding Natural Beauty (AONBs)** – the Cotswolds, Chilterns and North Wessex Downs provide a framework for wider landscape and habitat improvement within their boundaries.

In developing this report, Wild Oxfordshire invited contributors to a workshop and asked them to suggest key actions to improve nature in Oxfordshire. More than 40 individuals, representing 30 organisations, attended. The key actions they proposed (page 5), and the contributions they and other organisations made to this report, reflect deep concerns in the county for the state of our natural environment.

The key actions recognise that, in order to improve nature in Oxfordshire, action is needed across all sectors. Planners and developers should ensure new construction projects achieve a net gain for wildlife by creating accessible natural green spaces to maintain connectivity between, and enhance, existing habitats. Farmers and landowners should be helped to manage their land in a way that is sensitive to local wildlife and the wider environment. Businesses can manage land and processes sensitively, and support new projects. While policy- and decision-makers should include wildlife-friendly and sustainable measures in policies and plans, and encourage action that supports nature and people.

The case studies in this report demonstrate ways in which people have made, or plan to make, a difference in the county. They are intended as inspiration and guidance for local communities and decision-makers who want to take action for nature in their local area. Some of the case studies are more strategic in their level of implementation, requiring cooperation across different sectors in order to deliver them.

River restoration (James Aylward)

> **Partnership is at the heart of what has already been achieved in Oxfordshire, and what could be to come ... when conservation management is joined up across sectors and landscapes, the outcomes can be dramatic.**
>
> *David Macdonald, Foreword*

Emerald damselfly (Stephen Burch/stephenburch.com)

the big question

HOW MIGHT WE MAKE MORE SPACE FOR NATURE THROUGH THE MORE, BIGGER, BETTER AND JOINED VISION?

MORE

To offset past losses and deliver real gains in the future, it is imperative that we capitalise on all opportunities for creating new sites for nature. New natural habitats can be created within housing and commercial developments, alongside major infrastructure or flood-defence projects, and through changes in farming and land management practices. Restored quarries and flooded gravel pits provide significant opportunities for enhancing wildlife.

Support for such conservation outcomes currently comes from grant-making bodies and funds, such as Defra, the Heritage Lottery Fund and the Landfill Communities Fund. In future, payments for ecosystem services (PES) schemes could support the creation of new habitats that provide specific public benefits, including natural flood management and carbon storage.

BIGGER

Bigger sites, on average, contain more species with larger populations. They also have proportionately less edge and often have greater landscape diversity with differing topography, geology and hydrology. Large sites present opportunities to restore and promote more natural geological, ecological and hydrological processes.

Strategic partnerships are needed to lead major habitat restoration and creation projects. Ambitious strategies are currently being put in place across the county, including the Strategic Environmental and Economic Investment Plan, led by OxLEP, and *In a Nutshell*, a woodland strategy for Oxfordshire, proposed by Sylva Foundation. We need to challenge ourselves to do more on a wider scale and have bigger ambitions for what can be achieved for wildlife in Oxfordshire.

BETTER

Lack of appropriate management, habitat fragmentation and human activities have all impacted upon the quality of Oxfordshire's natural habitats. It is vital that our existing sites for nature are managed effectively to ensure they are in the best possible condition, enabling them to support thriving populations of Priority Species.

There are some outstanding examples of good practice in habitat management from across Oxfordshire that could be followed elsewhere; these are exemplified in case studies throughout this report, which range in scale from multi-hectare wetland creation to enhancements for small, local green spaces. These studies, and the people and organisations responsible for them, are invaluable sources of knowledge and skills that can be used to inform better future delivery.

JOINED

Small patches of habitat, no matter how well they are managed, are inevitably more vulnerable to external impacts than large sites. They also provide fewer habitat niches for plants and animals. Nature's chances of survival is improved by joining existing habitat patches to create larger, more resilient sites. There are many ways this can be achieved, for example, by establishing wildlife-friendly field margins alongside sympathetically managed hedgerows, or by creating new woodlands linking existing patches of precious ancient woodland.

However it is achieved, joining-up patches of habitat to create wildlife corridors or 'stepping stones', through which species can move around, is vitally important for increasing the resilience of both species and ecosystems to environmental pressures, such as climate change and pollution.

CHALLENGES AND SUCCESSES

OVERVIEW

While the overall picture is one of continued pressure on Oxfordshire's wildlife, there are success stories that show how, with the right interventions, declines in our natural habitats and the diversity of our species can be reversed. Great examples include the otter and red kite, which were both rare 30 years ago, but are now widespread across the county thanks to huge conservation efforts.

Society is becoming increasingly aware of the benefits nature brings, including providing the resources for life, underpinning the services that regulate these resources, and enhancing our quality of life. It is imperative that we continue to show people from all walks of life the benefits nature can bring in order to push the preservation of our natural environment up the political agenda.

CLEAR TRENDS IN OXFORDSHIRE HIGHLIGHTED BY THIS REVIEW

*Species-rich **SEMI-NATURAL GRASSLANDS** suffered **HUGE LOSSES** in the mid-20th century.*

***WATER QUALITY** and **RIVER HABITAT** have been **SEVERELY IMPACTED** by historic modifications to watercourses and pressures from human activity.*

*The **VALUE** of our **SPECIAL PLACES FOR NATURE** has **REDUCED** due to shortfalls in management across a range of habitats (with some notable exceptions).*

***ACCESSIBLE GREEN SPACES** and **HABITATS** have **DECREASED** due to increases in the extent of urban areas and housing density.*

***FARMLAND BIODIVERSITY**, including birds and plants, has suffered **MAJOR DECLINES**.*

***WOODLAND BIODIVERSITY**, including birds and butterflies, has suffered **MAJOR DECLINES**.*

*The amount of **WOODLAND INCREASED** in the latter part of the 20th century.*

*Some **WETLAND HABITATS** and **SPECIES**, such as otter and snipe, have **BEGUN TO RECOVER** when properly protected and managed, though many are still vulnerable.*

THE CHALLENGES FACING OUR WILDLIFE

Oxfordshire's natural environment faces many new challenges, notably a fast-developing economy, increasing housing, and the upgrading and creation of infrastructure. All of these are acting against the backdrop of long-term changes in farming practices and, possibly more dramatically, changes in our global climate that will have international, national and local repercussions. Together, these factors make our already fragmented and degraded habitats and species even more vulnerable to major losses.

To enhance the management of our landscapes and alert us to potential problems, we need to improve monitoring at a local level. The review process for this report has highlighted gaps in county-wide data that prevent comparisons to be made over time. This is something that must be tackled urgently by the conservation and recording community in conjunction with local authorities and government agencies.

This report has demonstrated some clear trends in the extent and quality of Oxfordshire's habitats and wildlife. But it is less clear what changes the county's soil resource and air quality have undergone, and the impacts of invasive non-native pests and diseases. The effects of climate change on weather patterns and land-use decisions, and the impact these have on local wildlife, are still in the early stages of assessment. These are important points for focusing future work.

DELIVERING NET GAINS FOR NATURE

We must plan to deliver net positive outcomes for biodiversity when developing and actioning strategies that effect our natural environment. This will be achieved through the exchange of knowledge and skills across all sectors. We also need to ensure that, in these times of economic uncertainty, spending on the environment is lifted up the political agenda in order to prevent further damaging losses that cannot be reversed and may send ripples, not just through ecosystems, but through society as a whole.

Actions to support these principles must be taken at many levels, and by many different people and organisations. Together with a continued focus on large-scale improvements in the county's water and air environments, this will give us the best chance to ensure that future generations will continue to benefit from Oxfordshire's nature as we do.

Otter (Ben Andrew/ rspb-images.com)

Against national declines in freshwater species, 20% of all UK wetland plant and macroinvertebrate species have colonised ponds at Pinkhill Meadow just seven years after their creation.

Pinkhill pond (Pascale Nicolet)

Lapwing (Andy Hay/ rspb-images.com)

Loss of wet grassland has led to dramatic declines in some of our wading birds. But, since 2006, the RSPB's Upper Thames Wader Project has worked with farmers to restore more than 990 ha of habitat.

Monkey orchid (Peter Creed)

Thought to be extinct before being re-discovered in 1960, careful management at Hartslock reserve has enabled its population of rare monkey orchids to stabilise and slowly increase.

The intensification of agriculture from the mid-20th century onwards contributed to dramatic declines in some wildlife. But Agricology.co.uk is inspiring good land management by sharing information and best practice across Oxfordshire.

Mowing Sainfoin (Agricology)

Nettlebed Common Ponds (Clive Ormonde)

Specialist acid plants, such as sharp-fruited rush and water purslane, are struggling in the county. The restoration of Nettlebed Common Ponds by the Nettlebed and District Commons Conservators (funded by TOE2 and others) has resulted in a huge increase in their abundance on site.

Hazel dormouse (Pete Newbold)

At risk from habitat loss and disturbance, the dormouse was found at three new sites in the county during the first year of Oxfordshire Mammal Group's Dormouse Project.

Historical dredging and straightening of rivers has reduced refuge areas for young fish, but 12 species were recorded using backwaters next to the River Thames just one year after wetland restoration by the Earth Trust.

River Thames (Environment Agency)

Green tiger beetles (David Kjaer)

Rare invertebrates, such as the green tiger beetle, are under threat, but newly created acid grassland at Shotover SSSI is helping them to thrive.

Marsh harriers, extinct at the end of the 19th century, have returned to Otmoor thanks to the RSPB and hundreds of volunteers tirelessly planting 150,000 reed plugs to create more reedbed habitat.

Marsh harrier (David Kjaer)

In 2004, BBOWT reverted 70 ha of arable fields back to hay meadows at Chimney Meadows, fighting back against previous catastrophic losses in this habitat. These fields are now brimming with wildflowers, insects and birds.

Chimney Meadows (Lisa Lane)

Fen violet (Philip Cutt)

Declines in some of the county's rare plant species are being countered by collaborations led by Flora Guardians from the Oxfordshire Flora Group. They coordinate work on 12 of our most vulnerable species, including the rare fen violet.

We would like to thank the very many people who have made the State of Nature in Oxfordshire 2017 possible. We particularly thank our funders: Oxfordshire County Council, Natural England and Banbury Ornithological Society. The organisations shown above have also been instrumental in putting this report together.

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