Draft Cotswold Water Park Nature Recovery Plan July 2021: Technical Details

Working in harmony to secure the future for wildlife and people, 2021 and beyond

Cotswold Water Park Nature Conservation Forum

Contents

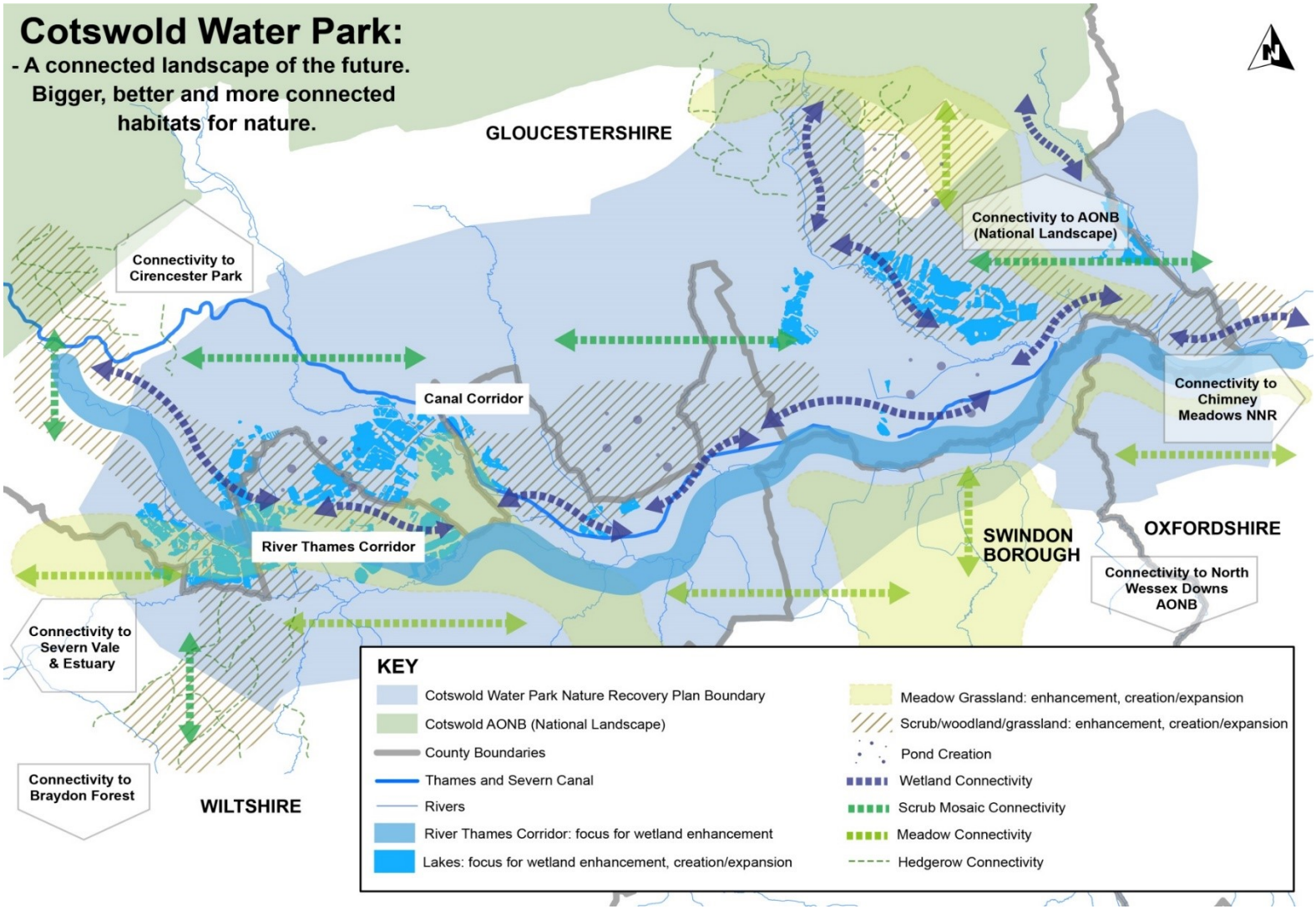
1. The Vision

The Cotswold Water Park is unique. It is a valued visitor destination with a range of attractions whilst being a desired place to live and work. The vast patchwork of 182 lakes is the defining feature, created as a result of mineral extraction and restoration. Other valuable habitats such as the canal corridor, rivers and streams, wet woodland, lowland neutral grassland and farmland are also present, interconnected by linear habitats including hedgerows and ditches. The park is a biodiversity hotspot with a wealth of wildlife, central to its economic and social successes.

A key outcome of the Nature Recovery Plan will be an increased awareness that biodiversity is fundamental to all aspects of the Cotswold Water Park. A robust ecological network is not only beneficial to wildlife, but it provides a range of "ecosystem services", such as clean air and water, food provision and improvements to wellbeing and the economy. It is therefore vital to work together to ensure that biodiversity continues to be protected, restored and enhanced. This will open up vast opportunities and improve the quality of life for both wildlife and people.

It is 2070 in the Cotswold Water Park. The continuous meandering corridors of enriched wetlands, meadows, wet woodlands and scrubland form a resilient mosaic of habitats. The wildlife is flourishing and species can easily move across the landscape. Farmers, land owners and local communities are actively engaged in adopting sustainable ways of living. An array of new footpaths and cycle routes are available for visitors and local residents to explore. Carbon is captured and stored in the wetlands, woodland mosaics and arable soils. The improved water quality and flood management has enhanced the lives of wildlife and people in the CWP and communities downstream. Local communities, visitors and businesses continue to work together in harmony to maximise the benefits for humans and for wildlife, ensuring fully functioning ecosystems within the CWP.

Map 1: A strategic map to demonstrate the 50-year vision. The Nature Conservation Forum aspires for habitats to be bigger, better and more join-up to ensure a resilient landscape and fully functioning ecosystems.



2. Introduction

2.1. Document Summary

This new Cotswold Water Park Nature Recovery Plan leads on from past biodiversity action plans[1,2]. The overarching aim is to work in partnership to protect, enhance and create habitat and ecological networks for biodiversity in the CWP. This will be achieved on a landscape scale, where management will be strategically directed to maximise the delivery of essential services (such as carbon storage, water and heat regulation etc.), ensuring wide ranging benefits for people and wildlife.

The actions fully incorporate the existing key initiatives and projects within the area. In this way, projects can be integrated and partnerships can be strengthened through a more holistic approach.

In the face of climate and ecological crises, this holistic approach is crucial to ensure long-term effective improvements for biodiversity within the CWP.

This Nature Recovery Plan has been developed with the input of key partners within the Nature Conservation Forum (NCF); a representative body that works across the CWP to protect and conserve biodiversity (*refer to the Appendix for a full list of partners*).

This is intended to be a 'living', ongoing document. Information can therefore be amended in response to any future changes there may be in the CWP and more widely.

The NCF intends to carry out follow-up workshops to identify the short-term (e.g. within a 5 years) and long-term, landscape level priorities that are informed by this plan (*further details in Box 9, Section 7*).

2.2. Ecological Crisis

There have been unprecedented declines in species and habitats in recent decades[3,4,5] (*refer to Box 1*). The most significant drivers influencing this trend are urbanisation, agricultural management, pollution and climate change[5]. These are negatively impacting on the state of nature, altering the distribution and assemblage of habitats and species.

Box 1

Decline in species
The recent State Of Nature Report (2019)[5] has highlighted:
41% of UK species studied have declined since 1970
15% of UK species studied are threatened with extinction

Habitat loss:
97% of wildflower meadows have been lost since the 1930s[3]
More than 1 million ponds have been lost in Britain over the last 100 years[4]

[1] Cotswold Water Park Biodiversity Action Plan 2007-2016: https://www.waterpark.org/wp-content/uploads/2013/01/FINALCWP-BAP-2007-16-v8print.pdf
[2] Useful resources and documents from the Cotswold Lakes Trust: https://waterpark.org/resources-documents/
[3] Plantlife, declines in meadow grassland: https://www.plantlife.org.uk/uk/about-us/news/devastation-of-meadows-endangers-flower-favourites-like-wild-strawberry-ragged-robin-and-harebell
[4] The Importance of Ponds, DEFRA: http://adlib.everysite.co.uk/adlib/defra/content.aspx?id=000HK277ZW.09SUFIYDQ4SEB6
[5] State of Nature Report, 2019: https://nbn.org.uk/wp-content/uploads/2019/09/State-of-Nature-2019-UK-full-report.pdf

The natural environment provides us with essential services including the air we breathe, water to drink, food, fibre, building materials, temperature and water regulation, carbon sequestration and air filtration, etc. Healthy, stable ecosystems also improve resilience to natural disasters (e.g. extreme floods or droughts) and underpin our health, wellbeing and the economy.

The UK Government has now set out a 25 Year Environment Plan with goals including protecting threatened species, creating richer wildlife habitats and mitigating and adapting to climate change[6]. Furthermore, most councils have declared climate emergencies and some including Cotswold District, West Oxfordshire District and Wiltshire, have now declared ecological emergencies too. Through doing so, councils illustrate their commitment to deliver nature recovery. Cotswold District Council has specifically mentioned this CWP Nature Recovery Plan within the Ecological Emergency Action Plan.

Cotswold District Council further highlights that the "importance of working in partnership to achieve nature recovery cannot be under-estimated"[7]. Given the current and increasing challenges that climate change poses, this will be ever more important and it should therefore be a top priority for partners to fully cooperate in order to reverse the current declines in biodiversity.

This Nature Recovery Plan aims to address the ecological emergencies whilst also considering the future challenges posed by climatic changes. This will be done so through a co-ordinated approach and a shared vision for biodiversity across the CWP, bringing together stakeholders to engage in biodiversity issues.

3. The Cotswold Water Park

3.1. What is the Cotswold Water Park

The Cotswold Water Park (CWP) is an area of over 42 square miles, with 182 lakes, set across the countryside of Wiltshire and Gloucestershire, extending into Swindon and West Oxfordshire (*refer to Map 2 for relevant boundaries).* It lies in the upper reaches of the River Thames and has been shaped since the Second World War primarily by the pattern of sand and gravel working. Within this Nature Recovery Plan, the area referred to as the 'CWP' relates to the CWP formal boundary, designated in the 1960's (*refer to Section 3.3 for information on the boundaries*).

The high water table in the area has left lakes after mineral extraction, only a few of which have been completely infilled with inert waste. The lakes and their surroundings have created a new landscape and opportunities for a wide range of new land uses and activities, ranging from water sports and holiday homes through to angling and the enjoyment of wildlife habitats.

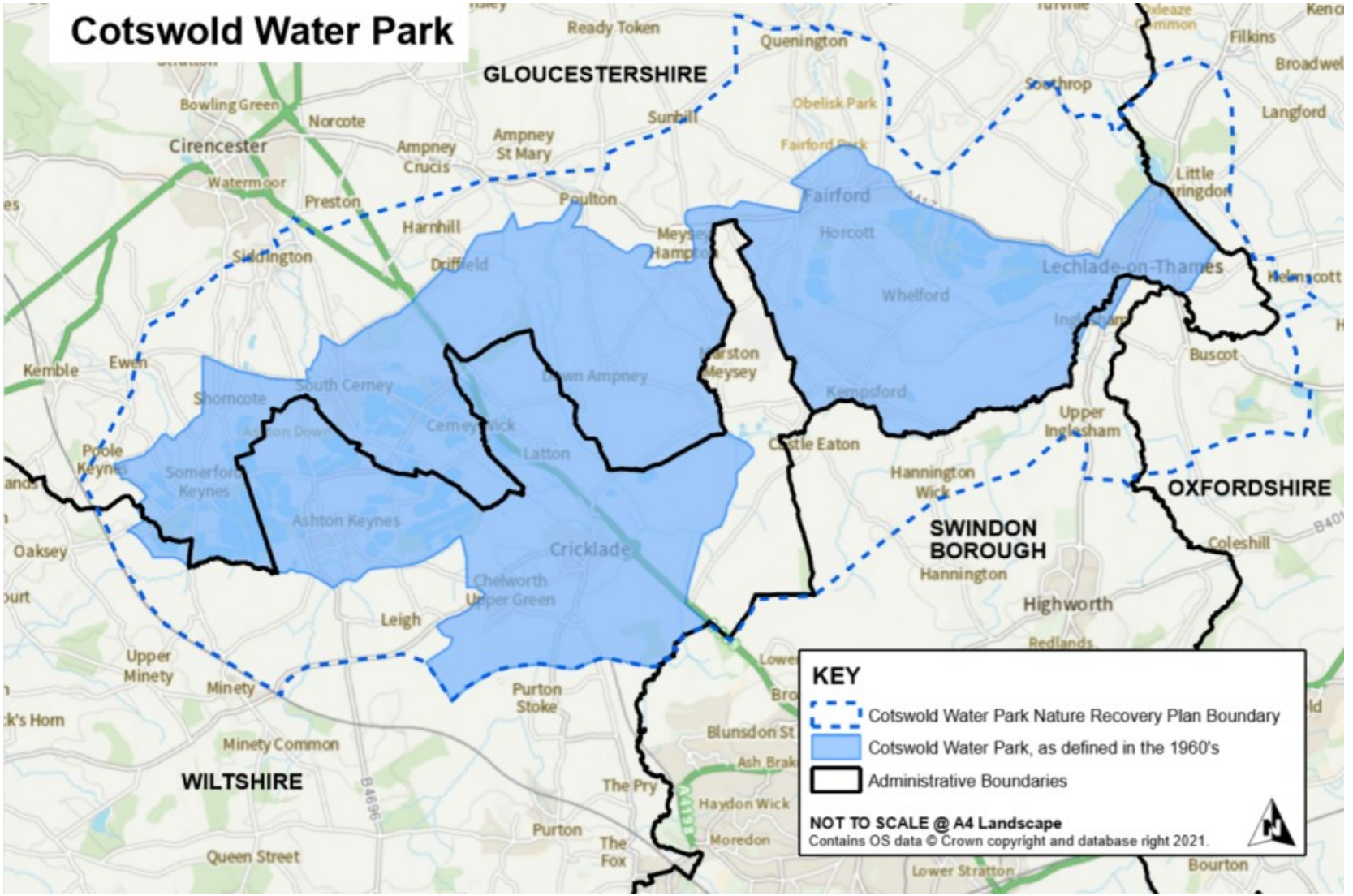
The CWP is a valued destination, attracting approximately 1 million people each year, from nearby town and villages and further afield. A range of activities are available including water sports (e.g. kayaking, paddle boarding, sailing and windsurfing) as well as angling, horse riding, golf and bird watching[8] .

[6] A Green Future: Our 25 Year Plan to Improve the Environment: https://www.gov.uk/government/publications/25-year-environment-plan

[7] Cotswold District Council, Ecological Emergency: https://news.cotswold.gov.uk/news/ecological-emergency-declared-in-the-cotswolds

[8] Cotswold Water Park, Activities: https://waterpark.org/things-to-do/activities/

Map 2: The Cotswold Water Park (boundary as defined in the 1960's) and the boundary of this Cotswold Water Park Nature Recovery Plan



3.2. Biodiversity interest within the Cotswold Water Park

3.2.1. Habitats and species

Biodiversity is defined as the variety of life on earth, encompassing plants and animals as well as the habitats and ecosystems that support them. The CWP holds high biodiversity interest, where the rich mosaic of habitats has created a valuable landscape for wildlife.

The vast patchwork of 182 lakes (with more planned as minerals are excavated into the future) is the defining feature of the CWP, created as a result of mineral extraction and restoration. The CWP hosts the most extensive marl lake (highly calcareous lakes[9]) system in Britain alongside other associated wetland habitat. This has formed an important wetland landscape and supports distinctive aquatic plant communities and internationally and nationally important breeding and wintering water bird populations. The importance is now reflected by the recent large expansion of the CWP SSSI, now encompassing many of the lakes across the region.

Other habitats provide connectivity, such as rivers and other water courses, the canal corridor and hedgerows, with wet woodland, lowland neutral grassland and farmlands (including internationally important hay meadows) also being present. The ongoing active gravel extraction also creates temporary, ephemeral features, such as bare ground and other early-successional habitats.

The combination of the above habitats provides a range of conditions within the landscape to suit the requirements of both generalist and specialist species. Subsequently, it is not surprising that the CWP supports an array of species including those that are protected and are of priority (listed under Section 41 of the NERC Act 2006) including bats, birds, invertebrates (e.g. dragonflies and damselflies), amphibians (including great crested newts), water vole, otter as well as the native black poplar (*refer to Appendix 3 for a full list of priority species within the CWP boundary*).

3.2.2. Designations

The CWP contains eight grassland Sites of Special Scientific Interest (SSSI) two of which form a Special Area of Conservation (SAC) (North Meadow and Clattinger Farm SAC) (*refer to Map 3*). Ten representative marl lakes were also notified as SSSI's in 1994 because of their lime-rich waters which support a wide diversity of aquatic plants. Natural England has recently undertaken a review of the SSSI network (*refer to Section 8*) to take into account a wider range of features, especially water birds and aquatic plants, throughout the CWP. On the 7th January 2021, the Cotswold Water Park SSSI has been enlarged to include land within and extending beyond the area that was previously notified, to encompass the full extent of open water and associated habitats necessary for maintaining the species interest features within the CWP[10]. The Nature Recovery Plan will be updated as and when the SSSI is formally designated *(refer to Map 3 for the locations of the designated sites).*

Gloucestershire Local Nature Partnership approved the CWP as a locally determined Nature Improvement Area (NIA) in August 2014 (*refer to Map 4*). These are discrete areas that, by taking a landscape–scale approach, will deliver a step change in biodiversity conservation, where a local

[9] JNCC, Freshwater Lakes: https://data.jncc.gov.uk/data/1b15dd18-48e3-4479-a168-79789216bc3d/CSM-FreshwaterLakes-2015.pdf

[10] Natural England, Cotswold Water Park SSSI re-notification: https://consult.defra.gov.uk/natural-england/cotswold-water-park/supporting_documents/Cotswold%20Water%20Park%20Notification%20Document%20notified%207%20Jan%202020.pdf

partnership has a shared vision for their natural environment. This Nature Recovery Plan will support the objectives and aims of the NIA through encouraging habitat creation and enhancement on a landscape scale, as recommended by the Lawton Review and the State of Nature Report[5,11].

3.3. Relevant boundaries

The CWP was originally designated in the 1960s with a boundary based on mineral extraction and parish boundaries. In order to better reflect the biodiversity realities on the ground, the previous BAPs and Masterplan used wider boundaries.

As a result, a number of different boundaries have been used to delineate the CWP over the years and this Nature Recovery Plan will be relevant within all these currently defined boundaries (including those parts of the Upper Thames Clay Vales National Character Area[12] that fall within Cotswold District), whilst falling outside of the Cotswold AONB, to complement the AONB Management plan (*refer to Map 5*). The reason for this is to allow for landscape scale conservation and encompass the ecological, social and economic interest across the area.

Box 2 (*see below*) explains each boundary in more detail. Table 1 provides the associated area that each boundary covers (*also refer to Map 5 and the Cotswold Water Park Master Plan*[13]).

Box 2- Boundary information

Cotswold Water Park boundary: the current designated area (as designated in the 1960's) to delineate the extent of the CWP based upon mineral extraction and parish boundaries. Some parishes did not wish to form part of the CWP.

Masterplan functional boundary: the masterplan aimed to achieve a vision that incorporated social, economic and environmental aspects. A boundary was identified for the study and this encompasses the wider setting and the area under the influence of the CWP.

Upper Thames Clay Vales National Character Area (NCA): NCA's are based upon the landscape, biodiversity, geodiversity and economic activity. The Upper Thames Clay Vale is described as a "broad belt of open, gently undulating lowland farmland on predominantly Jurassic and Cretaceous clays".

CWP Biodiversity Action Plan (BAP) 2007-2016 boundary: the BAP's area of interest was ecological rather than political and extends beyond the Water Park's formal boundary, including part of Wiltshire, Swindon Borough, Gloucestershire, and Oxfordshire.

New Cotswold Water Park Nature Recovery Plan boundary: The new boundary encompasses all existing boundaries (excluding the AONB). This is so that the biodiversity conservation interests as well as the social and economic aspects are acknowledged.

[11] Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., & Wynne, G.R. (2010) Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra. Available at: https://webarchive.nationalarchives.gov.uk/20130402170324/http:/archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf

[12] Upper Thames Clay Vales National Character Area (NCA): http://publications.naturalengland.org.uk/publication/5865554770395136

[13] Cotswold Water Park Master Plan: https://waterpark.org/resources-documents/

Table 1: The boundaries used to demarcate the Cotswold Water Park and the respective areas (hectares & square miles) for each.

Associated boundary	Area (ha)	Area (square miles)
New Cotswold Water Park Nature Recovery Plan Boundary	21,893	84.53
Cotswold Water Park Formal Boundary	10,996	42.46
Master Plan Functional Boundary	18,992	73.33

3.4. Status of the plan

It is anticipated that this Nature Recovery Plan will be endorsed by the Local Nature Partnerships (LNP) and have widespread support of the partner organisations. The plan is based on relevant information sources and has benefited from the input of a wide range of biodiversity professionals.

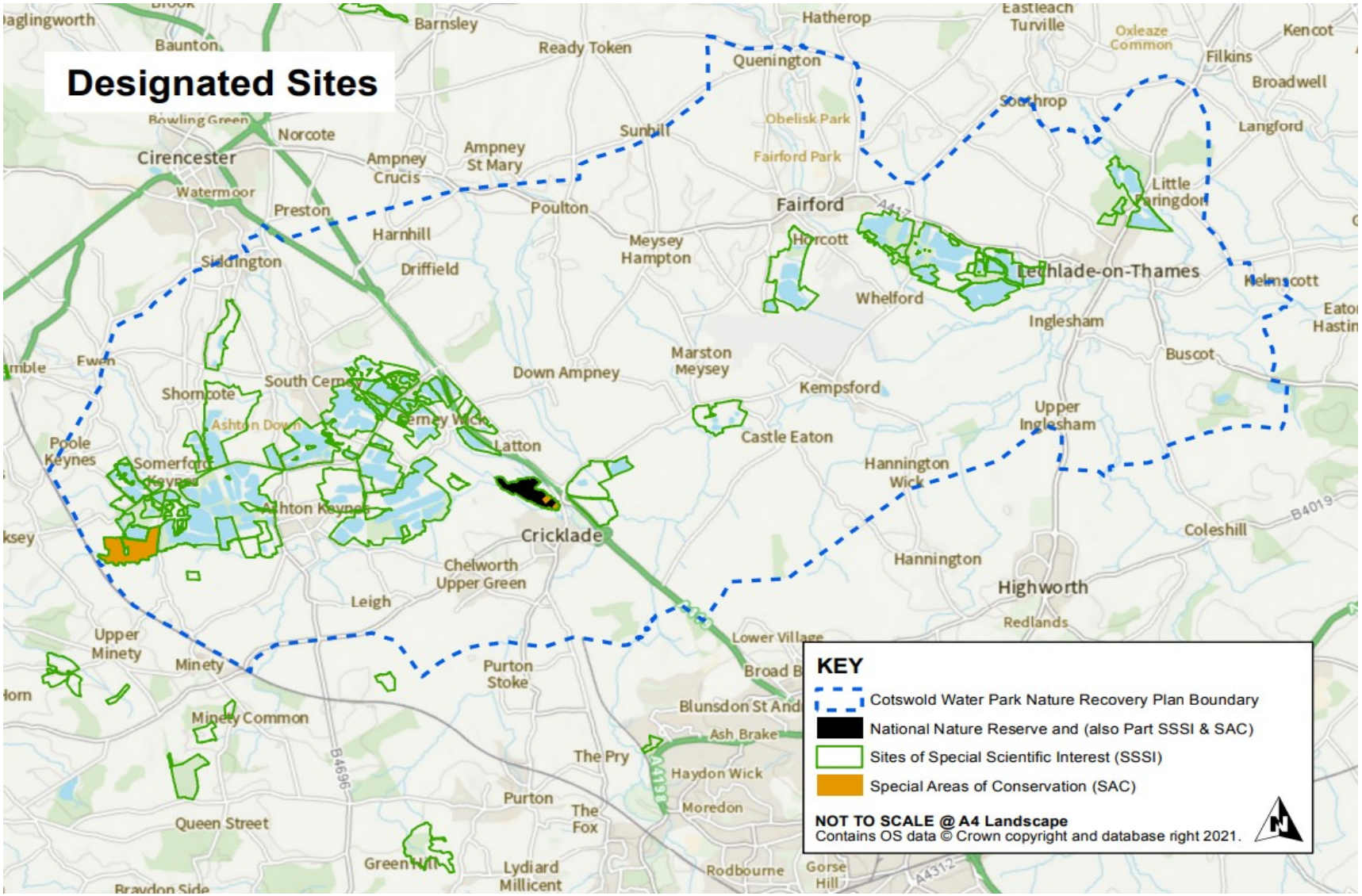
An important aspect of the plan is to work in partnership with all stakeholders including the leisure and retail industries as well as such as mineral operators etc. so that we can all take a pro-active role towards nature's recovery. The weight of the plan will therefore be decided by the Nature Conservation Forum, Local Nature Partnerships, Local Authorities and all partner organisations.

This section will be up-dated following the endorsement.

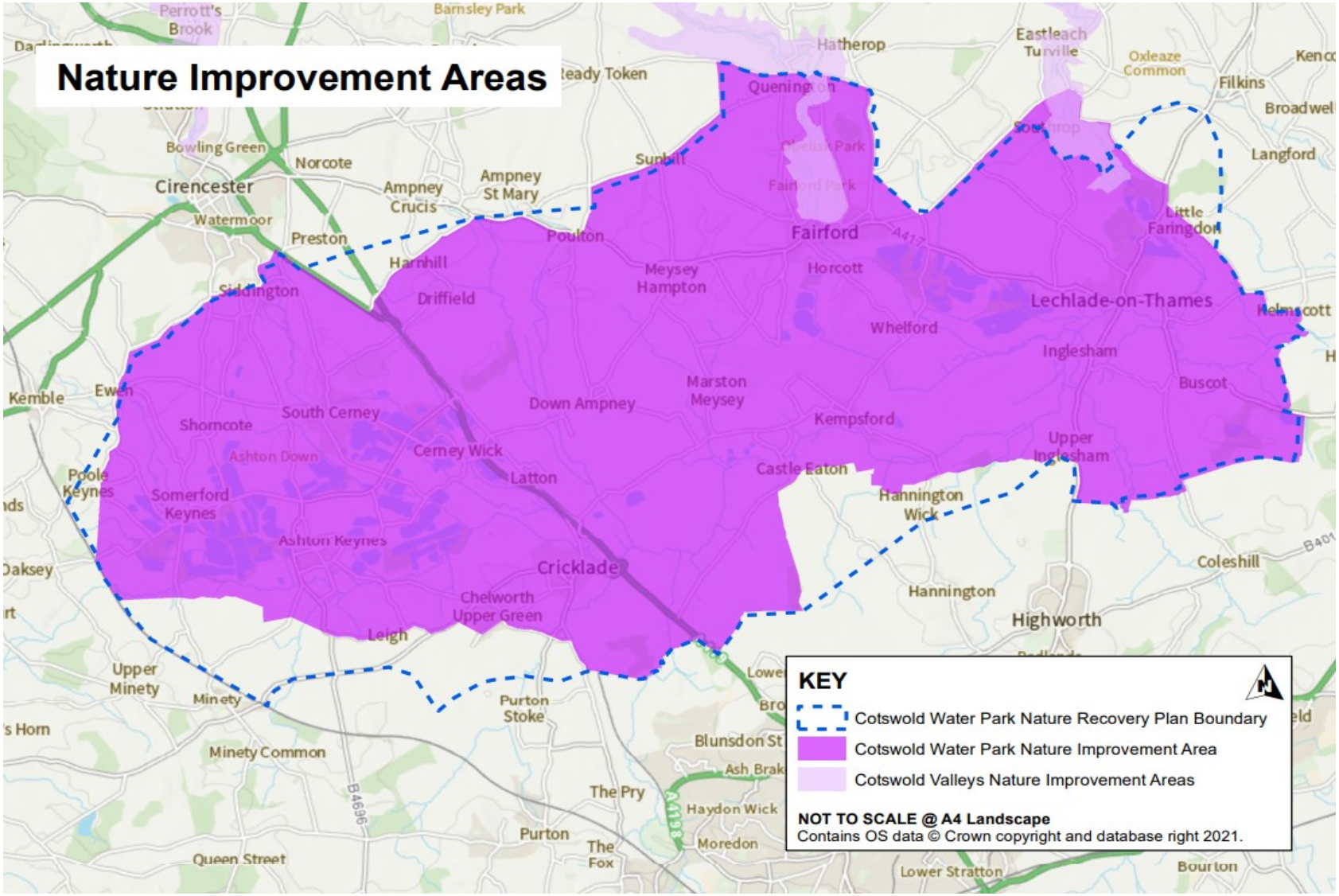
3.5. Support future Local Nature Recovery Strategies (LNRS)

Given that future Local Nature Recovery Strategies (LNRS) will become a mandatory requirement under the Environment Bill, this CWP Nature Recovery Plan will therefore become embedded within the emerging LNRS. The CWP Nature Recovery Plan will help to achieve the higher level aims of the LNRS for Gloucestershire, Wiltshire and Oxfordshire through identifying 'Priority Nature Recovery Zones' that are determined mainly by the Nature Recovery Network mapping.

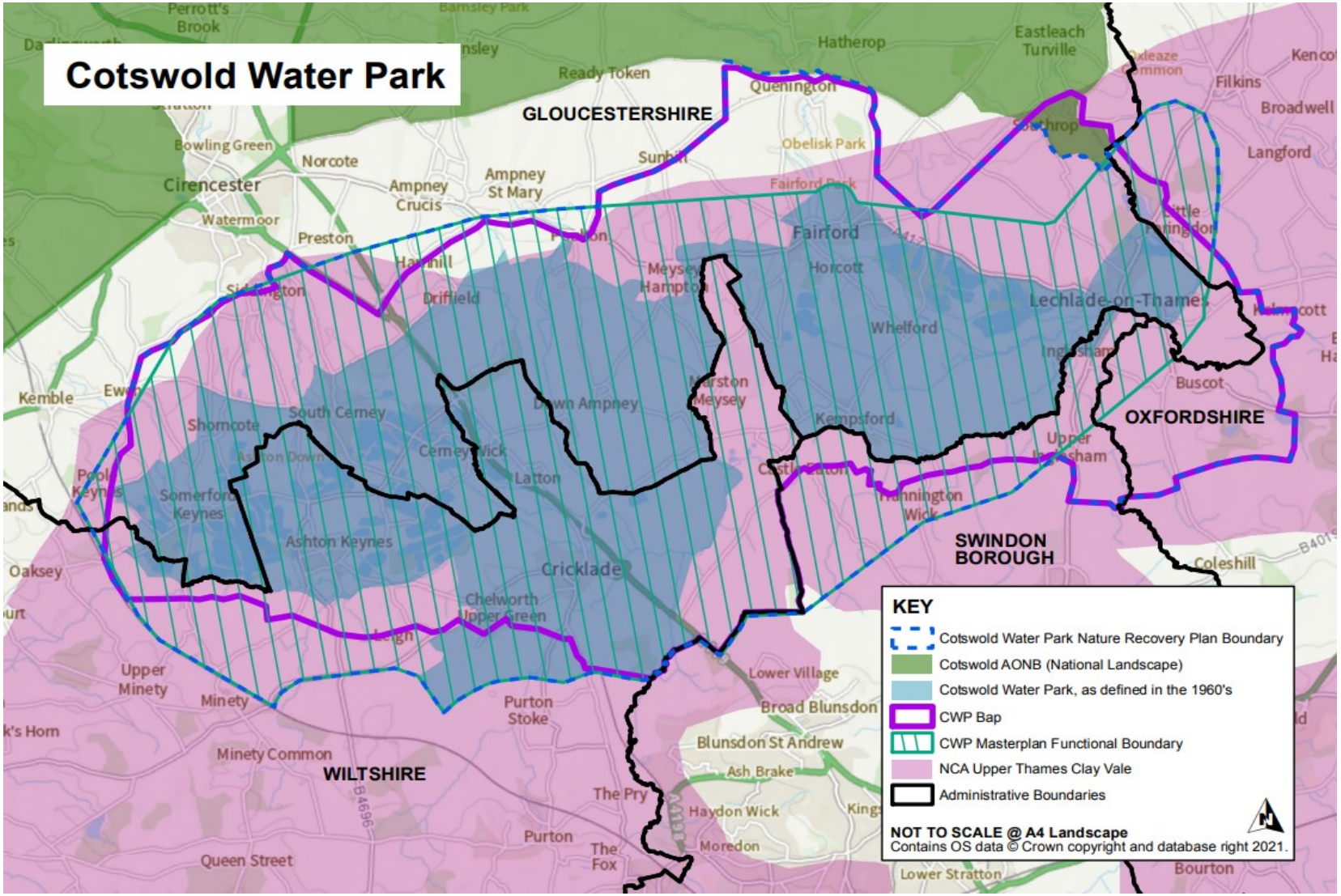
Map 3: Designated sites within the Cotswold Water Park



Map 4: Nature Improvement Areas (NIA's) associated with the Cotswold Water Park



Map 5: The boundaries used to demarcate the Cotswold Water Park and respective areas



4. The purpose of the CWP Nature Recovery Plan

Previous Biodiversity Action Plans (BAP) for the CWP have been effective in targeting biodiversity efforts. However, given that we are now increasingly aware of the climate and ecological crises, it is even more important to ensure that our ecosystems are robust and functional enough to provide maximum support – effectively a support network – providing species with the best possible chance to adapt to future changes and the last BAP requires updating to meet current needs. This document has been written to fulfil that need.

4.1. Importance of the Nature Recovery Plan for wildlife and people

- The loss of the nationally and internationally important populations of species within the CWP would be significant on at least a national level. Management that creates new habitat, enhances condition and connectivity, will support populations, allow for dispersal and improve ecosystem functioning.

- The pressure from both recreation and development is likely to increase in future years so management is required to ensure the habitats and the associated species are protected, are not unduly disturbed and that connectivity is not further impacted.

- Located within the flood plains of the Upper Thames, ongoing action is required to ensure sympathetic land use, effective water regulation and pollution control. This is needed to reduce soil erosion, store carbon, improve water quality and allow for more sustainable management of water during floods and droughts.

- The CWP is highly accessible and a popular tourist destination, being near major towns and cities, such as Swindon, Cirencester and Gloucester, and the A417/A419 duel carriageway between the M4 and M5 motorways. The protection and enhancement of biodiversity will ensure that the water park continues to provide benefits to human health and wellbeing.

- Biodiversity forms a fundamental building block of Natural Capital; the elements of nature that produce value for people and generate various good and services ("ecosystem services"). Protecting and enhancing biodiversity within the CWP, as well as improving the quality of the environment (e.g. air and water quality), can secure multiple benefits such as climate regulation, carbon sequestration, food and water provision and improved health and wellbeing. It is vital that we acknowledge this inter-relationship between humans and nature through protecting and enhancing biodiversity. This will act to defend against future climatic changes and secure a sustainable future.

This Nature Recovery Plan builds on previous and current initiatives (*refer to Section 8*), policy and guidance. It will join up and add to these initiatives delivering a holistic 'landscape scale' approach to biodiversity.

This plan is working in line with Gloucestershire and Wiltshire (the mapping for Wiltshire is currently in progress) Nature Recovery Network (NRN) and Lawton Principles to ensure that a coherent and resilient ecological network is established and maintained within the CWP *(refer to Box 3)*[11, 14]. The work promoted by the plan will protect, enhance and create valuable habitats whilst fully considering the spatial context to deliver multiple benefits for wildlife and people.

[14] Nature Recovery Network: https://www.gov.uk/government/publications/nature-recovery-network/nature-recovery-network

Box 3 - Nature Recovery Network (NRN) definition[14]

A national network with an aim to expand, improve and connect the wildlife rich places across the countryside as well as towns and cities.

Lawton Principles (based upon Lawton et al. 2010)[11]:

Creating a network of wildlife sites in line with 4 key principles: More, bigger, better, more joined up:

Create new sites: e.g. target areas of important habitat, target degraded areas with high potential for restoration and ecosystem delivery, ensure high connectivity to existing sites; and creating new habitats.

Bigger sites: e.g. big enough to encourage natural processes and functioning ecosystems, reduce edge effects, join up habitat fragments, restore degraded surrounding habitat;

Better site quality : e.g. encourage natural processes, create more niches and habitat mosaics, reduce edge effects by buffering sites;

Enhancing connectivity: e.g. creation of wildlife corridors/stepping stones, use linear landscape features, expanding sites towards existing habitats.

5. A guide to using the document

This Nature Recovery Plan will help a range of organisations and individuals to better understand the risks and opportunities for nature within the CWP and the actions required to best respond. These are particularly focused on a number of key species and habitats as well as more general issues.

The following information suggests how user groups may wish to use the plan and highlights the relevant action plans (*although, also refer to Section 10 for further information*).

Table 2: Examples on how different user groups can use the plan.

User group	When/how to use it	Relevant action plans
Developers and agents	• Design development projects using information on the most relevant/appropriate species and habitats to support through habitat management and creation. • Consider the NRN mapping; which is translated within the plan. • Engage with expert advice available from Natural England to ensure the requirements of the SSSI notifications are met.	Strategic Action Plan; Green Infrastructure; Built Structures. Look at specific actions for habitats or species within or surrounding the site
District, Unitary and County Councils	Development Management • Determine Biodiversity Net Gain (BNG) in planning applications and provide advice at the pre-application enquiry stage, whilst considering the details of all threats and opportunities for associated/relevant designated sites, species and habitats • Work in partnership with bodies and organisations to protect and enhance biodiversity and ensure suitable long-term management • Ensure land is sufficiently managed if owned by Cotswold District Council or Wiltshire Council • Engage the public and ensure effective communication • Refer to this document within any future strategies (e.g. climate change strategy etc.) • Encourage Green Infrastructure (GI) within projects/schemes	Strategic Action Plan; Green Infrastructure; Built Structures and Invasive Non-Native Species. Look at specific actions for habitats or species within or surrounding the site.

	• Inform and possibly fund appropriate local environmental projects Policy • Developing local plans and any new strategic initiatives	
Parish and Town councils	• Develop Neighbourhood Development Plans (NDP)[15]. Cross-reference locally distinctive and important habitats and species within the area with those in this document. • Ensure the NDP policies and community actions help to deliver on a strategic level	
User group	When/how to use it	Relevant action plans
Mineral operators	• Ensure mineral operations and restoration schemes protect and benefit biodiversity in the right manner and in the right place.	Strategic Action Plan; Active Sand and Gravel Quarries; Bare Ground and Early Successional Habitats; Standing Open Water; Dragonflies & Damselflies; Fen, Marsh and Reed Swamp; Scrub Woodland
Leisure providers	• Ensure all proposed schemes provide a net gain in biodiversity through suitable habitat enhancement and creation. • Understand the requirements of the SSSI re-notification process within the CWP. Contact Natural England if there are any queries	Strategic Action Plan; Green Infrastructure; Built Structures; Invasive Non-Native species; Standing Open Water; Rivers and Streams; Wild and Stocked Fish. Look at specific actions for habitats or species within or surrounding the site.
Landowners and farmers	• Use information on the most relevant species and habitats to help inform suitable farming practises, habitat management and creation, and applications for agri-environment payments • Understand and engage with the relevant projects and initiatives in the local area to contribute towards nature conservation	Strategic Action Plan, Rivers & Streams, Scrub Woodland, Lowland Neutral Grassland, Terrestrial and Riparian Mammals, Barberry Carpet Moth. Look at specific actions for habitats or species within or surrounding the site.

[15] Somerford Keynes Neighbourhood Plan is an example of best practice: The plan identifies target habitats and species. Specific actions of this Plan can be referred to and help guide local management on private land and nature reserves. Somerford Keynes and Shorncote Neighbourhood Development Plan 2015-2-31 https://www.cotswold.gov.uk/media/5xldrrzi/somerford-keynes-draft-neighbourhood-development-plan.pdf

User group	When/how to use it	Relevant action plans
The public	• Become aware of the concerns and opportunities and engage with local projects. • Please note, more "easy to read" information on the biodiversity of the CWP is available on the Cotswold Lakes Trust website: https://waterpark.org/what-we-do/conservation/	Strategic Action Plan
All	• Refer to the existing records/record centres/organisations and contribute towards the records of habitats and species to provide an up to date evidence base for mapping and action plans.	
Organisations (e.g. Natural England; Gloucestershire and Wiltshire Wildlife Trust; Cotswold Lakes Trust (formally the Cotswold Water Park Trust); Environment Agency etc.)	• Refer to the relevant habitat and species action plans and priorities to help implement projects to protect and enhance biodiversity within the CWP, in line with expertise. • Consider the NRN mapping (which is translated within the plan) as well as other mapping (e.g. Natural Capital, B-Lines, GCN District Level Licencing) to help direct and priorities projects and opportunities.	Strategic Action Plan. Look at specific actions for habitats or species within or surrounding the given area.

6. Biodiversity concerns and opportunities

The Nature Conservation Forum (NCF) identified a number of overarching concerns and opportunities to be addressed through a strategic action plan and more specifically, the species and habitats action plans. The key biodiversity concerns and opportunities are described below:

6.1. Concerns

- **Climate change:** Climate change can have wide-ranging effects, such as changes in temperature and extreme weather events (e.g. floods and droughts). This is impacting on biodiversity through affecting species' range and distribution, the composition of plant communities and leading to species' extinctions. It can further increase the potential for non-native species to establish and spread.

- **Successional change:** Without appropriate management, natural succession leads to the formation of later successional habitats such as willow carr. In this way, bare ground and earl-successional habitats within aggregates sites can be lost during the restoration process when habitat features are left to naturally colonise. Often, habitats are also created that are perceived to be of higher ecological value. This can reduce the habitat suitability for species (e.g. particular wader birds) that rely upon the early successional, ephemeral habitat.

- **Agriculture and private ownership:** Long-term habitat management and maintenance is difficult to secure on land under private ownership, making long-term, landscape scale conservation challenging.

- **Water Quality:** Most water bodies and water courses in the CWP are nearby or adjacent to development and other land uses (e.g. agriculture). These land uses, as well as visitor activities, can increase the amount of nutrients entering the water environment and lead to issues such as eutrophication. Recent research has also found dogs to introduce the chemicals from flea treatments into waterbodies. The chemicals are highly toxic to the aquatic life (including nationally important charophytes) and harm the wider ecosystem[16].
  Another issue is that the foul drainage is often connected to package sewage plants rather than the mains sewerage. These packet sewerage plants often are not maintained and are a constant pollution risk.

- **Residential and Commercial Development Pressure*:*** Future changes and increases to leisure or development schemes may pose direct (damage to/fragmentation of habitats) and indirect (increased recreational pressure) impacts on biodiversity. However, there is a lack of funding for managing existing sites in the CWP in response to these pressures.

- **Mineral Extraction:** Ongoing mineral extraction will continue to have a considerable influence on the landscape of the CWP. The methods of mineral working and the way that they are restored can influence the associated biodiversity.

- **Bird Strike:** Large flocks of birds attracted by water features can pose hazards to aircraft, especially on landing and take-off. The CWP sits within the statutory bird strike safeguarding

[16] Flea treatment for dogs impacting on UK rivers: https://www.theguardian.com/environment/2020/nov/17/pet-flea-treatments-poisoning-rivers-across-england-scientists-find

zones surrounding RAF Brize Norton and RAF Fairford. The Ministry of Defence (MOD) is concerned with wetland habitat creation and management as this can attract accumulations of large or flocking bird species which pose particular hazard to air traffic.

- **Management of recreational disturbance and antisocial behaviour**: Designated wildlife sites, such as North Meadow and Clattinger Farm SAC, and other valuable habitats within the CWP have been subject to increasing recreational pressure in recent years. The 2020-21 COVID19 pandemic has also led people to explore their local area and better appreciate the local wildlife. Increasing housing figures in nearby areas (e.g. Swindon) and the increase in holiday accommodation within the CWP will also lead to higher visitor numbers.

  Recreational disturbance from new residents and increased visitors can, if not carefully managed, disturb sensitive species such as breeding and wintering birds.

  Antisocial, unpermitted and intrusive behaviour (e.g. litter dropping, wild camping, fires, irresponsible dogs – fouling/disturbing wildlife and livestock) has also been a significant problem within the CWP.

- **Lack of understanding:** Particular habitats (such as scrub) that are of high ecological value and relied upon by specific species (such as nightingales) are often undervalued. The lack of understanding means that highly valuable areas of habitat are removed or left to degrade.

- **Surveying and monitoring:** Whilst much is known about particular wildlife groups, such as birds, in the CWP, other groups are more difficult to survey and acquire data on.

- **Data management:** The sharing of data and knowledge is often difficult as the CWP stretches over different administrative boundaries. It is therefore not always clear where sightings or issues (e.g. if concerned about the condition of a habitat) should be reported to.

- **Cross-boundary difficulties:** Policies (e.g. local development plans), Area Action Plans and projects can differ across different administrative boundaries, posing cross-boundary issues.

6.2. Opportunities

- **Climate change:** A resilient habitat network is required to enable species to move in response to changing climatic conditions. This will be ensured through habitat enhancement and creation in line with the Nature Recovery Network, to provide connectivity for species within the CWP (*refer to Box 4 for an example*). The Natural Capital mapping will also be considered to maximise the benefits delivered such as carbon storage, water supply, soil health etc[17]. This mapping also shows the opportunity areas of the Nature Recovery Network (*see link within reference no. 17*).

  Through increasing the awareness of suitable management techniques, we can develop ways to adapt habitat management to suit future climatic scenarios and events. For example, specific management, such as low intensity grazing systems, would have a lower carbon debt. Gloucestershire Local Nature Partnership and partners such as the Farming and Wildlife Advisory Group (FWAG) are developing ways in which carbon credits can be paid to farmers and landowners for changing their land management practices to ones which sequester more carbon. This can encourage habitat creation (e.g. new wetlands and 'wet' woodlands) where appropriate to improve carbon sequestration.

[17] Ecosystem Service mapping, Gloucestershire Local Nature Partnership: https://naturalcapital.gcerdata.com/

It is also important to raise awareness of using public transport/cycle/walk to reduce pollutants from cars and other motorised vehicles.

Given that climate change can lead to the presence of Invasive Non-Native Species (INNS) and that the management of existing species may become more onerous, ongoing efforts to prevent, control and carry out necessary monitoring of INNS will be a key requirement.

Box 4 - The Greater North Meadow Project

The NCF aspire to deliver the 'Greater North Meadow Project' where North meadow NNR is proposed to be expanded and extended to Elmlea Meadows. The proposed extension could also connect to Clattinger Farm with a band of neutral grassland creation along the River Thames.

This would benefit biodiversity and enhance the connectivity within the CWP, allowing wildlife to move/disperse during future climatic events.

- **Successional change**: It is important to ensure that the ephemeral, early successional habitats are not all lost after mineral extraction. Mineral restoration schemes should include appropriate management and maintenance of early successional habitat features and avoid the excessive growth of particular plant species, such as willow, over time. This will provide suitable early successional habitat for particular waders and other species.

- **Agriculture and private ownership:** Organisations/bodies will need to work with farmers and landowners to ensure that wildlife-friendly practices are used and integrate the farming community into the aspirations of the Nature Recovery Plan, to demonstrate the vital role it could play for biodiversity and the provision of ecosystem services. The work of FWAG and the ELMS trial can assist in ensuring that appropriate practises are carried out and to ensure relationships with farmers and landowners are maintained[18].

- **Water Quality:** Surveys are required to understand the water quality of the waterbodies within the CWP and direct the actions for improvements. It is also important to work with local landowners to increase water quality, ensuring that they are aware of suitable practises to carry out alongside the waterbodies.

- **Development pressure:** Any development should be strategically located to avoid impacting on key biodiversity sites or habitats of ecological value. Green Infrastructure (GI) standards, such as Building with Nature (BwN), will also ensure that developments are of high quality, incorporating features to provide wildlife, water and wellness in proposals at design stage, carried forward to the final build and managed beyond the lifetime of the development.

  The mitigation strategies of Habitat Regulations Assessments (HRA's) can inform the protection and minimise potential impacts on European protected sites (e.g. Special Areas of Conservation or Special Protection Areas) such as North Meadow, to avoid or reduce adverse impacts (e.g. recreational pressure) posed by future development projects or plans.

[18] ELMS Trial: https://www.gov.uk/government/publications/environmental-land-management-tests-and-trials

Development pressure presents a number of opportunities:

- **Biodiversity Net gain**
  Landscaping, restoration and aftercare schemes should incorporate suitable habitat enhancement and creation and ensure that biodiversity net gain (BNG) is delivered where possible, in line with local plan policy and NPPF (*refer to Box 5 and Section 8 for further detail on BNG*). Mandatory Biodiversity Net Gain (BNG) will be soon be introduced (from 2023) for most developments. The CWP Nature Recovery Plan, alongside interrogation of the NRN, will help to inform biodiversity gain delivered in association with new development. Habitat enhancement and creation should be targeted at producing area appropriate habitat in areas that would enhance connectivity and increase the size of the habitat network in line with the Nature Recovery Network (*refer to Section 8*).

  The Gloucestershire Local Nature Partnership (LNP) is currently exploring the possibility of developing an investment trust to manage off-site net gain funds. If 10% biodiversity net gain cannot be achieved on site, developers will need to pay for habitat to be created off-site (*refer to Box 5*).

Box 5- Biodiversity Net Gain

Biodiversity Net Gain (BNG) is an outcome of new development to ensure that developments deliver measurable biodiversity improvements, leaving the natural environment in a better state than it was before development. This was a key government objective in the 25-year Environment Plan. Measurable biodiversity net gain is a specific planning policy requirement of the National Planning Policy Framework (revised in 2018) and the Environment Bill 2021 (which makes changes to the Town and Country Planning Act 1990) proposes that a minimum 10% BNG is made mandatory for the majority of new development.
For more information, please refer to Section 8.

Local Habitat Bank

The CWP provides an ideal location for there to be a 'Local Habitat Bank'. In this way, funds can be directed towards habitat enhancement, creation and restoration locally, within the CWP. This will be informed by the Nature Recovery Network, Natural Capital Mapping, requirements of species and climate change.

A potential pilot trial could be carried out in a specific region of the CWP, to explore the effectiveness/benefits of a local habitat bank. Advice and funding to set up the bank may be sought from the Gloucestershire Local Nature Partnership as well as other potential funding opportunities such as visitor giving schemes (*refer to Box 6*). Data (e.g. baseline habitat data) that has been gathered through ongoing initiatives (such as the ELMS Trial) and habitat management work (e.g. at Lake 99) may be used to provide a baseline habitat calculations for the Defra metric.

Similar initiatives already occur. Examples and further information can be found in the following links:

-Trust for Oxfordshire's Environment: https://www.trustforoxfordshire.org.uk/biodiversity-net-gain-payments

-Environment Bank: https://www.environmentbank.com/blog/habitat-banks-will-be-the-way-to-deliver-biodiversity-net-gain/

- **Visitor Giving Schemes**

Existing leisure facilities/developments (including holiday homes etc.) should consider a small optional charge (e.g. between 1% and 5% of the overall fee) to each guest, through a 'Visitor Giving Scheme' so that funds can be directed to the management of the reserves, country parks as well as important habitats and target species.

This would secure income to support biodiversity management and maintenance to ensure on-the-ground improvements within the park and raise awareness of biodiversity conservation (*refer to Box 6*). The scheme would also have benefits for green infrastructure (e.g. cycle ways), climate change (e.g. tree planting and wetland creation) and visitors (e.g. improved facilities and a greater abundance and diversity of wildlife to watch).

Box 6- Visitor Giving Schemes

As part of the 'Visitor Giving Scheme', leisure facilities can contribute towards a fund for conservation based projects. Businesses and leisure facilities can apply to join the scheme and be awarded an accreditation to show their contribution towards biodiversity conservation.

Visitor Giving Schemes have already been carried out within particular locations of the UK, including North Wales and the Lake District. These request that visitors make a small donation which can be added to the accommodation bill or admission fee. The schemes around the UK have been successful in generating income for local biodiversity.

For example, the Lake District Foundation has generated more than £2.5 million for local conservation projects through the 'Visitor Giving Scheme'. Through these funds, conservation based projects have been carried out such as the planting of native trees in selected areas. More information on this case study is available at:

https://www.visitlakedistrict.com/ideas-and-inspiration/caring-for-the-environment/lake-district-foundation

The beginning steps involved in the setup of the payback schemes

The link below includes useful information to detail how to start setting up the scheme and this can be applied to the CWP. A user toolkit is included to assist with this.

Available at:
https://www.visitengland.com/sites/default/files/downloads/visitor_giving_helpsheets.pdf

https://users.aber.ac.uk/mec/Publications/Papers/JEPM_03_%20Visitor%20Payback.pdf

- **Mineral extraction:** mineral restoration schemes provide significant opportunities for habitat restoration and creation, and can enhance ecological networks and habitat connectivity within the landscape. Extraction will continue to have a considerable influence on the landscape of the CWP. To maximise opportunities for biodiversity, schemes should fully consider the context of the specific site and create suitable habitats that are in-fitting with the local environment and the Nature Recovery Network.

- **Operational requirements of RAF Fairford:** Rather than wetland habitat, considerations are needed for alternative habitat types and management schemes in restoration schemes where risks are considered greatest, such as around RAF Fairford. Examples include a habitat mosaic of

ponds, neutral grasslands, scrub and woodland. Lake edges will also need to be managed to be unattractive to problem bird species e.g. geese, gulls and starlings.

A possible expansion of RAF Fairford will mean that several surrounding lakes may need to be infilled. The infilling of the lakes will require compensatory habitat to be created elsewhere, to commensurate with that lost. This offers opportunities for habitat creation (e.g. open water and reedbed) in new locations to compensate for the expansion of the base. If planned well there could be good opportunities towards landscape-scale nature recovery. The potential project could help meet the objectives of the national Nature Recovery Network, the Local Nature Recovery Strategies and be complimentary to the Futurescape work of the RSPB (*see below*) and other similar initiatives by NGOs.

- **Reviving the FutureScapes Project:** Wetland enhancement, expansion and creation could help support and revive the Futurescapes project of the RSPB[19]. The NCF encourage the future creation of lakes and associated wetlands in areas that do not pose safety issues (e.g. bird strike) and where connectivity can be enhanced. New lakes can be strategically located in the most suitable locations between Clattinger Farm and Lechlade, building on and supplementing pre-existing high quality nature sites and promoting their connectivity. New lakes can be designed effectively to benefit both wildlife and tourism (e.g. including leisure facilities). The wetlands could be made easily accessible to the public so that the nature can be enjoyed by all (e.g. through including bird hides etc.).

- **Management of recreational disturbance and antisocial behaviour:** We should ensure that the public have access to nature, given the vast benefits it can bring to health and wellbeing[20]. However, management should also continue to protect, restore and enhance sites for biodiversity. Opportunities should therefore be identified to create new easily accessible wildlife-rich green space for people to enjoy, diverting the public (including dogs) away from sensitive areas/sites to alternative areas (such as wildflower meadows, flowering lawns, specific routes within wetlands etc.).

  As previously highlighted, mitigation strategies of Habitat Regulations Assessments (HRA's) will minimise potential recreational impacts on European protected sites (e.g. Special Areas of Conservation or Special protection Area) such as North Meadow, associated with development projects.

  It is also important to identify alternative sites that offer opportunities for biodiversity to enhance connectivity between existing sites as future pressures may make existing sites unsuitable.

  The 'Visitor Giving Scheme' (*refer to Box 6*) would ensure all important habitats within the CWP, as well as the reserves and country parks, are managed to reduce anti-social behaviour and recreational pressure.

  Awareness raising and engaging local communities and visitors with the local biodiversity would also be beneficial in minimising antisocial behaviour (*see relevant paragraph below*).

[19] Futurescapes Project, RSPB: https://www.rspb.org.uk/our-work/conservation/landscape-scale-conservation/futurescapes/
[20] Health and the Natural Environment, Natural England: http://publications.naturalengland.org.uk/category/127020

Public Space Protection Orders (PSPO)[21] are also being considered and this is to be led by Cotswold District Council (CDC). PSPO's are aimed at ensuring public spaces are free from anti-social behaviour and disturbance (e.g. ensuring dogs are on leads at particular times of year so wetland birds are not disturbed).

To control dog use within sensitive sites, way-marker discs or similar could be implemented to advise dog walkers to keep dogs to specific areas and on leads. This would help landowners to have more control over dog use and create areas where dogs are not allowed. Alternative sites could be used as designated dog walking areas. Possible alternative sites could include dry land created through restoration schemes as disturbance of these sites would have lower ecological impacts.

- **Surveying and monitoring:** Whilst much is known about particular wildlife groups, such as birds, in the CWP, other groups are more difficult to survey and acquire data on. A number of conservation initiatives within the CWP have compiled and analysed data on different species for a number of years. For example, the CWP Bat Initiative was launched in 2005 which promotes and coordinates bat conservation and study to better understand the bat activity in the CWP[22]. Further research is still required to continue to assess and monitor the foraging, commuting and roosting behaviour of bats in response to the dynamic nature of the CWP (e.g. lake and wetland creation etc.), and similarly, to assess the trends of other species when deemed necessary.

  This highlights an opportunity to encourage local community groups and volunteers to survey for particular species, increasing the local engagement as well as contributing towards conservation research and citizen science within the CWP.

  Future climatic changes may lead to the presence of new Invasive Non-Native Species (INNS) so ongoing monitoring of the INNS is necessary where appropriate (*refer to the INNS Thematic Action Plan*).

- **Data management:** People should be encouraged to send their sightings to local record centres such as Gloucestershire Centre for Environmental Records (GCER) or Wiltshire and Swindon Biological Records Centre (WSBRC) to help fill the gaps in data for particular species. Data on habitats (e.g. condition) should also be reported and made freely available. A potential "alert" system with the Cotswold Lakes Trust could also be put in place for people to use if concerned about a habitat or other issues in the area.

- **Engagement and increasing awareness:** The involvement of local community groups and individuals in biodiversity conservation should be encouraged (e.g. through volunteering or education). Activities would benefit biodiversity as well as human health and wellbeing. Particular efforts should be made to raise awareness of the ecological importance of habitats such as scrub (*refer to the Scrub Woodland Habitat Action Plan*) that are often undervalued but heavily relied upon by particular species. This would be particularly relevant to the local community to ensure that the local residents understand the issues within the CWP and take part in the identification and delivery of solutions.

[21] Public Space Protection Order, Local Government Association: https://www.local.gov.uk/sites/default/files/documents/10.21%20PSPO%20guidance_06_1.pdf
[22] CWP Bat Initiative: https://waterpark.org/cwp-bat-atlas-published/

- **Cross-boundary difficulties:** Authorities, organisations and groups should liaise at an early stage when developing relevant policies, action plans or projects so that complementary measures can be set out in the respective local plan/neighbourhood plan/strategies. Approaches and initiatives can then be managed in harmony to maximise benefits for biodiversity as well as the local community. Ecological networks (e.g. the Nature Recovery Network) also offer opportunities for joint approaches to be adopted.

  The Nature Conservation Forum should meet at least twice a year to discuss any cross-boundary issues and well as the benefits of working together. The regular meetings would also be helpful for Habitat Regulations Assessments (HRA) mitigation purposes.

- **Balancing the different uses within the CWP:** Biodiversity conservation needs to be balanced against recreational and development needs which are inevitably going to continue/increase in future years. Cleveland Lakes aims to demonstrate an example of balancing recreation with biodiversity conservation and more areas like this should be encouraged. Taking the example of water sports, such as water skiing, these will need to ensure that they consider the biodiversity value of a site and its surroundings. This can include ensuring that the banks of lakes are not disturbed or impacted significantly, ensure external lighting do not impact on vegetation features, and for the wash generated by boats is minimised. For example, there could be spatial and temporal zoning restrictions on certain activities to minimise the impact on biodiversity without unreasonable total banning.

- **Species re-introductions:** Future re-introductions and/or re-colonisations would benefit biodiversity and the local community and also offer nature-based solutions (such as improving the functioning of ecosystems). Much planning and community engagement will need to be carried out before any potential reintroduction to fully understand the attitudes of the local community and any concerns to be addressed.

  To enhance the resilience of ecosystems, native species may be re-introduced or be allowed to naturally re-colonise. Beavers have been introduced across the UK and are showing to have a positive effect on their environment. In 2005, 6 beavers were released into Flagham Fen at Lower Mill Estate in the CWP as the first population to be re-introduced in the UK. A small population still exists today. This trial provided valuable evidence and advice for further trials across the UK (*refer to Box 7*). With the vast patchwork of lakes, watercourses and associated wetlands within the CWP, there are ample opportunities for further re-introductions across the CWP. The re-introduction would benefit the local wildlife, offer nature-based solutions such as improving the functioning of ecosystems, as well as benefitting the local community and economy. Evidence from the past trial within Lower Mill Estate can be used to support any future re-introductions in the park.

Box 7- Beaver re-introduction

Beavers have been re-introduced across the UK. Lower Mill Estate was the first site in the UK where beavers were re-introduced. This provided information and evidence to inform and advise further trials across the UK in locations such as Cornwall (most recently, Plymouth in 2020), Forest of Dean, Devon, Kent, Wales and Scotland. The projects have seen huge benefits including improved water quality, the control of flooding and improved ecosystem functioning (acting as ecosystem engineers).

The future re-introduction of native species, such as the beaver, is a future action we should consider across the CWP.

Further information can be found at the following links:

https://www.wildlifetrusts.org/saving-species/beavers

https://www.forestryengland.uk/beavers-greathough-brook-forest-dean#:~:text=Why%20have%20beavers%20been%20introduced,meat%2C%20fur%20and%20scent%20glands

7. Strategic Action Plan

This Nature Recovery Plan includes an over-arching strategic action plan as well as a series of action plans for selected habitats, species and themes. The strategic action plan relates to general issues and opportunities that have been highlighted in gathering evidence for this plan (*see Section 6*) and also highlights actions that are common to a number of habitat and species action plans.

At this stage specific delivery partners have not been identified for each action as they are likely to require action by a wide range of partners both from within the Nature Conservation Forum (NCF) but also in the wider community – including businesses and landowners. It is intended that all actions are to be carried out by the delivery partners including those identified within Section 8.

7.1. Key strategic actions

Table 3: The key strategic actions relating to general issues and opportunities.

Section A - Policies and Strategies
A1: Ensure that the biodiversity and natural capital value of the CWP is recognised in relevant policy documents including local plans, minerals/development/waste transport plans, Green Infrastructure (GI), economic, visitor and Local Nature Recovery strategies, Nature Recovery Plans (e.g. Cotswolds NRP) etc., ensuring that projects provide multi-functional benefits.
A2: Maximise the opportunities for habitat enhancements within Green Infrastructure (GI) projects and initiatives. For example cycle ways should form part of multifunctional corridors, providing linkages for wildlife and people (*refer to Box 8*).
Section B – Designated Sites
B1: Ensure that the SSSIs in the CWP are appropriately protected, managed and enhanced through working with landowners, farmers, the public and decision makers.
B2: Review the boundaries of the Key Wildlife Sites (local Sites) post-re-notification.
B3: Progress work on minimising recreational disturbance and other harm towards the Special Areas of Conservation. This can be informed by Habitat Regulation Assessment (HRA) mitigation strategies.
Section C – Habitat management creation
C1: Encourage habitat management and creation to deliver nature recovery, informed by priorities and opportunities within the NRN mapping and local knowledge (referred to in the habitat action plans). Improved habitat management and habitat creation should be focused, where possible, on those areas that would provide the maximum contribution to strategic biodiversity initiatives including: • the Nature Recovery Network (as shown on the NRN habitat mapping) • B-lines • Natural Capital mapping or where local specialist knowledge, specific habitat/species plans or community requirements indicate.
C2: Restore natural processes and ecosystem functioning through low intensity, minimal management.
C3: Fully consider the importance of habitat mosaics to ensure structural diversity.
C4: Ensure that habitat connections are created and enhanced (e.g. hedgerows, field margins, water courses etc.) to maximise foraging, commuting and refugia opportunities for biodiversity.
Section D : Enhance ecosystem resilience
D1: Work in partnership with organisations that are within and border the CWP to progress current projects and initiatives and enhance landscape connectivity (e.g. connectivity to Braydon Forest, Severn Vale and Estuary, Swindon's Great Western Community Forest, Cotswold AONB etc.).

D2: Amend management practices in response to climatic changes.
D3: Manage biodiversity in a way that increases its ability to provide ecosystems services.
Section E: Built development and green infrastructure
E2: Encourage leisure facilities and developments to join the 'Visitor Giving Scheme' (*refer to Box 6*).
E3: Encourage developers to use the 'Local Habitat Bank' to achieve biodiversity net gain off-site (*refer to action G3*).
Section F: Antisocial behaviour and recreational pressure
F1: Direct funds from the proposed 'Visitor Giving Scheme' (*refer to Box 6*) partly towards managing anti-social behaviour within country parks, nature reserves and important habitats.
F2: Introduce Public Space Protection Orders (PSPO) to ensure that public spaces are free from anti-social behaviour and disturbance (e.g. ensuring dogs are on leads during the bird nesting season).
F3: Reduce recreational pressure on sensitive biodiversity sites through management and by providing alternative, less sensitive, destinations for visitors and local residents to visit and enjoy.
F4: Introduce way-marker discs, or similar, to advise dog walkers to keep dogs to specific areas and on leads. Alternative sites (e.g. dry land created through restoration schemes) could be used as designated dog walking areas.
Section G: Funding opportunities/contributions
G1: Exploit/work in partnership to access new funding opportunities (including off-site biodiversity net gain (BNG), great crested newt (GCN) district licencing and S.106 agreements) to enhance and create habitats. This should be explored whilst fully considering any restrictions
G2: Consider the setting up of a 'Visitor Giving Scheme' to contribute funds towards biodiversity projects and aid long-term biodiversity conservation management (*refer to Box 6)*.
G3: Work with the Gloucestershire Local Nature Partnership to set up a 'Local Habitat Bank' and a 'carbon credit scheme', with habitat enhance and creation opportunities governed by Natural Capital mapping and the NRN.
G4: Encourage local companies/organisations to sponsor a particular site (e.g. a lake) to secure site management funding and allow companies/organisations to gain environmental credentials.
Section H: Raising Awareness
H1: Distribute information detailing the biodiversity interest of the CWP and ways to safeguard the natural environment. This will help to discourage damaging activities including antisocial behaviour as well as increase an appreciation and respect for nature.
H2: Encourage visitors to engage with biodiversity conservation by promoting volunteering opportunities and creating accessible green spaces nearby towns and villages (e.g. Fairford).
Section I: Ongoing research, data management and monitoring
I1: Continue to survey and assess information on the biodiversity resource of the CWP and encourage landowners and volunteering schemes (e.g. WeBS) to record/report notable species' sightings to direct future management. Send all new data to the Local Record Centres (LRCs).
I2: Continue in line with any updates of Local nature Recovery Strategies and NRN mapping to identify areas for habitat restoration, creation and enhancement within and around the CWP.
I3: Encourage the public to send sightings to local record centres such as Gloucestershire Centre for Environmental Records (GCER) or Wiltshire and Swindon Biological Records Centre (WSBRC).
I4: Set up a local "alert" system for the public to use if concerned about a habitat or other issues.
I5: Following on from the SSSI re-notification process, review the designation of the nature reserves across the Gloucestershire and Wiltshire areas of the CWP to ensure that the designations are still justified and compliment/add to the SSSI interest features. Work with

landowners to ensure that they are aware of the wildlife value of their sites and how to safeguard and enhance the nature conservation value.
Section J – Strategic planning
J1: Following the publication of the CWP Nature Recovery Plan, set up regular meetings and workshops with the Nature Conservation Forum (NCF) to prioritise actions within this document over specific periods and identify the most efficient way for these to be undertaken (*refer to Box 9*).
J2: The CWP will work together with the surrounding landscape areas, including the Cotswold AONB, to identify the priority actions to be undertaken to enhance connectivity.

Box 8- Supporting Green Infrastructure projects

This Nature Recovery Plan will support Green Infrastructure (GI) projects within the local area. These are noted within the relevant GI strategies (e.g. Cotswold District's GI strategy) and include projects such as the strategic creation of cycle and pedestrian routes and canal restoration (e.g. Cirencester to South Cerney along the old canal route, Fairford to Lechlade and out of the CWP etc.). Wildlife habitats along the linear routes will also be enhanced to increase habitat connectivity and ensure multi-functional benefits for people and biodiversity. The projects will help deliver a wider range of ecosystem services such as flood prevention, improved water and air quality, climate regulation, pollination and recreation.

Box 9- Prioritising the actions: future workshops

The Nature Conservation Forum (NCF) should set up regular meetings and workshops to discuss how to prioritise the actions within this document, over specific periods. The meetings will also be useful for partners to discuss any other issues that have arisen.

The NCF should identify short-term goals (e.g. that can be achieved within 5-years of publication) and long-term goals (e.g. landscape scale projects over longer timeframes). For more complex actions, the NCF should try to identify how the action can be segmented so that incremental, self-contained elements of the full requirement can be delivered.

8. Delivering landscape scale enhancements within the CWP

Whilst working alongside key initiatives and projects within the local area, this Nature Recovery Plan strives to meet the vision and aims of the Nature Recovery Network (NRN).

The sections below outline the key projects/initiatives that could help deliver the Nature Recovery Plan.

8.1. Nature Recovery Network (NRN)

Box 10 - The Nature Recovery Network vision[23]

"Nature conservation in the last century succeeded in protecting some vital wildlife sites. But wildlife has still declined. Protected wildlife sites alone cannot meet the needs of wildlife or our society. To achieve that, we also need to provide effective protection for the many other places in the landscape that are still rich in wildlife despite the many pressures they face.
And we must invest time, effort, commitment and money into bringing wildlife back across a far wider area – stitching back together Britain's tattered natural fabric of wild land.
We need to create a Nature Recovery Network that extends into every part of our towns, cities and countryside, bringing wildlife and the benefits of a healthy natural world into every part of life.
Letting flowers bloom along road verges, installing green roofs across city skylines, planting more street trees to give people shady walks in the summer, encouraging whole communities to garden for wild plants and animals.
A network that brings wildlife into every neighbourhood would also provide fairer access to nature for people. Studies have shown the benefits of living close to nature, but many people are deprived of these benefits."

The NRN[23] is a fresh initiative and will be enshrined in legislation when the Environment Act is passed. Local nature recovery maps and associated Nature Recovery Strategies identify existing wildlife habitat as well as habitat restoration, enhancement and creation opportunities to improve connectivity and resilience.

Local Nature Recovery Strategies, together with local knowledge and professional judgement, can direct funding opportunities to areas or zones within the NRN where habitat restoration, enhancement and creation would deliver the greatest benefits (e.g. in terms of water and heat regulation, carbon sequestration, habitat connectivity etc.). This latter stage of the process is able to identify any constraints to habitat creation, such as the presence of historic features and/or existing valuable habitats.

Opportunity areas or zones are seen as priority because this is where habitat creation and better management can deliver multiple benefits that enhance connectivity, meet species' requirements and improve ecosystem functioning and resilience.

[23] The Nature Recovery Network vision: https://www.wildlifetrusts.org/sites/default/files/2018-06/Nature_recovery_network_final.pdf

As the CWP is located across boundaries, this CWP Nature Recovery Plan is working in line with NRN mapping carried out for both Gloucestershire, Wiltshire (also covering Swindon) and Oxfordshire[24,25]. Maps are provided within relevant habitat action plans together with the associated delivery actions.

The Nature Recovery Network mapping is available online as part of the Gloucestershire Natural Capital Mapping Project[26]. The mapping identifies opportunities for the enhancement of natural capital through mapping different ecosystem services such as flood relief, carbon storage and climate regulation. These factors will be taken into consideration through all restoration, enhancement and creation.

Please note that the NRN mapping for Wiltshire is in progress and the plan will be amended once the opportunity mapping is available.

8.2. Other related projects and initiatives

Natural England re-notification of an expanded CWP Site of Special Scientific Interest (SSSI)

Natural England has re-notified the CWP SSSI. The SSSI has been enlarged under section 28C of the Wildlife and Countryside Act 1981, as amended. The original CWP SSSI was notified in 1994 and comprises ten gravel pits that were designated due to the aquatic macrophyte populations and the supporting lime-rich waters. The re-notification expands the size of the current SSSI network and will secure the protection of important biodiversity features including nationally important breeding and non-breeding birds plus their supporting habitat, and aquatic plants. Parts of the previously notified CWP SSSI have also been removed from the re-notification under section 28D of the WCA. Very small parts of the earlier SSSI, amounting to just over 2ha, mostly relating to original mapping errors have been removed from the SSSI[10].

The re-notification will inform the work of land managers, farmers, planners and developers through ensuring activities, future minerals workings, waste, commercial, residential and leisure/recreation facilities fully consider the biodiversity interest of the expanded SSSI.

This plan fully supports the works of Natural England and will enable the nationally important wildlife resource to be safeguarded and enhanced.

B-Lines project[27]

The B-Lines project has recently been developed by Buglife to reverse the decline of pollinators. A series of 'insect pathways' have been mapped, linking up existing wildlife areas. In this way, wildflower-rich habitats can be restored and created in strategic locations to best enhance landscape level connectivity. This will provide large areas of valuable species-rich habitat to benefit pollinators as well as other species.

[24] The NRN mapping in Gloucestershire is produced by Gloucestershire Wildlife Trust on behalf of the Local Nature Partnership, Oxfordshire's mapping is led by Thames Valley Environmental Records Centre (TVERC), Wild Oxfordshire and the Berks, Bucks, Oxon Wildlife Trust (BBOWT) and mapping in Wiltshire is produced by the Wiltshire Wildlife Trust (in progress).
[25] Oxfordshire's Nature Recovery Network: https://www.wildoxfordshire.org.uk/biodiversity/draft-map-of-oxfordshires-nature-recovery-network/
[26] Gloucestershire Natural Capital Mapping Project: https://naturalcapital.gcerdata.com/
[27] B-Lines Project: https://www.buglife.org.uk/our-work/b-lines/

The project aims to restore and create 150,000 hectares of flower-rich habitat across the UK. This CWP Nature Recovery Plan will therefore work in line with the mapping of the B-line pathways within Gloucestershire, Wiltshire and West Oxfordshire when restoring and creating grassland habitats.

Flood Meadows Partnership[28]

This is a project that focusses on research, management, promotion and restoration of meadows in England and Wales. The partnership undertake monitoring to understand the responses of communities to climate change to help guide the conservation, management and restoration of floodplain meadows.

ELMS (Environmental Land-Management Scheme)[29]

The ELMS scheme is being developed by DEFRA. It is a potential payment system that replaces the Basic Payment and Countryside Stewardship schemes with one where payments will be based upon the delivery of public goods and the 25 year Environment plan.

Through the trial, a Natural Capital recording tool (The Land App) and methodology is being developed to score the condition of farmland in terms of public benefit based on environmental measures.

FWAG has led on this ELMS trial whilst working with partner organisations and the Farmers of the Upper Thames.

The work of ELMS can contribute towards the NRN and further inform the actions of this Nature Recovery Plan to help identify projects that would provide multiple benefits.

Green infrastructure (GI) projects and initiatives

Many GI projects and initiatives exist within the local area and further afield. This includes those listed above (e.g. the WILD project, NRN and the SSSI re-notification) as well as rural SuDS schemes, biodiversity net gain and specific community projects.

GI has been incorporated into policy and guidance documents including the GI strategies and Local Plans of Cotswold District Council[30], Wiltshire Council[31] and West Oxfordshire District Council[32].

A number of GI standards have also been produced including Building with Nature (BwN)[33]. This is a national benchmark for GI within the development process used throughout the design, planning, construction and long-term management. The BwN standards have been applied within the development process of Lower Mill Estate and are being applied for other proposals within the CWP.

[28] Flood Meadows Partnership: http://www.floodplainmeadows.org.uk/
[29] ELMS Trial: https://www.fwagsw.org.uk/environmental-land-management-system-trial
[30] Cotswold District Council Local Plan 2011 – 2031: https://www.cotswold.gov.uk/planning-and-building/planning-policy/local-plan-2011-to-2031/
[31] Wiltshire Council Local Plan (under review): https://www.wiltshire.gov.uk/planning-policy-local-plan-review
[32] West Oxfordshire District Council Local Plan: https://www.westoxon.gov.uk/localplan2031
[33] Building with Nature: https://www.buildingwithnature.org.uk/about

Natural Capital Mapping (Gloucestershire Local Nature partnership)[34]

The Gloucestershire Local Nature partnership and partners have collaborated and have developed a Natural Capital baseline for the county. This will help us to understand the value of the natural environment and to help decision-makers better consider the opportunities of a given area of land.

Box 11 Natural Capital Mapping

The Natural Capital Mapping is shown within the following website link, where the Nature Recovery Network mapping by the GLNP/GWT forms particular layers:

https://naturalcapital.gcerdata.com/

Gloucestershire Tree Strategy (Gloucestershire Local nature Partnership)

The Gloucestershire Local Nature partnership has also created a Tree Strategy for the county, ensuring "the right trees in the right place for the right reason"[35] This plan will work alongside these actions to best direct any new planting within the CWP.

Off-site Biodiversity Net Gain

Biodiversity Net Gain (BNG) is an outcome of new development. The aim is to ensure that developments deliver measurable biodiversity improvements, leaving the natural environment in a better state than it was before development, which was a key government objective in the 25-year Environment Plan. Measurable biodiversity net gain is a specific planning policy requirement of the National Planning Policy Framework (revised in 2018) and the Environment Bill 2021 (which makes changes to the Town and Country Planning Act 1990) proposes that a minimum 10% BNG is made mandatory for the majority of new development.

BNG involves the use of a metric (e.g. the Defra Biodiversity Metric 2.0), which uses habitats as a proxy to measure the number of 'biodiversity units' before and after development. The mitigation hierarchy is embedded into this approach with the aims to reduce biodiversity loss (avoid impacts in the first place), minimise impacts (retain/enhance important features and minimise loss on-site) and compensate for any residual losses (provision of new habitats on or off-site).

Where biodiversity net gain needs to be delivered off-site, a developer or a local planning authority can agree on where this is located. There will be a default biodiversity credits systems run by the government, however, more local habitat banks are likely to emerge over the coming year to receive funds also. The advantage of local investment trusts is that the money received would be spent locally and overhead cost are likely to be smaller. A local trust, Trust of Oxfordshire's Environment (TOE) already exists but only operates in a very small part of the CWP[36].

The Gloucestershire Local Nature Partnership is currently researching the options for a local habitat bank. It is envisaged that off-site biodiversity net gain contributions would secure the delivery of the Nature Recovery Network through the creation and restoration of habitats as part of a connected

[34] Natural Capital Mapping: https://www.gloucestershirenature.org.uk/ecosystem-natural-capital-mapping
[35] Gloucestershire Tree Strategy: https://f55bc3b4-dbac-4e43-8254-a45b43ca06b3.filesusr.com/ugd/5c4a64_93a71de396fc44b9a5c9dfd9f65fd97c.pdf
[36] Trust for Oxfordshire's Environment (TOE): https://www.trustforoxfordshire.org.uk/

landscape, which should be informed by the requirements for priority species, natural capital (and ecosystem services) and climate change.

Great Crested Newt District Level Licencing Scheme

The great crested newt district level licensing scheme has recently been developed by Natural England as a way of reducing the delays to development and to provide a more meaningful approach to great crested newt conservation at the landscape scale. This is an alternative approach to the traditional newt mitigation licencing for development projects. The main benefits to developers are increased certainty and fewer delays (i.e. not having to wait for a full great crested newt survey to be carried out within the restrictive season).

In Gloucestershire and Oxfordshire, a District Level Licencing Scheme is administered on behalf of the local planning authorities by NatureSpace and the habitat creation and monitoring work is carried out by The Newt Conservation Partnership (joint partnership between the Amphibian and Reptile Conservation Trust and Freshwater Habitats Trust)[37]. In Wiltshire and Swindon, the scheme is run directly by Natural England with habitat creation being contracted out to the Farming and Wildlife Advisory Group (FWAG).

The CWP has been identified as a conservation priority area for habitat creation as part of this scheme and funds will become available for more projects as the scheme builds up. The NRN wetland habitat mapping and local knowledge can aid the identification of priority areas for pond creation within the CWP. Delivery partners should be encouraged to put forward their sites.

8.3. Delivery Partners

There are a wide range of bodies and organisations that will play a crucial role in delivering the outcomes of the plan and ensure success. Based upon the action, specific stakeholders/partners will lead the delivery whilst working with other partner organisations.

Delivery partners include:

- Cotswold Lakes Trust (CLT) (formally the Cotswold Water Park Trust)
- Natural England (NE)
- Farming and Wildlife Advisory Group (FWAG)
- Environment Agency (EA)
- Gloucestershire Wildlife Trust (GWT)
- Gloucestershire Centre for Environmental Records (GCER)
- Wiltshire Wildlife Trust (WWT)
- Gloucestershire County Council (GCC)
- Oxfordshire County Council (OCC)
- West Oxfordshire District Council (WODC)
- Cotswold District Council (CDC)
- Wiltshire Council
- Gloucestershire Rural Communities Council (GRCC)
- Thames Water
- RSPB
- Ecological consultants
- Leisure operators (e.g. hotels)
- Developers
- Mineral companies

[37] Great crested newts district licencing scheme: https://naturespaceuk.com/

- Land owners including farmers
- Local residents
- Parish councils
- Local universities/colleges (e.g. the Royal Agricultural University and the University of Gloucestershire)
- Schools
- Businesses

9. Wider connections

It is vital that connections to the surrounding landscapes inform the management within the CWP. In this way, we can ensure that there are robust links to improve the functional connectivity for species and to also maximise the provision of ecosystem services. In the face of climate change, these connections are essential to allow wildlife to adapt and move in response to climatic events and to form a resilient habitat network.

The CWP provides an important link within the landscape (*refer to Map 6).* The Nature Recovery Mapping demonstrates this and it is now time to improve connectivity on a landscape level.

North-South connections

The CWP forms a strong link between Cotswolds AONB (Area of Outstanding Natural Beauty), to the north, and Braydon Forest and the Great Western Community Forest, to the south. Braydon Forest and the Community Forest then connect to the North Wessex Downs AONB further south.

The Cotswold Water Park and the Cotswolds National Landscape (AONB) have ecological links and this can be illustrated by the Nature Improvement Areas (NIAs), for both areas, shown in Map 6. These links reflect river valleys joining the plain of the upper Thames gravels. It is important to enhance these connections and to carry out management that is complementary to measures outlined within the upcoming Cotswold AONB Nature Recovery Plan.

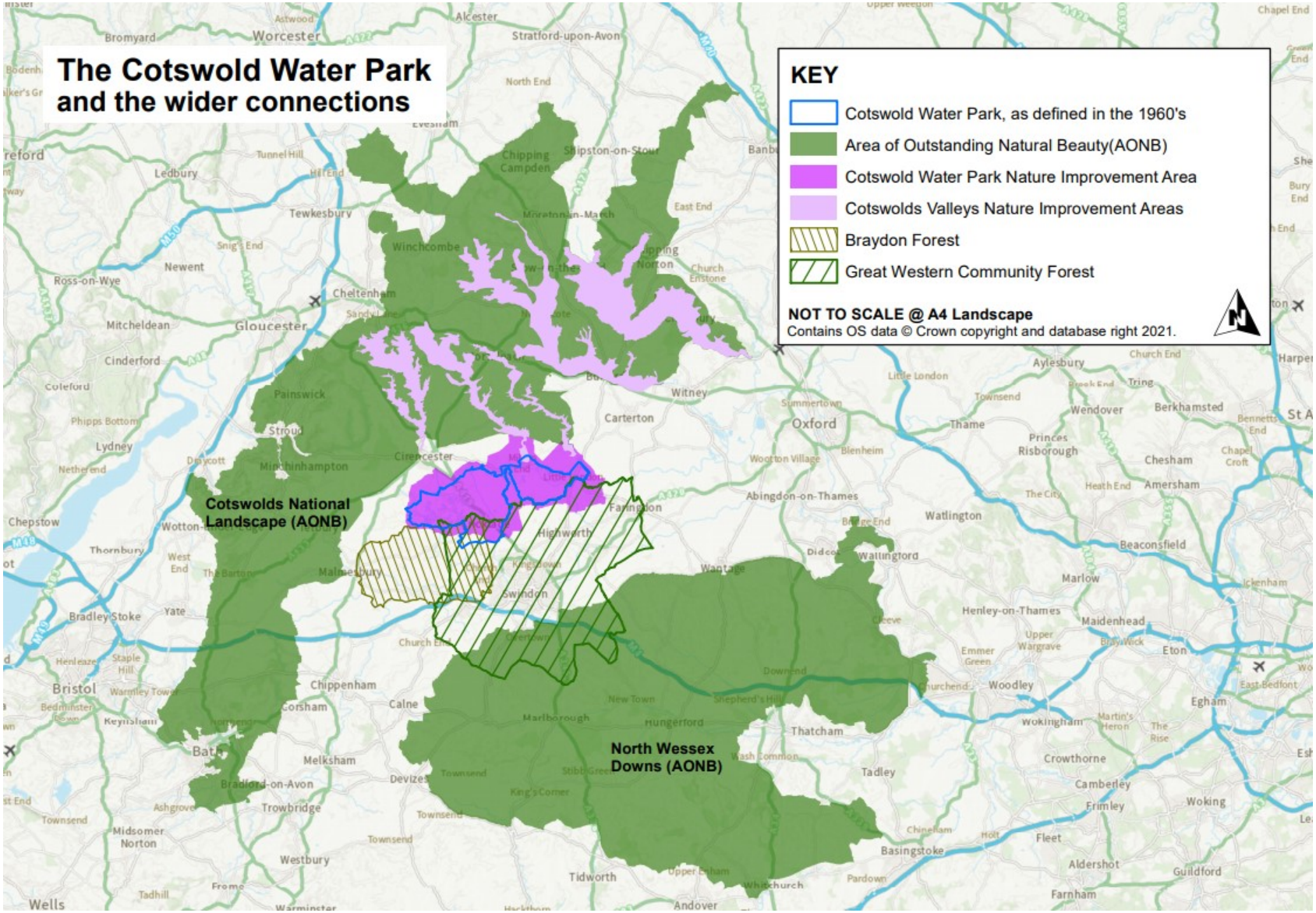
Furthermore, the CWP has been identified as a “bridging area” within the Big Chalk project, linking the Cotswolds AONB with the North Wessex Downs AONB. The project is aimed at linking together the calcareous (limestone and chalk) protected landscapes across southern England to help nature recovery and adapt to climate change. The work within the CWP therefore aims to support this.

As highlighted above, other links are present such as those with Braydon Forest and The Great Western Community Forest. Braydon Forest is a biodiversity hotspot where habitat management and restoration has taken place for years. The area comprises a matrix of species-rich wildflower meadows, ancient woodlands and hedgerows. A great number of habitat restoration, enhancement and creation projects have also been carried out within The Great Western Community Forest to improve the green infrastructure and ecological value of the area. It is therefore important to strengthen these connections to ensure a fully functional ecosystem.

Other connections

Management should also strengthen connections to the Severn Vale & Estuary, located to the west, as well as connections eastwards along the River Thames towards the wetlands and wildflower meadows within Chimney Meadows National Nature reserve (NNR).

Map 6: The Cotswold Water Park and the wider connections to the surrounding area



10. Habitat and species priorities within the CWP

The specific habitat and species that were selected for the action plans were identified within a workshop that was held with the Nature Conservation Forum in January 2020. The following information details the habitat and species that were chosen to be included within this plan (as habitat and species action plans).

10.1. Key Habitats

All habitats present within the CWP was compiled and reviewed. The criteria for selecting habitats for which action plans have been prepared are:

- Priority habitats Listed under Section 41 of the NERC Act 2006 in England;
- Other habitats that are considered to be locally distinctive;
- Habitats that support a wide range of species.

Table 4: The key habitats within this CWP Nature Recovery Plan assessed against the latest review of the UK broad and priority habitats, protected under the NERC Act 2006 (Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 in England - "Habitats of Principle Importance for Biodiversity Conservation").

CWP focal habitats	Relevant category within the Nature Recovery Network (NRN)	English List (S41 NERC)	
		Broad Habitat	Habitat Name
HAP: Standing Open Water (ponds, canals and lakes)	Wetland NRN	Standing Open Water and Canals	Eutrophic Standing Waters/ Mesotrophic Lakes/ Ponds/ Oligotrophic and Dystrophic Lakes
HAP: Fen, Marsh and Reed Swamp	Wet Core Habitat NRN	Fen Marsh and swamp	Lowland Fens/ Reedbeds
HAP: Rivers and Streams (including ditches)	Wet Core Habitat NRN	Rivers and streams	Rivers Streams
HAP: Scrub woodland	Woodland NRN	Broadleaved, Mixed and Yew Woodland	Wet Woodland/ Lowland Beech and Yew Woodland/ Lowland Mixed Deciduous Woodland

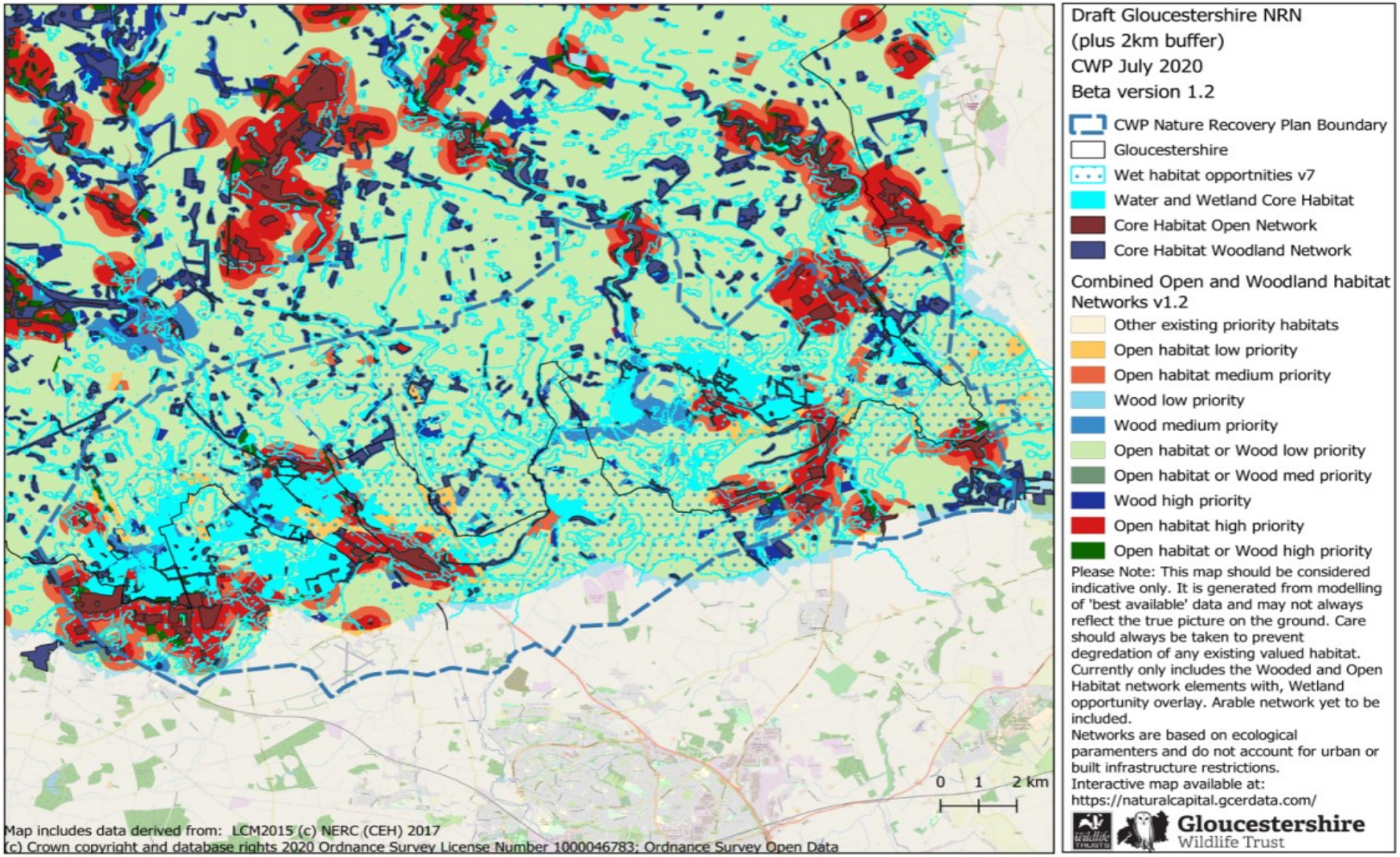
CWP focal habitats	Relevant category within the Nature Recovery Network (NRN)	English List (S41 NERC)	
		Broad Habitat	Habitat Name
HAP: Lowland Neutral Grassland	Open Habitat NRN	Neutral grassland	Lowland Meadows
HAP: Active Sand and Gravel Quarries HAP: Bare Ground and Early Successional habitats	Not included	Inland Rock	Open Mosaic Habitats on Previously Developed Land

Of the habitats selected, several are identified within the NRN. The habitat action plans of those associated with the NRN will specifically refer to potential opportunity areas within Gloucestershire (*refer to Map 7).* The actions for habitats that are not part of the NRN mapping will still aim to create and enhance habitat whilst fully considering habitat connectivity within the landscape.

Objectives for Habitat Action Plans

- To acquire comprehensive knowledge of the extent, distribution and condition of habitats within the CWP;
- To ensure existing habitats are protected, appropriately managed, restored and enhanced in line with the NRN, whilst considering the requirements of site-specific species;
- To allow for the adaptive management in response to climatic changes;
- To raise public awareness of the importance of the key habitats.

Map 7: Gloucestershire Nature Recovery Network (NRN) opportunity mapping, available at: https://naturalcapital.gcerdata.com/



10.2. Key species

The important species present within the CWP were compiled and reviewed. The criteria for selecting species for which action plans have been prepared are:

- Priority species, listed under Section 41 of the NERC Act 2006;
- Other species or species groups that are considered to be locally distinctive and important in the CWP.
- Specialist species with specific requirements that may not be supported through general habitat management.
    - Barberry Carpet Moth
    - Dragonflies and Damselflies (Odonata) (group)
    - Bats (group)
    - Fish : wild and stocked populations (groups)
    - Terrestrial and riparian mammals (group)
    - Black Poplar
    - Breeding water birds (group)
    - Wintering water birds (group)
    - Snakes Head Fritillary (species statement)
    - Marsh Helleborine (species statement)
    - Stoneworts (Charophytes) (species statement)
    - Nightingale (species statement)
    - Bittern (species statement)
    - Brown Hairstreak and Grizzled Skipper (species statement)

Objectives for species

- To protect and safeguard existing populations of species/species groups of conservation significance;
- To enhance and create habitat for species of conservation significance nearby known populations to ensure connectivity;
- To continue to monitor specific species/species' groups where appropriate and adapt management accordingly.

10.3. Thematic action plans

Alongside the habitat and species action plans there are a set of thematic action plans, which relate to more general issues but are not of sufficiently strategic nature to be included in the strategic action plan.

The species, habitat and thematic action plans should be read in conjunction with the overarching action plan in Section 7.

Table 5: Cross-cutting themes where the associated actions can benefit a range of species and improve the landscape multi-functionality.

Thematic action plans	Reason
Invasive Non-Native Species (INNS)	INNS have adversely impacted on native species within the CWP. Species include New Zealand pygmyweed (*Crassula helmsii*), American mink (*Neovison Vison)*, signal crayfish (*Pacifastacus leniusculus*), himalayan balsam (*Impatiens glandulifera*), Japanese knotweed (*Reynoutria japonica*), Canada goose (*Branta canadensis*) and Egyptian goose (*Alopochen aegyptiaca*). Future introductions of INNS are highly likely due to species being able to spread easily into the CWP by watercraft along river corridors or by recreational equipment.
Built structures	Existing built structures should be protected to safeguard protected and priority species (e.g. bats and birds). Enhancements can be provided to further support biodiversity.
Green Infrastructure	The incorporation of high quality green infrastructure can improve the multi-functionality of the landscape, benefiting local communities and biodiversity through habitat creation and improving connectivity.
Re-introductions	The reintroduction of beavers will be a future consideration to help improve ecosystem resilience.

10.4. Targets

Habitats:
Numerical targets and timescales are not included within all habitat action plans. Appropriate targets will be driven by the NRN mapping, providing a given percentage increase over the existing habitat coverage.

Species:
Numerical targets and timescales are not included within all species action plans and statements, given ongoing difficulties with recording and monitoring.

11.Habitat Action Plans (HAP's)

Each habitat action plan includes the following information:

- Habitat definition and importance
- Relevance to NRN (if included within the NRN)
- Key issues/threats affecting the habitat type
- Priorities/directions for future management and key actions to be taken
- Relevant habitat and species action plans/statements
- Further links to online guidance

11.1. HAP: Standing Open Water (lakes, ponds and canals)

Priority Habitat Description

Broad habitat: Standing Open Water & Canals[38]

Ponds: permanent and seasonal standing water bodies up to 2ha in extent;

Mesotrophic Lakes: relatively infrequent in the UK and largely confined to the margins of upland areas in the north and west. Characterised by having a narrow range of nutrients, the main indicative ones being inorganic nitrogen (N) and total phosphorus (P);

Eutrophic Standing Waters: highly productive as plant nutrients are plentiful, either naturally or as a result of artificial enrichment. Characterised by having dense, long-term populations of algae in mid-summer, often making the water green. Beds covered by dark anaerobic mud, rich in organic matter.

Relevant action plans:
Fen, Marsh, Reed Swamp
Sand and Gravel Quarries
Bare Ground and Early Successional Habitats
Rivers and Streams
Scrub Woodland
Wintering Water birds
Breeding Water birds
Dragonflies and Damselflies (Odonata)
Fish (Wild and Stocked populations)
Bats
Black Poplar
Invasive Non-Native Species
Stoneworts (Charophytes) Species Statement
Nightingale Species Statement
Bittern Species Statement

1. Importance of the habitat within the CWP

The vast patchwork of 182 lakes is the defining feature of the CWP, created as a result of mineral extraction and restoration. The lakes are mostly characteristic of eutrophic and mesotrophic waters[38], with the CWP hosting the most extensive marl lake system in Britain, supporting distinctive aquatic plant communities and internationally and nationally important water bird populations. Marginal habitats (e.g. reed-bed and carr woodland) exist alongside the standing open waters and provide foraging, commuting, shelter and breeding opportunities for a range of species including invertebrates, amphibians (e.g. great crested newts), water birds and mammals.

The derelict Thames and Severn Canal runs through the CWP and acts as a wildlife corridor, connecting with the natural watercourses. Ponds are present and new ones, if designed suitably, can benefit biodiversity.

[38] UK Priority Habitat description for Standing Open Waters and Canals:

- https://hub.jncc.gov.uk/assets/dec49c52-a86c-4483-90f2-f43957e560bb

2. Relevance to the Nature Recovery Network (NRN)

Standing open waters are shown as existing features within the NRN. However, all wetland habitats fall into the 'Wetland' opportunities category. Therefore specific local level project mapping is further required to identify opportunity areas for standing open water only.

For now, please refer to the actions where there is specific reference to local opportunity areas, identified through local knowledge. The actions also refer to the need for updating the data and mapping the opportunity areas for standing open water features specifically, as the up-to-date data is not currently available.

3. Issues/ threats

- **Land use changes:** including development, non-mineral restoration (e.g. canal restoration), recreation and agricultural intensification impacting biodiversity.
- **Non-wildlife friendly extraction, restoration and management:** in some circumstances quarries have been restored into uniform, ecologically poor habitat with unsuitable long-term management, reducing opportunities for species;
- **Invasive species:** introductions of alien species to lakes;
- **Bird strike:** habitat creation needs to minimise the risk of bird strike
- **SSSI re-designation:** the re-designation would mean that Natural England have more control over a wider range of activities related to the lakes.
- **Natural succession:** habitats develop over time and later successional stages of vegetation form if there is a lack of management. Management is required to ensure that a range of successional states are present to provide different habitats for species.

4. Priorities and opportunities for future management

Given the risk of bird strike, lake creation opportunities may be limited around RAF Fairford, in the central section of the CWP, and controlled by MOD restrictions. Efforts should therefore be directed towards protecting and enhancing the existing lakes and creating wildlife ponds[39] to best improve the biodiversity interest, ecosystem functionality and habitat connectivity.

Ponds should be designed to benefit a range of species including invertebrates (e.g. dragonflies) and great crested newts.

Every opportunity should be taken to create new lakes and associated wetland habitats in areas that increase connectivity, this would also bring other benefits for the local economy and tourism industry.

The SSSI re-notification must be considered within all management decisions associated with the lakes, if they affect the interest features. The re-notification encompasses the full extent of open water and associated habitats that are necessary to maintain the features of species interest.

Funding opportunities should be focused on where habitat restoration, enhancement and creation would best deliver multiple benefits such as aiding habitat connectivity and delivering ecosystem services. This should be directed by local mapping and priorities.

[39] Creation of ponds to minimise bird strike: https://freshwaterhabitats.org.uk/wp-content/uploads/2013/09/BIRDSTRIKE.pdf

5. Key Actions
5.1: Enhance existing standing open waters ensuring habitat management suits the given species' assemblages at the site. Habitat management should include the provision of shingle areas, scrapes, islands/rafts, irregular lake/pond profiles and the enhancement of marginal habitat alongside the canal (*refer to Section 6 of this HAP*).
5.2: Update the wetland habitat data within the CWP so that local project mapping can be carried out. Use this to further identify and map opportunity areas.
5.3: Ensure standing open water creation (e.g. ponds and lakes) is in line with local priorities and knowledge (*refer to Section 6 of this HAP)*: Pond creation: -Ponds can be created to benefit GCN (subsequently benefiting other species such as dragonfly etc.). These can be located within areas that already offer of suitable terrestrial habitat for GCN[40], including areas on council owned land (e.g. Cotswold District Council- though this is limited). -Pond creation within the central section of the CWP should be encouraged as this will aid connectivity and not pose a bird strike risk. Lake creation: -Lakes with associated wetland habitat should be created to compensate any lake infilling around RAF Fairford. This should be strategically located to best benefit biodiversity (e.g. expanding wildlife rich habitat sites), at specific locations between Clattinger Farm and Lechlade.
5.4: Use the available funding opportunities (e.g. through the Great Crested Newt District Licencing Scheme) to deliver pond creation and ensure ongoing maintenance.
5.5: Promote the value of standing open water habitats (in particular wildlife ponds) and encourage the local community to create their own. Garden wildlife ponds can be promoted through parish newsletters and websites, providing information on the pond design and creation (*refer to Section 6 of this HAP and additional information*).
5.6: Create pond dipping platforms around selected lakes to raise awareness of freshwater biodiversity and to generate income (e.g. encouraging school groups to visit) for further habitat management in the CWP.
5.7: Ensure that the management and activities on each lake are in accordance with the specific Lake Management Statement, written by landowners and approved Natural England (NE). These management statements can be amended by agreement if appropriate, and NE will review the statement with landowners after five years to ensure it is still fit for purpose. Lake owners will have to apply to NE for consent for any activities not described in the lake management statement that are in the ORNECs list.
5.8: Assess the water quality of waterbodies alongside the associated agricultural practises in adjacent land of a given sample/survey. Improvements to water quality can be directed towards specific locations, to benefit charophyte populations and wildlife.

[40] Nature Space, The Risk Zones Explained: https://naturespaceuk.com/gismaps/impact-risk-map/

6. Habitat management guidance
6.1: Shingle areas: Increase the provision of vegetation-free shingle areas to suit the species assemblage (*refer to Breeding and Wintering Water Birds SAP's and Stonewort Species Statement*) by creating shingle areas without vegetation and free from human (and dog) disturbance. Low intensity management (e.g. hand weeding or rakings) is required to keep free of vegetation. Management will need to be mindful of Crassula helmsii to ensure the species does not dominate around the water edges in the future.
6.2: Island maintenance and creation[41]: Create new and manage existing islands/rafts within the lakes as these provide nesting/breeding and loafing sites away from land based predators. Ensure low causeways to allow for future mechanical access for maintenance (e.g. regrading of island gravels). -Ensure islands have a mosaic of vegetation (e.g. reed-beds on the margins, a low density of willow) and some bare ground. More edge habitat can be provided through creating islands that are narrow and long (similar to those at Shorncote reedbeds). Allow for natural succession on selected larger islands to provide carr habitat (*refer to Scrub Woodland HAP*). Island structure should be specific to species' requirements on site.
6.3: Pond/lake profiles[42]: Create irregular lake and pond profiles to enhance sites for biodiversity. For example, water bodies should have variation in lake and pond depth. The introduction of fish should be avoided and the water body should be left to colonise naturally for 2 years.
6.4: Pond creation should refer to the Pond Creation Toolkit (guidance by the Fresh Water Habitat Trust)[43] and guidance provided by The Amphibians and Reptiles Conservation Trust. This includes the creation of submerged shoals and bars to encourage rare plants (*refer to Stonewort Species Statement*) and the creation of a network of ponds of varying profiles and sizes in close proximity. The Great crested Newt Conservation Handbook also refers to suitable pond and terrestrial habitat guidance for GCN[44]
6.5: Marginal habitat (including around lakes and along canals): Avoid excessive over-shading by trees through measures such as coppicing and felling of trees. Enable natural regeneration of native species but still ensure open conditions.
6.6: Buffer zones: create at least 10metre buffers zones (i.e. protected from high disturbance and comprise native, marginal vegetation) around lake to minimise disturbance and erosion.

[41] Island maintenance and creation:

- https://www.rspb.org.uk/our-work/conservation/conservation-and-sustainability/advice/conservation-land-management-advice/artificial-islands/
- http://ww2.rspb.org.uk/Images/Designofrafts_tcm9-212589.pdf

[42] Pond/lake profiles:

- https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/
- https://www.arc-trust.org/Pages/Category/gardens-and-ponds
- https://www.arc-trust.org/Handlers/Download.ashx?IDMF=8b3624ae-3aec-4f00-a362-f41d70fe450c
- https://www.froglife.org/wp-content/uploads/2013/06/GCN-Conservation-Handbook_compressed.pdf

[43] Pond Creation Tool Kit (Freshwater Habitats Trust): https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/

[44] Great Crested Newt, Conservation Handbook: https://www.froglife.org/wp-content/uploads/2013/06/GCN-Conservation-Handbook_compressed.pdf

Species Statement: Stoneworts (Charophytes)

Stoneworts (Charophyta group) are complex algae that grow submerged in freshwater habitats. They are early colonisers in newly formed water bodies and play an important role in the ecosystems; enhancing water clarity, aiding sediment stabilisation and providing habitat and food for other organisms.

Of the 28 species of Stonewort within the UK, more than half are now listed as threatened or endangered in the Red Data Book of British Stoneworts or nationally scarce[45].

The CWP is a nationally important site for stoneworts, supporting at least 11 species in total, including 1 Vulnerable and Nationally Rare, and three Nationally Scarce species. Some lakes have been designated as SSSI's due to the present aquatic macrophyte communities (including Stoneworts). Notable stonewort species present within the CWP include the lesser bearded stonewort (*Chara curta*), the pointed stonewort (*Nitella mucronata*) and the starry stonewort (*Nitellopsis obtusa*).

Given that stoneworts are particularly sensitive to water quality and intolerant to nutrient-rich conditions, eutrophication can be harmful and can lead to a faster succession of other species. Reduced sunlight availability and the accumulation of leaf litter increases the nutrients within the water body and leads to eutrophication which limits stonewort growth. Excessive tree cover can also reduce wind action and allow for stratification to develop which can be detrimental.

Guidance for habitat enhancement and creation[46],[47]:

Clean water: ensure ponds/lakes have clean water sources (e.g. groundwater, rainwater or clean surface-runoff). Ensure that all gravel extractions (and any infilling) do not disrupt the lateral flow of water (as this can lead to nutrient build up and poor water quality). Avoid inputs from streams or ditches. Minimise or control use of the lake edge and the lake itself by geese (import of nutrients) through reduced management of vegetation to allow scrub to develop to replace large areas of grass. Preference could be given to fishing practises of low intensity (e.g. game fishing) rather than intensive fisheries (e.g. carp and coarse fisheries) in lakes which demonstrate the greatest sensitivity (e.g. those with the best stonewort diversity).

Bare substrate: create bars and shoals in lakes and ponds, both at the margins and in shallow water. These should be kept clear of other vegetation (e.g. reedbeds) and sediments.

[45] Red Data Book of British and Irish Stoneworts : https://www.nhm.ac.uk/our-science/data/uk-species/checklists/NBNSYS0000000023/version1.html

[46] Stonewort habitats, ecological requirements and conservation: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290960/scho0309bpsd-e-e.pdf

[47] Creating ponds and lakes for Stoneworts: https://freshwaterhabitats.org.uk/wp-content/uploads/2013/09/Stonewort_V2-Feb15.pdf

Minimise tree shade: manage marginal trees so there is not a dense canopy over the waterbody to ensure sunlight availability and avoid the accumulation of leaf litter. Design lakes/ponds so that shoals exist beyond the overshadowed area.

Site specific management: ensure above management measures are implemented in lakes and pools to suit specific species requirements.

Species Statement: Brown Hairstreak and Grizzled Skipper

The Brown Hairstreak and Grizzled Skipper butterflies are both found within the boundary of the additional area of proposed SSSI habitat. Both species are Section 41 species of principal importance under the Natural Environment and Rural Communities Act, Priority Species in the UK Biodiversity Action Plans and are also listed as vulnerable under the GB Butterfly Red List (see below for relevant website link).

The Brown Hairstreak and Grizzled Skipper are both present within the boundary of the re-notified SSSI habitat within the CWP.

Both species have suffered from long-term declines in distribution and abundance since 1976. There was a slight increase in occurrence for both species between 2005 and 2014.

Management within the SSSI area of the CWP will need to ensure that the species' habitat requirements are specifically considered to ensure their continued presence within the landscape.

Butterfly Conservation can offer management advice to landowners to ensure that habitat is enhanced, created and maintained for both species.

Further information can be found at:

Brown Hairstreak Factsheet, Butterfly Conservation:
https://butterfly-conservation.org/sites/default/files/1.brown-hairstreak-species-factsheet.pdf

Hedgerows for Hairstreaks, Butterfly Conservation:
https://butterfly-conservation.org/sites/default/files/habitat-hedgerows-for-hairstreaks.pdf

Grizzled Skipper Factsheet, Butterfly Conservation:
https://butterfly-conservation.org/sites/default/files/grizzled-skipper-psf.pdf

The Butterfly Red List of Great Britain, Butterfly Conservation:
https://data.jncc.gov.uk/data/08e25223-1b26-4c73-978c-b36bfc5294dc/SpeciesStatus-12-Butterfly-WEB-2010.pdf

11.2. HAP: Fen, Marsh, Reed Swamp

Priority Habitat type: Fen, Marsh and Swamp[48]

Reedbeds: 'wetlands dominated by stands of the common reed *Phragmites australis*, wherein the water table is at or above ground level for most of the year'

Lowland Fens: 'peatlands which receive water and nutrients from the soil, rock and ground water as well as from rainfall: they are minerotrophic'

Relevant action plans:

Standing Open Water
Wintering water birds
Breeding water birds
Bats
Stoneworts (Charophytes)
Bittern Species Statement

1. Importance of the habitat within the CWP

Fen, marsh and reed swamp exist as marginal vegetation on the fringes of waterbodies such as lakes, ponds, rivers, wet ditches and pools[48]. The habitats are ground-water fed and are permanently, seasonally or periodically waterlogged. The vegetation sits on peaty or mineral soils. Emergent marginal vegetation, such as reeds and sedges, are often present within shallow slow moving waters.

Wetland habitats have high ecological interest, supporting an array of notable species including bittern, reed bunting, bats, otter, water vole and invertebrates (e.g. dragonflies and aquatic beetles). The habitats are also crucial in providing ecosystem services (e.g. flood management, carbon storage, and air filtration), playing an important role in tackling climate change.

Once covering large areas of England, wetlands now occur in small, fragmented areas across the landscape. In spite of this, there has been an increasing provision of wetlands within the CWP. Cleveland Lakes and Shorncote Reed-bed now host large areas of wetland within a habitat mosaic of carr woodland, wet grassland and scrub.

Wetlands have a high capacity to sequester and store carbon. There is evidence of this within the Ecosystem Service mapping[49] carried out by the Gloucestershire Local Nature Partnership, where wetland habitats scored 10/10 for carbon storage (higher than most other habitats and in line with broadleaved and mixed woodland). This emphasises the importance of enhancing and creating wetland habitat within and around the CWP.

[48] UK Bap Priority Habitat Descriptions: https://hub.jncc.gov.uk/assets/6fe22f18-fff7-4974-b333-03b0ad819b88#UKBAP-BAPHabitats-44-Reedbeds.pdf
[49] Ecosystem Service Mapping, Gloucestershire Local Nature Partnership: https://naturalcapital.gcerdata.com/

2. Relevance to the Nature Recovery Network (NRN)

Fen, marsh and reedswamp are within the 'wetland' habitat category of the NRN. However, all wetland habitats fall into the 'Wetland' opportunities category. Therefore further local level project mapping is required (*refer to the Standing Open Water HAP*).

Please refer to the actions where there are specific references to local opportunity areas, identified through local knowledge. The actions also refer to the need for updated mapping data for reed-beds and fens as existing data is old/incomplete/inaccurate.

3. Issues/ threats

Wetland loss: excessive land drainage, intensified agriculture, development and recreational activities can fragment or reduce the size or quality of existing sites. This impacts on the ecological functionality and reduces the suitability for dependent species (such as bittern), oxidation of sequestered carbon contributes to greenhouse gases/climate change;

Eutrophication: Agricultural run-off and other nutrient sources, such as sewage discharges, alters plant communities and reduces species diversity;

Inappropriate management: sites can be neglected, leading to succession into woodland and scrub. Also inappropriate management is carried out where aesthetics are being put ahead of biodiversity (e.g. mowing and planting trees unsuitably close to the water edge leading to over shading and other impacts).

Unsuitable quarry restoration: unsuitable bank profiles of restored gravel quarries can limit the suitability for wetland plant communities (usually the older developments where nature conservation was ill-considered during restoration design).

Proximity to disturbance factors: access from dry land increases the risk of disturbance from human activity, dogs etc. on inhabiting fauna such as low/ground nesting birds.

4. Priorities and opportunities for future management

Wetlands offer natural solutions for water/flood management and carbon storage. In light of the widespread decline of wetlands elsewhere in the UK, management should continue to maintain, restore and enhance existing wetland in the CWP.

A diverse vegetation structure and subsequently enhanced species richness can be ensured through minimal appropriate management. In terms of reed-beds, a combination of older, drier stands as well as early successional areas can support a greater diversity of species, including invertebrates. Ditches, pools and ponds can also be created and enhanced within the wetland habitats to improve structural diversity and support aquatic invertebrates and plants. Wetland habitats are dynamic ecosystems and habitat mosaics would ensure a range of successional stages and features for dependent species. Rotational management across the CWP as a whole can ensure a range of successional ecotones and diversity.

Reed-bed can be created along ditch networks to act as a habitat corridor. Wide ditches will be encouraged within restoration schemes (e.g. mineral restoration plans) and existing ditches can also

be widened. Reed-bed habitat can be created along the ditches (and even other water bodies such as along the River Thames) to create a network of smaller areas of reed-bed, enhancing habitat connectivity between the larger areas of reed-bed in the CWP. This will benefit species such as water voles, birds (e.g. reed warbler and bittern) and invertebrates.

5. Key Actions
5.1: Protect, enhance and create fen and reed-bed habitat within suitable locations. Use local knowledge/judgement to direct funding (e.g. through funding from off-site BNG and Great crested Newt District Licencing) to opportunity areas that would most enhance landscape connectivity and ecosystem resilience. Ensure the projects are informed by species' requirements (e.g. breeding bitterns prefer reed-beds of at least 20 ha in extent[50]). Opportunity areas include: -Protect and enhance existing reed-beds in the Western and Eastern section of the CWP, ensuring a diverse structure (e.g. Swillbrook Lakes, Roundhouse Farm, Eysey and Coln Country Park); -Ensure future mineral restoration schemes include wide ditches along the fringes of sites where reed-beds can be created. This should be encouraged during the planning/design process of the restoration schemes (e.g. encourage ditches within upcoming restoration projects around Down Ampney, Eysey and Marston Meysey). -Create reedbed along the route of the River Thames within the central section of the CWP. This will connect to future reed-bed creation within mineral restoration schemes (outlined above). If possible, continue to create reed-bed along the Thames corridor to connect to Chimney Meadows NNR.
5.2: Create ponds within existing reed-bed, fen and marsh *(also refer to standing open water HAP*). Ensure the following: -Locate ponds in areas of uniform stands of emergent plants, on reed-bed margins, away from existing ditches or pools. -Create and manage ponds on rotation to ensure diversity of successional stages. -Consider the preferences of water vole when designing ponds as they can be useful as refuges.
5.3: Ensure effective long-term management is outlined within mineral restoration plans to avoid the excessive growth of particular plant species, such as willow, over time. This must be ensured within the planning process through a long-term Landscape and Ecological Management Plan (LEMP).
5.4: Enhance the reed-bed habitat for relevant key species such as bittern by stocking lakes with eels (e.g. at Shorncote Reedbed and Cleveland lakes)
5.5: Ensure that all management is in-keeping with the surrounding habitats.
5.6: Further monitor the abundance and distribution of any notable species within relevant suitable habitat (e.g. bittern and reed bunting) (this would also be ensured through the requirement of a LEMP- as stated within action 5.3.).

[50] Reed-bed design, 2004: https://www.rspb.org.uk/globalassets/downloads/documents/conservation--sustainability/lm-advice/reedbed_design_and_establishment.pdf

6. Habitat Management guidance
6.1: Enhancing existing reed-beds[51]: -Carry out rotational cutting on a 4-7 year cycle; -Remove cuttings to avoid excessive accumulation of litter and nutrients. -The reeds could be used for thatching or other local artisan products, or harvested for biofuel. *-More information is available at:* http://ww2.rspb.org.uk/Images/bringing_reedbeds_to_life_tcm9-385799.pdf
6.2: Extending existing reed-beds[52]: -Ensure shallow water levels (from 5cm to 1m deep), an existing reed source and cease existing management on target area. Control competition through cutting back existing vegetation. *-More information is available at:* https://assets.sussexwildlifetrust.org.uk/create-and-manage-reedbeds-2.pdf
6.3. Creating new reed-bed[53]: -The planting of new reed-bed should follow the guidance in : http://ww2.rspb.org.uk/Images/bringing_reedbeds_to_life_tcm9-385799.pdf -Transplant small reed turves from existing and well-established reed-beds (Cotswold Lakes Trust to advise on appropriate method).

[51] Enhancing reed-beds, RSPB: http://ww2.rspb.org.uk/Images/bringing_reedbeds_to_life_tcm9-385799.pdf
[52] Extending reed-bed: https://assets.sussexwildlifetrust.org.uk/create-and-manage-reedbeds-2.pdf
[53] Creating reed-bed, RSPB: http://ww2.rspb.org.uk/Images/bringing_reedbeds_to_life_tcm9-385799.pdf

Species statement: Bittern

The Bittern is a declining amber-listed species of conservation concern in the UK[1]. In the 19th century, Bitterns became extinct as breeding birds in the UK due to wetland drainage and hunting. Recorded later in 1911 in Norfolk, the species slowly re-colonised and the population grew. However, numbers have been fluctuating since.

Breeding bitterns are confined to lowland marshes and reed-beds where they feed upon aquatic animals including fish, amphibians and invertebrates. Breeding bitterns require extensive, wet reedbeds (20 ha minimum), with up to 30% open water in a network of dikes and meres, and with at least 600m of reed edge habitat per hectare. Wintering bitterns can occur in much smaller areas of reedbed, reed fringes at lake edges and willow carr[26].

The loss of suitable reedbed habitat has influenced their decline. Further factors that have threatened the species include the degradation of habitat through pollution, and lack of food availability such as eels. It has also been found that large spectacular roost/murmerations in the reed-bed can cause water quality issues (e.g. ammonia from the bird droppings), limiting fish survival and therefore impacting on the food availability for bittern.

Within the CWP, efforts were made as part of the last BAP (2007-2016) to establish large areas of marsh and reed-bed habitat on mineral sites such as Cleveland Farm, Eysey Manor and Roundhouse Farm.

Despite there being limited extensive reed-beds within the CWP, Bittern were recorded breeding in 2020, at a number of locations. Long-term management and monitoring should continue to maintain and enhance these areas, ensuring suitability for both breeding and wintering bittern. To enhance connectivity for bitterns, the creation of reed-beds will be encouraged within existing and newly formed ditches as well as other water bodies such as along the River Thames (*refer to the Fen, marsh and Reedswamp HAP*).

The following management options outline ways in which sites can be enhanced for wintering and breeding bitterns by taking into account the ecological requirements:

Maintain, enhance and extend existing reed-beds: ensure 20-30cm of water in reedbed, that there is 30% open water with reed edge, reed edge to be shallow and gradual gradient (not steep). Cut on rotation no more than 30% of reed cover each winter and remove waste material. Encourage fish by promoting growth of submerged aquatic plants. Reduce tree and shrub cover through rotational coppicing, cutting or pollarding adjacent trees. Extend existing reed-beds in line with actions in Fen, Marsh and Reedswamp HAP.
Ongoing monitoring: monitor the bittern population and habitat quality/conditions (including food supply).

11.3. HAP: Rivers and Streams

Priority Habitat type: Rivers and Streams[54]

'This habitat type includes a very wide range of types, encompassing all natural and near-natural running waters in the UK (i.e. with features and processes that resemble those in 'natural' systems). These range from torrential mountain streams to meandering lowland rivers'.

Relevant action plans:
Standing Open Water
Scrub Woodland
Fen, Marsh and Reed Swamp
Bats
Dragonflies and Damselflies (Odonata)
Fish (Wild and Stocked populations)
Invasive Non-Native Species

1. Importance of the habitat within the CWP

Situated at the head of the River Thames, the CWP hosts an abundance of rivers and streams including the Swill Brook, River Thames, River Churn, Ampney Brook, Marston Meysey Brook and the River Coln. These often connect to lakes and associated wetland habitats.

Rivers and streams[54] (as well as the associated ditches) provide wildlife corridors that aid species' dispersal. Bankside vegetation provides a variety of habitat features to aid this movement whilst simultaneously providing refugia and foraging opportunities. For example, riparian woodland, scrub, reeds, ditches, pools and hedgerows are often found alongside watercourses. Furthermore, the actual habitat features and conditions within the water itself (e.g. water quality, cover, barriers, substrate, and differing water flows), create a diverse range of micro-habitats. Therefore, a range of wildlife can be supported, including otters, water voles, fish and invertebrates.

2. Relevance to Nature Recovery Network (NRN)

Rivers and streams are existing features within the NRN but all wetland habitats fall into the 'Wetland' opportunities category. As stated within the standing open water HAP, updated data is not currently available for specific features within the CWP and so habitat management will currently be guided by local knowledge, until contemporary data is available.

[54] UK Bap Priority Habitat description: https://hub.jncc.gov.uk/assets/01d6ab5b-6805-4c4c-8d84-16bfebe95d31#UKBAP-BAPHabitats-45-Rivers-2011.pdf

3. Issues/threats

Poor water quality: pollution from industrial, domestic and agricultural sources.
Water resources: abstraction and increased evaporation from open waterbodies may lead to reduced groundwater levels and river flows, which are likely to be exacerbated by future population growth/demand and climate change.
Human modification: modifications to the channel disrupt the natural flow and processes.
Inappropriate management: lack of management leads to excessive shading and lower water quality. Intensified management (e.g. intensified grazing, trampling by dogs) can erode banks.
Increased development and recreation: impermeable surfaces reduce natural infiltration, leading to flooding events. Recreation can disturb wildlife and damages bankside vegetation.
Invasive Non-Native species (INNS): Wetland and river ecosystems are particularly vulnerable to the impact of aquatic INNS, partly due to their connected nature. American mink, American signal crayfish and Himalayan balsam, Canada geese Australian swamp stonecrop and invasive bivalves can impact on lake and river ecosystems.

4. Priorities and opportunities for future management

Future management should ensure the continued monitoring of rivers and streams. Under the Water Framework Directive (WFD), UK waterbodies are required to meet Good Ecological Status (or Potential) and are assessed on how close they resemble this 'natural state' under a set of parameters (Hydrology, Ecology and Chemistry)[55]. Therefore those that are failing can be identified. The Environment Agency monitors a network of English sites to determine compliance with this but other projects (such as the WILD project[56]) should continue to assess and improve the condition of waterbodies which are not specifically monitored for WFD purposes.

The local community (including landowners) within the Upper Thames catchment should be encouraged to carry out suitable management alongside rivers/streams (e.g. on the bankside and adjacent land) to contribute to achieving good ecological status. Pollution run-off into water bodies should be reduced through appropriate/suitable land practises along the water course. This could be achieved through collaboration with local NGOs (so as to attract grant funding) without necessarily needing to be part of a landscape scale project.

This HAP supports the Fen, Marsh and Reed Swamp HAP in that suitable habitat creation along the rivers and ditches (e.g. reed-bed creation) is encouraged to aid habitat connectivity along riparian corridors (e.g. the creation of reed-bed habitat). Ditches can also be enhanced to benefit species such as otter and water vole. River connections with areas outside of the CWP should be enhanced and should complement management of neighbouring land boundaries (e.g. Cotswold AONB).

Extreme climatic events, such as summer droughts and wet winters, will become more apparent in future years. This will need to be accounted for in future management to improve the resilience of the habitat within the flood plains. Furthermore, invasive species may be better able to adapt to the changing conditions than native species, potentially reducing species-diversity. Ongoing monitoring and management will need to consider this.

[55] Water Framework Directive: https://ec.europa.eu/environment/water/water-framework/info/intro_en.htm
[56] WILD project: https://www.grcc.org.uk/community-projects-and-services-/wild-project

5. Key Actions
5.1: Direct funding opportunities towards river systems identified as priority areas within the NRN mapping and through professional knowledge. Include those that are 'failing' within the WFD (e.g. where high sedimentation is present). Management to be led by the Upper Thames Catchment Partnership.
5.2: Enhance the river, stream and ditch corridors in line with the guidance provided in Section 6.
5.3: Work in line with the relevant strategies and initiatives such as the Upper Thames Catchment Action Plan (developed by the Upper Thames Partnership)[57].
5.4: Ensure that management complements other river restoration management strategies and the flood management plans within the Upper Thames catchment.
5.5: Support the delivery of projects within the Upper Thames Catchment (e.g. in-channel works, reduction in over-shading, natural flood management work and reducing sedimentation) where such works do not compromise biodiversity.
5.6: Promote appropriate, good practise land management along the catchment. Landowners should be made aware of beneficial land management that can be carried out alongside water bodies as well as those that are detrimental to water quality. *Refer to Section 6.*
5.7: Restore modified areas of the channel and remove barriers if required (e.g. weirs) through the management guidance outlined within Section 6.
5.8: Manage and enhance ditches through appropriate management (e.g. silt clearance) and reducing shade levels to provide suitable habitat for water vole, invertebrates (e.g. dragonflies), black poplar as well as herons and egrets. *Refer to the Fen, Marsh and Reedswamp HAP.*
5.9: Continue to collect and update data on the main rivers within the CWP, in line with the WFD parameters (Hydrology, Ecology and Chemistry). Identify those rivers that are failing to meet the WFD parameter targets (e.g. those that are not of 'good ecological status') and ensure that this informs future work. Work to be guided by the EA.
5.10: If possible, carry out a gap analysis, comparing sections that are 'failing' to those in 'good' condition. To be guided by the EA and Natural England (NE) (regarding SSSI management requirements) with support from partners.

6. Habitat Management guidance
6.1: Suitable land management alongside river corridors[58]: -Create dappled shading through rotational coppicing or felling of surrounding trees/woodland. -Avoid intensive management (e.g. intensive grazing) along watercourses. -Naturalise banks by creating buffer strips of at least 10 metres, planting native, locally sourced vegetation, or facilitating natural recolonisation of the same. -Reduce the application of fertiliser on land adjacent to waterbodies particularly further up the catchment and ensure appropriate storage of slurry[59]. -Create reed-bed where suitable (*refer to the Fen, Marsh and Reedswamp HAP*). -Reduce disconnection from the floodplain. Allow areas to flood where appropriate, and create back-waters even if ephemeral in nature.
6.2: Restoring modified areas of the channel[60]: -Introduce diverse habitat features within the channel e.g. introduce woody material, create 'berms' or replace gravels where dredging has removed the gravels.

[57] Upper Thames Catchment partnership: https://www.fwagsw.org.uk/upper-thames-catchment-partnership
[58] Buffer strips: https://edenriverstrust.org.uk/your-eden/explore-edens-landscape/buffer-strips/
[59] Storing silage, slurry and agricultural fuel oil
https://www.gov.uk/guidance/storing-silage-slurry-and-agricultural-fuel-oil
[60] River restoration:
https://www.therrc.co.uk/sites/default/files/general/Training/esmee/what_is_river_restoration_final.pdf

6. Habitat Management guidance
6.3: Ditch management[61]: -Never clear all ditches at the same time. -Cut vegetation on a 2-year rotation and leave one side uncut every year. -Do not de-silt ditches too frequently or all in one year. Do not over-deepen or over-widen channels. -Confirm status of protected species potentially present (e.g. water vole) prior to works.

[61] Ditch Management:

- https://farmwildlife.info/how-to-do-it-5/field-boundaries/ditches/
- https://www.rspb.org.uk/globalassets/downloads/documents/farming-advice/ditch-management-advisory-sheet-england_tcm9-207520.pdf

11.4. HAP: Scrub Woodland

Priority Habitat Description

Broad UK Priority habitat type: Broadleaved, Mixed and Yew Woodland[62]
This includes:

Lowland Mixed Deciduous Woodland: woodland that grows on a range of soil conditions, from very acidic to base-rich. Many are **ancient woodlands** (continuous woodland cover since at least 1600 AD to present day);

Wet woodland: occurs on poorly drained or seasonally wet soils, usually on flood plains as successional habitat.

Relevant action plans:
Standing Open Water
Lowland Neutral Grassland
Rivers and Streams
Dragonflies and Damselflies (Odonata)
Bats
Terrestrial and Riparian Mammals
Nightingale Species Statement

1. Importance of the habitat within the CWP

Most woodland types[62] have been modified by human intervention. As a result, species-rich ancient woodlands now only cover 1.2% of the UK. Secondary woodland (e.g. lowland mixed deciduous woodland and wet woodland) is usually species poor compared to ancient woodland[63]. However, through sensitive management, secondary woodlands can be managed, alongside a mosaic of habitats and habitat features, to provide valuable habitat for biodiversity.

The CWP has limited woodland cover; it is mostly fragmented and is not a distinctive habitat within the CWP. Ancient woodland is poorly represented (12.3ha overall, standing in separate pockets) and the remainder is secondary woodland (such as wet woodland along the valley floodplains and water bodies) that has arisen through the natural colonisation of vegetation on old gravel pits and silt lagoons, comprising mainly alder and willow.

Wet woodlands provide valuable habitat for a range of species groups, from invertebrates to larger mammals such as otter. In the last century, there has been considerable loss of wet woodland within the UK due to factors such as clearance and drainage.

[62] JNCC Priority Habitat Descriptions: https://hub.jncc.gov.uk/assets/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae
[63] The Wildlife Trusts, Woodland: https://www.wildlifetrusts.org/habitats/woodland

Woodlands have a high capacity to sequester and store carbon. The Ecosystem Service mapping[64] (carried out by the Gloucestershire Local Nature Partnership) shows evidence of this, as broadleaved and mixed woodland habitats scored 10/10 for carbon storage (higher than most other habitats and in line with wetlands and bogs). This emphasises the importance of enhancing and creating mixed woodland habitat within and around the CWP.

A way to enhance the pockets of woodland is to allow for scrub to grow (e.g. through natural succession of grassland to woodland) so that habitat mosaics can form. Although often undervalued, scrubland has high importance for biodiversity conservation, providing valuable opportunities and niches for wildlife whilst delivering ecosystem services (e.g. air filtration, carbon sequestration, and heat and water regulation).

2. Relevance to the Nature Recovery Network (NRN)

Woodland is identified as a core habitat within the NRN (*refer to Map 8*). The NRN mapping will be used to guide future management to where existing core habitats can be restored, enhanced and expanded, through mainly focusing on natural regeneration and planting in specific areas (this would also benefit nightingale- *refer to Nightingale Species Statement*). 'Formal tree planting' will not be encouraged unless it relates to delivering community engagement projects, ensuring the 'right' trees are planted in the 'right' places.

Scrub is considered as a habitat of high permeability within the woodland network, areas of scrub make softer woodland edges or permeable habitat to connect woodland features within appropriate dispersal distances for species. Scrub will therefore be encouraged.

3. Issues/threats

Loss and degradation: fragmentation and removal of scrub due to development pressure, mineral extraction, drainage, clearance, water pollution, and the desire for a "tidy" landscape.
Disease: ash dieback will become an increasing issue with ash trees requiring removal;
Unsuitable management: inadequate management that is not focused on biodiversity (e.g. unsuitable planting of tree species). Lack of management on lake margins leading more advanced successional stages and causing issues such as the excessive shading of lakes.
Climate change: changes in precipitation (e.g. reduced water availability) may have an impact on wet woodland and drive succession towards drier woodland types.
Landscape interruption: creation of mature woodland can lead to interruption of the landscape for certain species groups as they move around the CWP, e.g. water birds.

4. Priorities and opportunities for future management

Enhancing connectivity and habitat diversity is essential. Wet woodlands should be enhanced by ensuring structural diversity through the integration of woodlands within habitat mosaics, (e.g. alongside scrub and other habitats including bare ground) with gradual gradients between habitat types. This will improve resilience to future climatic events and be valuable for biodiversity. Native

[64] Ecosystem Service Mapping, Gloucestershire Local Nature Partnership: https://naturalcapital.gcerdata.com/

planting and natural regeneration of native species should be carried out where suitable, e.g. to buffer existing sites to increase the resilience of patches.

The opportunity areas and relevant actions will be guided by the NRN mapping and local knowledge, in order to identify the most suitable locations as well as any conflict there may be.

Management actions will consider the minimum patch sizes of specific taxa outlined within the Natural England Handbook (p. 111)[65]. Though, as a general rule of thumb, Natural England state:

- "*To maximise the species richness of lower and higher plants and woodland vertebrates, with some heterogeneous structuring, a wildlife site needs to be at least 40 ha*."
- "*To support populations of wider-ranging species or those with specialist requirements and low dispersal abilities, a wildlife site needs to be at least 100 ha*."

Of the above metric thresholds, the former is seen as being most relevant to the water park to maximise species richness. However, as woodland is not a distinctive habitat of the CWP, it may be more appropriate to focus efforts towards other habitat types whilst enhancing the existing woodland and creating new scrub habitat.

Existing woodland will therefore be enhanced, expanded and buffered through allowing habitat mosaics to develop and encourage the natural growth of scrub and planting where appropriate (e.g. to connect existing stands). 'Scrub woodland' will be encouraged. The maintenance of scrub woodland would also be low cost, requiring minimal management such as rotational coppicing/cutting. This management would support diverse ground flora and provide different microhabitats and habitat features, offering food and refuge opportunities for invertebrates, mammals (including otters and bats) and birds (*refer to the Nightingale Species Statement*).

Scrub creation offers additional opportunities for biodiversity. Bands and patches of scrub can be created in particular areas (*refer to the relevant actions for specific details*).

5. Key Actions
5.1: Ensure landscaping and restoration schemes maximise benefits for biodiversity (e.g. avoid planting around lake margins and undertake rotational thinning of marginal woodland). Schemes should allow for the growth of scrub and manage this in a suitable way (*refer to Section 6 for habitat management guidance*).
5.2: Work alongside other relevant projects, initiatives and strategies (such as the Gloucestershire Tree Strategy[66], Cotswold and Vale Ash Dieback Forum) to decide on the suitable replacements for the ash trees to be lost.
5.3: Ensure that local plan policies reflect the local importance of scrub habitat for particular species, such as the iconic nightingale populations.
5.4: Enhance (i.e. through rotational coppicing, felling, thinning etc.) existing woodland patches and encourage scrub growth (*refer to Section 6 for habitat management guidance*).
5.5: Ensure that 10% of woodland networks are >40ha in size to maximise species richness of higher and lower plants and woodland vertebrates within strategic locations. Support the creation/expansion of targeted new 'scrub woodland' in particular areas (e.g. central section) of

[65] Nature Networks Evidence Handbook (NERR081), Natural England: http://publications.naturalengland.org.uk/publication/6105140258144256

[66] Gloucestershire Tree Strategy: https://f55bc3b4-dbac-4e43-8254-a45b43ca06b3.filesusr.com/ugd/5c4a64_93a71de396fc44b9a5c9dfd9f65fd97c.pdf

5. Key Actions
the CWP through the natural growth and planting of scrub. The following points are opportunity areas where woodland can be expanded: Enhance and expand woodland currently categorised as being <40 ha, of medium and high priority in the NRN: -Woodland habitat patches nearby Fairford, such as Ash Copse as well as around lake no. 101, 128, 129, 131, 135 and 136. Allow scrub growth. -Create a scrub woodland corridor between the above cluster of lakes and those south-east of Fairford / north of Whelford / west of Lechlade. Scrub could be created alongside the corridor of the River Coln, adequately set back from the bankside to avoid overshading. Potentially extend this scrub woodland corridor along the north of the RAF Fairford. -Enhance and buffer woodland to the north-west and south-east of Down Ampney. Ensure scrub growth is encouraged and potentially carry out native planting. *-(Refer to Section 6 for habitat management guidance).*
5.6: Create areas of scrub across the CWP. For example, scrub can be encouraged to grow and planting can be carried out alongside hedgerows, within the corners and margins of agricultural fields (land of lower productivity). Specific locations could include: -Across the central section of the CWP, within a habitat mosaic (*this will also benefit Nightingale- refer to the Nightingale Species Statement*); -Agricultural land that is considered to be low in productivity (e.g. field corners); -Towards Braydon Forest to enhance connectivity; -Scrub creation alongside a mixture of other habitat types (such has wildflower grassland) in areas accessible to the public to encourage the acceptance of scrub whilst considering potential public perceptions (e.g. thought of as 'messy'). Signs could be installed to engage the public (*also refer to the action below*);
5.7: Promote the importance of scrub woodland for biodiversity and the value of having structural diversity and habitat features (e.g. scrub and dead wood) through education, publicity events and working alongside farmers/landowners. As above, create scrubland in areas accessible to the public and install signage to detail the importance of scrub[67,68]
5.8: Refer to the Natural Capital mapping[69] to further analyse the potential opportunity areas where suitable scrub woodland enhancement or scrub creation will deliver multifunctional benefits (e.g. natural flood management) and whether there are any further constraints at the local level (e.g. landscape type etc.).
5.9: Continue to identify future management actions, such as increasing the connectivity to surrounding significant stands of woodland surrounding the CWP. For example: -Create scrub in a band or patches towards Cirencester Park and Braydon Forest.

[67] The nature conservation value of scrub in Britain, JNCC: https://hub.jncc.gov.uk/assets/39590874-8927-4c42-b02a-374712caccd6

[68] Importance of scrub, RSPB: https://www.rspb.org.uk/our-work/conservation/conservation-and-sustainability/farming/advice/managing-habitats/scrub/

[69] Natural Capital Mapping: https://naturalcapital.gcerdata.com/

6. Habitat management guidance
6.1: Enhancing scrub woodlands[70,71,72]: -Avoid a dense canopy over standing open water and lake fringes, unless required by site-specific species (*refer to the Odonata SAP*). -Carry out rotational coppicing, cutting and thinning to maintain varied successional stages (woodland and scrub) as well as a diverse understorey. Thicker areas can create opportunities for mammals and nesting birds. -If herbivores are an issue, such as deer, carry out rotational pollarding. Cut trees 1.5-2.0m from the ground – keeping the canopy at a low levels and allowing for easier flight patterns between sites. -Ensure 'soft' edges between woodland stands and other habitats (e.g. scrub or bare ground) to provide habitat for birds and invertebrates. E.g. ensure management intensity is reduced within 50-100m of the core habitat. -Ensure a small amount of felling or ring-barking (when safe to do so) to provide dead wood and microhabitats/niches for species, allowing moss and fungi to colonise. Leave dead wood where fallen. -Increase edge availability within the habitat mosaic – e.g. allow for scrub growth and areas of bare ground. -Avoid dense scrub with more than 50% shade, unless close to housing where cat predation could be an issue.
6.2: Creating or expanding new scrub woodland/scrub[73]: -Ideally, allow for natural regeneration of scrub along water courses. Rotational grazing or coppicing should be carried out right up to the river bank so that excessive over shading is avoided. -Expand existing woodlands through encouraging natural succession (e.g. scrub growth) and carry out the planting of native species. Create a corridor between patches by expanding sites. -Do not plant trees in areas that are already valuable for other biodiversity (e.g. species-rich grassland) as this will lead to fragmentation. Ensure formal planting is within suitable areas, using locally characteristic native species that are climate change resilient[74].

[70] Scrub Management Handbook, Natural England: http://publications.naturalengland.org.uk/publication/72031
[71] Management of riparian buffers, Forest Research: https://www.forestresearch.gov.uk/research/riparian-woodland-and-water-protection/managing-riparian-buffer-areas/
[72] Rotational coppicing, Forest Research: https://www.forestresearch.gov.uk/tools-and-resources/biomass-energy-resources/fuel/energy-crops/short-rotation-coppice/

[73] Planting trees, Woodland Trust: https://www.woodlandtrust.org.uk/plant-trees/advice/choose/
[74] Planting trees that are resilient to climate change: https://www.forestresearch.gov.uk/research/climate-change-adaptation/

Species Statement: Nightingale

The nightingale is a nationally declining, red-listed species[75]. Numbers have reduced by 90% since the 1960's due to the lack of suitable management such as the maturation of vegetation, uniform less dense hedgerows, and the clearance of scrubland leading to habitat loss and fragmentation.

The CWP is of regional importance for the species, holding a majority of the individuals present within Gloucestershire and Wiltshire and being located in the most western extent of the species' range. Most nightingale 'hotspots' are in the western extent of the waterpark and these include; Swilbrook Lakes (lake 46/48), Lower Mill Estate, Dairy Farm an Manor Farm Quarries in Ashton Keynes, Lakes 43/65, Cleveland Lakes. Nightingales have also been recorded between Whelford and Fairford in the eastern section.

It is vital that we maintain, enhance and create habitat for nightingales in the existing nightingale sites as well as create new habitat between the existing territories.

This species prefers scrub mosaics and woodland habitats, requiring vegetation of up to 2 metres high to sing and bare ground underneath scrub to feed on invertebrates. Dense vegetation at the sides of the bare ground provides cover from predators. Areas of dense field vegetation (e.g. nettles) also provide nesting sites (breeding season occurs from mid-April to early July). Ideally, these habitats should all be in close proximity to each other[76].

Management actions for Nightingale:

Update the nightingale census: management can then be directed to locations where nightingales are present or to adjacent sites[77]

Maintain and enhance scrub and woodland in existing locations and between existing sites: Ensure bare ground beneath scrub and woodland understorey. Maximise the area of scrub at the thicket stage and cut these on rotation (10-15 year cycle) in large dispersed blocks. Carry out rotational coppicing to facilitate younger, dense vegetation in woodland[78]

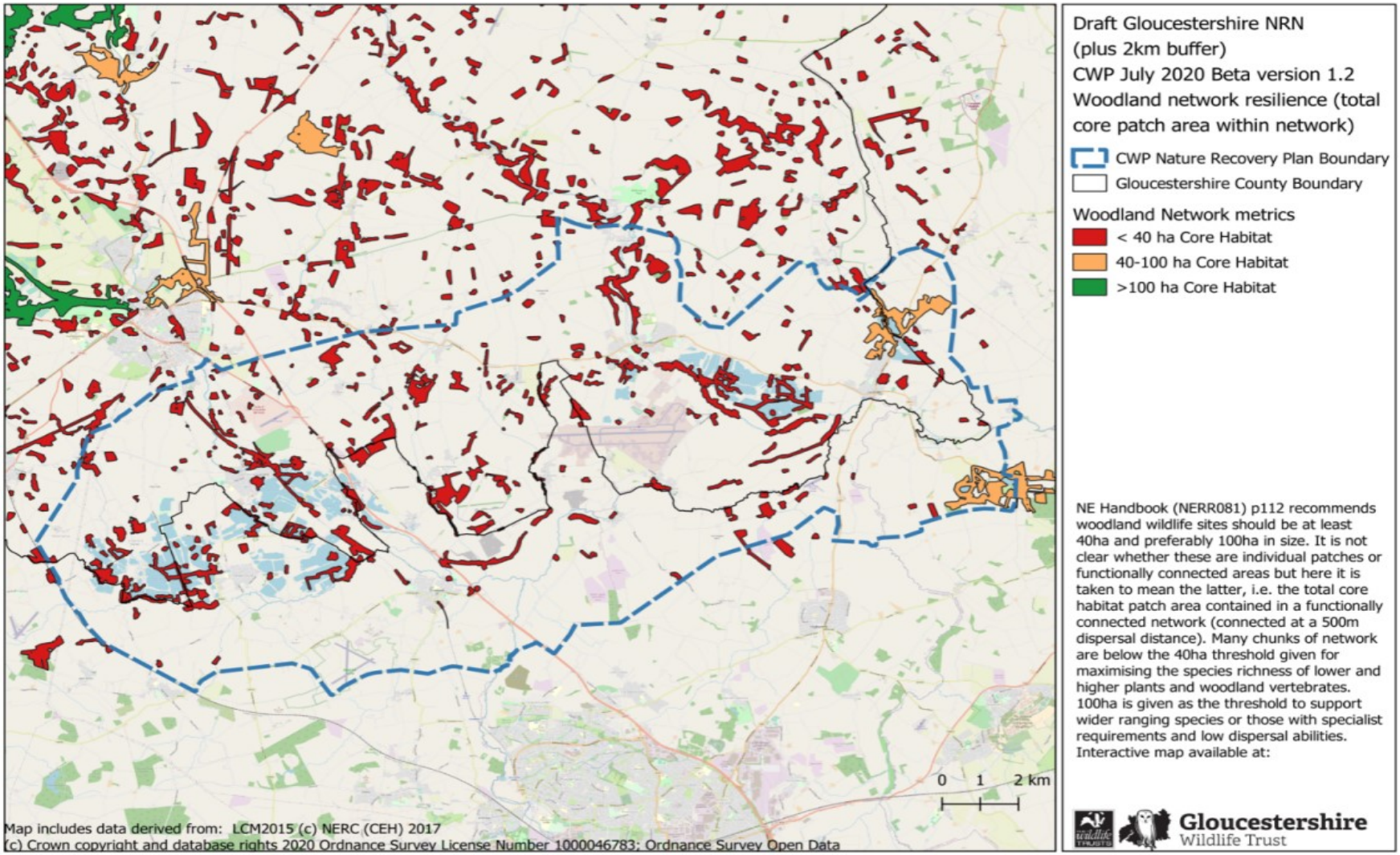
Continue to monitor nightingale success through inputting new data to the nightingale census and submitting data to the local records centres as well as relevant organisations (e.g. British Trust for Ornithology).

[75] Birds of Conservation Concern, BTO: https://www.bto.org/our-science/publications/psob
[76] Information on the Nightingale: https://www.wildlifetrusts.org/wildlife-explorer/birds/thrushes-chats-flycatchers-starling-dipper-and-wren/nightingale

[77] The BTO National Nightingale Census 2012: Some local perspectives in the Cotswold Water Park, Contributing to the Cotswold Water Park Biodiversity Action Plan 2007-2016, Cotswold Lakes Trust

[78] Managing scrub for Nightingales, BTO: https://www.bto.org/our-science/publications/conservation-advice-notes/managing-scrub-nightingales

Map 8: Total core woodland habitat area within woodland networks (at 500m connectivity), shown by the Gloucestershire NRN mapping



11.5. HAP: Lowland Neutral Grassland

Priority Habitat Description

Broad habitat type: Lowland Grassland[79]

Lowland meadows: most forms of unimproved neutral grassland across lowland areas within the UK. The priority habitat descriptions include those managed as hay meadows but also those where livestock grazing is the main land use.

Relevant action plans:
Scrub woodland
Rivers and Streams
Dragonflies and Damselflies (Odonata)
Bats
Terrestrial and Riparian Mammals
Snakes Head Fritillary Species Statement

1. Importance of the habitat within the CWP

Lowland neutral meadows[79] can support distinct plant communities; including the MG5 community and the rarer MG4 community (as classified within the National Vegetation Classification (NVC) system). MG5 grasslands are associated with widespread native plants and occur on free-draining clay-based soils. The MG4 community supports rare plant species, found on lowland floodplains.

The CWP hosts notable areas of species-rich unimproved neutral grasslands, including seasonally inundated floodplain meadows, with 8 being designated as Sites of Special Scientific Interest (SSSI's) (*refer to Map 3*) of which 2 are also Special Areas of Conservation (SAC). These include Pike Corner, Elmlea Meadows, Whelford Meadow, Wildmoorway Meadow, Upper Waterhay Meadow, Long Meadow, North Meadow and Clattinger Farm.

Through traditional management, meadows can host a diverse array of species. Those within the CWP support rare plant species (*refer to the Snakes-Head Fritillary Species Statement*), notable invertebrate species (including the glow-worm) and also provide feeding and nesting opportunities for birds (e.g. skylarks and curlew) and mammals (e.g. brown-hares and bats). However, species-rich lowland grasslands have declined by 97% in the past 50 years, leaving only fragmented parcels of land, reducing available habitat for dependent species.

[79] Lowland Grassland, JNCC UK BAP habitat description: https://data.jncc.gov.uk/data/cf50f420-1b38-4253-89f8-1cb7ba010f27/SSSI-Guidelines-3-LowlandGrasslands-2019.pdf

2. Relevance to Nature Recovery Network (NRN)

Lowland neutral grassland is identified within the 'Open' habitat category of the NRN. The NRN mapping will be used to guide future management to where existing core habitats can be restored and expanded (*refer to Map 9*).
The actions refer to the relevant network metric thresholds for the CWP. This will concentrate on enhancing and expanding smaller core habitats (e.g. those of <10ha) whilst also ensuring that this improves connectivity (e.g. acting as stepping stones) between the larger core habitats (e.g. those of 10-29ha and greater).

3. Issues/Threats

Inappropriate management regimes: poorly timed cutting/grazing or over/under intensive management reducing the floristic diversity. High fertiliser usage, slurry application, silage production etc.;
Increased water levels within drier lowland meadows: prolonged waterlogging can alter the community composition as drier meadows are not used to being inundated;
Prolonged flooding within seasonally inundated meadows: the water is often unable to drain from the meadow due to downstream obstructions (such as silt and unmanaged trees blocking the watercourses), impacting the biodiversity value of the lowland meadow. Climate change could worsen this issue, impacting on the hydrograph/flood regime;
Surrounding land-use: land-use changes (e.g. lake creation following gravel extraction) changes the groundwater hydrology, affecting community composition.
Increasing recreation and development pressure: trampling and increased use by dogs etc. can increase nutrient accumulation and damage plant communities. Development can fragment grasslands habitat and change the hydrology of the area.

4. Priorities and opportunities for future management

Management should maintain and enhance existing unimproved neutral grasslands and identify opportunity areas for habitat creation, restoration and enhancement. Traditional management, e.g. hay meadow management, should be encouraged and adapted to suit notable species on site.

Recreation and development pressure will likely increase in the future. Management should ensure that frequently visited sites, such has North Meadow, are not damaged and that any future development does not lead to fragmentation or changes to hydrology (e.g. adjacent to drier and seasonally inundated meadows). Alternative sites should be identified and designated as 'recreation sites' to direct recreational pressure away from sensitive sites.

Actions should be in line with the Nature Recovery Network (NRN) and also guided by on-the-ground advice. For example, there may be opportunities for grassland creation, amongst a habitat mosaic (e.g. alongside scrub woodland and ponds), nearby RAF Fairford to reduce bird strike as well as along the fringes of the CWP where there is less intervention. There are also opportunities to manage and enhance existing floodplain meadow communities such as at Upper Waterhay and Blakehill, including Stoke Common Meadows SSSI. Sites like these, where there can be 'quick wins' should be given priority if funding becomes available. The NCF aspire to deliver the Great North Meadow

Project where North Meadow NNR is proposed to be expanded and extended to Elmlea Meadows. The proposed extension could also connect to Clattinger Farm with a band of neutral grassland creation along the River Thames.

Extreme climatic conditions (e.g. dry summers and wet winters) could shift species composition and threaten both rare and common plant species. Continued monitoring and remedial action should be carried out. Efforts should concentrate on protecting sites vulnerable to climatic events (e.g. North Meadow) but also on enhancing and restoring other sites (e.g. Elmea meadows).

Management should ensure connectivity to areas outside of the CWP (e.g. Cotswolds AONB), to secure long-term benefits for biodiversity. For example, the CWP has been identified as a "bridging area" within the Big Chalk Programme (the coming together of all the calcareous protected landscape across southern England) and therefore management will aim to support this (*also refer to Section 9*) and other similar projects to enhance connections across the landscape.

5. Key actions
5.1: Ensure that management and restoration schemes avoid creating large areas of grassland to reduce populations of Canada geese and Egyptian Geese – encourage schemes to incorporate habitat mosaics (*refer to HAP Scrub Woodland*).
5.2: Encourage traditional hay meadow management, where suitable, within grassland restoration/creation projects (*refer to habitat management in Section 6*), such as at Stoke Common Meadows SSSI.
5.3: Where suitable, encourage suitable extensive grazing to manage the sward structure. Encourage landowners/farmers to work alongside the WWT and GWT teams to help meet the conservation aims and objectives at given sites (such as Upper Waterhay).
5.4: Protect and restore lowland meadows (e.g. North Meadow, Upper Waterhay and Stoke Common SSSI) from prolonged water-logging. This includes ditch restoration/management (e.g. ditch clearance) to remove silt build up downstream so that water can flow off the site. To be carried out by landowners through the WILD project.
5.5: Prioritise restoration and creation opportunities in line with the NRN mapping and the B-lines project through targeting networks of <10ha core habitat. For example, create buffers and extend existing sites (e.g. <10ha core habitat) towards larger core habitat areas (e.g. those 10-29ha and larger) to enhance the connectivity and benefit biodiversity: Example target/priority areas for habitat creation/restoration opportunities include: -North Meadow – continue to restore and buffer site. Form a connection between North Meadow and Elmlea Meadows through enhancing and extending both sites; -Identify priority areas to aid connection between North meadow and Clattinger farm – extending and buffering core habitat of <10ha as shown on the NRN mapping. Areas to focus on include Waterhay Farm, Swillbrook meadows, Acres Farm Meadow and BlakeHill Farm; -Protect, enhance and buffer Oaksey Moor Farm, Whelford Meadow, Wildmoorway Meadows; -Protect, enhance and buffer core habitat of <10ha along the fringes of the CWP where there would be less intervention and disturbance. -Protected, enhance and buffer grassland either side of the River Thames from the Eastern section to the Central section of the CWP (connecting the core habitat areas <10ha with the larger areas of 10-29ha). Potentially create this within a habitat mosaic (alongside scrub) when near RAF Fairford.

5. Key actions
-Grassland creation and enhancement can extend out of the CWP, east along the River Thames towards Chimney Meadows NNR, northwards towards Cotswold AONB and south-west towards Malmesbury (in line with the B-lines mapping[80]). Support the work of The Big Chalk Programme.
5.6: Reduce the recreational impact by visitors on designated sites (e.g. at North meadow) by diverting the public away from vulnerable, species-rich areas, especially within the spring and early summer when species are flowering. Ensure to provide clear footpaths and signage. Potentially create designated 'recreational areas' to divert the public to.
5.7: Work with landowners to identify indicator species on land. In the short term, include use of the Environment Land Management Scheme (ELMS) trial to identify any areas/features that have not been recorded in the past. Use these results to help guide habitat creation/restoration opportunities.
5.8: Engage and work with farmers and land-owners within agri-environment schemes to aid/contribute to habitat creation and restoration of species-rich grassland. Promote this within areas that have been identified as high priority within the NRN mapping.
5.9: The Flood Plain Meadow Partnership[81] should continue to survey and monitor notable grassland sites and update the habitat data. Provide data to LNP (or GCER) to feed data into the annual NRN mapping update.
5.10: Continue to identify priority areas for grassland creation and/or expansion as informed by the NRN and the Gloucestershire and Wiltshire B-Lines Network project. Consider existing ecological interest, condition, location, fertility and soil type (refer to B-lines and the NRN mapping.

[80] B-Lines Mapping: https://www.buglife.org.uk/our-work/b-lines/
[81] Floodplain Meadow Partnership: http://www.floodplainmeadows.org.uk/

6. Habitat management guidance[82]
6.1: Undertake/continue traditional management on existing sites, if deemed suitable, through using the following guidance and advice: Hay meadow management cycle (allow flexibility due to climate change): -'Shut up' the meadow in March, removing livestock. Allow flowers to bloom April-August. -Cut hay between July and September (depending on species' assemblage). -Leave uncut strips around field margins for biodiversity. Cut these on rotation. -Once cut, lay hay in rows to dry. Turn once a day. -When dry (e.g. 3-5 days later), bail and store for winter. -Can apply grazing in late summer a few weeks after the hay cut (e.g. July to October) to help seed germination. Aim to reduce height of vegetation without extensive poaching. -Cuts should avoid harm to ground nesting bird species on site. Pasture management: -Meadows can either be grazed at a low density through the season or can be 'shut up' (as above) from March to late summer (July/August). -Remove livestock during wet weather to avoid poaching ground excessively.
6.2: Restoring grassland : -If land is agriculturally improved, remove existing grassland cover before seeding (e.g. strip turf and top 10-15cm of soil). -If land is arable, reduce nutrients by cropping without additional fertiliser or have a grass crop and regularly cut and remove. Alternatively, grow 'nutrient hungry crops' on arable land before the reversion to grass as these crops can reduce nutrient levels, restore soil quality and help sequester carbon. This is also a more-cost effective way of reducing nutrients. Contact FWAG for further advice[83]
6.3: Management for restoring and creating lowland meadows[84], [85]: Creating lowland meadows: -Use seeds harvested from nearby species-rich hay meadows. -Sow seeds August-October. These should be trampled or rolled in. -Within the first year, prevent dominant grasses by cutting when at a height of 10-15cm, reduce to 5cm. Remove cuttings. -Cut or graze in the long-term. Refer to the above hay or pasture guidance.

[82] Management advice available:

- https://www.fwagsw.org.uk/
- http://www.magnificentmeadows.org.uk
- http://adlib.everysite.co.uk/adlib/defra/content.aspx?id=000IL3890W.189ERKAKX9Y10UZ
- http://www.floodplainmeadows.org.uk/

[83] Farming & Wildlife Advisory Group (FWAG): https://www.fwagsw.org.uk/pages/category/upper-thames-catchment-partnership-projects

[84] Hay meadow management:
http://www.magnificentmeadows.org.uk/assets/pdfs/Hay_meadow_and_pasture_management.pdf
http://www.magnificentmeadows.org.uk/assets/pdfs/Neutral_Grasslands.pdf

[85] Wildflower meadow creation: https://farmwildlife.info/how-to-do-it/flower-rich-habitats/livestock-wildflower-rich-grassland-creation/

Species Statement: Snakes Head Fritillary (*Fritillaria meleagris)*

The snake's head fritillary[86], distinguishable by their nodding pink and purple chequered flower heads, grow between April to May on floodplain hay meadows within Southern England and the Midlands.

The species is present within only a few locations within the CWP including Elmlea Meadows SSSI, North meadow National Nature Reserve and Clattinger Farm SSSI. The areas consist of traditionally managed unimproved floodplain grasslands. These continue to be managed as pasture and hay-meadows and comprise a rare species-rich plant community (MG4 community), where the snake head fritillary is found.

The species is classified as 'vulnerable' on the Vascular Plant Red Data List for Great Britain[87]. The MG4 community was once widespread in the CWP but the intensification of agriculture, extensive gravel extraction and increased recreational pressure (especially within North Meadow NNR) have led to the loss of suitable habitat, adversely impacting on the species. Recreational pressure is especially harmful within the spring months when the species is flowering and this issue will be of greater concern in the future due to the growing towns and settlements in the nearby area. Furthermore, extreme climatic events such as prolonged flooding can lead to the deterioration of soil structure and create unsuitable conditions for the plant community.

Management actions:

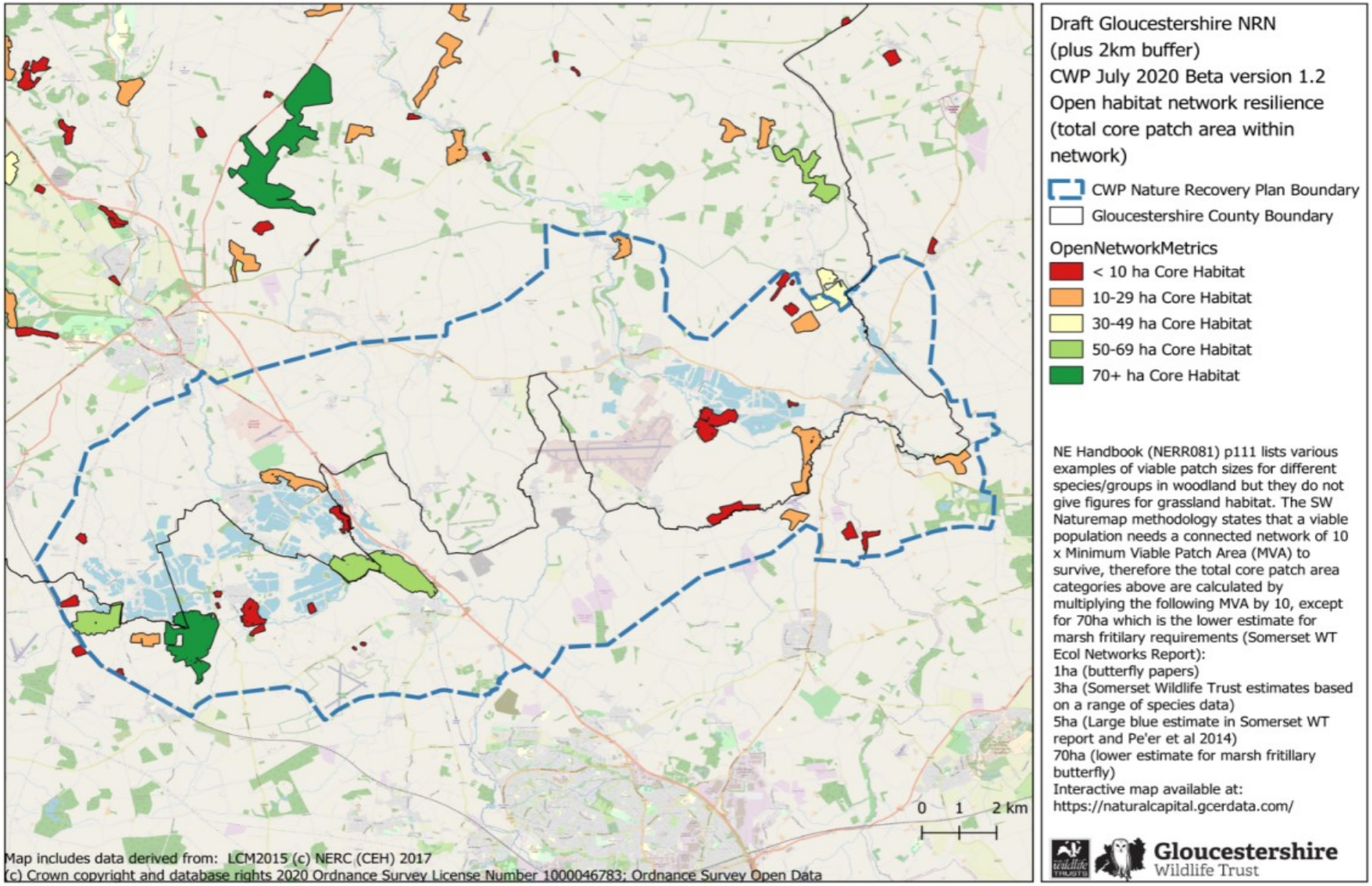
- Reduce recreational pressure: divert the public away from sensitive areas by maintaining clear footpaths with signage and enhance less sensitive grassland areas. Raise awareness of sensitive plant communities.
- Manage pro-longed waterlogging: create and maintain a network of ditches or shallow surface drains around sites to drain into the waterbodies. This will ensure that the meadow is moist but not water-logged.
- Restoration and enhancement of existing sites: expand existing and/or creation of other grassland sites: (in line with actions of the above HAP) to increase resilience of the rare plant community and increase the distribution.
- Raise awareness: create signage, encourage land owners to carry out traditional hay meadow management, suitable grazing regimes;

[86] Snakes Head Fritillary information:

- https://www.plantlife.org.uk/uk/discover-wild-plants-nature/plant-fungi-species/fritillary
- https://www.wildlifetrusts.org/wildlife-explorer/wildflowers/snakes-head-fritillary
- http://www.floodplainmeadows.org.uk/sites/www.floodplainmeadows.org.uk/files/Floodplain%20Meadows%20-%20Beauty%20and%20Utility%20A%20Technical%20Handbook.pdf

[87] The Vascular Plant Red Data List for Great Britain, JNCC: https://data.jncc.gov.uk/data/cc1e96f8-b105-4dd0-bd87-4a4f60449907/SpeciesStatus-7-VascularPlant-WEB-2005.pdf

Map 9: Total core open habitat area within open habitat networks (at 500m connectivity), shown through the NRN mapping



11.6. HAP: Active sand & gravel quarries

Priority Habitat Description

Sand and Gravel Quarries are listed under the Priority habitat Open Mosaic Habitats on Previously Developed Land[88]

The above priority habitat is defined as:

-Area of mosaic habitat at least 0.25 ha in size;

-Disturbance at the site, or evidence that soil has removed/modified;

-Containing some vegetation – including early successional vegetation;

-Loose bare substrates and pools may be present;

-Spatial variation is present forming a mosaic of one or more early successional communities.

Relevant action plans:

Bare Ground and Early Successional Habitats

Fen, Marsh, Reed Swamp

Standing Open Water

Dragonflies and Damselflies (Odonata)

Stoneworts (Charophytes)

Nightingale Species Statement

Marsh Helleborine Species Statement

1. Importance of the habitat within the CWP

Sand and gravel quarries[88] are a defining feature of the CWP. Mineral extraction within the Cotswold Water Park accounts for a significant proportion of the total UK area of aggregate extraction.

Subsequently, the CWP supports nationally important populations of birds (e.g. little ringed plover) that rely on the unique conditions created during the extraction process.

Active quarries create unique habitat features. For example, the bare gravel and sand (e.g. silt beds and sand cliffs) attract specific bird species such as sand martin and little ringed plover as well as invertebrates such as mining bees and ground beetles. The dynamic nature of these temporary habitats also creates ephemeral aquatic pools that can also support specific dragonfly species (e.g. the scarce blue-tailed damselfly).

This HAP aims to ensure that the operational workings maximise opportunities available for notable species that rely heavily on this activity.

[88] UK Priority Habitat Description (Inland Rock): https://hub.jncc.gov.uk/assets/a81bf2a7-b637-4497-a8be-03bd50d4290d#UKBAP-BAPHabitats-40-OMH-2010.pdf

2. Issues/threats

Timing of works: Quarry operations (e.g. topsoil stripping, de-watering, gravel extraction, scrub clearance) can disturb species if undertaken at the wrong time of year.

Excessive disturbance: active quarries are constantly changing and activities may impact on most habitat features within a small time frame, leaving little area for wildlife.

3. Priorities and opportunities for future management

Increase the understanding of the importance of mineral workings for nature among site managers and operatives.

Ensure restoration schemes include active mineral habitat features so that dependent species can continue to use the site after extraction.

Given future projected climatic changes, continue to monitor the trends of nesting birds associated with gravel pits and adapt management accordingly.

4. Key Actions
4.1: Ensure that mineral working meet the requirements of relevant mineral local plan policies and strategies, including policy DM06 of the Minerals Local Plan for Gloucestershire 2018-2032[89] (May 2018) and Planning Policy Statement 9 within the Wiltshire and Swindon Minerals Core Strategy 2006-2026 (June 2009)[90].
4.2: Active mineral sites and associated restoration schemes should be run in line with the best practise guidance, such as the guidance within Section 5 and provided in the additional information (e.g. bare cliff faces, shingle stretches etc.). There should be a meeting prior to the works so that specific advice can be given.
4.3: Mineral sites should ensure the provision of valuable habitat features to meet different species' requirements[91]. If possible, mineral extraction should be localised and alternate between areas, allowing for the temporary re-creation of habitats until the next disturbance. Leave areas not used for mineral extraction undisturbed. Corner off areas with shallow inundation zones, features such as rock faces and/or unconsolidated material. *Refer to Section 5 for species specific requirements.*
4.4: Leave the boundary habitats (e.g. hedgerows and rank vegetation) undisturbed during works for species such as nesting birds.
4.5: Raise awareness of species that are dependent upon active quarries, particularly consider the nesting birds and invertebrates with specialist requirements such as the scarce blue-tailed damselfly. Advice should be provided to mineral operators to deliver more locally-targeted habitat enhancement/creation (e.g. through a training manual or similar).
4.6: Continue to identify areas within restoration schemes where specific 'active quarry type habitat features' can be maintained. For example, the Cotswold Lakes Trust (CLT) and/or partners

89 Gloucestershire County Council, Minerals Local Plan for Gloucestershire 2018-2032 (May 2018): https://www.gloucestershire.gov.uk/media/1520152/mlp-for-glos-2018-2032-publication-plan.pdf

90 Wiltshire and Swindon Minerals Core Strategy 2006-2026 (June 2009): https://www.swindon.gov.uk/downloads/file/5391/wiltshire_and_swindon_minerals_development_core_strategy_2006_-2026

91 Habitat management for biodiversity within quarries: https://www.quarrylifeaward.cz/sites/default/files/media/web_hc_biodiv_im_steinbruch_buch_englisch.pdf

4. Key Actions
should visit quarry workings to identify areas where 'active quarry habitat' can be maintained post-extraction to best benefit biodiversity (e.g. ensuring connectivity to active quarry sites or similar habitat in the area). This can be negotiated with quarry managers to ensure that sufficient habitat management is incorporated into restoration schemes.

5. Habitat management guidance
Sand martins[92]: excavate nest burrows within exposed vertical cliff faces. Before the breeding season, create a buffer zone around cliff faces to provide a safe nesting site. Avoid excavation in and nearby these areas from March to September. If there are sand martin records nearby, create an exposed vertical cliff face, free of vegetation, rising at least 1.5m above water level (can also encourage mining bees and kingfisher).
Little Ringed Plovers[93]: provide freshly-created expanses of gravel, clay, or backfill. Identify and safeguard nests before works commence. Ensure areas of shingle stretches are available within pits and corner off/leave undisturbed.
Lapwing[94]: provide sparse, short vegetation close to water, leave sections of vegetation undisturbed.
Blue-Tailed Damselfly[95]: provide ephemeral pools with shallow water and little vegetation. Ensure actives quarries offer suitable features (*refer to Odonata SAP for further habitat creation details*). This can also benefit other invertebrates species.

[92] Sand Martins:

- https://www.rspb.org.uk/our-work/conservation/conservation-and-sustainability/advice/conservation-land-management-advice/sand-martin-nest-sites/

[93]

Little Ringed Plovers:

- https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/little-ringed-plover/
- http://www.birdsofbritain.co.uk/bird-guide/l-r-plover.asp

[94] Lapwing:

- https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/lapwing/breeding-and-nesting-habits/

[95] Blue-Tailed Damselfly:

- https://british-dragonflies.org.uk/species/scarce-blue-tailed-damselfly/
- Dragonfly Atlas, available at: http://wsbrc.org.uk/news/the-cotswold-water-park-dragonfly-atlas/

Species statement: Marsh Helleborine (Epipactis palustris)

Marsh helleborine (*Epipactis palustris*) is an orchid species, flowering during July and August. The species grows in damp, lime-rich soils and can be found in habitat such as calcareous fens, marshes, wet meadows and dune slacks. During the winter months, the plant is found submerged within the water and then maintains moisture during the summer months.
The species has suffered past declines due to a combination of the drainage of wet meadows and dry summers, reducing the soil moisture.
Populations have been recorded within the CWP on the silt beds of old disused mineral workings, which offer suitable calcareous conditions and are inundated with water in winter months.

Actions for management:

Ensure that scrub does not encroach within existing or future sites through carrying out rotational cutting;

Ensure activities do not alter the water level (e.g. the digging of ditches) or lead to encroachment of willow carr;

Reduce eutrophication through the thinning and/or coppicing of marginal vegetation (e.g. trees) near waterbodies so habitats are not dominated by vigorous vegetation, improving light availability and reducing leaf litter accumulation.

11.7. HAP: Bare ground & early successional habitats

Priority Habitat Description

Bare ground and successional habitats fall within the Priority habitat **Open Mosaic Habitats on Previously Developed Land** (also refer to HAP Active Sand and Gravel Quarries for a further description)[96]. The following information relates to this specific HAP:

Early successional communities include stress-tolerant species (e.g. indicative of low nutrient status or drought). These can comprise annuals, mosses/liverworts, lichens, ruderals, open grassland, flower-rich grassland or heathland. Un-vegetated, loose bare substrate and pools can be present.

Relevant action plans:
Active Sand and Gravel Quarries
Scrub Woodland
Lowland Neutral Grassland
Dragonflies and Damselflies (Odonata)
Stoneworts (Charophytes) Species Statement
Nightingale Species Statement

1. Importance of the habitat within the CWP

This HAP has close affiliations with the Active Sand & Gravel Quarries HAP and also relates to the 'Scrub Woodland' HAP. Bare ground[96, 97] is present both during and after mineral extraction and is an important feature for many species of conservation concern. It's also worth noting that this HAP can also relate to other areas within the CWP such as brown field sites where land has been previously developed but not currently in use. After disturbance, early pioneer plant communities re-colonise and grow. Early successional habitats are highly ephemeral and dynamic, regularly changing in species composition and successional stages over time.

The early successional communities (including wildflower and grasses) and are valuable for species including birds, reptiles, amphibians, small mammals and invertebrates. For example, low vegetation cover provides refuge for mammals and birds whilst open areas allow light to reach the ground, creating suitable conditions for invertebrates, particularly bees, wasps and insects.

- [96] UK Priority habitat description: https://data.jncc.gov.uk/data/a81bf2a7-b637-4497-a8be-03bd50d4290d/UKBAP-BAPHabitats-40-OMH-2010.pdf
- [97] Biodiversity management within quarries: https://www.quarrylifeaward.cz/sites/default/files/media/web_hc_biodiv_im_steinbruch_buch_englisch.pdf

2. Issues/threats

Lack of suitable management: vegetation can be left to grow and reach later successional stages, reducing opportunities for dependent species;
Overlooked: alternative habitats, such as grassland or woodland, are perceived to be of higher importance are more desired within restoration schemes;
Vulnerable to development: the habitat is likely to be re-developed as there is little awareness of the value;
Lack of public awareness: the habitat can be perceived as untidy and therefore not appreciated. The land is often subjected to inappropriate management, reducing the ecological interest.

3. Priorities and opportunities for future management

It is vital to raise awareness regarding the importance of bare ground and early successional habitats. Quarry restoration schemes should ensure the inclusion of these habitats to support dependent species.

Scrubland is often overlooked but can be valuable for a wide variety of species (*refer to Scrub Woodland HAP*) such as nightingales (*refer to Nightingale Species Statement*). Management should adapt to suit species' requirements.

4. Key actions
4.1: Ensure that post-extraction sites retain areas of exposed soils (ideally south facing aspects) and early successional habitat and undertake minimal rotational management (*refer to habitat management guidance- Section 5*).
4.2: Enhance the habitat for biodiversity through the creation of suitable habitat features for particular species groups such as invertebrates, reptiles and waders (*refer to section 5 for further guidance*).
4.3: Encourage natural succession in specific areas adjacent to the bare ground (do not apply top-soil, seed or plant) whilst ensuring structural diversity (*refer to Scrub Woodland HAP*) and maintained areas of early successional habitat.
4.4: Raise the awareness of the importance of bare ground and early successional habitats for biodiversity so that the habitats can be appropriately maintained and managed in the long-term[98]. Carry out open days with mineral extraction companies and land-owners and/or create an advice/training annual (*combined with that referred to within Active Sand and Gravel Quarries HAP and Scrub Woodland HAP*).
4.5: The Cotswold Lakes Trust and partners should continue to survey species that depend of bare ground and early successional habitat, where required (e.g. *refer to Nightingale Species Statement and Odonata SAP*). Send new data to the local record centre, national recording scheme and specific organisations such as the British Trust for Ornithology (e.g. for nightingale data).

[98] Importance of bare ground: https://www.arc-trust.org/news/the-importance-of-bare-ground

5. Habitat management guidance
5.1: Post-extraction sites to retain areas of exposed soils (ideally south facing aspects). Undertake rotational management (re-exposing areas colonised by plants). This can include de-turfing, grazing or scraping and ensuring that willow and other later successional species do not over dominate.
5.2: Create small crevices in ground and shallow ephemeral pools for bare ground invertebrates. Leave some leaf litter to accumulate in areas[99,100,101,102]
5.3: If scrubland is present on site or if projects wish to create areas of scrub, please refer to the Scrub Woodland HAP for further guidance.

[99] Bare ground for wildlife:
http://www.magnificentmeadows.org.uk/assets/pdfs/How_to_create_an_earth_mound_for_wildlife.pdf

[100] Brownfield sites:

- https://cdn.buglife.org.uk/2020/01/Introduction-to-brownfields.pdf
- https://www.wildlifetrusts.org/habitats/towns-and-gardens/brownfield

[101] Managing for species: integrating the needs of England's priority species into habitat management, Natural England

[102] Management of Bare Ground, English Nature: http://publications.naturalengland.org.uk/publication/86028

12.Species Action Plans

Each plan includes information on:

- Status, habitat and ecology
- The issues/threats affecting the species
- Priorities for future management
- Key actions
- Relevant habitat and species action plans/statements
- Links to online guidance

12.1. SAP: Barberry Carpet Moth

Relevant action plans:

Scrub Woodland

1. Status, habitat, lifecycle and ecology

The Barberry Carpet Moth was once widespread across southern England, in locations as far north as Yorkshire[103]. However, there are now only 12 colonies in England, confined to particular locations within Wiltshire, Gloucestershire, Dorset and Oxfordshire. The species is now listed as a priority species in the UK Biodiversity Action Plan and is protected in the Red Data Book of species[104].

There are 10 colonies in Wiltshire and Gloucestershire. Within the CWP, a small colony of Barberry Carpet Moth has been recorded at Ashton Keynes in that past and there is an existing colony near Somerford Keynes. A population is also present to the south in North Wiltshire.
The species has 2 broods per year. The first generation is active in May and the caterpillars emerge in June. The caterpillars pupate in late-July and a second brood is active in late August through throughout September, over-wintering in the pupa stage before emerging the next May. Adult moths lay their eggs on the leaves of the barberry bush. The caterpillars feed on these leaves[105] and pupate at the base of the food plant (Barberry).

Consequently the species is found on hedgerows within farmland, road verges and woodland edges, where barberry bushes are present. Leaf litter surrounding the bushes is used during the pupation stage. The species prefers overgrown, untrimmed hedgerows, up to 5m in height, in full sun.

2. Issues/threats

Removal of barberry bushes: barberry was the host of a wheat stem rust (*Puccinia graminis*) fungus that impacted on agricultural yield, the widespread removal led to declines in moth populations. The development of resistant wheat varieties then meant that this was no longer an issue but the moth population was significantly reduced by this point. However, there is still a chance that we will see new strains in the future in the UK and we need to consider this.
Inappropriate management of barberry: this can impact on the life cycle of the species. For example, the clearance of leaf litter around barberry bushes during pupation damages pupa and increases their vulnerability to predation/weather. Also, hedgerow cutting can have a direct impact on second generation larvae so hedges should be left uncut until October and then cut on rotation.

[103] Barberry Carpet Moth distribution: https://species.nbnatlas.org/species/NHMSYS0021144040
[104] UK Bap terrestrial invertebrate species, JNCChttps://data.jncc.gov.uk/data/98fb6dab-13ae-470d-884b-7816afce42d4/UKBAP-priority-terrestrial-invertebrates.pdf
[105] Life cycle and ecology: https://butterfly-conservation.org/moths/barberry-carpet

3. Priorities/opportunities for future management

The barberry bush is now resistant to the fungus and removal is no longer desired. However, Barberry is still vulnerable to the stem rust (*Puccinia graminis*) it new strains appear in the future, particularly due to climate change. Specific projects have been underway to increase the number of moth colonies within the UK. For example, the 'Back from the Brick' project (2017-2021), led by Butterfly Conservation and funding by the National Lottery Heritage Fund, encourages the planting of barberry bushes in Dorset, Gloucestershire and North Wiltshire[106]. So far, the project has planted 2500 Barberry plants in North Wiltshire and Gloucestershire in over 125 sites. There are currently 10 known colonies in Wiltshire and Gloucestershire. Habitat management within the CWP should aim to work alongside this project and any future projects/initiatives, contributing towards the targets.

Barberry is slow growing and can be out-competed by faster growing plants such as brambles, clematis and dogwood. Specific management and maintenance is required to ensure the plant is suitable for the Barberry Carpet Moth to establish and thrive.

4. Key actions
4.1: Ensure barberry bushes and known moth colonies are considered within the planning process through ensuring that LPA's have access to up-to-date records provided by the local records centre. If colonies are present in or nearby (within 2km of a colony) an application site, please refer to the habitat management (the creation and maintenance of barberry bushes) guidance in Section 5.
4.2: Encourage landowners/developments to contribute towards the targets of existing projects (e.g. Butterfly Conservation projects) if within 2km of a known colony.
4.3: Encourage the local community to volunteer with local Butterfly Conservation branches. Butterfly Conservation may host open days and educational visits for the public to attend. Please see footnotes to understand how to get involved[107]
4.4: Submit new data to 'Barberry Rust Explorer' online (see footnote for the further information)[108].
4.5: Licenced surveyors from Butterfly Conservation should survey each site annually (or at least once every 5 generations) through larval surveys using a beating tray.

5. Habitat management guidance
5.1: Carry out the planting of barberry through suitable guidance[109,110]: -Prioritise planting of barberry bushes in existing sites or within 2km of existing colonies, to act as stepping stones. -If planting a hedge: Plant two-year old transplants, at least 450-600mm high, of Barberry and other slow growing shrubs. Plant in a staggered double row (60cm apart) with a minimum of 3 plants per metre. Plant in winter months. Allow hedges to reach and be maintained at a minimum height of 3m and minimum width of 3m by year 5. -If planting as a standalone shrub on woodland edges and in glades: plant at least a metre away from other plants. Young Barberry (smaller than 45mm) can be planted. Butterfly Conservation

[106] Back from the brink: https://naturebftb.co.uk/the-projects/barberry-carpet-moth/
[107] Volunteering: https://butterfly-conservation.org/how-you-can-help/get-involved/volunteering

[108] Barberry Rust Explorer – submitting record data: https://barbre.co.uk/
[109] Guidance template: https://butterfly-conservation.org/sites/default/files/barberry-carpet-cs-template.pdf
[110] Factsheets: https://butterfly-conservation.org/sites/default/files/2021-01/Common%20Barberry%20factsheet_0.pdf
https://butterfly-conservation.org/sites/default/files/2021-01/Common%20Barberry%20factsheet_0.pdf

5. Habitat management guidance
advice planting out when they are 0cm high and growing them in deep pots until they are a suitable height. Use a tree stake and mesh tree guard for protection from livestock. - Contact Butterfly Conservation for a list of suppliers and for advice on growing your own Barberry from seed (which is easily done).
5.2: Ensure that post-planting care is carried out through the following guidance: -Rotational trimming (only if it is necessary) in winter months after leaf fall (only a third of available bushes should be pruned in any one year). -Cut hedges between October and the end of February on rotation. -Avoid removing litter/debris immediately adjacent to bushes, particularly in the winter months. -Carefully remove competing vegetation whilst the barberry is establishing. -Water during drought periods for the first few years. -Protect young plants from browsing deer etc. with a stake and mesh guard. -Avoid using fertilisers, lime and insecticides within 5m of a barberry bush. -Infill any length of hedge that has more than 10% gaps

12.2. SAP: Dragonflies & Damselflies (Odonata group)

Relevant action plans:
Fen, Marsh, Reed Swamp
Standing Open Water
Rivers and streams
Bare Ground and Early Successional Habitats

1. Status, habitat and ecology

Dragonflies and damselflies are species of freshwater habitats. They also depend upon other habitats for different stages of their lifecycle.

The CWP offers vast opportunities for Odonata, consisting of a mosaic of habitats whilst also being a warm southerly location and comprising an extensive patchwork of water-bodies of high water quality. The CWP therefore hosts a diverse assemblage of dragonflies and damselflies, some of which are nationally scarce.

Odonata benefit from diverse habitat features and marginal vegetation around the water bodies, such as tall grasses and broad-leaved vegetation, as this provides suitable emergence, egg laying and feeding habitat. Shorncote reed-bed and Cleveland lakes are exemplar sites, consisting of deep water, shallow scrapes, ditches and smaller pools; suiting generalist species.

There are however specialist species with specific requirements. For example; the Broad Bodied Chaser and Scarce Blue-tailed Damselfly prefer shallow pools within early successional habitats, consisting of bare ground and less dense vegetation. Others, such as the Downy Emerald, prefers over-shadowing by mature trees, dense woodland and hedgerow networks for dispersal. Management would need to suit a range of generalist and specialist species within the CWP and should be informed by robust survey data.

2. Issues/ threats
Lack of suitable habitat: the requirements of specialist species are not always met;
Pollution incidents (e.g. agricultural run-off, sewage/silt discharges): impacting on water quality;
Loss of habitat: processes such as the drainage of wetlands and build-up of silty substrates on the bottom of lakes has degraded habitat for some species;
Over-stocking of fish: high fish populations can reduce plant growth, affect water clarity and increase predation.

3. Priorities/opportunities for future management

The requirements of both the specialist and generalist species will need to be considered. Habitat creation and enhancement for specific species should be directed to nearby hotspots for the target species.

In light of climate change, the CWP will present favourable opportunities for odonatan in the future. Management should therefore ensure that any shifts in species' distribution are accommodated, allowing species to adapt to climate change.

4. Key Actions
4.1: Consider the requirements of the specialist species within mineral restoration schemes as well as development projects. If required, consult the Dragonfly Atlas[111] and further links within the further information provided.
4.2: Enhance the current water bodies to suit generalist species where present, through following the further guidance in Section 5 and information[112]
4.3: Create additional habitat features to benefit generalist species as well as other species/species' groups such as water voles, amphibians, reptiles and invertebrates through referring to the guidance in Section 5.
4.4: Keep particular areas of larger lakes free of boats/recreation use to reduce disturbance from wave action. The Cotswold Lakes Trust or partners are to contact leisure facilities and raise the awareness of protecting sensitive area for biodiversity within sites.
4.5: Ensure appropriate management for nationally scarce species, including the **Downy Emerald** and the **Blue Tailed Damselfly**, in areas of known populations. Refer to the guidance in Section 5.
4.6: Reduce the stocking density of fish within lakes valuable for dragonflies and damselflies. Dragonfly and damselfly larvae can be vulnerable to predation by fish if there are high stocking numbers. Cotswold Lakes Trust or partners are to contact/liaise with fisheries/angling groups to raise awareness of sensitive stocking numbers. The EA Fisheries Officers, responsible for permitting fish stocks, should be contacted if there are any changes to fish stocking.
4.7: Finalise a comprehensive database through liaison between the British Dragonfly Society, local vice-county recorders, Cotswold Lakes Trust and reserve managers. Ensure that the updated database informs ongoing management.

[111] Cotswold Water Park Dragonfly Atlas: http://wsbrc.org.uk/news/the-cotswold-water-park-dragonfly-atlas/

[112] Managing habitats for Dragonflies, the British Dragonfly Society: https://british-dragonflies.org.uk/wp-content/uploads/2019/01/Managing-Habitats-for-Dragonflies-compressed.pdf

5 Habitat management guidance
5.1: Enhancing water-bodies to suit generalist species: -Provide submerged, emergent or floating vegetation; -Provide marginal vegetation around standing and running water; -Ensure reed-beds are structurally diverse, maintaining a range of successional stages through rotational cutting; -Reduce cutting of marginal vegetation at fishing points.
5.2: Creating additional habitat features to suit odonatan and other species groups: -Create buffer strips along rivers, streams, ditches and canals through low intensity management e.g. rotational cutting, create rough grassland. Sow with native, locally sourced, wildflower seed mixes. -Create ponds using funding opportunities (e.g. District Licencing for GCN or Biodiversity Net Gain) (*also refer to standing open water HAP for further advice).*
5.3: Habitat requirements and management for the Downy Emerald[113]: -Identify sites where there are known populations or nearby hotspots that consist of older lakes, mature woodland and a nearby dense hedgerow network. -Part of water body and shore to be shaded by overhanging trees. -Slowly-decomposing vegetation on bottom of water bodies, formed from the leaf litter of surrounding trees. -Dense fringes of vegetation and scrub growth. -Dredging works and intensified management of marginal trees/scrub to be avoided.
5.4: Habitat requirements of the Blue Tailed damselfly[114]: -Identify sites where there are known populations or nearby hotspots that consist of newly created, early successional habitats; -Shallow, small water bodies (nearby larger water bodies) and maintain minimal (early successional veg)/no vegetation cover; -A low degree of aquatic vegetation.

[113] Downy Emerald information: https://british-dragonflies.org.uk/species/downy-emerald/

[114] Blue tailed damselfly information: https://british-dragonflies.org.uk/species/blue-tailed-damselfly/

12.2 SAP: Bats

Relevant action plans:

Scrub Woodland
Fen, Marsh, Reed Swamp
Standing Open Water
Rivers and streams
Bare Ground and Early Successional Habitats
Built Structures

1. Habitat and ecology

Bats are highly mobile and use a variety of habitats for roosting, commuting and foraging. They are an ideal flagship group, indicating the health of the landscape and ecosystem.

The mosaic of man-made and natural features within the CWP offer an array of opportunities for bats. Fourteen species have been recorded in the CWP, with eleven species roosting and three using the CWP to forage and commute. Species include those of higher conservation status (e.g. Greater and Lesser horseshoe, Bechstein's and Barbastelle bat) as well as those more common and widespread.

Bats use roosts for breeding, hibernating and mating. The Cotswold stone and brick buildings (e.g. houses, barns and churches) within the settlements of the CWP are potential roost sites. Other roosting features include bridges, trees and tunnels. Roost requirements vary from species to species.

Quarry restoration has created a large wetland complex of gravel pits and associated wetland habitats (e.g. standing open water, river corridors, canals, red beds and fens, broad leaved woodland and species rich hedgerows). These support an abundance of invertebrates, fed on by bats from May to October. Linear features (e.g. hedgerows and water courses) within the landscape are used for commuting too.

2. Issues and threats

Reduction in prey: intensified, inappropriate management including more widespread pesticide use, has led to invertebrate decline;
Habitat loss and fragmentation: fewer roosting, foraging and commuting opportunities;
Lack of public understanding: bat behaviour and requirements are poorly understood;
Ineffective enforcement of legislation: there is a lack of enforcement to prosecute when roosts are damaged or disturbed.

3. Priorities/opportunities for future management

The Bat Assemblage of the Cotswold Water park report (dated 2014)[115] highlights the need for the status of different bat species within the CWP to be better understood. Therefore, further surveys and monitoring of bat species/known roosts can be carried out to inform the existing knowledge. Management should also ensure that roosting features are provided nearby known foraging grounds.

The UK is located in the northern range of many of many bat species (e.g. Lesser Horseshoes, Noctules, Bechstein's and Leislers bat species). Warmer temperatures could lead to shifts in the distribution, abundance and assemblage and there may be a higher dependence on the CWP to fulfil species' requirements. Future management will need to account for this.

Management should ensure habitat connectivity with the wider landscape. The Braydon Forest (South-East of the CWP, North Wilshire) consists of species-rich meadows, ancient woodland and a dense hedgerow network. The area supports a high number of bat roosts, of common and rarer species. Improving the connectivity between Braydon Forest and the CWP could encourage a greater abundance of bat species to the CWP.

4. Key Actions
4.1: Ensure that LPAs have access to up-to-date records from the local records centre (including any significant roosts e.g. maternity) so that consideration can be given to significant roost sites and habitat features within the planning process. This includes minimising external lighting along significant bat flight lines, foraging habitat and roosting locations as well as ensuring enhancement for bats are incorporated into scheme (bat boxes, bricks, tubes or lofts).
4.2: Farmers and landowners should ensure that their farming practises are wildlife friendly and benefit biodiversity, including bats. FWAG should continue to liaise with farmers and landowners in the CWP to ensure this. Refer to Section 5 for further guidance.
4.3: Landowners, leisure/recreation, developments, community groups etc. should provide specific roosting features adjacent to water bodies (e.g. bat boxes on trees and buildings) as additional roosting features for a range of bat species. For example, the Swill Brook corridor represents an ideal location for this (hosting mature lakes and mature woodland). The Cotswold Lakes Trust should liaise with the above stake holders to ensure this.
4.4: The Cotswold Lakes Trust and/or partners should host open days for the local community and distribute information leaflets to inform the public on the actions to take if bats are potentially roosting within their property and ways they can enhance habitat for bats/provide roosting features[116,117,118].
4.5: Continue to update data of known bat roosts within the CWP and surroundings (e.g. Braydon Forest). Use the current data from the CWP Bat Initiative[80], past survey results of ecological consultancies and records from other stakeholders (e.g. landowners). Ensure the local records centre holds all updated records.

[115] CWP Bat Atlas: https://www.waterpark.org/wp-content/uploads/2014/07/CWP-Bat-Atlas-v6-FINAL-sm61.pdf
[116] Further information on protecting bat species: https://www.bats.org.uk/
[117] Bat Conservation Trust, good practise guidelines: https://cdn.bats.org.uk/pdf/Resources/Bat_Survey_Guidelines_2016_NON_PRINTABLE.pdf?mtime=20181115113931&focal=none
[118] Bat Mitigation Guidelines, English Nature: http://www.warksbats.co.uk/pdf/Batmitigationguide.pdf

5. Habitat management guidance
5.1: Habitat management guidance for farmers and landowners[119]: -Avoid the use of anti-parasitic drugs (e.g. avermectins) during the spring and summer months in agricultural practises. If used, keep livestock housed after treatment. Alternatively, use more sustainable agricultural practises such as herb-rich grazing practises where there is a reduction in the use of wormers. -If possible, reduce size of agricultural fields to create a greater number of smaller fields with field margins, creating linear boundary features and increasing invertebrate abundance. -Reduce management to field margins to increase the abundance and diversity of plant and invertebrate species.
5.2: Enhancements that homeowners and landowners can provide for bats: -Ensure careful use of lighting to avoid roost entrances and suitable wavelengths to impact less. Use timers on lights where required[120] -Woodstone/woodcrete bat boxes mounted onto buildings or mature trees -Integrated bat boxes/tubes/bricks within new external walls -Create new ponds (*refer to guidance in standing open water HAP*) -Strengthen/fill gaps in hedgerows with native species to enhance the flight route.

[119] Bat conservation: https://www.conservationevidence.com/synopsis/pdf/8

[120] Bats and Artificial Lighting in the UK, Bat Conservation Trust: https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229&focal=none

12.4. SAP: Fish (wild and stock populations)

Relevant action plans:
Standing Open Water
Rivers and streams
Invasive non-native species

1. Background

Approximately 70 of the lakes within the CWP support fishing and the area attracts a high number of anglers every year – therefore supporting large stocked fish populations. With the CWP located within an area of high ground water levels and it hosting a vast freshwater complex, it is not surprising that wild fish populations, such as European Bullheads, are also present.

2. Stocked fish populations

Angling within the CWP supports the local economy and brings social benefits. However, these activities should be strategically controlled and sustainable to ensure disturbance and harm the wider ecosystem is avoided.

Issues to consider relating to stocked populations:

Over-stocking: this increases water turbidity, reduces plant growth and increases nutrient enrichment, deteriorating the overall water quality. Fish can also impact on the populations of other species, predating on species such as great crested newts and the larvae/nymphs of dragonflies/damselflies[121].

Fencing around lakes: this aims to stop species (e.g. otters) predating on the fish but can reduce landscape connectivity and disrupt species dispersal.

3. Wild fish populations

Particular wild fish species, such as the European bullhead, can be a valuable indicator of 'naturalness' in stream ecosystems. Like other wild fish species, bullheads require moderate flows and water that is oxygen rich. Having a variety of micro-habitats can also suit different stages of the lifecycle. These include areas with larger stones, shallower stony riffles, and sheltered sections (e.g. with woody debris, leaf litter and/or macrophyte cover)[122].

[121] Fish Ponds and Wildlife, SWT: https://www.suffolkwildlifetrust.org/fish-ponds-and-wildlife
[122] Bullhead fish, Wildlife Trusts: https://www.wildlifetrusts.org/wildlife-explorer/freshwater-fish/bullhead

Fish that inhabit standing water (e.g. lakes) can play an important role in influencing species composition and richness within the closed system. These fish are also a valuable food source to wader birds.

Future management should continue to ensure that both running and standing water bodies provide suitable conditions to sustain the wild fish populations.

Issues to consider for wild fish populations[123]:

Accidental and intentional introductions: introduced non-native species can have harmful impacts on native species

Pollution incidents: this can affect water quality and therefore impact on the ecosystem structure, affecting wild fish populations.

Unsuitable management of waterbodies: dense marginal vegetation and a lack of microhabitat features can reduce the suitability for wild fish populations.

Climate change: changes in temperature due to climatic changes have a significant impact on some fish species.

4. Key Actions
4.1: For any changes to recreational activities (e.g. angling), such as changes to stock densities or changes to visitor numbers etc., to consult Natural England and adhere to the guidelines and regulations of the SSSI designations and EA fish movement requirements.
4.2: For fishery management to allow for the continued dispersal of wildlife (e.g. otters) within all angling lakes. Avoid fencing all lakes within a given area, select lakes that are further apart in the landscape.
4.3: Avoid introducing fish to existing ponds/waterbodies where Great Crested Newts (GCN) are present and to newly created ponds (*please refer to Standing Open Water HAP for more information*). To aid this, GCN sightings must be recorded with the local records centres and stocking permission should take GCNs and other protected species into account.
4.4: Avoid works within rivers and streams that will affect the flow dynamics and/or increase the silt/sedimentation level. For example avoid creating weirs or widening, deepening and/or straightening a channel, unless advice has been sought from the Environment Agency.
4.5: Ensure that habitat enhancements within rivers and streams benefit the wild fish populations. *Please refer to Section 5 for habitat management guidance.*
4.6: Ensure an abundance of smaller fish within larger lakes and that these can penetrate the marginal vegetation and/or reed-beds to increase food availability for waders (e.g. bitterns), liaise with the Cotswold lakes Trust and the Environment Agency for further advice.
4.7: Ensure good water quality in all waterbodies, through complying with the Water framework Directive (WFD). Partnerships/volunteers/Citizen Science should update the data through surveys and ongoing monitoring. Also refer to HAP Standing Open Water and HAP Rivers & Streams.
4.8: Raise awareness of aquatic biodiversity (e.g. impacts of water quality and nutrient enrichment, stocking densities, importance of waterbodies for biodiversity, biosecurity) by hosting

[123] Wild Fish Habitats, Salmon & Trout Conservation: https://salmon-trout.org/wild-fish-habitats/

4. Key Actions
open days and producing information leaflets to engage lake owners, angling clubs and other recreational clubs.
4.9: To gather updated information on stocking rates and densities through liaising with local angling clubs. Use this to highlight any issues. Potential issues could be the stock densities (e.g. high densities of bottom-feeding fish such as carp can reduce plant and invertebrate abundance), potential invasive species and water quality.

5. Habitat management guidance
5.1: To enhance rivers and streams for wild fish populations, ensure habitat diversity through creating[124,125]: -Faster riffle areas with smaller stones/shingles; -Larger rocky areas; -Debris and submerged aquatic vegetation (native and locally sourced) in particular locations along the water corridor; -Avoid excessive clearance of boundary vegetation so there is some marginal refugia.
5.2: To enhance the water quality of all waterbodies, ensure[126]: -An improved drainage system upstream to avoid inconsistent water flows along rivers; -The creation of buffer strips along water courses, to reduce agricultural run-off and excessive algae growth. -Reduce soil compaction on land surrounding water bodies and use porous surfaces in potential waterside development to allow water to infiltrate to the ground (through Sustainable Drainage Systems (SuDS)). This should be considered at the planning stage of development.

[124] Restoring and enhancing streams and rivers, Farm Wildlife: https://farmwildlife.info/how-to-do-it-5/wet-features/streams-and-rivers/
[125] Microhabitat creation: https://www.caryinstitute.org/sites/default/files/public/downloads/lesson-plans/water_life_riffle_and_pool_background.pdf
[126] River habitat, Freshwater Habitats Trust: https://freshwaterhabitats.org.uk/habitats/river/

12.5. SAP: Terrestrial and riparian mammals

Relevant action plans:
Scrub Woodland
Lowland Neutral Grassland
Fen, Marsh and Reed Swamp
Rivers & Streams

1. Status, habitats and ecology

Terrestrial mammals utilise a vast range of niches available within the landscape and play key roles within ecosystems. However, the recent State of Nature report (2019) has identified a long term decline in their distribution, where 26% of mammal species are now threatened in the UK. Furthermore, according to a recent review carried out by Natural England and The Mammal Society, nearly one in five British mammal species faces a high risk of extinction. For example, species such as the hedgehog, are now vulnerable to extinction due to factors such as loss of habitat, fragmentation and intensified farming practises[127,128].

Surprisingly, given their vital role in ecosystem functioning, terrestrial mammals are often overlooked within management plans and are actually one of the most un-recorded species in Britain.

The CWP supports a range of terrestrial and riparian mammals such as hedgehogs, brown hares, harvest mice, field mice, wood mice, dormice, bank vole, field vole and water vole and otter, to name but a few. Most of these species have either suffered in the past or are currently under pressure.

Through encouraging suitable management for terrestrial mammals, this will in turn enhance the habitat conditions for others species groups with similar requirements, improve ecosystem functioning and also improve connectivity within the landscape. Consequently, these efforts can ensure robust ecosystems to better cope with future climatic challenges.

2. Issues/threats

Loss of habitat: inappropriate management, development and human activities can limit foraging, nesting and refugia opportunities for mammals and fragment the landscape;

Intensified agriculture: a reduction in invertebrates and seed availability can reduce feeding opportunities;

[127] The Mammal Society: https://www.mammal.org.uk/2018/06/british-mammals-fight-for-survival/
[128] State of Nature report, 2019: https://nbn.org.uk/wp-content/uploads/2019/09/State-of-Nature-2019-UK-full-report.pdf

Climatic changes: the life cycles of prey/food resources can shift as a response to changing climatic conditions, limiting food availability for mammals.

Water quality: poor water quality can affect riparian mammals that feed on plant matter along water bodies.

3. Priorities and opportunities for future management

As noted above, intensified agriculture, inappropriate management, increased development and recreational activities have all led to the loss of foraging, nesting and refugia opportunities within the CWP. This has also adversely impacted on the habitat connectivity. Future management will need to ensure that habitat for a range of terrestrial mammals is either created or enhanced within suitable locations of the CWP.

In the future, mammals will respond to extreme weather events by shifting their distribution and range. However, broad-scale climate projections are not entirely useful in predicting events that deviate from the 'normal' and there are uncertainties in predicting the response of mammals to the changing climate. Nevertheless, management should still ensure particular measures that can be particularly beneficial given climate change, such as improving landscape connectivity and diversity, enhancing habitat, reducing stressors and monitoring this change.

4. Key Actions
4.1: Promote the importance of terrestrial and riparian mammals and encourage local residents, farmers, landowners and development schemes to provide habitat enhancements. *Refer to Section 5 for specific habitat management guidance.*
4.2: Restore and enhance waterbodies, the banks and marginal habitat so that there are suitable opportunities for terrestrial and riparian mammals. E.g. enhancing the River Thames corridor for water vole in specific locations such as between Lower Mill Estate and Ashton Keynes.
4.3: Encourage landowners, the local community etc. to create suitable habitat features for mammals (such as hedgehogs) including hedgehog highways, log piles, scrub, native species-rich hedgerows etc. (*refer to Section 5 for further information*).
4.4: Continue to monitor and manage for invasive species where additional data would be beneficial (*refer to INNS Thematic Action Plan*).

5. Habitat management guidance
5.1: Small and large scale enhancement measures for terrestrial and riparian mammals[129,130,131,132]: -Plant new species-rich native species hedgerows to best aid habitat connectivity; -Fill gaps/strengthen existing hedgerows with native species (e.g. field maple, hawthorn, hazel, holly, wild privet, beech or hornbeam); -Provide hedgehog holes in the fences/walls to allow for continued dispersal; -Reduce the mowing/cutting of grass in particular areas of the garden/land, sow areas of land with flowering lawn mixes, wildflower seed mixes, or tussocky grass seed mixes;

[129] Habitat management for mammals, Agricology: https://www.agricology.co.uk/resources/managing-mammals
[130] Creating a wildlife friendly garden, RSPB: https://www.rspb.org.uk/birds-and-wildlife/advice/gardening-for-wildlife/creating-a-wildlife-friendly-garden/
[131] Homes for Hedgehogs, RSPB: https://www.rspb.org.uk/birds-and-wildlife/advice/gardening-for-wildlife/homes-for-hedgehogs/
[132] Hedgerow creation, Wildlife Trusts: https://www.wildlifetrusts.org/actions/how-make-hedge-wildlife

5. Habitat management guidance
-Create buffer strips of long tussocky species rich grass alongside water courses and/or field margins (*also refer to HAP Streams & Rivers*); -Encourage ground flora growth in woodlands through rotational coppicing (*also refer to HAP Scrub woodland*). -Plant native small-medium sized shrubs or trees: e.g. hazel, crab-apple, hawthorn, privet, guilder rose, wayfaring tree and/or spindle. Ivy can also provide cover, autumn flowers and winter berries. -Create undisturbed hibernacula features within gardens or on land nearby hedgerow boundaries, scrubland or woodland. -Reduce agricultural pesticide usage and antibiotics (e.g. avermectins, slug pellets) to increase invertebrate abundance and reduce pollutant run off near water courses. -Carry out minimal management to scrubland (*refer to Scrub woodland HAP*). -Carry out pest management practises if necessary to control for wildlife such as rats, rabbits and mink.
5.2: Enhancement measures specific for waterbodies and surrounding marginal habitat to benefit riparian mammals e.g. water voles and otters[133,134]: -Reduce intensity of grazing adjacent to banks of waterbodies to reduce poaching; -Reduce land drainage if the land is less valuable to farming so that it is wetter for long periods and allow for seasonal wetting; -Manage water courses on an 8 year rotational cycle, so that management is less intensive and only a portion of the water courses are managed each year. -Cut ditches on a 2-year rotation – leave one side uncut every year. -Create/retain areas of rush and sedge as winter refugia; -Create /expand reedbeds (*see HAP Fen, Marsh and Reed Swamp*); -Create woody brash piles; -Pollard / coppice trees on rotation alongside the waterbody;

[133] Management for Water Vole, Sussex Wildlife Trust: https://assets.sussexwildlifetrust.org.uk/Files/managing-land-for-water-voles.pdf

[134]Management for Otters, Sussex Wildlife Trust: https://assets.sussexwildlifetrust.org.uk/managing-land-for-otters.pdf

12.6. SAP: Black Poplar

Relevant action plans:
Scrub Woodland
Rivers and streams

1. Distribution, ecology and habitat

The distribution of the European black poplar (*Populus nigra*) extends from south and central Europe to central Asia and northern Africa. A particular sub-species is confined to particular locations within Great Britain and Northern France and it is considered the rarest native hardwood in Britain.

The species is associated with riparian ecosystems such as riparian woodland, wet meadows, hedgerows boundaries, farm ponds and rivers. It can therefore be a valuable indicator of riparian habitats. Black Poplar establish in damp locations and has adapted to growing in winter flooded meadows.

Black poplar has male and female trees. The species depends on wind and water to allow the seeds to disperse, they are only viable for a short period and need specific soil conditions to germinate. Therefore, successful germination requires an availability of winter flooded meadows within the landscape, when fresh soil that is moist, non-compact, well-drained is available for colonisation.

The CWP supports extensive riparian habitats and the hedgerows, river banks, farm ponds, within the water park provide suitable opportunities and conditions for germination and seedlings to establish. Recent evidence shows that the black poplar trees within the CWP are genetically distinct (possess rare clones) when compared to other populations within Britain and are of national significance. Therefore there is a need to understand the gene pool and the natural generation of the species within the CWP so that it is protected and conserved. Through protecting and enhancing the environment for black poplars, we can also restore and enhance the riparian ecosystems within the CWP.

2. Issues/threats

Human activities: agriculture, drainage and urbanisation, pose a large threat to the species and have led to the wide scale loss and modification of riparian habitats, limiting the number of potential germination sites.
Planting of exotic clones: hybrids can outcompete the native populations.

3. Priorities and opportunities for future management

It is believed that there is high diversity within the CWP, however, more DNA testing is required to understand the genetic diversity further and to also be carried out before anyone wants to carry out work for black poplar. Tree planting should not be undertaken unless the DNA analysis has been carried out on the specimens, to avoid the introduction of hybrids.

Normally there is a gender imbalance within black poplars due to male trees being preferred as they do not produce the unfavourable white-fluff that females do, leading to natural cross-pollination being rare. However, the CWP is especially important for black poplars because there is a much more even sex ratio. The presence of so many clones indicates that there have been occasions of sexual reproduction here. However, natural regeneration can be rare as both sexes are rarely present in close proximity or if they are, the environment might lack the suitable conditions for black poplar to germinate. Action is therefore required to better understand the genetic diversity within the CWP and conserve and manage the genetic diversity in the native black poplar population in the CWP. Genetic analysis offers high potential for conserving the species within the park and can inform the planting of individual trees with specific genetics. Black poplar can then be planted in strategic locations to maximise chances of reproduction.

There may be opportunities for establishing black-poplar based wet woodlands within the CWP using the cuttings of the selection of unique CWP clones. This would support a diverse assemblage of species including fungi, invertebrates, bats and birds.

Efforts should be given to the protection and enhancement of riparian ecosystems through suitable habitat management to create additional opportunities for sexual reproduction and seedling establishment around the river systems and lakes within the CWP. Management should consider and adapt to changing climatic conditions.

4. Key Actions
4.1: Maintain the numbers and distribution of black poplar at all known locations through[135]: -Use fences to allow the natural regeneration of fallen trees -Corrective thinning of existing trees
4.2: Create and enhance habitat to support the natural reproduction of the black poplar: -Identify appropriate habitat and locations for the establishment of new populations and confirm their suitability (e.g. close to a water source); -Ensure suitable conditions that will allow successful germination: e.g. ensure the soil is not compact to allow for excess water to drain, keep the soil moist within riparian habitats.
4.3: Establish new populations within the CWP through human mediated schemes where appropriate (*also refer to Section 5*): -Carry out DNA analysis to identify the genetic structure of the existing population[136]. Do not carry out any work on black poplars unless DNA analysis has been undertaken to avoid the planting of hybrids.

[135] Technical guidelines for genetic conservation and use, 2003, Euforgen

[136] Conservation of Black Poplar: insights from a DNA fingerprinting approach, September 2018, Forest Research

4. Key Actions
-Identify where there are gaps in the genetic structure and produce clones of specific individual trees. -Once DNA analysis has been carried out, plant black poplar in strategic locations along riparian habitats, in pairs to maximise the chances of reproduction[137]. -Explore opportunities to establish a black poplar based wet woodland using the cuttings of unique CWP clones.
4.4: Address and raise awareness of the black poplar on sites where the species exists to ensure suitable management regimes are applied.
4.5: Work with organisations and land owners along the catchment to arrange for new planting sites in suitable locations nearby water sources (e.g. along riparian habitats).
4.6: Analyse the distribution data and identify any potential future locations for planting, where there are gaps.
4.7: Submit genetic material to Forest Research to be screened for hybrid status then the genotype can be identified. This can then inform the database detailing the clones within Great Britain

5. Habitat Management Guidance
Human mediated schemes[138,139,140]: • For short term conservation: undertake static ex situ conservation to preserve the rare genotypes (in ex situ collection or gene banks). • For long term conservation: undertake in situ conservation through long-term breeding programmes or the restoration of stands • Take cuttings from known and newly recorded trees, in particular from the rarer clones, for DNA testing and planting in tree nurseries • Distribute propagated black poplars to land owners in the CWP in suitable locations (identified in Section 4).

[137] Saving our native Black Poplars, National Trust: https://www.nationaltrust.org.uk/features/saving-our-native-black-poplars

12.7. SAP: Breeding Water Birds (group)

Relevant action plans:
Wintering Water Birds
Standing Open Water
Fen, Marsh, Reed Swamp
Active Gravel Quarries

1. Importance, habitats and ecology

Given the extensive patchwork of lakes and wetlands, it is not surprising that the CWP is nationally important for water birds. Nationally important populations of great-crested grebe, little ringed plover and little egret are present. Other breeding water birds include mallard, mute swan, gadwall, shoveler, teal, moorhen, tufted duck, coots and pochard.

Several species are of red or amber UK conservation status (such as pochard, gadwall, shoveler and teal). The conservation of the water birds at a local scale will deliver benefits for conservation at the national scale.

Breeding water birds require a variety of habitat structures such as varying water depths, profiles, and shorelines. Shorncote reedbed (Lake 84/85) represents an exemplar site, comprising diverse structures, suiting a variety of water bird species.

Most water bird species such as great-crested grebe, mute swan, mallard, gadwall, shoveler and pochard have similar habitat requirements for breeding: dense bank vegetation (e.g. marginal reed-bed) with access to the open water. Some species, subject to higher predation rates (e.g. tufted duck, pochard and gadwall), also require low disturbance. Kingfishers can also nest in the banks a distance from the water and require low disturbance. Management will need to adapt depending on the assemblage present on a given site.

Food requirements can also vary depending upon the species. The actions below highlight requirements of specific species and appropriate management to enhance the suitability of habitat.

2. Issues/threats

Unsuitable habitat creation: uniform lakes with steep sides are often created within restoration schemes and suboptimal breeding habitat is often used;
Human activities: disturbance can impact on water bird distribution/breeding.
Lack of refuges: Other birds and mammals (e.g. corvids, foxes, American mink) can predate on breeding water birds when habitat quantity and quality is insufficient (e.g. when there is a lack of refuges for birds).

3. Priorities and opportunities for future management

Climate change may affect breeding water birds by altering their distributions, abundance and timing of occurrence in the UK (e.g. often breeding earlier in the spring). New species may also start to colonise habitats within the water park. For example, the numbers of little egret within the CWP have increased in recent years with a notable population breeding within the woodland pocket of Cleveland lakes. The assemblage of breeding birds will therefore be dynamic overtime and will mostly likely increase. Bittern have already established and the great white egret has bred successfully last year. Other species such as crane, cattle egret and marsh harrier are now regular summer visitors. Management should closely monitor the bird assemblage of the CWP, taking into account species naturally colonising, and adjust/adapt management accordingly.

Management will need to ensure that there are a greater number of breeding sites available to accommodate for future breeding success of specific species. It is vital for management to respond to any changes in populations and therefore ongoing monitoring is required.

4. Key Actions
4.1: Maintain and enhance habitat on sites, specific for the breeding water bird assemblages or individual species. -Select key sites of important breeding populations and establish management for each assemblage or species (if particular requirements). Work with mineral restoration schemes, landowners, reserve managers, Cotswold Lakes Trust to identify measures to suit individual species and/or assemblage. *-Please refer to the habitat management guidance in Section 5*
4.2: Reduce disturbance and predation on lake shorelines through implementing a 10m buffer area (include signage) where possible to prohibit people and dogs around the shorelines of lakes with public access. The buffer can include undisturbed marginal vegetation.
4.3: Identify locations that offer future potential suitability for specific species such as the little egret, to allow for the expansion of nesting sites. Accommodate for the needs of the species. e.g. mature trees around water for little egrets to nest.
4.4: Management and monitoring should ensure the protection and enhancement of the breeding bird assemblage, in support of Natural England's SSSI re-notification. Management and decisions are to be aligned with the conservation objectives of Natural England.

5. Habitat management guidance
5.1: Enhancing habitat for assemblages or specific species: -Ensure sites have diverse profiles, water depths and submerged aquatic plants to suit most species' requirements. -Assemblages that mostly include great-crested grebe, mute swan, mallard, shoveler and pochard: Ensure dense bank side vegetation such as reed-bed surrounding waterbody and/or densely vegetated islands, can fell surrounding willows into water to create nest sites but ensure easy access to water. -Tufted duck, pochard, gadwall: Strategically select/identify sites away from human activities with lower disturbance. Ensure dense marginal reeds and vegetated islands. Create suitable sites nearby known populations.
5.2: Feeding requirements of specific species[138]: -Great-crested grebes and duck species: water rich in invertebrates, small fish, amphibians;

[138] Further information available for specific species: https://www.rspb.org.uk/

5. Habitat management guidance
-Teal, shoveler, moorhen, little grebe: shallow areas with abundant floating seeds and invertebrates; -Pochard and tufted duck: deep water with abundant invertebrates; -Gadwell, pochard, mute swan and coot: abundant submerged water plants.

12.8. SAP: Wintering Water Birds (group)

Relevant action plans:
Breeding Water Birds
Standing Open Water
Fen, Marsh, Reed Swamp
Active Gravel Quarries

1. Importance, habitat and ecology

The CWP now has more than 35,000 wintering water birds. It supports internationally important populations of wintering lesser black-backed gull and nationally important numbers of pochard, great-crested grebe, tufted duck, coot, gadwall and pochard. The Wetland Bird Survey (WeBS), is undertaken each winter on almost all lakes in the Cotswold Water Park, and data is available by lake number for all wetland birds in the CWP. This data identifies the importance of individual lakes for wintering water birds.

These wintering water birds depend on suitable wetland habitats within mid-winter periods, such as shallow wetlands, gravel pits, reed-beds, willow carr, standing open water, ponds and wader scrapes for feeding, nesting and refuge. Research shows wintering birds to alter their habitat selection and diets depending on the conditions, such as the level of disturbance and competition.

Habitat requirements can be species specific where those that 'dabble' prefer vegetated peripheral habitats, whilst those that dive require submerged aquatic vegetation. It is therefore important for a mosaic of suitable habitats to be available within the CWP to suit the needs of different species.

2. Priorities and opportunities for future management

Climatic changes, such as the shift in seasons and changes in temperature and rainfall can all have an effect upon the abundance, distribution and assemblage of winter water birds present within the CWP. Research has revealed that the changes in climate have driven particular bird species to migrate to their breeding grounds earlier and also for the warmer winter temperatures to mean that birds do not migrate as far (known as 'short-stopping'), shifting their range. However, extreme temperatures may also lead to colder winters across Europe and the birds may then be forced further south and west. This is relevant to the CWP and means that wintering bird population may change overtime and therefore the assemblages should be closely monitored.

The above findings highlight the importance of having flexible, adaptable management within the CWP to account for any changes to species assemblages, any new species' requirements and changes in bird energy reserves. A comprehensive wetland network within the CWP should respond

to these changes through creating a mosaic of conditions to suit different requirements. Ongoing monitoring will need to be carried out to account for this.

3. Key Actions
3.1: Maintain and enhance existing wintering water bird habitats to ensure that there are abundant feeding opportunities' for dabbling (e.g. shoveler and gadwall) and diving (e.g. pochard, tufted duck, smew, great-crested grebe) species across the CWP. *Please refer to Section 4 for further information.*
3.2: Minimise disturbance on those lakes with the most important 'refuge' usage, and work to increase the area of open water that is further from disturbance from people and dogs.
3.3: Restrict dogs from accessing lakes, to minimise disturbance and reduce water pollutants/chemicals from entering water bodies.
3.4: Create a mosaic of habitat to offer greater opportunities to changing bird assemblages/abundance/ distribution in response to climate change
3.5: Ensure that there is ongoing monitoring of wintering water birds and associated habitats throughout the CWP (e.g. through WeBS).
3.6: For future management to be informed by updated data for wintering birds or even any changes to distribution/abundance.
3.7: All management and monitoring should support Natural England's work regarding the SSSI re-notification.

4. Habitat management guidance
4.1: Ensure that the peripheries of water bodies are vegetated in suitable locations to provide seeds, increase invertebrate abundance on and above the water surface. Ensure aquatic plant and thus invertebrate abundance within water bodies for diving species.
4.2: Creating a mosaic of habitat: -Vary the depth and profile of the water bodies; ensuring the presence of standing open water and shallow water wetland with undulating floors in the landscape (*refer to Standing Open Water HAP*); -Ensure there are scrapes and bare ground available; -Ensure reed-beds are of varying structure/maturity through rotational cutting (*refer to Fen, Marsh and Reed Swamp HAP*).

13. Thematic Action Plans (TAP)

Each plan includes information on:

- Background information
- Issues
- Priorities for future management
- Key actions
- Relevant habitat and species action plans/statements
- Links to online guidance

13.1. TAP: Invasive Non-Native Species

Relevant action plans:
Rivers and Streams
Standing Open Water

1. Definition and impacts of INNS

Non-native species exist in nearly all habitats within the UK and most do not pose a significant threat to ecosystems. However, some can intersect ecosystem processes, causing harm to the environment or associated species. It is these that are considered invasive non-native species (INNS). Aquatic ecosystems are most at risk of impact from INNS.

Under the Wildlife & Countryside Act 1981 (section 14), it is an offence to release certain non-native species into the wild in the UK as INNS have environmental, economic and/or social impacts. The species can disrupt ecosystems through predating on or out-competing native species or even through spreading disease. These species can impact on agricultural yields and pose a risk to public health, for example by increasing flood risk.

2. Issues/ threats

The expanse of standing and running water in the CWP offers vast opportunities for INNS to spread and colonise habitats quickly within all areas of the water park. INNS have therefore had adverse impacts on the native wildlife[139]. Examples of INNS in the CWP include:

American mink (*Neovison vison*) predates on water voles *(Arvicola amphibious*);
American signal crayfish *(Pacifastacus leniusculus*) have led to the decline of the native white clawed-crayfish, through the spreading of disease and direct competition;
Himalayan balsam (*Impatiens glandulifera*), impacts on the banks of river corridors, leading to bare banks that are susceptible to erosion. Producing large amounts of nectar, it can indirectly compete for pollinators and result in poor pollination of native plant species.
Japanese knotweed is a fast growing weed that suppresses the growth of other plant species. Difficult to control, it can be problematic in the area in the past, raising issues along the Churn in Cirencester;

[139] Invasive Non-Native Species, RSPB: https://www.rspb.org.uk/our-work/our-positions-and-casework/our-positions/species/invasive-non-native-species/#:~:text=Species%20which%20have%20been%20introduced,as%20invasive%20non%2Dnative%20species

Crassula helmsii (a non-native invasive plant) can form dense mats and reduces the abundance of native plant species and the availability of bare ground[140]. It has similar impacts where it grows completely submerged.

3. Priorities and opportunities for future management

Factors that have led to the spread of INNS within the CWP, include; the transference of seeds and other propagules downstream through waterbodies and the lack of co-ordinated management between land owners that share waterways. There is also a lack of awareness within recreation and development which leads to accidental local introductions from contaminated clothing and equipment, e.g. fishing gear and boats.

It is important to note that climate change has the potential to increase the spread and movement of INNS species as they shift or expand their range and some species may become invasive as a response to changing climatic conditions in future. Controlling for this may become an impossible task and therefore it may be better to adapt to living with existing invasive species whilst preventing new ones.

Although a priority of this Nature Recovery Plan is to increase the connectivity of habitats within the CWP, this will need to be carried out with caution, as to not continue, or even increase, the spread of INNS through the waterpark or wider landscape. Ongoing monitoring and management would be required where necessary and when this is an effective use of resources (e.g. mink control). Monitoring should be targeted at the right level and achievable.

Given the high number of water sources that flow through the CWP (such as the River Thames), management should consider the impacts of future INNS that are likely to appear in the CWP. For example the Quagga mussel exists within the River Thames and could easily spread into the CWP by movement of watercraft or recreational equipment.

4. Key Actions
4.1: Ensure that the 'check, clean and dry' principle[141] is carried out in all leisure/recreation facilities and elsewhere (including checks on boats, fishing equipment and clothes including footwear) so accidental introductions of specific species (e.g. quagga mussel, water primrose, signal crayfish) are avoided.
4.2: Landowners within the catchment should apply consistent management procedures e.g. the removal of Himalayan balsam through hand pulling, cutting the stem below the first node or applying herbicide. FWAG, the EA and The Cotswold Lakes Trust should ensure that there is a consistent approach across the catchment through hosting open days or provide information leaflets to landowners/residents.
4.3: Ensure that landowners, residents and visitors can identify and report INNS in the CWP and understand the biosecurity measures ('Check, clean dry') so that future introductions / spread can be avoided or minimised and that any new introductions are recorded[142].

[140] Controlling Crassula helmsii. Freshwater Habitats Trust: https://freshwaterhabitats.org.uk/projects/other-projects/controlling-crassula-helmsii/

[141] Check-Clean-Dry Principle, Defra: https://secure.fera.defra.gov.uk/nonnativespecies/checkcleandry/documents/check-clean-dry-england.pdf

[142] Information on INNS, The Rivers Trust: https://www.theriverstrust.org/2019/05/17/invasive-river-species/

4. Key Actions
4.4: Encourage volunteers to take part in monitoring programmes and citizen science projects. FWAG and the EA should promote volunteering opportunities within the local community.
4.5: The EA, Cotswold Lakes Trust and partner organisations should continue to monitor and map the current locations of INNS species when necessary. Send new data to the local records centre. Use the data to identify sensitive/vulnerable areas/hotspots. Please note that monitoring is resource intensive so should only be undertaken where a change in management strategy has or might be adopted and targeted at the right level and achievable. Future introductions should also be considered and management should adapt to any changes.

13.2. TAP: Re-introducing the European Beaver

Relevant action plans:
Rivers and Streams
Standing Open Water
Scrub Woodland
Terrestrial and Riparian Mammals

1. Importance of re-introductions

The European beaver (*Castor fiber*) was formally native to Britain but was hunted to extinction in the UK within the 16th century for its fur. In recent decades, efforts have been made to reintroduce the species to particular areas within the UK.

Beavers play an important role within the landscape. They are 'ecosystem engineers', meaning that they have the ability to modify, create and maintain habitat which can further support other species. In 2005, 6 beavers were released into Flagham Fen at Lower Mill Estate in the CWP as the first population to be re-introduced in the UK. This trial was one of the first in England and provided valuable evidence and advice for further trials across the UK. A number of trials are now underway in locations such as Cornwall, Kent and Scotland, where beavers have been introduced to enclosed areas of land. A 5-year trial in Devon recently came to an end and it was agreed that the beaver population along the river otter could stay with the trial having been a success[143,144].

So far, the trials have demonstrated their ability to create dams, ditches and ponds within wetland habitats that alter the hydrology and ecological value of the landscape and have wide-ranging benefits down-stream. This modification of wetland habitat has shown to reduce flooding events and control pollution levels (e.g. sediment reduction and water filtration). The habitat alteration can further benefit other species within the associated ecosystem, opening up additional niches, increasing habitat and species diversity[145].

2. Priorities and opportunities for future management

The past trial within the CWP in 2005 can provide evidence and support for future re-introductions within the CWP. Given the vast patchwork of lakes and wetlands present, there are ample opportunities for the future re-introductions. Actions will need to be thoroughly considered to

[143] Beaver Re-introduction in the UK: https://www.rspb.org.uk/our-work/our-positions-and-casework/our-positions/species/beaver-reintroduction-in-the-uk/
[144] Beaver re-introductions, Wildlife Trusts: https://www.wildlifetrusts.org/sites/default/files/2018-11/181023%20Beaver%20Brochure_WEB.pdf
[145] Information on Beavers, Wildlife Trust: https://www.wildlifetrusts.org/saving-species/beavers

ensure a success, similar to those existing trials elsewhere in the UK. It is worth noting that beavers may arrive eventually via natural colonization so communities should still be prepared for this.

If successful, beavers represent an opportunity for low key, sustainable management associated with habitats on lake fringes (e.g. such as the riparian woodland and willow stands), and having further environmental, economic and social benefits elsewhere in the CWP. Beavers offer a way to engage the public with wildlife and will bring benefits to the tourism /leisure industry within the water park.

With extreme weather events to become more common in future years, the re-introduction presents an effective opportunity, to reduce and buffer the potential negative impacts (e.g. within flooding events etc.). This is especially relevant to the CWP being an area of high ground water levels and an expansive freshwater complex. Therefore, the CWP may provide potential future locations for additional UK re-introductions.

In August 2020, the decision was made to allow the unenclosed beaver population along the River Otter to remain. Reports have been published which detail the benefit and issues of beaver re-introduction[146]. This highlights some concerns such as impacts on land drainage for agriculture causing elevated water levels and water encroachment when dams are in inappropriate areas. Action was taken in order to resolve the conflicts quickly. Actions to manage any future issues that arise from the natural colonisation of beavers or beaver re-introductions will be informed by these past trials.

3. Key Actions
3.1: Ensure that LPA's are aware of the potential future beaver re-introduction within the CWP.
3.2: Identify locations where the presence of beavers would be most beneficial (e.g. where there would be multiple benefits – those for both biodiversity and people through the provision of ecosystem services). These areas should preferably be upstream, wet woodland/river corridors. The Natural Capital Mapping could be used to inform this.
3.3: Ensure there can be a robust management regime at a catchment level. Specific management guidance/advice to be written when there is confirmation of the re-introduction.
3.4: Carry out separate consultations with landowners, developers, leisure companies, local residents/community groups, anglers, mineral companies the CWP to understand all viewpoints.
3.5: Engage stakeholder groups and raise awareness of the importance of beavers and the benefits they bring for people and biodiversity through hosting open days and distributing information leaflets.
3.6: Review the results of the 2005 trial in Lower Mill Estate and consult the organisations involved in other UK trials to gather evidence to support future re-introductions. Also review and understand any difficulties that were faced. Work alongside Gloucestershire Wildlife Trust (GWT) to assess the feasibility for re-introductions.
3.7: Identify potential benefits and any negative impacts (social, environmental and economic) of beaver re-introduction, weigh these up in a cost-benefit analysis.
3.8: Ensure a long-term monitoring programme can be implemented (e.g. identify sources of funding).
3.9: Identify a potential source population of beavers and ensure no biosecurity risks.

[146] River Otter Beaver Trial and associated reports: https://www.devonwildlifetrust.org/what-we-do/our-projects/river-otter-beaver-trial

13.3. TAP: Built Structures

Definition:

The plan includes man-made built structures including the construction and repair of built developments and other features such as bridges.

1. Importance

The CWP is subject to high levels of new development, being an important area for tourism. Structures are constantly being built or repaired and this will inevitably increase in the future. This action plan ensures that current and future development maximises opportunities for biodiversity within the CWP, enhancing the functionality of ecosystems.

The plan ensures that relevant approaches and initiatives, such as Biodiversity Net Gain (BNG), are fully considered within development projects (*refer to Section 8*).

Built structures provide opportunities for a number of different species such as nesting birds (e.g. house sparrows, swallows, swifts, house martins and barn owls) and roosting bats. Reptiles and amphibians can depend upon structures such as stone walls for shelter in the winter. It is therefore important for these features to be safeguarded and enhanced.

2. Issues/threats

Built development: Biodiversity can be negatively impacted if biodiversity is not considered at the planning stage within developments. However, through BNG, biodiversity would benefit.
Intensive management: green spaces associated with built development are often poorly designed, managed to look neat, with low ecological value, impacting on biodiversity.

3. Priorities and opportunities for future management

The Biodiversity Net Gain (BNG) approach holds positive opportunities for biodiversity. In this way, biodiversity compensation and enhancements can be guaranteed whether it is on or off site. Projects to ensure the delivery of BNG can be directed towards specific areas outlined within the NRN or can aid local projects/initiatives.

Even smaller schemes, such as householders, can deliver benefits for biodiversity. Low intensity management in back gardens/small holdings and the provision of ecological features (e.g. bat and bird boxes) can really benefit biodiversity and aid habitat connectivity.

4. Key Actions
4.1: For LPA's to ensure that all major developments (>10 dwellings) show biodiversity net gain, of at least 10%, through using the biodiversity net gain metric (current version of the Defra metric). If 'off-site' net gain is required, promote contributions towards delivering the NRN and/or aiding local projects and initiatives.
4.2: For all development to provide compensatory and enhancement provisions to suit the given species on or adjacent to the site such as roosting (e.g. bat boxes/tiles/bricks/loft) and nesting provision (e.g. house sparrow terrace, swift bricks, swallow nest cups, starling boxes and/or barn owl boxes) and/or hedgehog gaps. Local residents should also be encouraged[147,148]
4.3: Promote the importance of nature in the built environment (e.g. bats, birds, importance of 'messy' back gardens) by hosting open days, events and/or working with school groups
4.4: Provide advice to ensure that bat roosts and bird nests are protected and safeguarded[149,150,151]
4.5: Enhance the road verges associated with development. If possible leave scrub to grow in patches of verge adjacent to flower rich habitat, manage scrub on rotation to create a mosaic (refer to HAP Scrub woodland)[152].
4.6: Ensure that developments are served by mains sewerage.

[147] Bat and bird boxes:

- https://www.wildcare.co.uk/
- https://www.nhbs.com/
- https://www.arkwildlife.co.uk/category/wildlife-care/bat-boxes/
- https://www.rspb.org.uk/get-involved/activities/give-nature-a-home-in-your-garden/garden-activities/buildabatbox/
- https://www.barnowltrust.org.uk/
- https://www.swift-conservation.org/Nestboxes&Attraction.htm#Built%20in

[148] Hedgehog Highways: https://www.hedgehogstreet.org/help-hedgehogs/link-your-garden/

[149] Bat Surveys for Professional Ecologists, Good Practice Guidelines, Bat Conservation Trust (Collins, 2016) https://cdn.bats.org.uk/pdf/Resources/Bat_Survey_Guidelines_2016_NON_PRINTABLE.pdf?mtime=20181115113931&focal=none

[150] Bats and artificial lighting in the UK, Bat Conservation Trust: https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229&focal=none

[151] Bats: protection and licences: https://www.gov.uk/guidance/bats-protection-surveys-and-licences

[152] Managing road verges: https://www.wildlifetrusts.org/wildlife/managing-land-wildlife/managing-road-verges-wildlife

13.4. TAP: Green Infrastructure

Definition

The National Planning Policy Framework's definition[153]:

"A network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities."

1. Importance

Further to the above definition[153], green infrastructure (GI) includes a range of green spaces and natural features, delivering multi-functional benefits for both the local community and wildlife[154,155]. For example, the delivery of high quality GI can maximise opportunities for biodiversity, improve human health and wellbeing whilst delivering essential ecosystem services to mitigate the impacts of climate change (e.g. heat and water regulation, carbon sequestration and air filtration).

All new and existing development and projects within the CWP offer significant opportunities for integrating high quality features to benefit biodiversity. Built features and their associated habitats can be created and enhanced through fully considering the surrounding context (e.g. habitat and species within the adjacent/surrounding area) to maximise the benefits delivered.

2. Issues/threats

Development and tourism: Species, habitats, human health and climatic functioning can be negatively impacted if biodiversity is not considered at the planning stage.
Intensive management: green spaces associated with built development are often managed to look neat, with low ecological value, and low connectivity to the wider landscape.

3. Priorities and opportunities for future management

All projects will need to consider the wider context to contribute towards a functional ecological network, aiding the movement of species whilst restoring natural processes. High quality green infrastructure can be strategically provisioned to ensure multi-functionality to benefit human health

[153] National Planning Policy Framework,2019: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf
[154] Natural England's Green Infrastructure Guidance, 2009: http://publications.naturalengland.org.uk/publication/35033
[155] Green Infrastructure Partnership: https://www.tcpa.org.uk/News/uks-biggest-green-infrastructure-knowledge-base-launched

and wellbeing whilst protected biodiversity and restoring ecosystem processes. Developments (such as Lower Mill Estate) within the CWP have already embedded high quality green infrastructure into the heart of their plans through using 'Building with Nature' standards. Future development proposals should follow this[156]. Cotswold District Council (CDC) have used BwN in Local Plan policies and other LPAs should also do so.

The Biodiversity Net Gain (BNG) approach holds positive opportunities for biodiversity. Biodiversity compensation and enhancements can be guaranteed whether it is on or off site. Projects to ensure the delivery of BNG can be directed towards specific areas outline within the NRN.

4. Key Actions
3.1: Promote high quality green infrastructure in all new developments and encourage applicants to use the 'Building with Nature' standards and secure appropriate on-going management of GI.
3.2: Work alongside the priorities and actions of Cotswold District Council's (CDC's) and Wiltshire Council's green infrastructure strategies' to ensure multi-functional benefits within the CWP e.g. support and aid footpath/cycle path creation in and around settlements.
3.3: Improve the water quality of water courses and ensure suitable management of the banks (*refer to the Rivers and Streams HAP*)
3.4: Ensure habitats are created and enhanced whilst being in-keeping with the habitat networks within the surrounding area
3.5: Ensure that on-site and off-site biodiversity net gain (BNG) is delivered through habitat creation and enhancement in ways that maximise habitat connectivity, benefit biodiversity and improves resilience to future climatic events.

[156] Building with Nature: https://www.buildingwithnature.org.uk/about

14. Appendices

Appendix 1: Preparation of the CWP Nature Recovery Plan

Appendix 2: Glossary of Terms

Appendix 3: Priority species within the CWP

Appendix 4: Partners included within the Nature Conservation Forum (NCF)

Appendix 1: Preparation of the Nature Recovery Plan

This Plan has been funded by the para 20 Section 106 agreement at Lower Mill Estate, Natural England and Cotswold District Council. It has been prepared with the input from the Nature Conservation Forum.

Appendix 2: Glossary of terms

Biodiversity Action Plan (BAP) – internationally recognised programs that focus on protecting and enhancing biodiversity.

Biodiversity Net Gain (BNG) – an approach to development that results in a net improvement to biodiversity within a defined area of land, leaving biodiversity in a better state than it was in before. More information available at: https://cieem.net/i-am/current-projects/biodiversity-net-gain/

Ecosystem services- the direct or indirect benefits that wildlife or ecosystems provide for people from natural capital assets. These include provisioning services (e.g. food and water), regulatory services (e.g. flood control) and cultural services. More information available at: https://www.iucn.org/commissions/commission-ecosystem-management/our-work/cems-thematic-groups/services

Green Infrastructure (GI)- a network of multi-functional green space (including the water environment) that can deliver a range of quality of life and environmental benefits. It includes natural and semi-natural green spaces, green corridors, parks and gardens, wetlands, rivers, canals etc. **More information is available at:**

- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf
- http://publications.naturalengland.org.uk/publication/35033

Great Crested Newt District Level Licencing (GCN DLL) – Schemes that work in certain parts of England to protect great crested newt populations. Developers can choose to join the scheme so that they do not have to carry out their own surveys or plan/undertake mitigation work and it can save time during the planning process. More information available at:

- https://www.gov.uk/government/publications/great-crested-newts-district-level-licensing-schemes
- https://naturespaceuk.com/

Habitat Regulations Assessment (HRA) – required when plans or projects are likely to have an adverse impact on a European designated site. Authorities (e.g. Local Planning Authorities) have the legal obligation to consider the impacts before granting consent or permission. More information available at: https://www.gov.uk/guidance/appropriate-assessment

Local Nature Partnership (LNP) – aims to bring nature to the forefront of decision making to benefit people, wildlife and the economy through working together with local organisations, businesses and local people. More information about the Gloucestershire Local Nature Partnership is available at: https://www.gloucestershirenature.org.uk/

Local Nature Recovery Strategies (LNRS) – the creation of LNRS are proposed as part of the Environment Bill, where each local authority would be required to prepare a LNRS to detail biodiversity priorities of their area including the details of particular protected sites and areas that could contribute towards achieving the biodiversity priorities.

Natural Capital- natural assets which directly or indirectly provides flow of services to deliver benefits for people, wildlife and the economy. More information available here: https://www.gloucestershirenature.org.uk/post/a-natural-capital-approach-to-growth

Nature based solutions- actions that involve the protection, restoration and management of ecosystems to address societal challenges effectively whilst providing benefits for human well-being and biodiversity at the same time. More information available at: https://www.iucn.org/theme/nature-based-solutions

National Character Area (NCA) – areas in England that are subdivided based upon natural factors such as landscape, geodiversity, biodiversity and economic activity. More information is available at: http://publications.naturalengland.org.uk/publication/1831421?category=587130

Nature Conservation Forum (NCF) – a representative body that works across the whole of the CWP area to protect and conserve biodiversity.

Nature Improvement Area (NIA) – established to create well-connected, resilient ecological networks at a landscape scale. More information is available at: https://www.gov.uk/government/publications/nature-improvement-areas-improved-ecological-networks/nature-improvement-areas-about-the-programme

National Planning Policy Framework (NPPF) – sets out the government's planning policies for England and how these are expected to be applied. More information is available at: https://www.gov.uk/government/collections/planning-practice-guidance

Nature Recovery Network (NRN) – a group of maps that provide information on the location of priority habitats, current connectivity and restoration/creation opportunities. More information and mapping for Gloucestershire available at: https://naturalcapital.gcerdata.com/

Special Area of Conservation (SAC) – high-quality conservation sites that are protected and form part of the UK's national site network. More information available at: https://jncc.gov.uk/our-work/special-areas-of-conservation-overview/

Site of Special Scientific Interest (SSSI) – a formal conservation designation, describing an area that is of particular importance to science because of the rare fauna or flora present within that area.

Water Framework Directive (WFD) – developed by the EU, establishes a framework for the protection of all waters (e.g. rivers, lakes, estuaries, coastal water and ground water) and the associated species/habitats.

Appendix 3: Priority species within the CWP

The priority species below were recorded in the last 10 years within the CWP (2011-present). Data sourced from the Gloucestershire Centre for Environmental Records and Wiltshire & Swindon Biological Records Centre.

Species group	Scientific name	Common name
Amphibians	*Bufo bufo*	Common Toad
	Triturus cristatus	Great Crested Newt
Reptiles	*Vipera berus*	Adder
	Zootoca vivipara	Common Lizard
	Natrix natrix	Grass snake
	Anguis fragilis	Slow-worm
Birds	*Limosa limosa*	Black-tailed godwit
	Pyrrhula pyrrhula	Bullfinch
	Emberiza schoeniclus	Common Reed Bunting
	Melanitta nigra	Common Scoter
	Emberiza calandra	Corn Bunting
	Cuculus canorus	Cuckoo
	Botaurus stellaris	Great Bittern
	Alauda arvensis	Eurasian Skylark
	Larus argentatus	European Herring Gull
	Locustella naevia	Grasshopper Warbler
	Perdix perdix	Grey partridge
	Coccothraustes coccothraustes	Hawfinch
	Passer domesticus	House Sparrow
	Vanellus vanellus	Lapwing
	Acanthis cabaret	Lesser Redpoll
	Dryobates minor	Lesser Spotted Woodpecker
	Linaria cannabina	Linnet
	Poecile palustris	Marsh Tit
	Phalaropus lobatus	Red-necked Phalarope
	Turdus torquatus	Ring Ouzel
	Aythya marila	Scaup
	Muscicapa striata	Spotted Flycatcher
	Sturnus vulgaris	Starling
	Anthus trivialis	Tree Pipit
	Passer montanus	Tree Sparrow
	Streptopelia turtur	Turtle Dove
	Anser albifrons subsp. albifrons	European Greater White-fronted Goose
	Phylloscopus sibilatrix	Wood warbler
	Jynx torquilla	Wryneck
Fishy – Bony	*Salmo trutta*	Brown Trout
Vascular plants	*Orchis ustulata*	Burnt Orchid
	Blysmus compressus	Flat-sedge
	Oenanthe fistulosa	Tubular Water-dropwort
	Orthosia gracilis	Powdered Quaker

Terrestrial invertebrates – moths	*Mesoligia literosa*	Rosy Minor
	Hydraecia micacea	Rosy Rustic
	Hoplodrina blanda	Rustic
	Cirrhia icteritia	Sallow
	Scotopteryx chenopodiata	Shaded Broad-Bar
	Graphiphora augur	Double Dart
	Apamea remissa	Dusky Brocade
	Ennomos fuscantaria	Dusky Thorn
	Tholera decimalis	Feathered Gothic
	Adscita statices	Forester
	Tyria jacobaeae	Cinnabar
	Arctia caja	Garden Tiger
	Hepialus humuli	Ghost Moth
	Allophyes oxyacanthae	Green-Brindled Crescent
	Acronicta rumicis	Knot Grass
	Malacosoma neustria	Lackey
	Apamea anceps	Large Nutmeg
	Rhizedra lutosa	Large Wainscot
	Brachylomia viminalis	Minor Shoulder-Knot
	Caradrina morpheus	Mottled Rustic
	Amphipyra tragopoginis	Mouse Moth
	Watsonalla binaria	Oak Hook-Tip
	Trichiura crataegi	Pale Eggar
	Aporophyla lutulenta	Deep Brown-Dart
	Melanchra persicariae	Dot Moth
	Atethmia centrago	Centre-barred Sallow
	Pareulype berberata	Barberry Carpet
	Agrochola lychnidis	Beaded Chestnut
	Timandra comae	Blood-vein
	Lycia hirtaria	Brindled Beauty
	Agrochola litura	Brown-spot Pinion
	Spilarctia luteum	Buff Ermine
Terrestrial invertebrates – butterfly	*Thecla betulae*	Brown Hairstreak
	Pyrgus malvae	Grizzled Skipper
	Cupido minimus	Small Blue
	Coenonympha pamphilus	Small Heath
	Satyrium w-album	White-letter Hairstreak
Terrestrial invertebrates – beetles	*Meloe proscarabaeus*	Black Oil-beetle
	Meloe rugosus	Rugged Oil-beetle
Terrestrial invertebrates – bees	*Bombus ruderarius*	Red-Shanked Carder Bee
Terrestrial Mammals	*Plecotus auritus*	Brown Long-eared bat
	Pipistrellus pygmaeus	Soprano Pipistrelle
	Rhinolophus hipposideros	Lesser Horseshoe Bat
	Barbastella barbastellus	Western Barbastelle
	Lutra lutra	European Otter
	Arvicola amphibius	European Water Vole
	Micromys minutus	Harvest Mouse
	Erinaceus europaeus	West European Hedgehog
	Mustela putorius	Polecat
	Lepus europaeus	Brown Hare

Appendix 4: Partners included within the Nature Conservation Forum (NCF)

Cotswold District Council

Cotswold Lakes Trust

Environment Agency

RSPB

Lower Mill Estate

Wiltshire County Council

Gloucestershire County Council

Wiltshire Ornithological Society (WAS)

Gloucestershire Ornithological Committee (GOC)

Gloucestershire Wildlife Trust

Wiltshire Wildlife Trust

Natural England

Wildfowl & Wetlands Trust

Cotswold Canals Trust

Farming and Wildlife Advisory Group

Gloucestershire Rural Communities Council (GRCC)