Vision

The overarching vision for the Lee Valley Regional Park Biodiversity Action Plan is to work with partners and communities to conserve, create, restore and enhance the biodiversity ~~habitats~~ of the Regional Park, providing access to and appreciation of this area.

This vision will be met through four ~~five~~key objectives:

Objectives

I. To conserve, create, restore and link characteristic ecological, hydrological and landscape features to form a fully integrated river floodplain corridor

II. To realise the full ecological potential of the Lee Valley Regional Park by maintaining and enhancing the present range of species, habitats and landscape features combined with extensive re-creation and expansion of key habitat types

III. To achieve a sustainable use of the natural resource

IV. To achieve awareness and understanding of the biodiversity of the Lee Valley Regional Park and to encourage participation in its conservation

What is Biodiversity?

'Biological diversity – 'Biodiversity' – is the variety of life on earth. It is nature's variety of species, habitats and whole ecological systems. Human society's interaction with biodiversity shows whether our economic and social development is sustainable.'

UK Biodiversity Group

Biodiversity does not just refer to rare or threatened species but the whole of the natural world from the commonplace to the critically endangered. It includes the plants and animals we see in and around the places where we live and work as well as those restricted to isolated pockets of fragile habitat.

Why conserve biodiversity in the Lee Valley?

Reasons for conserving biodiversity range from the social, cultural and health benefits it brings, through the essential environmental services natural areas provide to the potential genetic resources that have been used in agriculture, medicine and other branches of science. We have a duty to future generations to ensure that the world they inherit is able to provide them with these same benefits. In addition to these utilitarian reasons for conserving biodiversity comes a moral responsibility to recognise the intrinsic right of other species to exist alongside us.

On a personal level most of us enjoy contact with the natural world. Our lives can be enriched by walking through a wildflower meadow or listening to bird song. Contact with wildlife can help us to feel in touch with our environment, the seasons and natural processes. In addition to the role of biodiversity in our day to day lives it also plays an important part in developing cultural identity and a sense of place reflecting our diverse communities' needs.

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Natural areas provide us with essential environmental benefits known collectively as Ecosystem Services. Unfortunately the scale and nature of these services often only becomes clear when the system breaks down. In the Lee Valley Regional Park, wetland areas are capable of holding and releasing floodwaters over an extended period of time, reducing the likelihood of flooding downstream and the associated damage to property and livelihoods. Many of the economic and social impacts caused by flooding could be eliminated if parts of our river systems still operated within natural floodplains. This same process of slowing down the rate at which rain water passes into river channels can also help to filter out pollutants, reduce soil erosion and improve water quality. The ability of vegetation to remove pollutants from water is currently being harnessed through the inclusion of reedbeds and other wetland habitats in Sustainable Urban Drainage Systems (SUDS), which are increasingly incorporated into modern urban developments.

Our changing climate poses a huge challenge to biodiversity in a number of ways from the timings of seasonal events to the distribution of species, the arrival of new species and alterations to specific habitats. Biodiversity and the way we manage key sites will have an important role in climate change adaptation, resilience and mitigation through for example reducing risk of flooding and helping to reduce the urban island heat effect of our built up areas.

There is growing evidence that access to the natural environment improves health and wellbeing, both physical and mental, can prevent disease and assist recovery from illness. As a nation however we are experiencing increasing obesity, a lack of physical exercise and a staggering one in four of us will experience a mental health problem at some time in our life. Evidence shows that contact with nature and in particular good quality green space can help to reverse and prevent these issues by increasing physical activity and reducing stress.

Lee Valley Regional Park Authority

Lee Valley Regional Park Authority was set up under the Lee Valley Park Act (1966) and is responsible for managing and developing the 26 mile long, 10,000 acre linear Lee Valley Regional Park - the only regional park serving London, Hertfordshire and Essex. The Authority has a broad and dynamic remit with a duty to develop and preserve nature, leisure, recreation and sport throughout the park. The Authority ~~is~~has been responsible for regenerating derelict and neglected land into high quality public open spaces and wildlife habitats of ecological importance, as well as preserving the region's historical value. Whilst the Authority owns and manages 4000 acres (1,600Ha) of the Regional Park, there are a number of other landowners and managers including charities such as RSPB, Herts and Middlesex Wildlife Trust, London Wildlife Trust and the Canal and River Trust, organisations such as Thames Water, Local Authorities and numerous other smaller private landowners. There are other key stakeholders in the management of the habitats of the Regional Park such as the Environment Agency and Natural England as well as regional and local interest groups. Map One shows the boundary of the Regional Park.

In April 2015, Lee Valley Leisure Trust came into operation as part of the Authority's commitment to further establish Lee Valley Regional Park as world class destination and ensure that public funds are utilised efficiently and effectively as possible.

The Trust runs the Authority's three London 2012 legacy venues and 11 other major sports and visitor sites to ensure they continue to deliver economic, sporting and social benefits for the residents of London, Essex and Hertfordshire.

This document aims to follow-on from the previous Biodiversity Action Plan produced in 2000 and provide a framework for biodiversity action for the Lee Valley Regional Park. It is hoped that through the development of the Biodiversity Action Plan Partnership the valley's key stakeholders will play an active role in the delivery of its targets.

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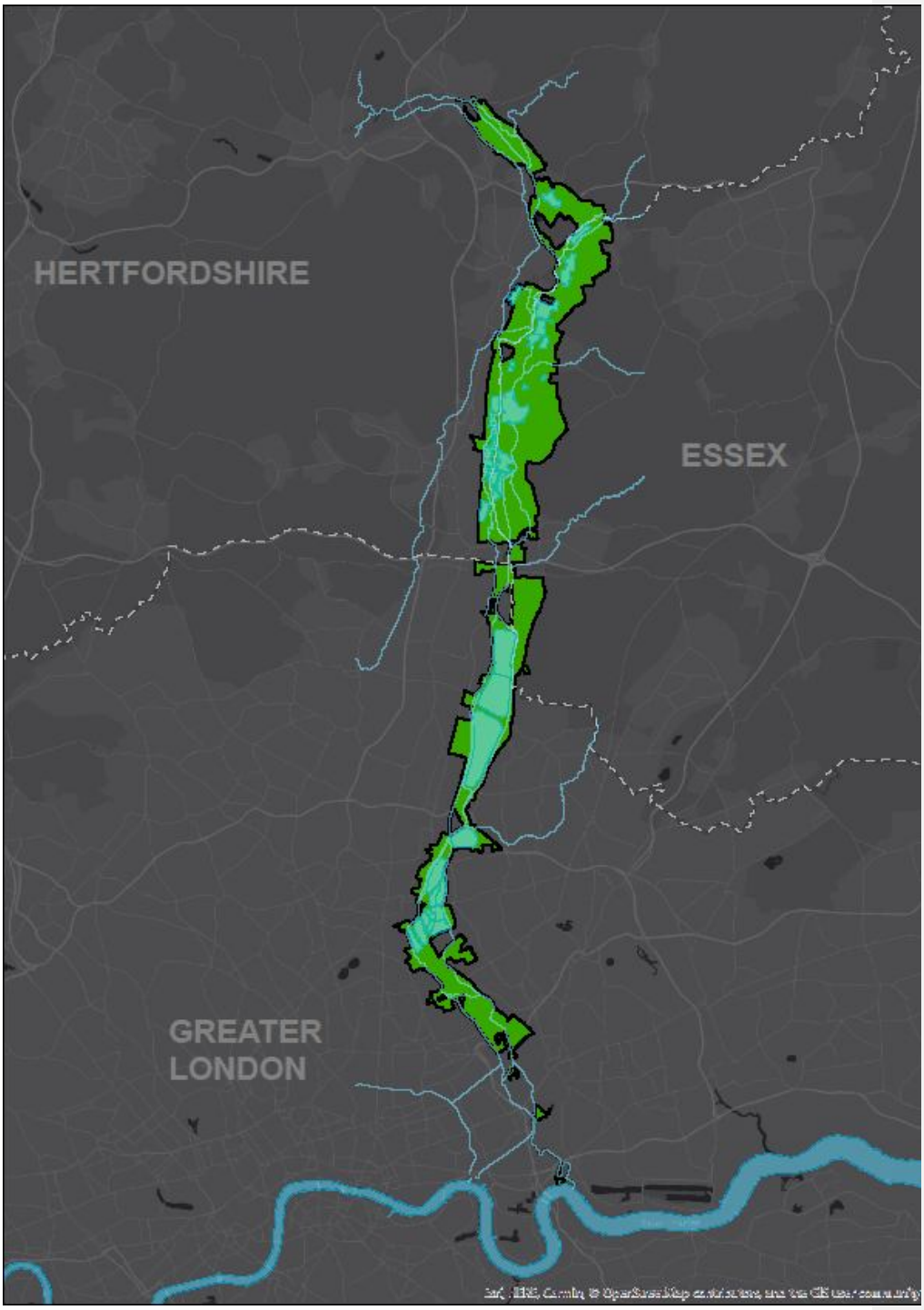
Map One: Statutory boundary of Lee Valley Regional Park Authority



Biodiversity Action – A global response

At the 1992 'Earth Summit' in Rio de Janeiro, 159 governments signed the Convention on Biological Diversity. This was the first treaty to provide a legal framework for the conservation of biodiversity. It called for signatory states to create and provide statutory support for national strategies and action plans designed to conserve, protect and enhance biodiversity.

In 2010 over 190 countries from around the world came together in Japan in order to reach agreement over actions to halt the continued decline in global biodiversity. As a result the 'Aichi' aims and targets were agreed.

Biodiversity Action – A national response

The UK's response to the Rio Earth Summit was the launch of the UK Biodiversity Action Plan in 1994. This was the result of extensive consultation with over 300 organisations and established the collaborative approach to nature conservation that proved to be the great strength of the Biodiversity Action Plan process. The first report, entitled 'Meeting the Rio Challenge'[1], established the framework and criteria for identifying species and habitat types of conservation concern. Action Plans were subsequently drawn up for 391 species and 45 habitats.

Devolution in 1998 led the four ~~countries~~ nations of the UK to develop their own ~~country~~ strategies for biodiversity. In 2007 this was followed by a shared vision for the UK, adopted by the UK Government and devolved administrations. This document 'Conserving Biodiversity – the UK approach' outlined the shared vision and approach to conserving biodiversity within the devolved framework. Guidance on the national priority habitats and species is found in the list of Habitats and Species of Principal Importance in England identified under Section 41 of the NERC Act 2006[2].

The 'UK Post-2010 Biodiversity Framework'[3] was published in July 2012 in response to a change in thinking after the Aichi targets and succeeds the UK BAP. The development of the Framework reflects a revised direction for nature conservation in the UK's four nations towards a shared approach which aims to consider the management of the environment as a whole, and to acknowledge and take into account the value of nature in decision-making.

Whilst the protection of key sites is important this alone will not offer a robust resilience to climate change or halt the loss of biodiversity. In recognising this there has been a move towards landscape scale conservation strategies. In England following on from the Lawton Review 'Making Space for Nature'[4] 2010, the Government produced 'The Natural Choice: securing the value of nature'[5] White Paper in June 2011. This outlined the creation of Local Nature Partnerships (LNPs) and Nature Improvement Areas (NIAs) to strengthen local action and reconnect nature at a landscape scale.

[1] Biodiversity: The UK Steering Group Report Volume 1: Meeting the Rio Challenge (JNCC 1995)

[2] Natural Environment and Rural Communities Act, 2006

[3] UK Post-2010 Biodiversity Framework, (JNCC, DEFRA, 2012)

[4] Making Space for Nature (DEFRA 2010)

[5] The natural choice: securing the value of nature (DEFRA 2011)

The ~~most recent~~ England biodiversity strategy 'Biodiversity 2020'[6] was published in 2011. The aim of the strategy is:

'To halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.'

It is aimed that these outcomes will be delivered through action in four areas:

- a more integrated large-scale approach to conservation on land and at sea
- putting people at the heart of biodiversity policy
- reducing environmental pressures
- improving our knowledge

The need to adopt an integrated landscape view of conservation has been recognised, however it should be noted that some species require additional more specific attention to aid their conservation. There are a number of landscape scale strategies applicable to the Lee Valley detailed below~~.~~

The most recent environment plan 'A Green Future: Our 25 Year Plan to Improve the Environment'[7] sets out government action in England to help the natural world regain and retain health through the achievement of a set of 25–year goals which are:

- Clean air
- Clean and plentiful water
- Thriving plants and wildlife
- Reduced risk of harm from environmental hazards such as flooding and drought
- Using resources from nature more sustainably and efficiently
- Enhanced beauty, heritage and engagement with the natural environment

In addition, they aim to manage pressures on the environment by:

- Mitigating and adapting to climate change
- Minimising waste
- Managing exposure to chemicals
- Enhancing biosecurity

It is intended that this plan will be revised and refreshed during its lifespan in order to take account of fast-moving changes in science, technology and our society.

The National Planning Policy Framework (NPFF)[8] published in July 2018 sets out the Government's planning policies for England and how these should be applied in order to contribute to the achievement of sustainable development through three overarching objectives. The environmental objective states that the planning system should to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity,

[6] Biodiversity 2020: A Strategy for England's wildlife and ecosystem services (DEFRA 2011)
[7] A Green Future: Our 25 Year Plan to Improve the Environment (DEFRA 2018)
[8] National Planning Policy Framework (Ministry of Housing, Communities and Local Government, July 2018)

using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Local Planning Authorities should develop Local Plans which apply a presumption in favour of sustainable development unless there would be adverse impacts which would significantly and demonstrably outweigh the benefits assessed against the NPPF taken as a whole.

Post-Brexit considerations

European legislation has provided a framework for key areas of statute with regard to nature conservation in the UK. Following the 2016 referendum Britain is in a transition period leading up to the scheduled date of leaving the European Union on 29th March 2019. The European Union (Withdrawal) Bill is currently progressing through Parliament and if passed, it will end the primacy of EU law in the UK and will incorporate all EU legislation into UK law which over a period of time will be reviewed.

This document will need to be reviewed to reflect any amendments made to UK statute following departure from the EU and the subsequent review of legislation.

Landscape Scale Conservation in the Lee Valley

The Lea Catchment Nature Improvement Area (NIA)

The Lea Catchment NIA partnership was formed in response to the Lawton Review; it covers the entire Lea Catchment and is made up of representatives from private organisations, charities, local authorities and statutory agencies. Map Two shows the boundary of the Lea Catchment NIA. The partnership narrowly missed out on becoming one of the 12 funded national NIAs in the first funding round in 2012, however it did receive some funding from Defra to assist in the delivery of its 34 targets outlined in the business plan.

The five key aims of the NIA are:

- To restore, recreate and link characteristic ecological, hydrological and landscape features to fully integrate the Lea floodplain corridor
- To improve the ecological management of designated sites within the Lea Valley
- To enhance and enlarge key biodiversity sites in the Lea Valley
- To begin to achieve good ecological status of the River Lea and tributaries
- To increase awareness and understanding of the biodiversity of the Lea Valley and to activate participation in its conservation

Whilst this initial funding is now complete the NIA group is seeking to continue its work seeking funding through different funding streams.

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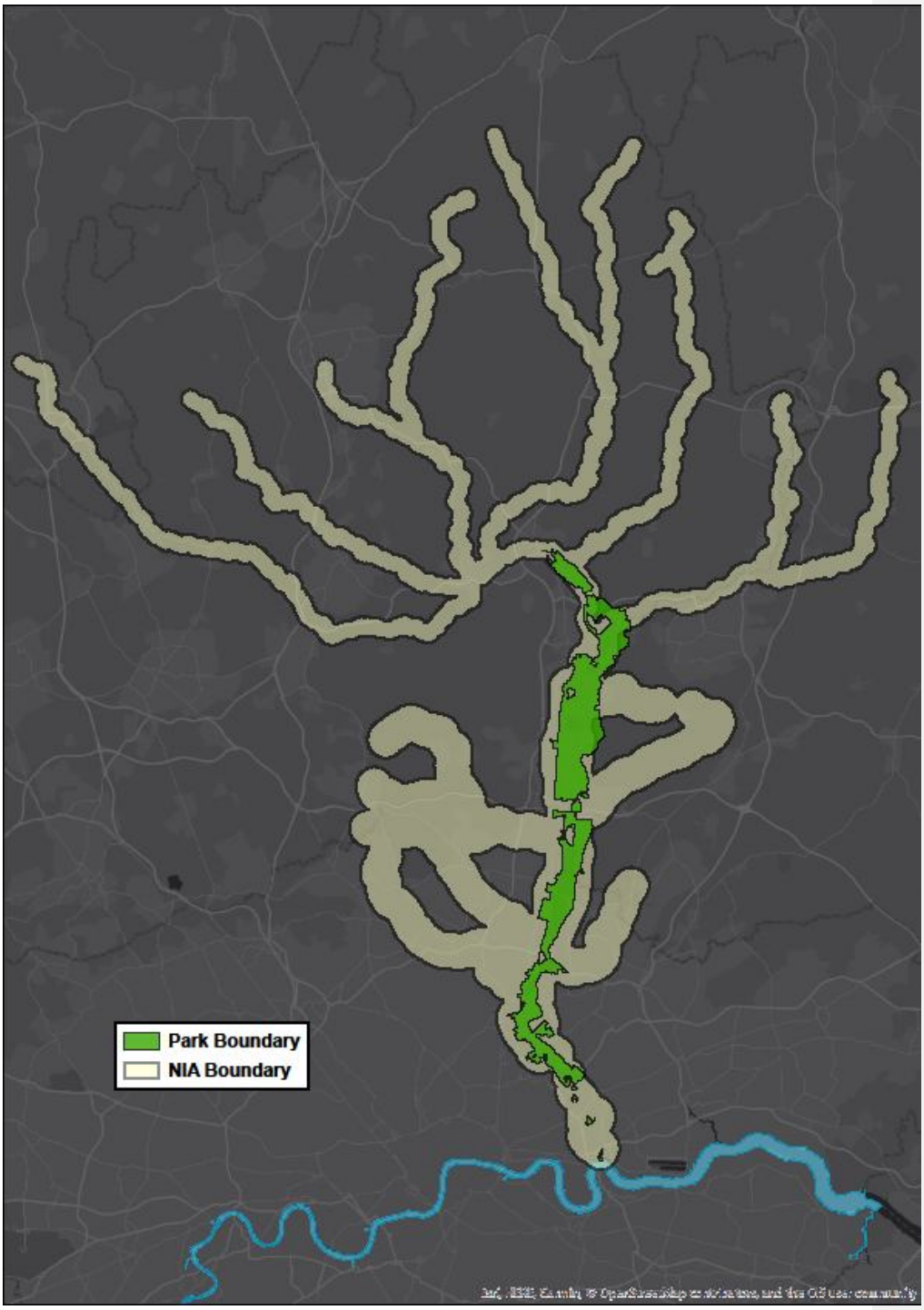
Map Two: Boundary of the Lea Catchment nature Improvement Area



The River Lea Catchment Partnership

Problems on rivers including pollution, invasive non-native species and over-abstraction have been recognised at a European level by the Water Framework Directive (WFD), a piece of legislation which became UK law in 2003. It states that all UK waterbodies (including rivers and lakes) must reach 'good ecological status' or 'good ecological potential' (for heavily modified waterbodies) by 2027. This means they should have good water quality and healthy communities of aquatic animals and plants. The UK has a legal obligation to meet this target. Rivers can be classified: 'Bad', 'Poor', 'Moderate', 'Good', or 'High'. This is assessed through monitoring of a range of indicators including physico–chemical water quality (e.g. dissolved oxygen, ammonia), aquatic invertebrates, fish and aquatic plants. There are two WFD waterbodies which flow through the Regional Park, the 2015 WFD baseline classifications for these are provided below:

- Lea Navigation (Fieldes Weir to Enfield Lock) – overall waterbody status: Poor. Ecological potential: Poor (elements not achieving good status- macrophytes (Poor) and phosphate (Poor).
- Lea Navigation (Enfield Lock to Tottenham Locks) – overall waterbody status: Bad. Ecological potential: Bad (elements not achieving good status- macrophytes (Bad), phosphate (Poor) and pH (Moderate).

The Catchment Based Approach was piloted by Defra in 2012 and launched nationally in 2013. The aim is to establish catchment partnerships formed of local people, landowners and statutory bodies, which work collaboratively across all the catchments in England. The hope is that this collaborative, bottom-up approach will be more successful at improving our rivers than previous approaches, which were lead from above by statutory organisations. The ultimate aim of the Catchment Based Approach is to help the UK meet our targets under the WFD.

The River Lea Catchment has six partnerships. The catchment hosts at time of publication ~~for the Lea Catchment~~ are:

- Luton Lea – Groundwork East
- Upper, Middle and Lower Lea, Rib and Quin, Ash and Stort, Beane, Mimram – Herts and Middlesex Wildlife Trust
- London Lea – Thames 21

RSPB Futurescapes

Futurescapes are the RSPB's response to the need for landscape scale conservation. They have designated 38 Futurescape areas including the Greater Thames area. Predominantly focused on the mudflats and marshes of the Thames Estuary, this 1000km^2 area stretches into London and up the Lee Valley as far as ~~the~~ Queen Elizabeth Olympic Park.

A Living Landscape - The Wildlife Trusts

The Wildlife Trusts have identified over 100 Living Landscapes around the UK. This recovery plan was launched in 2006 to restore, recreate habitats and reconnect people to wildlife. The Lee Valley is identified as a Living Landscape by the three local Wildlife Trusts, Herts and Middlesex, Essex and London. These are mostly

being implemented through discrete projects to contribute to the greater whole, for example Walthamstow Wetlands, opened in 2017.

All London Green Grid (ALGG)

The ALGG is the Greater London Authority led Green Infrastructure strategy for London identifying a wide range of functions that can be delivered by a healthy natural environment including adaptation to climate change, conserving biodiversity and increasing access to nature. The ALGG has 11 Area Frameworks of which the Lea Valley and Finchley Ridge is one. The ALGG is due for review as part of the revised London Plan, due for adoption in 2019.

GreenArc

Founded in 2004 the GreenArc is a partnership of organisations with the joint aim of 'bringing the big outdoors closer to everyone - by creating, linking and managing extensive and valued landscapes for people and wildlife around London'. Lee Valley Regional Park is one of their five zones of interest.

Local Nature Partnerships

Local Nature Partnerships (LNPs) were formed following the publication of 'The Natural Choice: securing the value of nature'[9]. They aim to bring together partners to work in a strategic way to help manage the natural environment to produce multiple benefits for people, the economy and the environment. There is an active Local Nature Partnership in Hertfordshire and whilst a partnership is registered in London it is currently under-developed.

B-Lines

The B-Lines initiative, led by Buglife aims to substantially increase the area of permanent wildflower-rich habitats in the UK, helping to support insect pollinators and other wildlife. The B-Lines are 3km wide linear pathways which encompass the best and most extensive areas of existing wildflower-rich habitat. The section of the Lee Valley from Ware to the Chingford Reservoirs forms part of an existing B-Line.

Agri-environment Schemes

Agri-environment schemes provide funding to farmers and land managers to farm in a way that supports biodiversity, enhances the landscape, and improves the quality of water, air and soil. The objectives of the current Environmental Stewardship scheme include:

- Wildlife conservation (biodiversity)
- Maintenance and enhancement of landscape quality and character, by helping to maintain important features, such as traditional field boundaries
- Protection of the historic environment, including archaeological features and traditional farm buildings
- Promotion of public access and understanding of the countryside

[9] The natural choice: securing the value of nature (DEFRA 2011)

- Natural resource protection – if taken up across large areas of the countryside, it will help to improve water quality and to reduce soil erosion and surface run-off.

There have been a number of agreements across land-holdings in the valley which can provide targeted enhancements for biodiversity. The availability of funding and range of options available can impact on the effectiveness of these schemes.

Lee Valley Wader Strategy

Started in 2016, the Lee Valley Wader Strategy draws together key organisations and landowners in order to try to address the identified decline or loss from specific sites of breeding waders in the valley over time as the habitats have matured. It is recognised that the management of reserves in isolation is not the most effective method to reverse this decline and that a co-ordinated, landscape scale approach would see the best results.

A Biodiversity Action Plan for the Lee Valley Regional Park

The Lee Valley Biodiversity Action Plan[10] was published in 2000 and identified habitats and species within the Regional Park that would benefit from specific programmes of action to conserve and enhance them.

This revised Biodiversity Action Plan is intended to update the original document and act as an introduction to the key wildlife of the Lee Valley Regional Park, setting out broad objectives that will ensure the Park Authority considers its duty to conserve and enhance biodiversity across all fields of work and will guide the decision-making process.

The cross-cutting themes, Species and Habitat Action Plans in this document provide the overarching aims and objectives for delivery however detailed SMART targets for each plan will be developed in partnership with key partner organisations following the formal adoption of the plan.

The Regional Park covers parts of Hertfordshire, Essex and London and each of these areas has its own Biodiversity Action Plan as do many of the constituent boroughs and districts, the list of relevant associated BAPs is shown in Table One. However as the focus at a national level changes there may be a knock-on effect to the continued implementation of these at a local level. The movement towards a landscape scale conservation approach reflecting the ecological connectivity between sites and the international importance of many of these sites for wildlife mean that the Regional Park benefits from consideration as one entity rather than being split along administrative boundaries.

Consideration of the BAPs for Hertfordshire, Essex and London and the incorporation of their appropriate targets into the Lee Valley Regional Park BAP will ensure that the partnerships delivering the BAP not only effectively conserve biodiversity within the Park but contribute towards wider initiatives throughout the region. The targets for London set out in the London Plan (2016)[11] have been reviewed and updated for the

[10] A Biodiversity Action Plan for the Lee Valley Regional Park (LVRPA 2000)
[11] The London Plan (GLA, 2016)

draft London Environment Strategy[12]. This approach will also help to ensure that action to enhance biodiversity within the Regional Park is relevant and adds value to initiatives surrounding it. This is essential given the Regional Park's strategic position within the Lea Catchment NIA, River Lea Catchment Partnership, Thames Gateway and the Green Arc.

Table One: Relevant local Biodiversity Action Plans

Area	Title	Date
Hertfordshire	A 50 year vision for the wildlife and natural habitats of Hertfordshire	2006
Essex	Essex Biodiversity Action Plan	2011
London	London Biodiversity Action Plan	2007
London Borough of Waltham Forest	Waltham Forest Biodiversity Action Plan	2010-2020
London Borough of Hackney	Hackney Biodiversity Action Plan	2012-2017
London Borough of Newham	Newham Biodiversity Action Plan	2010
London Borough of Tower Hamlets	Tower Hamlets Local Biodiversity Action Plan	2014 – 2019
London Borough of Enfield	Nature for People: A Biodiversity Action Plan for Enfield	2011
Queen Elizabeth Olympic Park	Biodiversity Action Plan	2014 – 2019

Strategic objectives

The Lee Valley Regional Park Development Framework (PDF)[13] sets out the Park Authority's aspirations for future development and management of the Regional Park.

The suite of documents will collectively provide a blueprint for the Authority's future efforts setting out what we want to achieve, how we plan to balance competing demands, and how we intend to make best use of the limited resources available. This Biodiversity Action Plan will be fundamental to successful delivery of the PDF.

The PDF has six key strategic aims set out under the following themes:

- Visitors
- Sport and recreation
- Biodiversity
- Community
- Landscape and heritage
- Environment

The Biodiversity aim 'A Park that delivers a high quality biodiversity resource for the Region' states that:

'The Park is a valuable biodiversity resource. Large areas of the Park are internationally designated and protected for their nature conservation value, while other sites within the Park have similar recognition and protection at a national,

[12] Draft London Environment Strategy (GLA, 2017)
[13] Lee Valley Park Development Framework (LVRPA, 2010)

regional and local level. We want to continue to develop and manage the Park to be an even richer place for wildlife – a place where plants and animals can thrive, and where people can experience and enjoy the natural environment.'

The Biodiversity aim is divided into two key objectives:

Flora and fauna 'An ecological resource from which biodiversity benefits can disperse across the region.' This will be achieved by focusing on three areas:

- To continue to protect and enhance the existing ecological resource; to recover and restore habitats and ensure they are resilient to climate change
- Continue to enhance and protect the condition of designated sites
- Wherever possible to expand the range of ecological values throughout the Park, in order to enhance the habitats and ecosystems beyond the Park boundary

Access to nature 'A range of opportunities for people to experience, interact with and enjoy nature':

- We want experience and interaction with nature to be an integral part of visiting the Park. Park wide access to nature can only be delivered through partnership; other landowners can play a key role to enable access to (and through) large areas of the Park, as well as help maintain and enhance biodiversity values
- There is space within the Park to balance the needs of both people and wildlife and ensure the public, especially children have an opportunity to engage and interact with nature and wildlife without causing it harm or disturbance
- We want to enhance and develop a number of flagship 'access to nature' destinations within the Park. These will be designed, managed and marketed as high quality attractions/destinations that will be of a comparable standard to the best biodiversity-focused attractions regionally and nationally. They will be located in and around sites of existing high biodiversity value and interest, with care taken to ensure increased access for visitors does not impact on biodiversity values. Each will feature a bespoke infrastructure and visitor facilities – in order to provide a distinctive and defining visitor experience
- Sites of special biodiversity interest where we want to develop a range of other 'access to nature' sites that will complement the regionally significant biodiversity destinations

The Lee Valley Regional Park Authority recognises that the Natural Environment and Rural Communities (NERC) Act 2006[14] confers responsibilities on the organisation and that these affect every facet of the Authority's activities. Section 40 of the Act states that 'Every public body must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity.'

The Park Development Framework targets, cross-cutting themes and NERC responsibilities will all feed into the development and subsequent delivery of the Biodiversity Action Plan. They will provide an overarching framework that will assist in the setting of SMART targets.

[14] Natural Environment & Rural Communities (NERC) Act, 2006

Monitoring

Monitoring of progress is important both within the specific action plans and the document as a whole. An annual progress report for the Biodiversity Action Plan will published on the LVRPA website.

Lee Valley Biodiversity Partnership

Each of the Action Plans will be steered by a group representing individuals with particular expertise or who are directly involved in the management conservation of that particular habitat or species. The BAP is intended to be a shared vision and a steering group consisting of all those involved in the conservation of the Regional Park's biodiversity is responsible for guiding the development of the Biodiversity Action Plan.

The ecological resource of the Lee Valley

Designated sites

The Park offers a natural resource of international, national, regional and local importance. There are eight Sites of Scientific Interest (SSSIs) in the Regional Park, four of these, Amwell Quarry, Rye Meads, Turnford and Cheshunt Pits and Walthamstow Reservoirs form the Lee Valley Special Protection Area and Ramsar site. The current condition of these SSSIs is noted in Table Two.

There are a range of other non-statutory, locally designated sites in the Regional Park. These Sites of Importance for Nature Conservation are the most important sites for nature conservation outside legally protected land. The locally designated sites are identified in Table Three. Maps Three, Four and Five shows ~~both~~the statutory and non-statutory sites in relation to the Park's statutory boundary.

Definitions:

Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds (79/409/EEC). They are classified under a criteria produced in each member state for rare and vulnerable birds listed in Annex 1 of the Birds Directive.

Sites of Special Scientific Interest (SSSIs) are some of the country's very best wildlife and geological sites. SSSIs are statutory sites designated by Natural England under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way (CROW) Act 2000 and the Natural Environment and Rural Communities (NERC) Act 2006).

Local Wildlife Sites are locally determined sites that meet a strict and robust selection criterion. Whilst they are non-statutory they are recognised in national planning policies that set out requirements for their protection through local plans and policies. In London these sites are called Sites of Importance for Nature Conservation.

Table Two: Lee Valley SSSIs current condition

SSSI	Local Authority	Date Assessed	Condition
Amwell Quarry	East Herts District Council	2007	Favourable
Rye Meads Nature Reserve	East Herts District Council	2013	Favourable 39.95% Unfavourable recovering 60.05%
Turnford & Cheshunt Pits	Broxbourne Borough Council Epping Forest District Council	2013	Favourable
Cornmill Stream & Old River Lea	Epping Forest District Council	2012	Favourable
Waltham Abbey Woods	Epping Forest District Council	2009	Unfavourable
Chingford Reservoirs	London Borough Enfield	2012	Unfavourable recovering
Walthamstow Reservoirs	London Borough of Waltham Forest	2014	Unfavourable recovering
Walthamstow Marshes	London Borough of Waltham Forest	2009	Favourable 7.56% Unfavourable recovering 92.44%

Table Three: Non-statutory locally designated sites in the Lee Valley

Site	Designation	Local Authority
Tumbling Bay Gravel Pit	Local Wildlife Site	East Herts District Council
Amwell Railway Fields	Local Wildlife Site	East Herts District Council
Meadow East of New River Ware	Local Wildlife Site	East Herts District Council
Lake south of the Maltings	Local Wildlife Site	East Herts District Council
Stanstead Abbotts Gravel Pits	Local Wildlife Site	East Herts District Council
Senior's Lake	Local Wildlife Site	East Herts District Council
Rye Meads Gravel Pit	Local Wildlife Site	East Herts District Council
Lea Valley North	Local Wildlife Site	Epping Forest District Council
Lea Valley Central	Local Wildlife Site	Epping Forest District Council
River Lea, Nazeing Mead	Local Wildlife Site	Broxbourne Borough Council
~~Carthegena Estate Lakes,~~ Broxbourne Gravel Pits	Local Wildlife Site	~~East Herts District Council~~ Broxbourne Borough Council
Admirals Walk Lake	Local Wildlife Site	Broxbourne Borough Council
Lea Valley South	Local Wildlife Site	Epping Forest District Council
Broxbourne Meadows	Local Wildlife Site	Broxbourne Borough Council
Silvermeade	Local Wildlife Site	Broxbourne Borough Council
Swamp South of Silvermeade west	Local Wildlife Site	Broxbourne Borough Council
Slipe Lane Open Space South	Local Wildlife Site	Broxbourne Borough Council
Land north and west of Turnford and Cheshunt Pits	Local Wildlife Site	Broxbourne Borough Council
Thistly Marsh and area west of Cheshunt Marsh	Local Wildlife Site	Broxbourne Borough Council
Lee Valley	Site of Metropolitan Importance for	London Boroughs of Enfield, Hackney, Haringey, Newham,

	Nature Conservation	Tower Hamlets and Waltham Forest
Banbury Reservoir	Borough Grade 1	London Borough of Waltham Forest
Tottenham Marshes East	Borough Grade 1	London Borough of Waltham Forest
Tottenham Marshes	Borough Grade 1	London Borough of Haringey
Easthale Allotments	Local Importance	London Borough of Haringey
Spring Hill Playing Fields	Local Importance	London Borough of Hackney
Springfield Park	Borough Grade 1	London Borough of Hackney
Bow Back Rivers	Borough Grade 1	London Borough of Newham
The Greenway and Old Ford Nature Reserve	Borough Grade 1	London Borough of Newham
Bow Creek Ecology Park	Borough Grade 1	London Borough of Newham
East India Dock Basin	Borough Grade 1	London Borough of Tower Hamlets
River Thames and Tidal Tributaries	Site of Metropolitan Importance for Nature Conservation	London Boroughs of Newham and Tower Hamlets

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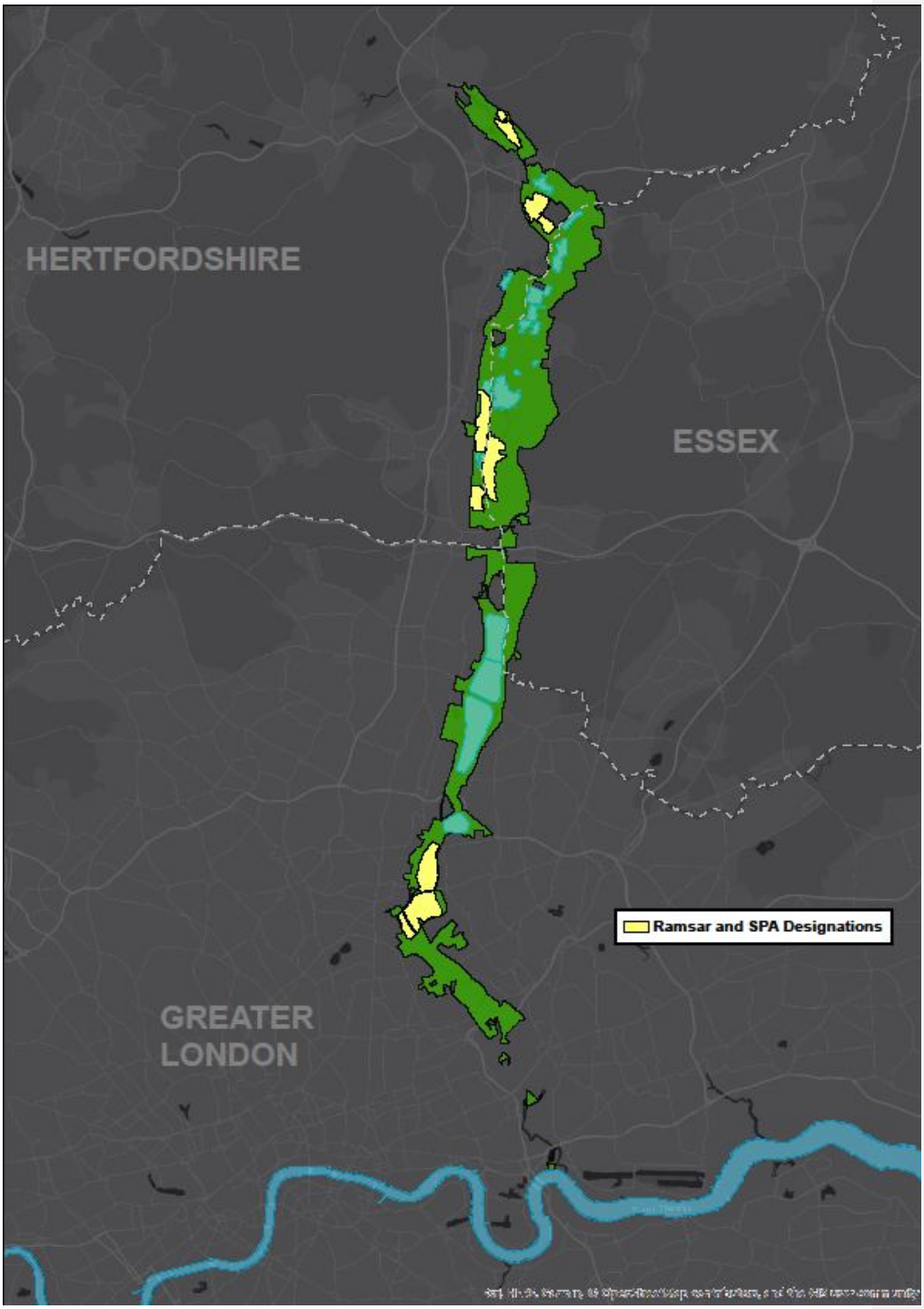
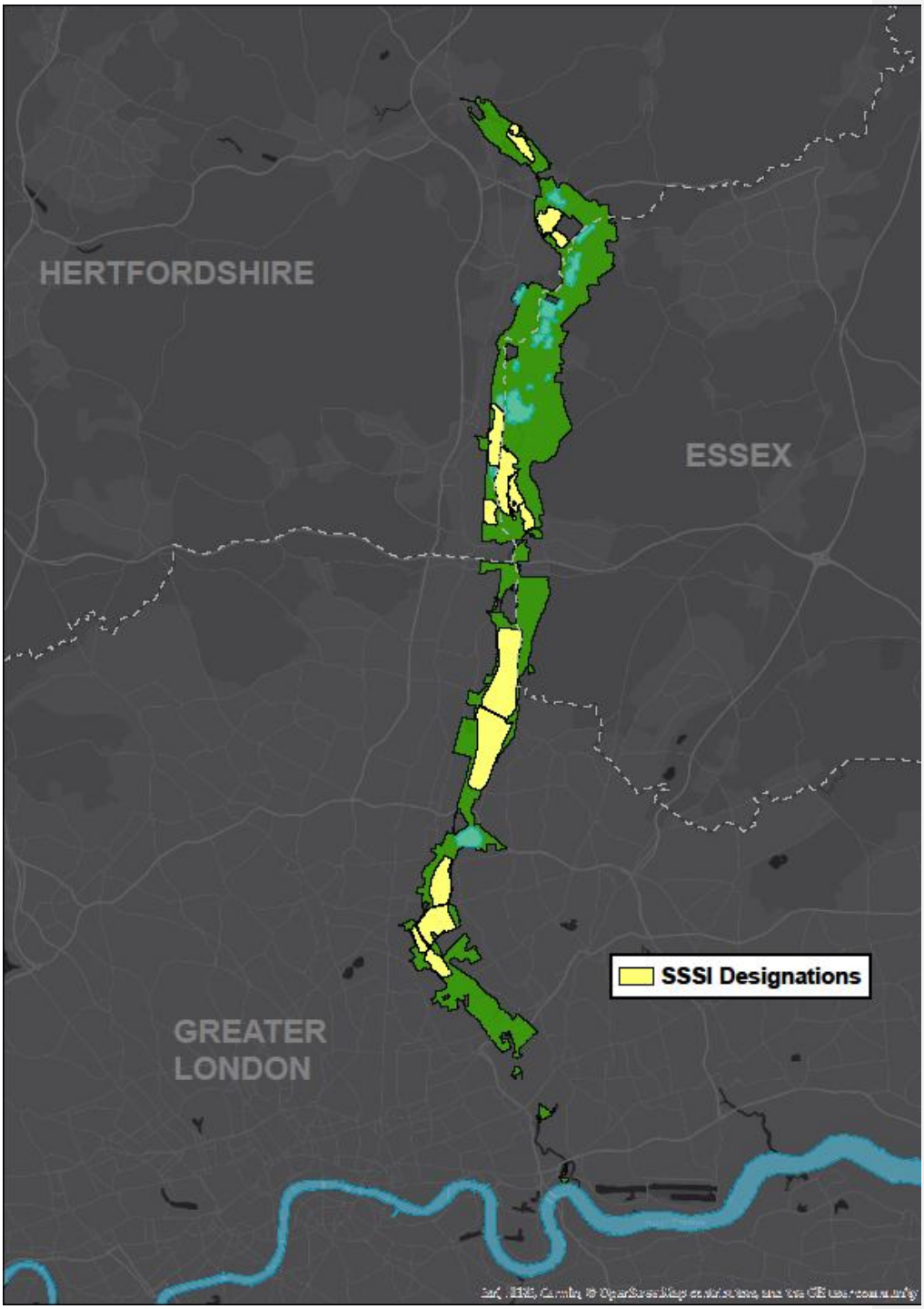
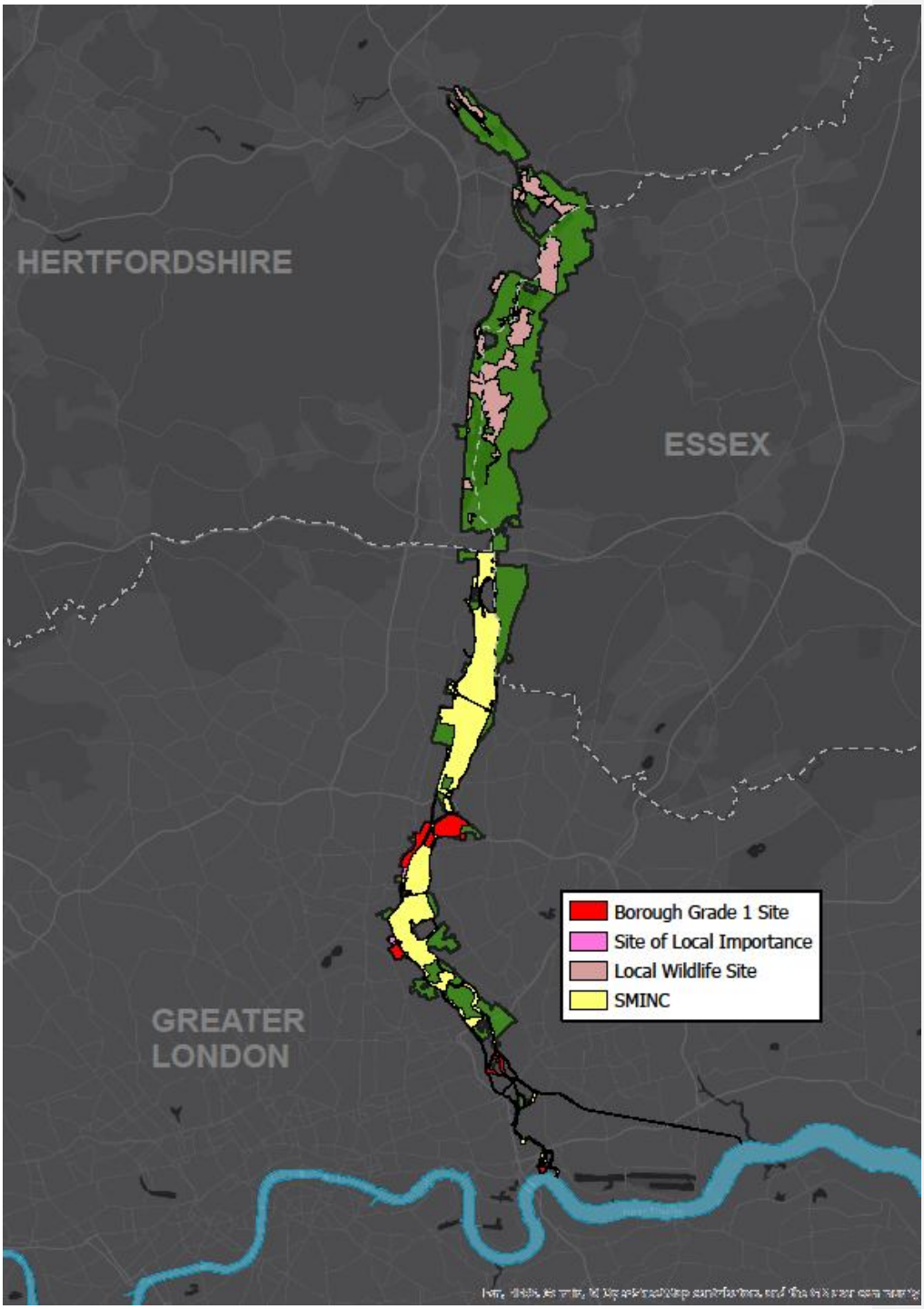
Map Three: Location of Lee Valley Special Protection Area and Ramsar site



Map Four: Sites of Special Scientific Interest in the Lee Valley Regional Park



Map Five: Non-statutory wildlife sites in the Lee Valley Regional Park



The biodiversity of Lee Valley Regional Park

Lee Valley Regional Park is made up of a patchwork of habitats resulting from centuries of changes due to the development of agriculture and industry. Whilst areas of habitat with some degree of naturalness can still be found in the valley it is evident that the vast majority has been altered over time by the actions of man.

Naturally the River Lee would have operated within a floodplain, with seasonal flooding resulting in a constantly shifting mosaic of water, swamp and forest. Gradually human impact on the landscape increased as forest was removed for dwellings and agriculture but the river would effectively still have behaved as a natural system.

In 1424 Parliament passed the first of many Acts designed to improve the River Lee for navigation. Since then the change has been dramatic, with new channels being excavated, existing ones contained within an artificial channel and water levels and flows carefully controlled through a system of sluices and locks.

Even the most superficial glances at a map of the Lee Valley will reveal a landscape that is still dominated by water. The marshes and pools that would have existed before human influence have been replaced by a network of lakes. The majority of these result from a legacy of gravel extraction, with many of the pits being left to flood once work was complete. There are also two significant reservoir complexes at Chingford and Walthamstow.

As the valley became more heavily populated, small patches of floodplain grassland remained. Despite them often not being as closely tied to the hydrology of the rivers as they used to, the best of these retain characteristics of the grassland and fen plant communities that would have existed prior to gravel extraction and other land uses. Elsewhere, a mosaic of grassland and scrub has become established on thin soils around the old gravel pits or on made ground following the infilling of gravel pits.

Whilst human intervention within the valley has undoubtedly increased the risk of habitat fragmentation and has, to a varying extent, compartmentalised the habitats and simplified the boundary between them, it has also presented new opportunities for wildlife.

Much of the land in the lower Lee Valley has at some point seen some form of urban regeneration. The most notable example of this is the redevelopment around Stratford for the delivery of the London 2012 Olympic Games. The construction of the Queen Elizabeth Olympic Park saw the creation of over 45ha of ~~biodiversity habitat.~~ biodiversity-rich habitat equivalent in 'value' to a Site of Borough Importance for Nature Conservation.

The Lee Valley of today

The main habitat types found within Lee Valley Regional Park today are: -

Rivers and streams

The River Lee and its associated channels form an integral part of the ecology of the valley, providing vital hydrological links between the various wetlands of the floodplain. Although human activities have heavily influenced the entire system, several stretches of more natural channel structure remain.

However, it is essential not to isolate individual stretches; the river clearly is a single ecological unit. All of the channels must be seen as of at least local importance due to the vital linkages they make with other habitats. Degraded stretches require enhancement to allow dispersal of species and there is a pressing need to restore the hydrological continuity between the river and its floodplain to allow the full potential of associated wetlands to be realised.

The intrinsic appeal of rivers is high and combined with the wildlife, cultural and landscape value, as well as the high level of accessibility throughout the valley, the river habitats are a significant local resource for people.

Standing open water

The amount and size of the open water habitat is a key feature of the Lee Valley. The associated bird communities are recognised to be of international importance. Although of recent human origin the open water features, in some way, compensate for the massive loss of wetland habitats throughout the country and now remain as last refuges for many species. In time they will come to more closely resemble natural systems and may be valued in a way that the Norfolk Broads are now.

Although abundant, the open water habitats vary in quality and ecology due to such features as nutrient status, use, size and structure. Clear water habitats with rich plant communities are valuable, as are large sites with reduced disturbance. The intrinsic appeal of open waters is high. Those supporting large numbers of waterbirds are visually attractive. The potential for management to benefit both wildlife and people is high.

Grassland and fen

Floodplain grasslands and fen have experienced significant declines and are now no longer the dominant semi-natural habitat they once were in the Lee Valley and as a result the remaining areas are of high conservation value albeit often increasingly isolated. They are vulnerable to changes in management and natural succession. They act as a refuge for a range of scarce or declining species and if maintained have the potential to facilitate range expansion to restored or newly created sites. They therefore form a vital link in the ecology of the Lee Valley.

Neutral and species rich grassland are of regional importance supporting a range of wildlife but are susceptible to encroachment by invasive non-native species and scrub. Much of the grassland is being managed under agri-environment schemes through a combination of grazing and cutting.

Woodland

The natural succession of marshes and fens has created pockets of wet woodland, typical of the old gravel workings, the wet woodlands of the Lee Valley provide important habitat for a range of species.

Drier scrub communities are developing on many areas of disturbed ground or rough grassland in the valley. Such areas can be important for birds and insects in particular, however their presence should be managed to prevent a loss to the important grassland and fen habitats.

Areas of more mature trees do exist in the valley, the associated dead wood provides rich habitat for invertebrates, fungi, birds and bats.

Urban (especially post-industrial habitats)

Post-industrial urban habitats have always been an important feature of the Lee Valley. The ecological value of these habitats, such as Pulverised Fuel Ash (PFA) dumps, redundant water treatment works and wildlife features in the built environment, have frequently been undervalued due to their obvious human influences and recent origins. The new associations of species that are occurring are interesting in their own right and have considerable ecological, educational and research value. The fact that many provide the only wildlife habitat available in urban areas increases their importance. However, many if not all of these early successional post-industrial landscapes in the Lee Valley have now been lost due to the cessation of active gravel extraction sites and increasing development pressures.

The newly created brownfield habitats of the Queen Elizabeth Olympic Park, have already established themselves as important areas for many species, in particular the invertebrate assemblage.

These habitats are important for a range of species, a number of which are noted within the statutory site designation citations.

Species Review

Lee Valley Regional Park holds data agreements with the relevant Local Environmental Records Centres (LERCs). A review of data from the LERCs~~Local Records Centres~~; Greenspace Information for Greater London, Hertfordshire Environmental Records Centre, Essex Wildlife Trust Environmental Records Centre and Essex Field Club carried out on behalf of the Authority by Hertfordshire Environmental Records Centre shows that in total over 4700 species have been recorded in Lee Valley Park[PC1]. This total included over 300 species of bird, with over 150 occurring annually, 33 species of mammal and over 900 species of flowing plant. There are records of over ~~2400~~ 3100 species of invertebrates of which there are 27 species of dragonfly and 3~~4~~3 species of butterfly. Within this diversity individual species or assemblages are significant from local up to international level, while the flora includes many wetland species in widespread and general decline. Appendix One provides a ~~full list~~ breakdown of species groups recorded within the Lee Valley Regional Park statutory boundary, a full list is available online.

Birds

The Lee Valley Regional Park is important for birds at all times of the year with 305 species of bird recorded, over 150 of which are present annually. Of these 53 are on the UK Birds of Conservation Concern Red List and 82 on the Amber List. There are 31 UK priority species and 83 are of Regional Conservation Concern.

It should be noted that it is not just the species themselves that are of importance but the assemblages of species, particularly those associated with the open water habitats that are important. The Special Protection Area designation under the EU Birds Directive recognises the winter assemblage of waterbirds as being of international (European) significance. Two species of duck, Gadwall *(Anas strepera)* and Shoveler *(Anas clypeata),* both reach accepted levels of international significance on an individual basis. Many other waterbirds including Tufted Duck *(Aythya fuligula)*, Smew *(Mergus albellus)*, Cormorant *(Phalacrocorax carbo)*, Black-necked Grebe *(Podiceps nigricollis),* Coot *(Fulica atra),* Grey Heron *(Ardea cinerea)* and Bittern *(Botaurus stellaris)* reach levels of national significance.

Moulting duck require undisturbed sites with a good food supply. Late summer moult assemblages of Tufted Duck and Pochard *(Aythya ferina)* are of international and national importance respectively. Overall the wetlands of the Regional Park represent one of the major inland wintering areas for birds in the UK, supporting over 10,000 waterbirds every winter.

The wetlands and waterways of the Regional Park support a range of Regional Species of Conservation Concern including Common Tern breeding on artificial rafts at Amwell Nature Reserve, Rye Meads Nature Reserve, Seventy Acres Lake and Walthamstow Reservoirs. Grey Heron and Little Egret (*Egretta garzetta*) have established colonies at Amwell Nature Reserve, Glen Faba and Walthamstow Reservoirs, the latter breeding for the first time in the valley at Amwell Nature Reserve in 2011. Wigeon *(Anas penelope)* are winter visitors to the lakes and reservoirs joined by Teal *(Anas crecca)* which also frequent East India Dock Basin adjacent to the River Thames.

The early successional habitats proved excellent for waders with Little Ringed Plover *(Charadrius dubius)*, Ringed Plover *(Charadrius hiaticula)*, Redshank *(Tringa totanus)* and Lapwing *(Vanellus vanellus)* having historically bred in the valley. The maturing habitats and loss of early successional stages can impact upon breeding success but there are still a number of breeding attempts made annually. Redshank and Little Ringed Plover breed at Amwell Nature Reserve and Lapwing have recently bred successfully on Cornmill Meadows, Glen Faba and Lee Valley Park Farm. Redshank, Lapwing and Snipe have historically breed at Rye Meads although not currently and Little Ringed Plover attempted to bred, although unsuccessfully until more recently at Hall Marsh Scrape.

Scrub and woodland habitat is dotted around the valley and provides habitat for Regional Species of Conservation Concern such as Long-eared Owl *(Asio otus)* and Red listed Nightingale *(Luscinia megarhynchos)* and Lesser Spotted Woodpecker *(Dendrocopos minor)*. The surrounding areas of grassland provide habitat for the UK Priority Species and Red listed Skylark *(Alauda arvensis)* and Grasshopper Warbler *(Locustella naevia)* and Regional Species of Conservation Concern the Meadow Pipit *(Anthus pratensis)* and Barn Owl *(Tyto alba)*.

The farmland areas provide important habitat for a number of Red listed and Regional Species of Conservation Concern including Turtle Dove, *(Streptopelia turtur)* Linnet *(Carduelis cannabina),* Yellowhammer *(Emberiza citrinella)*, Tree *(Passer montanus)* and House Sparrow *(Passer domesticus)* and Starling *(Sturnus vulgaris).*

A number of birds of prey have been recorded in the Lee Valley including the Regional Species of Conservation Concern Marsh Harrier (*Circus aeruginosus*), Peregrine Falcon *(Falco peregrinus)* and Hobby *(Falco subbuteo)* a summer visitor.

Observation over many years has shown that the valley is very important for large numbers of birds on migration in both spring and autumn. Wetland birds such as waders, terns and gulls are amongst the most obvious but work by the Rye Meads Ringing Group has shown that many hundreds of warblers, swallows, martins and other small birds find suitable resting and feeding areas in the valley whilst on migration.

Plants

Records show that there are 9534~~9~~ species of higher plants identified with one European Protected Species, Seven UK Priority Species and 72 Regional Species of Conservation Concern.

The Lee Valley is highly significant on a regional and local basis for the abundance and variety of wetland plants. As a group wetland plants have generally shown severe reductions in range as wetland habitats have become degraded or lost.

As would be expected for a wetland habitat the Lee Valley has significant populations of aquatic and marsh flora. The submerged aquatic plants of clear, flowing or still waters are one group of significance. These include the vulnerable Water Whorl-grass *(Catabrosa aquatica)*, nationally threatened Whorled Water-milfoil (*(Myriophyllum verticillatum)* and the regionally important River Water Crowfoot *(Ranunculus fluitans)*, Shining *(Potamogeton lucens)*, Lesser *(Potamogeton pusillus)* and Fennel Pondweed *(Potamogeton pectinatus*) and Fringed Water Lily *(Nymphoides peltata).*

Associated with these wet areas are the marginal, marshy and damp habitats which themselves play host to some notable and characteristic species. These include the vulnerable Round Fruited Rush *(Juncus compressus)* and Tubular Water Dropwort *(Oenanthe fistulosa)* alongside the regionally important Water Dock *(Rumex hydrolapathum)*, Greater Pond Sedge *(Carex riparia),* Blunt-flowered Rush *(Juncus subnodulosus)*, Brown Sedge *(Carex disticha)*, Greater Pond Sedge *(Carex riparia)* and Butterbur *(Petasites hybridus)*. The nationally threatened Ragged Robin *(Lychnis flos-cuculi)* and regionally important Common Meadow Rue *(Thalictrum flavum)*, Yellow Loosestrife *(Lysimachia vulgaris)* and Adders Tongue Fern *(Ophioglossum vulgatum)* are associated with the valley's damp grassland.

The European Protected Species and nationally scarce Creeping Marshwort (*Apium repens*) was discovered on Walthamstow Marshes in 2002 and targeted management takes place annually to try to maintain the habitat in favourable condition.

The brackish water at East India Dock Basin has allowed the formation of an interesting saltmarsh community including Sea Club-rush *(Bolboschoenus maritimus)*, Sea Arrowgrass *(Triglochin maritima)* and Sea Beet *(Beta vulgaris subsp. maritima)*.

The diversity of the sward can vary amongst the drier neutral grasslands of the valley however many contain good indicator species including the nationally scarce Yellow Vetchling *(Lathyrus aphaca)* and regionally important species including Meadow Cranesbill *(Geranium pratense)*, Wild Marjoram *(Origanum vulgare)* and Yellow Vetch *(Vicia lutea)*.

There are seven species of orchid recorded regularly in the Lee Valley, often associated with post-industrial landscapes such as the areas of Pulverised Fuel Ash at North Metropolitan Pit and Amwell Nature Reserve and the remnant gravel sorting area Bowyers Water. The nationally threatened Early Marsh Orchid *(Dactylorhiza incarnata)* is of particular note and readily hybridises with Southern Marsh Orchid *(Dactylorhiza praetermissa)*. Pyramidal Orchids *(Anacamptis pyramidalis)* are more widely distributed across the grasslands of the Park alongside the ephemeral Bee Orchid *(Ophrys apifera)*.

Tree species associated with the wetland habitats include regionally important species including Black Poplar *(Populus nigra)* and Eared *(Salix aurita)* and Purple Willow *(Salix purpurea)*.

The extent of certain communities is also noteworthy, the large swathes of Common Reed *(Phragmites australis)* provide important habitat for key species and grassland species such as Black Knapweed *(Centaurea nigra)*, Yarrow *(Achillea millefolium)* and Wild Carrot *(Daucus carota subsp. Carota)* all provide a long-lasting nectar source for invertebrates.

Lower Plants

Surveys of lower plants have not widely been carried out however 126 species have been recorded including eight species of regional importance including the liverwort Blueish Veilwort *(Metzgeria violacea)*, the mosses Red-stemmed Feather-moss *(Pleurozium schreberi)*, Tufted Feather-moss *(Scleropodium cespitans)* and Blunt-fruited Pottia *(Tortula modica)* as well as Common Stonewort *(Chara vulgaris)* including *Chara vulgaris var. longibracteata.*

~~**Moths**~~

~~There has not been widespread moth monitoring undertaken in the valley and therefore it is likely that as with other species they are under recorded. However over 700 species have been recorded of which 51 are UK priority species and 105 are regionally important.~~

~~Many UK priority species are still widely distributed but are classed as priority species to stimulate research. The Latticed Heath *(Chiasmia clathrata)* and Cinnabar Moth *(Tyria jacobaeae)* are widespread across the grasslands of the valley as is the Garden Tiger *(Arctia caja)* identified a priority species primarily due to the decline since the 1980's. Many of the UK priority species are found across a range of habitats with obvious close associations to specific food plants.~~

~~The large expanses of wetlands mean that they are of particular note for a number of reedbed specialists including the Regional Species of Conservation Concern including Reed Dagger *(Chilo phragmitella)*, Fen Wainscot *(Arenostola phragmitidis)*, Brown-veined Wainscot *(Archanara dissoluta)*, Reed Veneer *(Chilo phragmitella)*, Pale Water-veneer *(Donacaula forficella)*, Scarce Water-veneer *(Donacaula mucronella)* and the Giant Water-veneer *(Schoenobius gigantella).*~~

Invertebrates

Over 3100 species of Invertebrates have been recorded in the Regional Park, of which certain classifications will be considered in greater depth below.

A lack of comprehensive data prevents a thorough assessment of the value of the Lee Valley as a whole for invertebrates. Some groups, such as dragonflies and butterflies, have been well studied while others have had less attention. However, a number of rare species have been identified and their presence is likely to be indicative of rich invertebrate habitats. Present knowledge points to the wetland and grassland habitats as being of most importance, recent surveys on the brownfield sites at Queen Elizabeth Olympic Park have shown an important assemblage.

Invertebrate surveys that have been carried out primarily in the south of the Regional Park have highlighted a number of UK priority species including Brown-banded Carder Bee (*Bombus humilis*) found at sites across the lower Lee Valley, a planthopper (*Ribautodelphax imitans*) on Queen Elizabeth Olympic Park and Rammey Marsh, Streaked Bombardier Beetle (*Brachinus sclopeta*), Stag Beetle *(Lucanus cervusare)* and Phoenix Fly (*Dorycera graminum)* recorded on Rammey Marsh. The Shining

Ramshorn Snail (*Segmentina nitida)* is associated with the grazing marsh ditches on Cornmill Meadows and is noted in the SSSI designation although there are no recent surveys to record its status.

There are a number of Red Data Book species found across a range of habitats in the Park. Recent surveys have confirmed the importance of the urban brownfield areas for invertebrates including the Red Data Book True Flies (*Cistogaster globosa*) and (*Chorisops nagatomii)* and Regional Species of Conservation Concern (*Merzomyia westermanni*) Adonis' Ladybird (*Hippodamia Adonia variegate*) and the planthopper (Asiraca clavicornis) which has seen a UK decline and is restricted mainly to London and the Thames Estuary.

Many species of invertebrate have close associations with grassland habitats. The Red Data Book beetle species (*Olibrus flavicornis*) has been recorded on a number of the grassland sites and is known on the continent to be often associated with Autumn Hawkbit (*Leontodon autumnalis*). The fly *Acinia corniculata* has close associations with Common and Black Knapweed and has been found on Walthamstow Marshes, Rammey Marsh and Queen Elizabeth Olympic Park. The True Bugs *Stictopleurus punctatonervosus* and *Stictopleurus abutilon* were once confined to the Thames Gateway area but have now increased their distribution, the former of which is found on Cheshunt Marsh. Another True Bug *Lygus pratensis* is also associated with the valleys grasslands, once localised it has recently extended its range.

Whilst not extensive the woodland of the valley have a number of invertebrates recorded which have close associations, including the Red Data Book Drab Wood-soldierfly (*Solva marginata*), the larvae of which develop in rotting wood and the Brown Ant (*Lasius brunneus*) a Regional Species of Conservation Concern found on Gunpowder Park. One of the Pill boxes here also has a population of the Cave Spider (*Meta bournetti*). The large and spectacular Musk Beetle (*Aromia moschata*), a nationally scarce species associated with willows, especially pollards has been recorded on Gunpowder Park.

Wet grasslands are rich in invertebrates however have been under surveyed in the Valley. The Red Data Book fly *Subclytia rotundiventris* is often associated with damp grassland as well as scrub habitat and has been recorded on Rammey Marsh. Aquatic invertebrates are poorly studied but older records of scarce bugs, such as lesser water-boatman species, hint that important species remain to be discovered, probably in the richer or older wetland habitats.

Grasshoppers and Bush-crickets

The Orthoptera (grasshoppers and bush-crickets) are well represented in the valley with 14 of the UK's 27 native species recorded. The Long-winged Conehead (*Conocephalus discolour*) is a Regional Species of Conservation Concern in London.

Disturbed ground and rank permanent grassland, preferably damp, are key habitats for orthoptera including Roesel's Bush-cricket (*Metrioptera roeselii*), Short-winged Conehead (*Conocephalus dorsalis*), Lesser Marsh Grasshopper (*Chorthippus albomarginatus*) and Slender (*Tetrix subulata*), and Common Groundhopper (*Tetrix undulata)*. The SSSI citation for Turnford and Cheshunt Pits notes the importance of the area, in particular Cheshunt Marsh which at the time was considered to be of national importance for orthoptera recognising Roesel's Bush-cricket and Lesser Marsh Grasshopper which at the time of designation was more associated with coastal areas. However it should be noted that the range of a number of these species has increased nationally since the sites were designated.

Dragonflies

The watercourses, ditches, gravel pits and early successional pools are key habitats for dragonflies in the Lee Valley and 27 species of dragonfly have been recorded in the valley, three of which are on the IUCN Red Data List. The Norfolk Hawker *(Anaciaeschna isoceles)* first recorded at Amwell Nature Reserve in 2015 is classed as endangered on the Red Data List and is also a national priority species. The Scarce Chaser *(Libellula fulva)* recorded at the same time is classed as lower risk near threatened alongside the Variable Damselfly *(Coenagrion pulchellum)* which has a solitary record in 1983.

There are eight species of dragonfly classed as a Regional Species of Conservation Concern including the White-legged Damselfly *(Platycnemis pennipes)*, Hairy Dragonfly *(Brachytron pratense)* and Ruddy Darter *(Sympetrum sanguineum)*. The Small Red-eyed Damselfly *(Erythromma viridulum)* is another more recent coloniser, first recorded in 2002 and is also a Regional Species of Conservation Concern.

The newest species recorded in the valley is the Willow Emerald Damselfly *(Chalcolestes viridis)* first recorded in 2014 at Amwell Nature Reserve and confirmed breeding at Cornmill Meadows in 2016, it is also now recorded in the Lower Lea.

Butterflies

The mosaic of habitats found across the Lee Valley provide habitat for a range of butterfly species with 34 species recorded. This includes five UK priority species including the White-letter Hairstreak *(Satyrium w-album)* found ~~amongst others~~ in the Elm *(Ulmus minor 'Atinia')* hedges of the Lee Valley Park Farm and Cornmill Meadows, and the Small Heath (*Coenonympha pamphilus*) as well as the ~~less common~~ occasional Wall *(Lasiommata megera)* at Gunpowder Park and the individual sightings of both Brown Hairstreak *(Thecla betulae)* at Walthamstow Marshes and White Admiral *(Limenitis camilla)*. ~~, Brown Hairstreak *(Thecla betulae)* and Wall *(Lasiommata megera)*.~~

~~There are five~~Five Regional Species of Conservation Concern have been recorded including the Brown Argus *(Aricia agestis)* and Marbled White *(Melanargia galathea)*.

Species such as Essex *(Thymelicus lineola)* and Small Skipper *(Thymelicus sylvestris)* are declining locally but are still widespread in the grasslands of the valley alongside commoner species such as Gatekeeper *(Pyronia tithonus)*, Meadow Brown *(Maniola jurtina)* and Common *(Polyommatus icarus*) and Holly Blue *(Celastrina argiolus)*.

Silver-washed Fritillary *(Argynnis paphia)* has been recorded and is known to be increasing locally, migrant species including Painted Lady *(Vanessa cardui)* and Clouded Yellow *(Colias croceus)* are recorded regularly and there are occasional vagrants such as a Long-tailed Blue *(Lampides boeticus)* recorded at East India Dock Basin in 2012.

Moths

There has not been widespread moth monitoring undertaken in the valley and therefore it is likely that as with other species they are under-recorded. However over 700 species have been recorded of which 51 are UK priority species and 105 are regionally important.

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Many UK priority species are still widely distributed but are classed as priority species to stimulate research. The Latticed Heath *(Chiasmia clathrata)* and Cinnabar Moth *(Tyria jacobaeae)* are widespread across the grasslands of the valley ~~as is the~~ and the Garden Tiger *(Arctia caja)*, occasionally recorded is identified a priority species primarily due to the decline since the 1980s. Many of the UK priority species are found across a range of habitats with obvious close associations to specific food plants.

The large expanses of wetlands mean that they are of particular note for a number of reedbed specialists including the Regional Species of Conservation Concern including Reed Dagger *(Chilo phragmitella)*, Fen Wainscot *(Arenostola phragmitidis)*, Brown-veined Wainscot *(Archanara dissoluta)*, Reed Veneer *(Chilo phragmitella)*, Pale Water-veneer *(Donacaula forficella)*, Scarce Water-veneer *(Donacaula mucronella)* and the Giant Water-veneer *(Schoenobius gigantella)*.

Mammals

Of the 33 species of mammal recorded in the Regional Park 10 are European Protected Species and nine are UK priority species and 14 are regionally classed as Regional Species of Conservation Concern.

The Lee Valley is a stronghold regionally for Otter (*Lutra lutra*), Water Vole (*Arvicola amphibius*) and bats of which nine species been recorded in the valley including the nationally scarce Leisler's (*Nyctalus leisleri*) and Serotine (*Eptesicus serotinus*) with UK populations estimated at 10,000 and 15,000[15] respectively. Nathusius' pipistrelle *(Pipistrellus nathusii)* is rare in the UK but is known to be present in the Lee Valley. Hedgehog (*Erinaceus europaeus*), a Regional Species of Conservation Concern is present in the valley and recent surveys have shown areas of the Lower Lea to be an important area for them in London.

Amphibians and Reptiles

Records show that ten species of amphibian and reptile have been recorded in the Park, of which one is a European Projected Species; five are UK priority species and three of regional conservation concern

The Lee Valley remains a stronghold of the Grass Snake *(Natrix natrix)* and the Common Toad *(Bufo bufo)*. Also present are the Regional Species of Conservation Concern, Common Frog *(Rana temporaria)* and Common Lizard *(Zootoca vivipara)*. A Great Crested Newt *(Triturus cristatus)* population is present in one known site at Fishers Green.

Fish

The Lee Valley has 24~~3~~ species of fish, two of which are European Protected Species and two are UK priority species. Whilst no species are noted as a Regional Species of Conservation Concern the Lee Valley is known nationally for its angling and the Barbel *(Barbus barbus)* is an important species of the Old River Lea and an excellent indicator of the river habitat. European Eel *(Anguilla anguilla)* is listed as critically endangered on the IUCN Red Data List and are found in the rivers and lakes of the lower Lee Valley however the numerous in channel features can provide barriers to their movement.

[15] Harris S., Morris, P., Wray, S. & Yalden, D. (1995) *A review of British mammals: population estimates and conservation status of British mammals other than cetaceans*. JNCC, Peterborough.

Invasive Non-native Species

There are an increasing number of invasive non-native species in the Lee Valley, including American Mink *(Neovison vison)* and four species of non-native crayfish, the widespread American Red Signal Crayfish *(Pacifastacus leniusculus)*, as well as the more localised Turkish Crayfish *(Astacus leptodactylus)*, Virile Crayfish *(Orconectes virilis)* and the Spinycheek Crayfish *(Orconectes limosus)*.

The waterways, waterbodies and riparian habitats are susceptible to colonisation by many invasive non-native species including New Zealand Pygmyweed (*Crassula helmsii)*, Giant Hogweed *(Heracleum mantegazzianum)*, Himalayan Balsam *(Impatiens glandulifera)*, *Canadian Waterweed (Elodea Canadensis),* Nuttall's Waterweed *(Elodea nuttallii),* Buttonweed *(Cotula coronopifolia)* and Floating Pennywort *(Hydrocotyle ranunculoides).* The grasslands have historically had stands of Japanese Knotweed *(Fallopia japonica)* of varying sizes although on-going management has seen many of these eradicated although there are still large stands along the various waterways. A more recent and perhaps more widespread coloniser is Goats Rue *(Galega officinalis)* which poses a significant problem on grasslands where it readily colonises bare soil impacting native species as well as general habitat quality.

Review of habitat and species priorities in the Lee Valley Regional Park

It is important that local Biodiversity Action Plans should take a dual approach to setting priorities concentrating both on the national priorities that exist in the local area as well as additional local priorities.

A three step process outlined in Guidance Note 4[16] 'Evaluating priorities and setting targets for habitats and species' (1997) is suggested for selecting habitats and species priorities and conservation action:

1. Review of species and habitats
2. Evaluation and prioritisation
3. Preparation of action plans with local targets

Review of species and habitats

For the review process a list of habitats and species of conservation concern has been compiled and reviewed based on the most recent and accurate data.

Priority habitat selection criteria:

- all the priority habitats listed in the Section 41 of the NERC Act 2006 which occur within the plan area; and
- habitats, not included in the above list, which are thought to be of local conservation concern, locally threatened, locally rare, locally distinctive/characteristic or locally popular

For species, the review list should include:

[16] Guidance Note 4 - Evaluating priorities and setting targets for habitats and species (UK Biodiversity Group, 1997)

- any species of UK priority, Section 41 of the NERC Act 2006 .
- other species not meeting the UK criteria but which are of local concern, locally threatened, locally rare, locally distinctive/characteristic or locally popular; and
- species that have now disappeared from the local area so that consideration may be given to the chances of bringing them back

Evaluation

The next step involves evaluating those habitats and species listed in the review process and deciding what the priorities for action in the Lee Valley are. Criteria to be used in this evaluation process have been developed in the guidance note.

- UK priority habitats and species, especially those most characteristic of the area
- The significance of the local resource in the national context
- The opportunity available to enhance the local resource and contribute towards national targets
- Local decline rates and local rarity
- Local threats to the habitat or species
- The degree of habitat fragmentation and the viability of the remaining fragments
- The importance of the habitat for key species
- Local distinctiveness - habitats or species used to raise the profile of Local Biodiversity Action Plan work within the plan area

A review of habitats and species was carried out for the previous Lee Valley Regional Park BAP (2000) following the guidance published by the UK Biodiversity Steering Group. This resulted in a list of habitats and species of conservation concern being drawn up, these habitats and species are still valid for the valley and it is considered important to continue the work of the previous document whilst also reviewing if any additions should be made.

The species review undertaken for this revision highlighted the difficulty in effectively evaluating any temporal changes in spatial distribution or rarity; however this piece of work should provide a baseline upon which further studies can be undertaken in the future. Actions for species monitoring will be taken forward through the individual Action Plans.

Priority Habitats

The priority habitats in the Lee Valley Regional Park BAP (2000) largely reflected the importance of the mosaic of wetland habitats upon which the wildlife of the Lee Valley Regional Park depends and the reasons for their selection remain valid today. However, whilst the wetland habitats within the Park are certainly the most important in a national and international context, the scope of the action plans was reviewed using the criteria below to take into account the opportunities for delivering targets that can contribute towards new UK and regional priorities, this is shown in Table Four.

Table Four: Habitats identified as being of conservation concern in the Lee Valley Regional Park and how they relate to the latest review of the UK broad and priority habitats.-

LVRPA Priority Habitat ~~2017~~ review	**UK Broad Habitat**	**UK Priority Habitats**
Rivers and Streams	Rivers and Streams	Rivers
Standing Open Water	Standing Open Water and Canals	Eutrophic Standing Water / Ponds
Grassland and Fen	Fen, Marsh and Swamp / Neutral Grassland / Improved Grassland	Lowland Meadows / Floodplain Grazing Marsh / Lowland Fens / Reedbeds
Woodland (formerly wet woodland)	Broadleaved, Mixed and Yew Woodland	Wet Woodland / Lowland Mixed Deciduous Woodland / Traditional Orchards / Wood Pasture and Parkland
Built Environment and Brownfield (formerly urban)	Inland Rock	Open Mosaic Habitats on Previously Developed Land

It is recognised within the BAP that there will be opportunities to deliver worthwhile habitat enhancement projects that may contribute towards UK priority habitat types but are not covered within the habitats listed in Table Four. These opportunities can be explored in the relevant site management plans.

Priority species

Following the species review on data provided by the Local Environmental Records Centres, a list of priority species recorded within the boundary of the Lee Valley Regional Park has been compiled. –This consists of 158 species that are either national or regional priorities.- This list is shown in Appendix Two.

Work to enhance the identified Priority Habitats will benefit the associated Priority Species; these associations are noted in Appendix Two. From this priority list a number of Species Action Plans ~~are~~ have been considered for species which require conservation effort that cannot easily be covered by an appropriate Habitat Action Plan or for species that are good indicators of the quality of habitats. Species Action Plans are also useful as a mechanism for engagement where projects specifically focusing on a species will raise the profile of biodiversity conservation in the Lee Valley Regional Park.

The species identified in Table Five were identified as being conservation priorities in the previous Lee Valley Regional Park BAP (2000). The importance of continuing this targeted management is noted however there are some new additions for this revision.

Table Five: Species identified as conservation priorities benefiting from their own Species Action Plan through the 2000 BAP

Species
Otter
Water Vole
Bats (all species)
Bittern
Kingfisher
Early Marsh Orchid

New Species Action Plans

Creeping Marshwort

Since the initial BAP species review in 2000, Creeping Marshwort has been identified on Walthamstow Marshes SSSI. It is listed in Annex II and IV of the EC Habitats Directive, Appendix I of the Bern Convention and is protected under Schedule 4 of the Conservation (Natural Habitats) Regulations 1994 and Schedule 8 of the Wildlife and Countryside Act 1981. This is one of only three known sites holding this species in the United Kingdom and the only one outside Oxfordshire. On Walthamstow Marshes the plant is currently restricted to a small area of grazed ditch margin and is vulnerable to the unpredictability of water levels and vegetation changes on the Marshes. This species will benefit from special management aiming to increase its cover, prevent it from being ousted by more vigorous competition and buffer it from extreme changes in water levels.

Barbel

The Lee Valley has long been considered to have one of the best Barbel rivers in the country and the stretch of the Old River Lea at Fishers Green still provides excellent habitat. However there are significant specific issues that impact on the Barbel population which require targeted action. Barbel is an excellent species to engage with the fishing community as well as the general public.

Invasive non-native species (INNS)

There are nearly 2000 ~~species of invasive~~ non-native species ~~(INNS)~~ established in the UK, with a trend of 10-12 new species becoming established each year. Of these 2000 species it is considered that 10-15%[17] of these can cause significant adverse environmental, economic and social impacts. To date no full survey of INNS has been undertaken in the valley although there has been some robust management undertaken to deal with certain key identified species. A list of INNS of concern in London has been produced by the London Invasive Species Initiative and managed by GIGL (Greenspace Information for Greater London). [18] INNS are a cross-cutting

[17] The Great Britain Invasive Non-native Species Strategy, DEFRA August 2015
[18] http://www.londonisi.org.uk/what-and-where/species-of-concern/

theme underpinning the management of all habitats, it is considered that the development of INNS Action Plan will help co-ordinate and target the work.

Cross-cutting themes

In addition to the above there are a number of cross-cutting themes that need to be addressed through each of the Habitat and Species Action Plans. These are:

Strategic planning and policy

- Ensure that the protection and enhancement of biodiversity is integrated across the work of Lee Valley Regional Park
- Recognise the importance of conserving and enhancing biodiversity throughout the whole Regional Park in the development and refinement of strategic plans
- Recognise the importance of the Lee Valley Special Protection Area, Sites of Special Scientific Importance as well as the role that non-statutory sites have in maintaining the special features of the Park's biodiversity

Engagement with stakeholders and communities

- Develop and promote opportunities for all of our regional stakeholders to enjoy the Park's biodiversity, to increase understanding and encourage involvement in its conservation
- Promote existing and develop new opportunities for volunteers to contribute towards the protection and enhancement of biodiversity in the Regional Park
- Increase community involvement in the planning and management of special places for biodiversity
- Work with partners to ensure that developments throughout the Park contribute towards the enhancement and promotion of biodiversity throughout the Lee Valley

Best practice management of built environment and open spaces

- Develop and share good practice in the management of open spaces and built facilities for biodiversity
- Develop and promote multi-functional open spaces encompassing biodiversity alongside recreation, sustainable transport and flood management
- Recognise the current and potential impact of climate change on the Regional Park's biodiversity and consider this when making land management decisions

Increasing understanding of the Regional Park's biodiversity resource

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- Carry out or facilitate data collection and scientific study where this will help further understanding of the Regional Park's biodiversity and assist in its conservation and enhancement

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Rivers and Streams Habitat Action Plan

Introduction

Rivers in their natural state are dynamic systems capable of carrying varying volumes of water and changing course over time as banks erode and sediment is removed, shifted or deposited.~~,~~ M~~m~~uch of this dynamism has been lost from the River Lea with the construction of the Flood Relief Scheme. River systems not only support a wealth of wildlife in their own right, they often define the characteristics of communities in adjacent habitats through periodic inundation or by providing a corridor to facilitate the movement of plants and animals. Marsh, wet grassland and wet woodland can all be affected ~~depend on this~~by the connectivity between the river and its floodplain.

Current status

The importance of rivers, streams and watercourses in the Lee Valley is illustrated by their inclusion in a number of the statutory designations as shown in Table Six below; however their importance as linking habitats between these key designated sites as well as regionally and locally important sites both within and outside the Lee Valley should also be recognised.

Table Six: Statutory designations of waterbodies in the Lee Valley Regional Park

Watercourse	**Designation**
Toll House Stream	Rye Meads SSSI / Lee Valley SPA
Small River Lea	Turnford and Cheshunt Pits SSSI/ Lee Valley SPA
Hall Marsh Ditch	Turnford and Cheshunt Pits SSSI / Lee Valley SPA
Hooks Marsh Ditch	Turnford and Cheshunt Pits SSSI / Lee Valley SPA
Diversion from Old River Lea	Waltham Abbey Woods SSSI
Cornmill Stream	Cornmill Stream and Old River Lea SSSI
Old River Lea	Cornmill Stream and Old River Lea SSSI
River Lea Diversion	Chingford Reservoirs SSSI
Coppermill Stream	Walthamstow Reservoirs SSSI / Lee Valley SPA Walthamstow Marshes SSSI

The rivers in the Regional Park are typical of much of lowland England. They flow down a very shallow gradient, largely over a clay substrate. In common with many rivers in heavily populated areas they have had much of their natural function removed as engineering works designed to relieve flooding or prevent erosion, have effectively isolated the river from its floodplain. The Lee Navigation holds a relatively constant volume of water, the distribution of that water determined by a system of locks, sluices and weirs, whilst high flows following storms or periods of prolonged heavy rain are directed into the Flood Relief Channel.

Whilst highly modified channels such as the Lee Navigation and the Lee Flood Relief Channel can have considerable value for biodiversity and artificial habitat enhancements can increase this value further, it is the relatively natural channels such as the Old River Lea and Small River Lea that have the greatest diversity of features and therefore the widest variety of plants and animals associated with them. Variations in the depth and flow rates caused by features such as gravel riffles provide habitat for spawning fish, notably Barbel and invertebrates such as the Banded Demoiselle. ~~Eroding~~Water Voles utilise river banks for their burrows; exposed banks provide suitable nesting sites for Kingfisher and Sand Martin, whilst still backwaters provide habitat for fish and a wide range of other wildlife including suitable sites for Otter holts.

Key stretches of river habitat in the northern section of the Park include the Amwell Magna backwater, the Old River Lea from King's Weir to Waltham Abbey, the Cornmill Stream and parts of the River Lee between Enfield Lock and Lea Bridge Road. Further south the interlinked channels of the Lee, Old River Lea and Lee Navigation south from Lea Bridge Road and through Queen Elizabeth Olympic Park, the Bow Back Rivers and onto the Thames are all important in an urban context. In total at least 75km of river channel exists within the Park of which 23km are considered to be of high nature conservation importance.

Although it is thought that many rivers have improved in quality over the past few decades, there are still current issues that need to be overcome. This has been recognised at a European level by the Water Framework Directive a piece of legislation that became law in 2003 that states that all UK waterbodies must be in 'good ecological status' or 'good ecological potential' on heavily modified catchments by 2027.

Threats

Low flows

Low water flows are a major threat facing rivers and streams in the Park. Surface and groundwater abstraction have reduced the amount of water flowing through river and stream channels. The effects of low flows are evident in most of the more natural river channels within the Park. The impoundment of rivers and the diversion of water down courses such as the Flood Relief Channel in order to protect adjacent property from flooding exacerbate these problems for rivers such as the Old River Lea. The worst effects can be seen during times of drought when flows in some channels can be negligible.

Water quality

The water chemistry of the River Lea and some of its tributaries is heavily influenced by the discharge of treated sewage effluent. Diffuse pollution from agricultural, industrial and domestic activities will also have an adverse effect on water chemistry as do misconnections and combined sewer overflows throughout the wider Lea Catchment. The issue of low flows is not entirely separate from that of water quality as pollutants are more concentrated when there is less water flowing through the channel.

Flood and erosion control

In a natural river floodplain a mosaic of wetland habitats characterised by species that are tolerant of periodic inundation would exist. The impoundment of rivers and effective control of flood waters means that most of this transitional habitat no longer exists. In many cases there is a complete absence of a natural wetland margin and stands of large trees have become established right up to the river bank. In addition, the processes of erosion and deposition that act to form important natural riparian habitats no longer occur due to modifications to river banks which cut the river off from its natural floodplain because of ~~to~~ the risk they pose to adjacent landowners.

Invasive non-native species

The establishment of invasive non-native species is a significant threat to our biodiversity as well as causing problems for navigation and recreational activities. Many of the worst effects are caused by plants such as Floating Pennywort *(Hydrocotyle ranunculoides)*, New Zealand Pygmyweed (*Crassula helmsii)* and Himalayan Balsam *(Impatiens glandulifera)* but animals such as non-native crayfish in particular the Signal Crayfish *(Pacifastacus leniusculus)* can also cause harm to

our native wildlife and bank stability. The Signal Crayfish is widespread throughout the river catchment and causes extensive damage to aquatic vegetation, undermining riverbanks, increasing turbidity and predating fish eggs. The effect of American Mink *(Neovison vison)* on Water Voles *(Arvicola amphibius)* is well documented but they also predate waterbirds and could have a significant effect on the breeding success of some species in the Park.

Inappropriate development

Riverside development continues to have a major impact on rivers and streams in and around the Regional Park. The best of these can actually deliver benefits to biodiversity where they attempt to address the hard engineering works of the past and restore the environment to a more natural state. Unfortunately the majority of riverside developments are less sympathetic. Modern developers are keen to offer their customers river views and access right up to the bank. This reduces the opportunity to create robust vegetated margins and increases shading. Increasingly planning applications are submitted that show surfaced footpaths running along both banks. Not only is this bad for wildlife, it also reduces the quality of the experience for people using these paths as they will be looking over another thoroughfare, rather than at a riverbank rich in wildlife.

Recreation

Rivers play an important role in providing people with opportunities for recreation. The Lee Navigation is a popular destination for boaters and anglers. Part of the attraction for participants in these activities is spending time in a picturesque and tranquil environment. River wildlife such as dragonflies and Kingfisher enhance this experience and a wealth of wildlife currently exists alongside fairly intensive recreational pressure. However, conflicts do exist such as the demand for additional moorings resulting from an increase in boat traffic and loss of soft banks. The cumulative effect of wash from passing boats can damage delicate aquatic vegetation, whilst the need to navigate the channel also results in the removal of features that would have had value to wildlife such as overhanging trees. There is space on the Park's waterways for recreation as well as nature conservation but finding a way of facilitating both depends on acknowledging that conflicts can exist and working out solutions to avoid or mitigate for losses.

Current action

River Catchment Partnerships

The Catchment Based Approach (CaBA) launched nationally in 2013 following a 2012 DEFRA pilot. The aim of CaBA is to establish catchment partnerships formed of local people, landowners and statutory bodies, which will work collaboratively across all the catchments in England. The hope is that this collaborative, bottom-up approach will be more successful at improving rivers than previous approaches, which were led from above by statutory organisations. The ultimate aim of the Catchment Based Approach is to help the UK meet targets under the Water Framework Directive.

Working at the catchment level, this partnership is a group that works with key stakeholders to agree and deliver the strategic priorities for the catchment and to support the Environment Agency in developing an appropriate River Basin Management Plan, required under the Water Framework Directive. These actions will help move the watercourse towards good ecological status or potential.

There are a number of river enhancement projects proposed through the Catchment Management Plan such as the installation of Eel passes on Holyfield Weir,

installation of floating reedbeds in the Lower Lea and the re-wetting of existing channels in the Waltham Abbey Royal Gunpowder Mills.

Habitat enhancement and management

Active management is being carried out on key sections of waterway throughout the Park. This includes installation of floating reedbeds in urban stretches of the river such as at Lee Park Way, Essex Wharf and Tottenham, tree removal to enhance marginal vegetation on sites including the Old River Lea at Cornmill Meadows and the Small River Lea in River Lee Country Park and restoration of the stretch of the River Lea along the Amwell Magma Fishery.

Monitoring

A range of ongoing surveys are undertaken on the riverine habitats. These include surveys for Water Vole, Mink and in some locations the BTO's Wetland Bird Survey (WeBS) include the rivers. Certain key stretches of river including the Old River Lea at Cornmill Meadows and Fishers Green have annual electrofishing carried out by the Environment Agency. There is also routine water quality monitoring undertaken by the Environment Agency in a number of the waterbodies and lakes of the Regional Park.

Invasive non-native species

There are currently a number of established schemes to manage invasive non-native species. tThese include the Hertfordshire Water Vole and Non-native Species Project with a funded post to co-ordinate effort across Hertfordshire and linking in to Mink management across the Regional Park. Work is also being carried out across the catchment to manage invasive plant species including New Zealand Pygmyweed, Floating Pennywort, Giant Hogweed *(Heracleum mantegazzianum)* and Himalayan Balsam.

Action Plan Aim:

To conserve, restore and enhance the ecological value of rivers and streams in the Lee Valley, through sympathetic and appropriate management.

Action Plan Objectives

- Assess the quality of the existing river and stream habitat in the Lee Valley
- Through appropriate management seek to enhance the river and stream habitat
- Raise awareness of best practice management with landowners and managers and awareness of the importance of rivers and streams with members of the public

Associated Action Plans

- Otter
- Water Vole
- Invasive non-native species
- Barbel
- Kingfisher
- Bats

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Standing Open Water Habitat Action Plan

Introduction

Standing open water includes freshwater natural systems such as lakes and pools as well as those resulting from human activities such as gravel pits, reservoirs and ponds. Open water bodies are often classified due to their nutrient status: either oligotrophic (nutrient-poor), eutrophic (nutrient-rich) or mesotrophic (intermediate). Eutrophic waters are naturally rich in plant nutrients and are typical of areas of lowland Britain such as the Lee Valley.

There are no accurate estimates of the amount of eutrophic standing water in Great Britain. The total area of still inland water is estimated as 675km^2 in England of which current work suggests that over 80% of this is eutrophic[19].

Ponds, for the purpose of UK BAP priority habitat classification, are defined as permanent and seasonal standing water bodies up to two hectares in extent, which meet one or more of a number of classifications. They are widespread throughout the UK, but good quality examples are now highly localised, especially in the lowlands. Estimates, based on the relatively small pond datasets currently available, suggest that around 20% of the c.400,000 ponds may meet the UK BAP priority habitat classification[13]. This plan covers all standing open water in the Lee Valley.

Current status

This is one of the most extensive and significant habitats in the Lee Valley and forms one of the largest complexes of open water habitats in England. The areas of standing open water include large flooded gravel pits north of Waltham Abbey, the reservoirs at Chingford and Walthamstow, the filter beds at the WaterWorks Nature Reserve and East India Dock Basin, adjacent to the Thames, as well as smaller ponds and the wetland habitats associated with the water's edge. A number of these sites are managed for commercial purposes be that for the water supply industry, fisheries, and marinas or as watersport venues. The total extent of open water in the Lee Valley is estimated to be around 1000 hectares, nearly half (490 ha) of which is made up of the large storage reservoirs in the south of the valley while the gravel pits to the north of Waltham Abbey comprise the rest.

All of the standing open waters in the Park are of human origin but they make a huge contribution to the biodiversity of the region. The value of open water habitats is enhanced if the edges merge gradually into other habitats such as reedswamp, fen and wet grassland. Unfortunately this transition can be very stark as gravel pits mature and the deep, steep-sided banks are colonised by trees which shade the narrow belt of shallow water, inhibiting the growth of aquatic and marginal plants. There are certainly animals associated with these tree-lined edges but if gravel pits are to achieve their full potential it is important to maintain a variety of habitat types around the edges.

The waters support large amounts of vegetation and a wide variety of animals and many are important wintering and breeding sites for waterbirds such as Shoveler *(Anas clypeata)*, Gadwall *(Anas strepera)*, Tufted Duck *(Aythya fuligula)* and Great Crested Grebe *(Podiceps cristatus)*. Such is this biodiversity value of the open water within the Regional Park that the majority have been designated as SSSIs and several combine to form the Lee Valley Special Protection Area (SPA). The Lee Valley SPA includes Amwell Nature Reserve, Rye Meads Nature Reserve, Turnford and Cheshunt Pits within River Lee Country Park and Walthamstow Reservoirs. It

[19] UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008.

was designated on account of the internationally important populations of Gadwall and Shoveler as well as wintering Bittern *(Botaurus stellaris)*.

Research carried out on a similar complex of waterbodies in south-west London confirms that birds move regularly between individual waterbodies. This means that the management of open water sites cannot be considered in isolation and that the waterfowl within the Lee Valley SPA are likely to be reliant on waterbodies outside it, including some that have no statutory protection.

Smaller complexes of open water such as ponds provide important habitat, particularly for dragonflies, reptiles and amphibians.

Threats

Natural succession
This can often be a significant threat to the biodiversity value of old gravel pits and inevitably leads to the complete loss of smaller ponds. When the majority of the gravel in the Lee Valley was excavated between the 1920s and 1980s the quarry operators were understandably interested primarily in the excavation of as much gravel as possible. This resulted in relatively deep pits with steep sides and very few shallow margins. The inevitable process of natural succession caused the bare gravel banks to be colonised by plants such as Common Reed *(Phragmites australis)*, which in turn led to an increase in the deposition of organic matter, allowing the eventual establishment of woodland. Naturally the processes of sediment deposition that occur in open water habitats provide new opportunities for marginal vegetation to become established but the steep sides of gravel pits often prevent this from happening and habitats such as fen and marsh are lost. Following pressure from knowledgeable local wildlife enthusiasts Amwell Pit was more sympathetically profiled as the gravel companies worked with shallower margins allowing the development of more diverse wildlife habitats.

Lack of management
The artificial nature of open water in the Lee Valley means that a lack of ongoing management will often result in the loss of habitats associated with the edges such as fen and swamp to scrub then woodland, a more common and widespread habitat. There is value in the full range of habitats associated with open water edges but those that are transient in nature depend on management such as reed cutting, grazing, scrub clearance and occasional bank profiling if they are not to be completely lost. In the Lower Lea, East India Dock Basin's natural siltation process due its tidal nature has been exacerbated by the complexities surrounding its removal resulting in the loss of standing open water.

Inappropriate management
Open waters can also suffer if the shallow water and banks are over-managed. The removal of too much aquatic vegetation or the manicuring of banks into short grass lawns can result in the loss of biodiversity. Access to the water's edge for visitors is important but it is possible to balance this against the need to maintain a vegetated margin.

Recreational use
The open water within the Lee Valley offers recreational opportunities for people ranging from walking and cycling through to watersports and angling. The Regional Park Authority has a remit to provide for these recreational pursuits and there is the opportunity to do this within the Park whilst maintaining the high biodiversity associated with its open water habitats. Overstocking, particularly of bottom-feeding

fish such as Carp *(Cyprinus spp)* and Common Bream (*Abramis brama*), can lead to increased turbidity, damage to aquatic vegetation and nutrient enrichment. Watersports have been shown to alter the behaviour and distribution of waterfowl across the Park. There is clearly room for both recreational activity and biodiversity in the Lee Valley and measures such as leaving some waterbodies and banks free from disturbance as well as restrictions on activity at sensitive times of the year can help to ensure that biodiversity is protected.

Pollution

One-off localised pollution incidents can have a serious often short-term impact on specific waterbodies, however longer term implications of pollution via input of nitrates or phosphates into the system can lead to widespread eutrophication with more serious long-term impacts. Algal blooms are a natural occurrence dependant on weather conditions, these blooms can cause depletion of oxygen levels impacting on the freshwater ecosystem. Avian botulism outbreaks can cause large numbers of bird deaths and is caused by the bacterium Clostridium botulinum.

Invasive non-native species

There are a number of established invasive non-native species present in the Lee Valley that have the potential to have a negative impact on the biodiversity value of the open water. These include New Zealand Pygmyweed (*Crassula helmsii)*, Himalayan Balsam *(Impatiens glandulifera)*, Giant Hogweed *(Heracleum mantegazzianum)*, Water Fern *(Azolla filiculoides)*, Floating Pennywort *(Hydrocotyle ranunculoides)*, Crayfish and American Mink *(Neovison vison)*.

Operational management issues of commercial sites

Many of the open water sites, including those with a statutory designation are managed as a part of the water supply industry. The operational need to undertake management can impact, both negatively and positively on the habitats present. For example requirements to undertake routine checks of reservoir banks can mean that marginal vegetation is kept to a minimum. The reduction in levels on reservoirs for operational reasons can provide excellent marginal habitats for wading birds however reduction in open water can have a clear detrimental impact on wildfowl.

Current action

Habitat management

On-going management to enhance key open water sites is undertaken. Much of this work focuses on management of the marginal vegetation, in many places to maintain the open nature of the larger water bodies and enable the expansion of marginal vegetation.

Zonation of recreational use

The zonation of recreational activities currently enables a range of activities to sit alongside the ecological importance of waterbodies. This is managed through the creation of refuges on certain lakes such as Holyfield Lake where sailing is not allowed across the whole area, the restriction of sailing on King George V reservoir- to the south basin or by certain lakes having no recreational activity other than managed angling.

Management plans

Conservation management plans are in place for a number of the key open water bodies in the valley. These focus management on key features for the particular waterbody both in terms of the habitats present and the key species.

Monitoring

The wetland bird numbers are monitored regularly via the BTO's Wetland Bird Survey (WeBS). Electrofishing takes place biannually on many of the lakes including Amwell Nature Reserve, Stanstead Innings and the lakes within River Lee Country Park. The Environment Agency also undertake routine water quality monitoring at various open water locations along the Lee Catchment.

Habitat enhancement schemes

Management is on-going at many open water sites; however larger scale development work also takes place if funds permit. Schemes of particular note include the enhancement works on Seventy Acres lakes funded through the EU Life Bid in 2002-~~02~~ 03, development of Walthamstow Wetlands opened in 2017, which includes habitat and visitor enhancements funded through the Heritage Lottery Fund and habitat creation works at Glen Faba enabled through S106 planning funds commenced in 2018.

Action Plan Aim:

To conserve and enhance the ecological value of standing open waters in the Lee Valley, through sympathetic and appropriate management most notably to ensure that the SPA/Ramsar site remains in favourable condition.

Action Plan Objectives

- Assess the quality and extent of existing standing open water habitat in the Lee Valley
- Through appropriate management seek to enhance the standing open water habitat
- Seek to increase the extent of standing open water habitat in the Lee Valley through creation of ponds
- Share best practice management with landowners and managers and raise awareness of the importance of standing open water with members of the public

Associated Action Plans

- Bat
- Bittern
- Invasive non-native species
- Kingfisher
- Otter
- Water Vole

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Grassland and Fen Habitat Action Plan

Introduction

There are a number of grassland types found in the UK many of which have suffered loss in extent and are threatened by a range of factors.

Wet grasslands are found where groundwater levels are close to, but not permanently at, the surface and are affected by shallow seasonal flooding. Although there may be considerable overlap with fen meadows, wet grasslands ~~tend to~~ can be floristically poorer, having a greater history of human intervention. They form the typically flat permanent grasslands of river valley floodplains, often with a network of water-filled ditches containing standing water. These areas are often managed by grazing with poaching of ditch margins creating and maintaining a habitat rich in plants and invertebrates. Both wet grasslands and fen meadows provide breeding habitat for wading birds such as Snipe *(Gallinago gallinago)* and Redshank *(Tringa totanus)* while winter floods can attract large numbers of both wildfowl and waders.

Fens, marshes and swamps consist of a range of similar habitats, all largely transitional between open water and dry land. Fens develop where water-logged conditions with a low oxygen concentration persist throughout the year, promoting the accumulation of organic matter and the formation of peat. Swamp is characterised by the water table at or above ground level for most of the year and has a relatively poor floral diversity. It is often dominated by a single species of tall fen vegetation, such as Common Reed *(Phragmites australis)*, Greater Reedmace *(Typha latifoli)* or sedges *(Carex spp.).* Marshes form on mineral substrates where water levels are at, or close, to the soil surface in summer and rise above ground level in winter. Except for the permanently inundated swamps, most sites would have been grazed during the summer months to form fen meadows. The traditional 'Lammas meadows' were cut for hay in July and then grazed into the autumn.

Fens and marshes can support a diversity of plant and animal communities. The best examples nationally can contain up to 550 plants, a third of the UK's native species, and up to half of our species of dragonflies. Reedswamp supports a distinctive bird community, including the Amber listed Bittern *(Botaurus stellaris).* The UK is thought to host a large proportion of the fen surviving in Europe where it has declined dramatically in the past century. The UK's lowland fens on intensively farmed land are more fragmented than fens elsewhere and are generally smaller in size.

Reedbeds are one of the most important habitats in the UK, supporting a range of birds and invertebrates. In 2008 it was estimated that there are about 5000ha of reedbed in the UK, and whilst there has been a co-ordinated and concerted conservation effort on reedbed habitat it is unlikely that this has increased to anywhere near its former range. The current areas of reedbed are also fragmented with only about 50 reedbeds greater than 20ha in size[20].

Unimproved neutral grassland habitat has undergone a substantial decline in the 20th century, almost entirely due to changing agricultural practice. It is estimated that by 1984 in lowland England and Wales, semi-natural grassland had declined by 97% over the previous 50 years to approximately 0.2 million ha. Losses have continued during the 1980s and 1990s, and have been recorded at 2 -10% per annum in some parts of England. This loss has been widespread with an estimated extent of less

[20] UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

than 15,000ha of species-rich neutral grassland surviving today in the UK. Unimproved seasonally-flooded grasslands are less widely distributed[21].

Current status

Grasslands and fen were formally the dominant semi-natural habitat in the Lee Valley but, mirroring national trends have been dramatically reduced.

Extensive long-standing areas of fen are scarce in the Lee Valley but key areas remain at Rye Meads Nature Reserve, Silvermeade and Walthamstow Marshes. Many of these seasonally flooded grasslands would have been grazed in the summer and this traditional management is being replicated on these sites in the Park.

Wet grasslands in the Lee Valley have been modified over several centuries. The traditional 'Lammas meadows' that would have occurred on sites such as Walthamstow Marshes would have been managed by hay cutting followed by grazing. Ditches have been excavated on many wet grassland sites such as Cornmill Meadows and Silvermeade to water livestock, manage grazing and facilitate irrigation. The resulting network of ditches which are separate from the main water course provides huge benefits to numerous wildlife including the ~~endangered~~ protected Water Vole *(Arvicola amphibius)*.

These complexes of wetland habitats also support impressive invertebrate assemblages, with sites such as Cornmill Meadows and Amwell Nature Reserve supporting over half of the total number of British dragonfly species.

The remaining sites are often fragmented and suffering from low water levels which means they are vulnerable to the successional changes that occur if traditional management ceases. Losses of these habitats, both nationally and locally in the Lee Valley, have been significant over the last 50 years. In the Lee Valley the loss has principally been to mineral extraction, although conversely this has also created some limited habitat. Agricultural intensification was also previously a major factor, although largely superseded by mineral extraction. Landfill, and subsequent use for sports fields, is a significant feature in the south of the Park.

In the early 2000s funding was made available through the EU Life fund Bittern Project to create 4.5ha of reedbed at Seventy Acres Lake. Elsewhere, reedbed creation was carried out at Rye Meads Nature Reserve and Amwell Nature Reserve, totalling further two hectares. This was part of a nationwide project looking to expand key Bittern sites to encourage an increase in the breeding population. To date no confirmed records of Bittern breeding in the valley however booming was heard in 2008. The transformation of the Lower Lea for the 2012 Olympic Games saw the creation of the Queen Elizabeth Olympic Park with 1.6ha of reedbed established.

The fen and meadow habitats remaining at Rye Meads Nature Reserve, Cornmill Meadows and Walthamstow Marshes are all recognised as of national importance and form part of their respective SSSIs. Other sites such as Silvermeade and Amwell Meadows are regionally significant and designated as Local Wildlife Sites.

Threats

Mineral extraction

Although this industry has been responsible for the opportunities to create much of the reedbed resource currently in the Park, it will also have caused the loss of fen

[21] UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008

and seasonally flooded grassland that existed prior to quarrying. At present there is no extraction taking place in the Lee Valley and it is believed that all deposits have been exhausted.

Nutrient enrichment
Improvement of grass swards through the addition of fertiliser has resulted in the loss of many plant species as they are ousted by more vigorous species and agricultural strains. The introduction of agri-environment schemes has meant that there is an incentive for land managers to reinstate more sympathetic traditional systems of management. Nutrient enrichment however is still occurring due to nutrients present in sewage effluent and runoff from gardens and farmland. Eutrophication is also taking place from air pollution.

Low water levels
The flood defence works of the past have contained flood waters within channels, preventing the natural inundation of low-lying grasslands that are essential in maintaining their character. Walthamstow Marshes is one example of a site that has suffered from low water levels in recent years. Without the flood defences the valley would be subject to widespread inundation~~If these flood defence measures ever fail the result would be a sudden extreme inundation~~ that could~~can~~ bring with it pollutants including untreated sewage effluent.

Lack of management
A lack of management will result in a natural succession from fen and wet grassland to scrub and woodland. This transition is much faster if it occurs alongside low water levels as this removes the competitive advantage of wetland plant species and allows aggressively invasive species such as bramble to become established.

Inappropriate management
Intensive cutting or excessive grazing pressure can both damage the biodiversity interest of fen and wet grassland sites. Well-intentioned but often ecologically inappropriate action such as tree planting can also reduce the special qualities of these habitats.

Fragmentation
The small size of many of the remaining patches of habitat make managing landscape scale issues such as water levels much more difficult and renders the habitat more susceptible to external influences such as nutrient enrichment and scrub invasion. Fragmentation also means that there is less opportunity for species that have been lost from a site to naturally recolonise that patch of habitat.

Invasive non-native species
An increasing threat to the grasslands and fens of the valley is invasive non-native species, in particular New Zealand Pygmyweed (*Crassula helmsii)*. This has become increasingly widespread and is now known to be found on Cornmill Meadows, Amwell Nature Reserve, Rye Meads Nature Reserve, Hall Marsh Scrape and Walthamstow Marshes.

Current action

Management planning
Many of the key sites have management plans in place. All the SSSI sites are currently subject to Water Level Management Plans.

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Habitat management
Active habitat management for key features is taking place on the majority of the sites. Rye Meads Nature Reserve, Silvermeade, Amwell Nature Reserve, Walthamstow Marshes and Commill Meadows are all in Higher Level Stewardship schemes supported by Natural England. Active management of New Zealand Pygmyweed is undertaken on all LVRPA-owned sites and strict biosecurity measures implemented however due to the nature of plant it is likely that it will be found in other locations.

Rotational management of the reedbeds at River Lee Country Park, Amwell Nature Reserve and Rye Meads Nature Reserve takes place. This is undertaken where possible by the use of a truxor amphibious reed-cutting boat.

Monitoring
Monthly winter Bittern roost counts are undertaken across the reedbeds in the north of the valley to monitor numbers and booming surveys are carried out in spring to assess if there is a breeding attempt.

Habitat creation schemes
Larger scale development work also takes place where funds permit. Schemes of particular note include the development of Walthamstow Wetlands which includes Heritage Lottery funded habitat and visitor enhancements delivered by a partnership of London Borough of Waltham Forest, Thames Water and London Wildlife Trust and habitat creation works planned for Glen Faba enabled through S106 planning funds.

Action Plan Aim
To conserve, enhance and restore the quality and extent of grassland and fen habitats in the Lee Valley and to prevent further loss.

Action Plan Objectives

- Assess the extent and quality of the existing grassland and fen in the Lee Valley
- Through appropriate management enhance and restore existing grassland and fen habitats, improve habitat connectivity and seek opportunities for habitat creation, exploring options to reconnect rivers with their floodplains.
- Share examples of best practice management with landowners and between managers and raise awareness of the importance of grassland and fen habitats with members of the public

Associated Action Plans

Bittern
Invasive non-native species
Creeping Marshwort
Early Marsh Orchid

DRAFT

Woodland Habitat Action Plan

Introduction

The woodland cover of the UK is sparse, with only 11.5% coverage[22]. If natural succession were left to continue unhindered, colonisation by trees and shrubs would continue to the climax woodland habitat. A number of woodland types, outlined below are noted as Priority Habitats within the UK.

Wet woodland forms when colonisation with trees take place but the over-riding wetness of the ground remains the key environmental factor. They are often dominated by Alder *(Alnus glutinosa)* or willow *(Salix spp.)* trees and are a typical feature of old gravel workings. Wet woodlands often occur in a mosaic with other woodland types and open habitats such as fens. Wet woodland is an important habitat for many invertebrate species and several species of bird dependant on the carr mosaic habitat in wetland habitats, as well as providing cover and breeding sites for Otter *(Lutra lutra)*.

Lowland mixed deciduous woodland grows on all kinds of soils, and includes most semi-natural woodland in southern and eastern England. Many are ancient woods which have been continuously wooded since the 17th century. There are about 240,000 hectares of lowland mixed deciduous woodland in the UK although now it only covers 1-2% of its original range and has declined by around 40% since 1935.[17] It remains important however for a wide range of birds including woodpeckers, Nightingale *(Luscinia megarhynchos)*, Treecreeper *(Certhia familiaris)* and Nuthatch *(Sitta europaea)*.

Orchards are known to be hotspots for biodiversity in the countryside, supporting a wide range of wildlife including an array of Nationally Rare and Nationally Scarce species. The wildlife of orchard sites depends on the mosaic of habitats they encompass, including fruit trees, scrub, hedgerows, hedgerow trees, non-fruit trees within the orchard, the orchard floor habitats, fallen dead wood and associated features such as ponds and streams. Traditional orchards are a long-established and widely distributed habitat and make a significant contribution to biodiversity, landscape character and local distinctiveness across the UK.

Wood pasture, where trees grow alongside grazing cattle often result in very mature standard trees and also the development of large amounts of dead wood. This dead wood is where much of the interest lies in particular with the associated invertebrate, fungi and bird species as well as the provision of habitat for bats.

Current status

Wet or carr woodland is the most widespread woodland type throughout the Regional Park where the vast majority has become established around old gravel workings and through natural succession from reed swamp and fen. There is an inevitable conflict between retaining the early stages of vegetation succession and developing carr woodland as both have significant value for wildlife.

The wet woodland of the Lee Valley has usually become established on nutrient rich soils and the majority of the trees are willows, with Alder featuring as a dominant species in some areas. Of particular note are the communities of mosses and liverworts that become established on the trunks of living and fallen trees. Many nationally scarce and notable invertebrates are associated with wet woodland

[22] UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008.

habitats and there is much that can be done to increase our knowledge of these species in the Lee Valley.

Wet woodland habitats are a key feature noted in the Turnford and Cheshunt Pits and Waltham Abbey Woods SSSI's and the wet woodland cover has increased in the Park as willow and Alder colonise the edges of the disused gravel pits. There are extensive areas within the River Lee Country Park, Rye Meads Nature Reserve, Waltham Abbey and Sewardstone. Osier Marsh Woodland at Sewardstone is worth special mention, not only because it is a good example of the habitat within the Park but also because a timber walkway offers visitors excellent access. The woodland in the Royal Gunpowder Mills at Waltham Abbey was originally planned to provide wood for the production of charcoal for gunpowder, this SSSI is currently in unfavourable condition. ~~and with~~ The Sycamore ~~now~~ which had ~~outcompeting~~ outcompeted the Alder and ~~dominating~~ dominated the sapling, shrub and canopy layer[23] has started to be managed.

Black Poplar *(Populus nigra)* is an endangered and important wetland tree and deserving of special mention, there are excellent examples of mature Black Poplar at Glen Faba and Gunpowder Park, Waltham Abbey.

Many areas of the Park were restored following gravel extraction and subsequent filling through the planting of pockets of trees, predominately Ash *(Fraxinus excelsior)*, Hawthorn *(Crataegus monogyna)*, Blackthorn *(Prunus spinosa)* and willow *(Salix spp.)* with some Common Oak *(Quercus robur)*. Whilst these areas can be important for birds and insects in particular the development of dense scrub on ancient fens or meadows is generally detrimental to key features.

There is an historic orchard in Waltham Abbey Gardens located on a burial ground dating from the 1400s. It is unknown when the orchard was planted but a photo from 1902[24] shows it to be well established with fruit trees planted at what appears to be 2-3m centres. The majority of these trees have now gone, but some of the rows can still be picked out, possibly from replanting in the meantime. A programme of replanting was started in 2008, but put on hold pending research as to there being any discernible burial remains in the area. A new orchard was created at Hayes Hill Farm in 2007 to celebrate the 40th anniversary of Lee Valley Park. In the Lower Lea Valley a number of community orchards have been created on London Borough of Hackney open space by community action supported by the Tree Musketeers, a local tree volunteer group. These orchards are found at Hackney Community Tree Nursery, Millfields Park, Springfield Park and Spring Hill, complementing adjacent orchards located outside the boundary of the Regional Park.

Parkland trees form an important part of the historic landscape in areas of the Lower Lea such as Springfield Park and Hackney Marshes. The Countryside Stewardship scheme at Ryegate Farm enabled the recreation of a parkland habitat through planting of trees in the pasture. Belts of mature trees also provide important habitat linking areas together providing commuting habitat for protected species such as bats. Areas of woodland, parkland trees and mature tree belts are often known to include veteran trees or indeed those with the potential to become veteran trees however there is little recorded information on their presence or condition in the Lee Valley.

[23] Natural England Condition Assessment 2009
[24] Reflections of the past Vol 1; Sears R. and Foster J. 1991 Biddles Ltd

Threats

Low water levels

Low water levels, which could be exacerbated by climate change, can cause wet woodlands to dry out and prompt a change in the species composition, with species such as Sycamore *(Acer pseudoplatanus)* able to compete with the wetland specialists.

Inappropriate management

Over tidied woodlands can remove important habitat for wildlife. The jumble of fallen rotten limbs provide habitat for invertebrates, fungi, mosses and liverworts, whilst cracks and loose bark on mature trees can shelter animals such as bats. The planting of inappropriate tree species can alter the ecology of wet woodlands. Lack of on-going management can allow woodland habitat to degrade in quality impacting on specific species for example the loss of rotational woodland management can impact on the breeding success of Nightingale *(Luscinia megarhynchos)*.

Changes in nutrient levels

Although wet woodland in the Lee Valley grows on nutrient rich sites, the input of additional nutrient can lead to a shift in the species composition and the loss of some characteristic species.

Disease

Disease can threaten woodland ecology if they affect an important component of it. A current example is the fungus *Phytophora*, which can kill large numbers of Alder. Other diseases such as Ash Die-back, or Sudden Oak Death could have a big impact on the composition of wooded areas in the valley. There was a major infestation of Watermark disease in the Cricket Bat Willow (*Salix alba var. caerulea*) at Sewardstone Marsh in the early 2000s, Watermark disease is notifiable in Essex and all diseased trees were removed and burnt.

Invasive non-native and naturalised species

As is true of most habitats the presence of invasive non-native species can have a negative impact on the habitat quality. New Zealand Pygmyweed (*Crassula helmsii)* and Himalayan Balsam *(Impatiens glandulifera)* can cause thick mats of vegetation significantly altering the native ground flora. The naturalised Fallow *(Dama dama)* and Muntjac Deer *(Muntiacus reevesi)* are both problematic when managing woodland as their browsing can cause serious damage. Oak Processionary Moth *(Thaumetopoea processionea)*, found since 2014 at the Lee Valley VeloPark and more recently at Middlesex Filter Beds can have serious implications for oak (Quercus spp.). The defoliation caused by the feeding caterpillars can leave the trees vulnerable to disease or attack, whilst they preferentially eat oak leaves they will move onto other trees once that food source is exhausted.

Current action

Habitat management

Providing there are suitable conditions ~~A~~areas of wet woodland require little management to maintain them in good habitat quality and therefore a minimal intervention approach is undertaken. Other wooded areas are managed dependant on their target condition such as rotational scrub management to maintain good quality habitat for Nightingale. At Waltham Abbey Royal Gunpowder Mills work commenced in

2014 on the restoration of the Alder plantations by the felling of Sycamore and the coppicing and planting of Alder. There is also a Deer Management Plan in place to reduce the impact of the wild deer herd on site.

Tree surveys

Regular surveys are undertaken on trees throughout LVRPA landholdings to monitor for tree health, associated public safety and disease. Any notifiable disease or pest is reported to the relevant organisation.

Interpretation

There is a wet woodland interpretation panel at Sewardstone Marsh to promote understanding and appreciation of wet woodland habitats and its associated key species.

Community action

Local groups in the Lower Lea Valley are undertaking on-going woodland creation and enhancement works on areas on and around Hackney Marshes. This has included planting along the edges of the existing mixed deciduous woodland and work to improve the habitat quality of these areas through active management including rotational coppicing.

Action Plan Aim:

To conserve and enhance the ecological value of woodlands in the Lee Valley, through sympathetic and appropriate management.

Action Plan Objectives

- Assess the quality and extent of existing woodland habitat in the Lee Valley
- Through appropriate management seek to enhance the existing woodland habitat
- Raise awareness of best practice management with landowners and managers and awareness of the importance of woodland habitat with members of the public

Associated Action Plans

- Bats
- Invasive non-native species

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Built Environment and Brownfield Habitat Action Plan

Introduction

Built Environment and Brownfield habitats encompass a wide range of habitats characterised more by their use rather than a particular predominant habitat. For the purpose of this document this habitat is defined as:

- Open mosaic habitats on previously disturbed land
- Built environment

Open mosaic habitats on previously disturbed land can provide habitat for a diverse and rich assemblage of species, including numerous invertebrates, birds and plants. Many sites have historically been undervalued in terms of their importance for biodiversity and therefore lost through redevelopment.

The built environment refers to enhancements on developments, new and retro-fitted such as living roofs, nest boxes, provision of greenspace within developments, Sustainable Urban Drainage (SUDS) and ecologically friendly landscaping schemes.

Current status

Urban habitats are a major feature of the Regional Park, ranging from the built environment of the Park's own facilities, the surrounding urban areas, the post-industrial landscapes of the Pulverised Fuel Ash (PFA), dumps or the relatively new brownfield habitats of the Queen Elizabeth Olympic Park.

The power stations of the Lee Valley have left their legacies in the form of dumps of Pulverised Fuel Ash, the residue remaining following the combustion of coal. This waste material was deposited in a number of locations along the valley floor. The unweathered PFA has a high boron and salt content, a high PH and minimal nitrogen. It therefore forms a highly stressful environment for many plants; however the communities that develop are distinctive and notable. Initially bare, the PFA in the Lee Valley was colonised by marsh and spotted orchids after a few years, often with associated fen vegetation. Unmanaged this succeeds to woodland with glades of orchids.

A number of industrial buildings, some now redundant, form distinctive habitats. These vary from fern-covered crumbling remains of old water mills and weirs to both used and disused water treatment works. Currently operational treatment works attract large numbers of feeding birds while disused sites show vegetational succession through unusual substrates. There are a number of historic Pillboxes in the Lee Valley, some of which have been converted to create bat hibernacula, such as those found at Hall Marsh Scrape and Gunpowder Park.

Naturally regenerating post-industrial habitats are frequent in the Lee Valley and are colonised by a distinctive flora made up of a diverse selection of ruderals such as arable weeds and introduced species. The succession generally passes through tall grassland and scrub phases before, if allowed, secondary woodland takes over. This succession may however be slow on these nutrient-poor, dry and stressful habitats.

The operational sewage treatment works provide feeding opportunities for large numbers of wagtails, finches and wading birds, while the disused Middlesex Filter Beds and Waterworks Nature Reserve exhibit classical wetland succession in miniature, supporting several scarce wetland species for London. Old brickwork supports ferns and mosses while the walls of the monastic remains at Waltham Abbey host one of the few remaining local colonies of Rue-leaved Saxifrage *(Saxifraga tridactylites)*.

The remaining PFA areas, totalling around 12ha in area are at Amwell Nature Reserve, Cheshunt gravel pits, Sewardstone Marsh and Rye House Power Station (although the latter site is just outside the Park boundary). There is also thought to be an area of PFA deposited from Millfields Power Station on Hackney North Marsh. Currently operational sewage treatment works occur at Rye Meads and Deephams. Important old brick walls and buildings occur at Waltham Abbey and Broxbourne. While remains of industrial sites occur throughout the valley most are to be found in the more urbanised south. The railway network that runs the length of the valley provides an important brownfield habitat that also provides linkages between sites.

These areas often fall outside statutory protected areas and for the majority of urban sites protection comes from local designations or through planning policies in local plans. Often the species found on these urban sites afford them some protection although this can be temporal.

The majority of brownfield habitats are created as the current use alters or ceases and are temporary in nature as new developments take place. The 2012 Olympic Games saw the redevelopment of large swathes of the Lower Lea and in legacy saw the creation of the Queen Elizabeth Olympic Park. Large areas of this have been developed to provide brownfield habitat with substrates installed and species planted to mimic natural conditions. Post 2012 a small new brownfield mosaic site on Hackney East Marsh was established from the remains of an Olympic transport hub.

Threats

Redevelopment or improvement

There is increasing pressure to build on brownfield sites which ultimately will see a reduction in overall sites left unmanaged and a subsequent decrease in the creation of new brownfield areas. There are opportunities for the mitigation of impacts through the installation of brown roofs but schemes such as this are often reliant on a robust planning response. Areas developed can see inappropriate mitigation such as relandscaping and planting schemes that inherently changing the nature of the site.

Colonisation by invasive non-native species

The inhospitable terrain of brownfield sites is often initially quite hostile to native flora and some invasive non-native species are able to thrive as the conditions mimic their native habitat. These can then grow forming a dense monoculture of detriment to the key features.

Lack of management

Left unmanaged the vegetation will mature, eventually seeing the loss of many of the important features that make this type of habitat so important. Where features such as nest boxes are installed on buildings on-going management such as clearing out old and failed nests can maintain them in good quality.

Current action

Creation of new urban habitats

The development of the Queen Elizabeth Olympic Park has seen 4.2ha of brownfield habitat created, although the challenge is to try and maintain these areas in an early successional stage through management practices. These areas have additional features within them such as the Toadflax Brocade Moth *(Calophasia lunula)* beds which are designed to replicate the coastal shingle beds of southern England where it first colonised the country.

Integration of wildlife features in building structures

The Lee Valley Hockey and Tennis Centre has a brown roof (1700m2) and a number of nest boxes have been installed both on the building itself and in the immediate surroundings. Bird and bat boxes have also been installed and occupied at Holyfield and Hayes Hill Farms and at Gunpowder Park the gabion baskets offer excellent habitat for nesting birds and overwintering invertebrates. There are a number of old Pillboxes in the Park that have been converted for use as bat hibernacula. They are also often used by overwintering invertebrates and a Cave Spider *(Meta bourneti)* are found in one of the boxes at Gunpowder Park.

Securing enhancements through planning

When responding to planning applications there is scope to push for enhancements to the built environment through the provision of nest boxes, green and brown roofs and appropriate landscaping. A particular challenge is increasing understanding and appreciation of early successional habitats, making them aesthetically acceptable to businesses and residents.

Management Plans

Many areas within the Regional Park have management plans in place that note urban habitats as a key feature and programme on-going management.

Action Plan Aim:

To maintain and enhance the ecological value of the urban environments in the Lee Valley and to raise awareness of their value.

Action Plan Objectives

- Include biodiversity features in all LVRPA built facilities and developments as an example of best practice for other developers
- To map and maintain a register of urban habitats and plan to retain a representative example of them each year
- To protect urban species of conservation concern through appropriate planning and management of their habitats
- Share best practice management with landowners and managers and raise awareness of the importance of urban habitats with members of the public

Associated Action Plans

- Invasive non-native species
- Bat

DRAFT

Bittern Species Action Plan

Introduction

Bittern (*Botaurus stellaris)* are secretive birds, confined almost entirely to lowland marshes dominated by Common Reed *(Phragmites australis).*They feed predominantly on fish, notably European Eel *(Anguilla anguilla)* but they also take a wide variety of other foods such as amphibians, insects, small birds and mammals. The males advertise their territories by a characteristic deep booming noise which allows the breeding population to be well known.

Up to the 17th century Bittern were widespread throughout England but land drainage and hunting led to a steady decline. By the 1880s they were extinct as a breeding species in this country. They recolonized in the early 1900s. At that time there were estimated to have been around 80 booming males. This was again followed by a steady decline linked to the loss of suitable habitat.

The resident population is increased in winter by the arrival of birds from the continent. The size of the influx is dependent on the severity of the weather but is never great. The total wintering population was estimated in 2009/10 at about 600 birds[25], with the Valley supporting between six and nine birds.

The Lee Valley Special Protection Area was classified in September 2000; Bittern is a key species in the designation with the citation noting that at the time of notification the valley was home to 6% of the UK's overwintering population.

In autumn 2001 the Authority joined a partnership of eight organisations nationally, co-ordinated by the RSPB, to submit an application to the European LIFE nature fund for a project to create a strategic network of reedbeds for Bitterns. Local partners in the Lee Valley included the RSPB, Herts and Middlesex Wildlife Trust and Ready Mixed Concrete Ltd. Sites targeted for reedbed creation and enhancement included Amwell Nature Reserve, Rye Meads Nature Reserve and Seventy Acres Lake in the River Lee Country Park. Work was completed in summer 2004.

Current status

Bitterns are afforded legal protection under Schedule 1 of the Wildlife and Countryside Act, Section 41 of the NERC Act and Annex 1 of the Wild Birds Directive. Bittern are a UK Priority Species with its association to reedbeds a UK Priority Habitat noted.

Bittern are Amber listed in the Birds of Conservation Concern, the status changed from Red listed in 2014. This change in status reflects the work that has been already done to recover from the historic decline noted above, however still recognises its rarity.

Results of the UK Bittern Monitoring Programme 2016 have shown a continued increase in the number of booming Bitterns with a minimum of 162 boomers recorded at 78 sites, this has increased from 2006 when there were 44 booming males recorded at 27 sites. Numbers of booming Bittern in the Fens have continued to rise along with increases on the Suffolk coast and Norfolk Broads. The Lee Valley heard its first booming bittern in 2008 but whilst some anecdotal evidence does suggest that breeding did take place in the 1980s in Broxbourne they are still to have breeding confirmed.

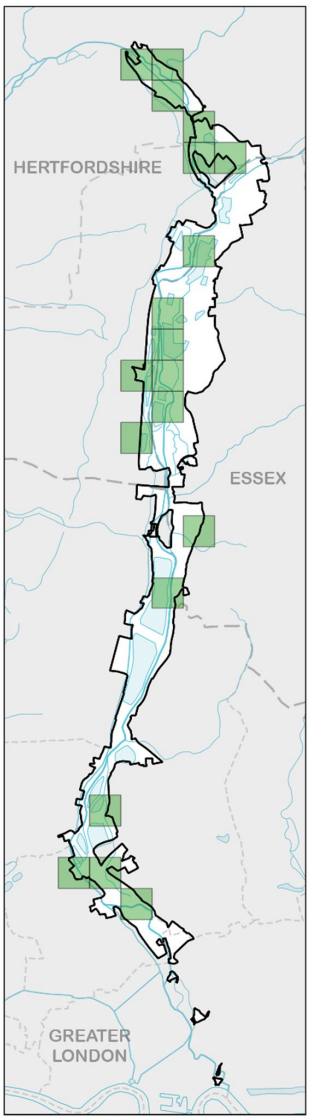
Records published in the annual London Bird Report and Birds of the Lee Valley show that until the late 1960s the Bittern was an irregular visitor to the Lee Valley. During the

[25] Wotton, S.R et al (2011) British Birds 104:636-641

1970s on average between one and two birds wintered in the Lee Valley below Ware, with the same pattern during the 1980s.

Exceptions to this were extremely harsh winters such as 1978/79 and 1981/82 when seven and six birds were recorded respectively. Since 1991 the number of wintering Bitterns has increased; regular and co-ordinated roost watches are now undertaken in the valley each winter and numbers average five to seven annually.

Map Six shows records of Bittern to a 1km grid square resolution in the Lee Valley Regional Park since 1980.



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Current factors causing loss or decline

Loss of habitat
The amount of reedbed is declining. Surveys[26] indicate there is only 5000ha of reed in the UK and only 53 sites with areas greater than 20ha. Increased awareness, conservation and protection in recent years have not stopped the decline. There has been an estimated UK loss between 1945 and 1990 of 10-40%[27]. The main causes have been uncontrolled natural succession leading to drier habitats, conversion to grassland by grazing, and salt water incursion due to the failure of sea defences.

In the Lee Valley the situation is slightly different in that the major loss of reed is due to natural succession to scrub and woodland.

Declining reedbed quality
As management regimes change, the quality of reedbed has also declined. The principal cause appears to be natural vegetation succession and a lack of management to control it leading to reedbeds becoming dominated by willow and alder scrub and woodland. Over abstraction of water can also cause the reedbeds to dry out and enable rapid scrub encroachment.

Water quality
Eutrophication (high levels of nutrients) can cause reeds to die back and high nitrate and phosphate cause the breakup and degeneration of floating reed-mats, and lead to anoxic (without oxygen) sediments which do not support food or reed colonisation. Algal blooms can decrease feeding efficiency because of turbidity (cloudiness) and direct fish kills. Pollution which contaminates their food may also contaminate Bittern.

Current action

On-going management to existing reedbeds
There is an on-going schedule of scrub removal particularly on Seventy Acres Lake, Rye Meads Nature Reserve and Amwell Nature Reserve, all of which are important wintering sites.

Reedbed expansion and creation
Existing reedbeds are targeted for expansion through both fencing to prevent wildfowl grazing and allowing regeneration or by management of adjacent vegetation to enable natural spread. Areas for the creation of new reedbeds are also targeted.

Rides are cut into a number of the key reedbeds annually to provide additional edge feeding habitat and rejuvenate the reed growth, this has the added benefit of creating better viewing opportunities for visitors.

Monitoring
Monthly roost watches are undertaken across the Park, in conjunction with key sites in Hertfordshire to monitor Bittern numbers. In the spring monitoring takes place to listen for any possible booming Bittern.

Engagement
The Bittern Information Point, at Fishers Green is staffed at weekends and bank holidays by volunteers who actively engage with visitors, highlighting Bittern ecology

[26] UK Biodiversity Action Plan Priority, Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008
[27] Bibby et al (1989) A Conservation Strategy for Birds (unpublished report)

and the conservation work undertaken for them. There is an annual winter Bittern Roost Watch at key sites in the Lee Valley and Hertfordshire.

Action Plan Aim
To conserve and increase the Bittern population and its range in the Lee Valley.

Action Plan Objectives

- Understand the current distribution and numbers of Bittern in the Lee Valley
- To maintain and expand the current distribution and abundance of wintering Bittern in the Lee Valley
- To provide suitable wetland habitat to attract breeding Bittern
- Raise awareness of Bittern and their wetland habitats through events and media

Associated Action Plans

- Grassland and fen
- Standing open water

DRAFT

Water Vole Species Action Plan

Introduction

The former widespread distribution of Water Vole *(Arvicola amphibius)* meant that until relatively recently it attracted little or no conservation interest. The species has undergone a dramatic decline in numbers nationally and this coupled with the fragmentation of its habitat is of great concern.

Water Voles are a charismatic creature which found fame as Ratty in the classic children's book 'Wind in the Willows', this alongside its relative tolerance of people nearby have made it a familiar and well-liked species. It is potentially an excellent indicator of the quality of waterside habitats and their associated plant communities. This high profile provides an excellent opportunity to bring its plight to the attention of people, to publicise the progress of its conservation and to develop public participation.

The Water Vole was once widespread along Britain's waterways. Two nationwide surveys were undertaken by the Vincent Wildlife Trust from 1989 – 1998 alongside a review of existing data, these studies concluded that there had been a long-term decline in Water Vole populations since the 1900s. Strachan and Jeffries concluded that the total loss of formerly occupied Water Vole sites could be as high as 94% by the year 2000[28], making this the most dramatic population decline of any British mammal this century.

A further survey was undertaken in Hertfordshire in 1996 by the Environmental Records Centre where stretches of river were revisited and the results estimated that the percentage of positive sites has declined by 72.9% since 1989.

Current status

The Water Vole is fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 and is a UK Priority Species.

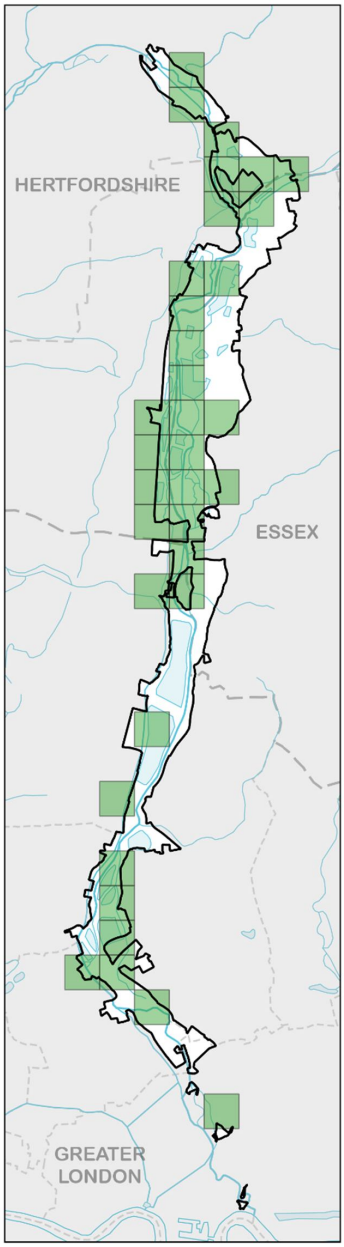
Water Voles in the Lee Valley now appear to have a patchy distribution, with populations restricted to a few key areas. In his 2012 survey of the Water Vole population in the Lee Valley, White[29] concluded that Water Voles are holding their own in the valley with good populations in core areas, albeit that sites within these areas may lose or gain colonies over time.

Core populations in the Lee Valley can be found at Amwell Nature Reserve, Rye Meads Nature Reserve, Silvermeade and Hall Marsh in River Lee Country Park and Walthamstow Marshes. A 2013 survey of Cornmill Meadows, which provides excellent habitat had Water Vole signs distributed widely across the site. This survey was repeated in 2016 and 2017 when no signs were found; it is considered that American Mink *(Neovison vison)* predation is a likely cause of this drastic loss.

[28] Strachan,R. & Jefferies, D.J. (1993) The Water Vole *Arvicola terrestris* in Britain 1989.1990; its distribution and changing status

[29] White, G. (2012) A Survey of Water Voles in the Lee Valley Regional Park

Map Seven shows records of Water Vole to a 1km grid square resolution in the Lee Valley Regional Park since 1980.



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Current factors causing loss or decline

Fragmentation and isolation of habitats and populations
This is viewed as being perhaps the major factor of concern. Loss of wetland habitats has reduced Water Vole populations and left them more vulnerable to other threats, such as predation. Land drainage, low water levels, inappropriate in-channel and riparian management have all contributed to a decline in the quality of water vole habitat. Intensive grazing and poaching by livestock along watercourses also contributes greatly to habitat loss.

Predation by American Mink
Water Voles have a range of natural predators but in spite of this were widespread until the introduction of Mink which disperse widely readily colonizing large areas. Water Voles are particularly vulnerable to female Mink as they are small enough to follow them down into their burrow system. However a larger scale riparian habitat that provides dense cover and interconnecting waterways can lessen the impact of predation as such scale of habitats makes it more difficult for Mink to search for voles.

Disturbance of riparian habitats
In the past, the most significant form of disturbance was caused by channelisation and subsequent dredging operations as part of flood defence management. These modifications have had a drastic effect on Water Vole habitat; the destruction of burrows, emergent and in-stream vegetation and the re-profiling of banks leaving them unsuitable for burrow formation. Fortunately these practices are now much less frequent. Other forms of disturbance are caused by activities that require the removal of vegetation and bank alterations to be made such as for mooring of boats.

Deterioration of water quality ~~and reduction of flow~~
Water Voles are relatively tolerant of low water quality but the full impacts of differing types of pollution such as biocides or build-up of plastics consumed are unknown. ~~Low flows and droughts such as those caused by over abstraction of groundwater can lead to the loss of Water Voles from the stretches of watercourses affected. By contrast, prolonged flooding can also be detrimental.~~

Low flow
Low flows and droughts such as those caused by over-abstraction of groundwater can lead to the loss of Water Voles from the stretches of watercourses affected. By contrast, prolonged flooding can also be detrimental.

Rodenticides
The use of poisoned grain and similar rat and mouse poisons are not specific to mice and rats and will be taken by Water Vole when they are placed within their range.

American Signal Crayfish
It has been suggested that large crayfish have the potential to enter Water Voles' burrows and predate newly born water voles. All water bodies in the Lee Valley are occupied by crayfish. Research is needed into this theory.

Current action

Mink trapping
There is a co-ordinated mink monitoring and trapping programme across the Lee Valley, Hertfordshire and parts of Essex. Floating Mink monitoring rafts are installed

and monitored at key locations and trapping instigated when needed. These locations target either key Water Vole populations or gateways to key sites.

Water Vole Project Officers
Both Hertfordshire and Middlesex, and Essex Wildlife Trusts host officers who provide a key role in both the monitoring of Water Vole populations and co-ordination of Mink monitoring. The role in Hertfordshire is currently co-funded by Lee Valley Regional Park Authority and Environment Agency. Funding of these roles is regularly reviewed and it is considered by the funding partners that the roles play a vital role in the conservation of Water Voles.

Monitoring
Volunteers undertake annual Water Vole surveys on key sites; these on-going surveys provide an excellent indicator of the Water Vole population status. A more in depth survey was carried out in the Lee Valley in 2012 which provides a baseline for further study work and highlighted key priority areas.

Habitat Management
Key Water Vole sites are targeted for on-going management work to ensure the habitat is maintained in good condition. Much of this is achieved through targets set out in Higher Level Stewardship agreements and involves bankside scrub removal and in-channel vegetation management. This work also takes place on sites outside of stewardship but important for Water Voles and can help achieve targets of the Water Framework Directive such as restoration of natural banks, enhancement of marginal vegetation and the provision of buffers to watercourses. Work is also carried out to improve habitats between key populations to provide linkages.

Action Plan Aim:
To conserve and enhance the Water Vole population of the Lee Valley, halt their decline and increase their numbers and range.

Action Plan Objectives

- Understand the current distribution of Water Voles in the Lee Valley
- To continue a strategic approach to control of invasive non-native species in the Lee Valley with particular emphasis on American Mink to prevent direct predation of Water Voles
- To maintain and expand the current distribution and abundance of Water Voles in the Lee Valley
- To facilitate recolonisation of previously occupied sites within 10 years through enhancement of existing habitat and increasing Water Vole populations
- Raise awareness of Water Voles, their protected status and best practice conservation management amongst land owners and public

Associated Action Plans

- Grassland and fen
- Rivers and streams
- Standing open water

Early Marsh Orchid Species Action Plan

Introduction

The Early Marsh Orchid (*Dactylorhiza incarnata)* is a plant of wet or damp habitats, usually always on calcareous or neutral soils. It is usually found in wet meadows, fens, marshes and by the sea in dune systems. It has declined sharply in many areas of its range, mainly because of the decline in its favoured habitats. However, in the Lee Valley and a few other places, colonies of Early Marsh Orchid, along with Southern Marsh and Common Spotted Orchids have become established on areas of dumped Pulverised Fuel Ash (PFA), a waste product from coal burning power stations and areas associated with the sand and gravel sorting. Of special interest is the formation of 'hybrid swarms' between the three species, exhibiting a wide range of hybrid features.

In the Lee Valley these colonies are large and of high aesthetic appeal at time of flowering. The habitats developing on PFA substrates are increasingly recognised as being important for a number of species, including orchids and invertebrates in particular.

Current Status

In the London area, the Lee Valley is now the only known site for this plant. It has disappeared from all its natural habitats. In Hertfordshire it has always been a rare plant of calcareous marshes. It now survives on two or three such sites.

In the Lee Valley it is known to have been at five sites, mostly on dumped PFA but also on the sandy substrates associated with the sand and gravel sorting. The population at North Metropolitan Pit has declined considerably over the years due to the nutrient enrichment of the PFA substrate. Orchids were formerly recorded at Sewardstone, at the southern end of the Former Royal Ordnance Site, now part of Gunpowder Park at Waltham Abbey. They were lost due to habitat succession to woodland and the SSSI at this site was subsequently denotified. At Amwell Nature Reserve orchids were introduced to a specially created area of dumped PFA. After an early decline numbers of orchids have steadily increased.

Map Eight shows records of Early Marsh Orchid to a 1km grid square resolution in the Lee Valley Regional Park since 1980. (INSERT MAP)

Current factors causing loss or decline

Natural succession

Natural succession to birch and willow woodland is occurring on all sites. Although some forms of orchids appear to be linked with the scrub margins, the increasing shading will in time reduce populations. In some areas such as Sewardstone Marsh, orchids are now no longer present.

Lack of management

The issue of lack of management is clearly linked to natural succession. This is only an issue on some sites, on the majority of sites habitat management is being carried out but further clarification of the type and timing of management may be necessary.

Theft

The digging up of certain distinctive colour forms or variations has been known to occur.

Enrichment of PFA

Possibly the major factor in the decline of the Early Marsh Orchid populations is the enrichment of the PFA which causes the orchids to be out-competed by more vigorous vegetation. Some of these nutrients may be imported by atmospheric deposition but a main causal factor could be material left by receding floodwaters.

Current action

Monitoring
North Metropolitan Pit in River Lee Country Park, historically the largest colony of orchids has been monitored over a number of years. Bowyers orchid area is also monitored annually. The methodology for both these areas is the same with annual counts of a randomly selected 20% coverage with a full count every five years.

Interpretation
An Orchid Discovery Trail has been installed in River Lee Country Park, taking in both North Metropolitan and Bowyers Orchid Areas.

A boardwalk and interpretative sign have been installed at North Metropolitan Pit to increase visitor's enjoyment while protecting the plants from trampling.

There is also an interpretation panel at Amwell Nature Reserve on the Dragonfly Trail.

Vegetation Management
Whilst on-going vegetation management including cutting and removal of ground flora and the removal of Alder *(Alnus glutinosa)* saplings is carried out annually the colony at North Metropolitan Pit is now in decline with few orchids left. Some scraping of vegetation to expose the PFA has taken place but with limited success as the areas are quickly recolonised by ruderal vegetation.

At Bowyers Water the vegetation is cut and removed annually alongside ongoing Alder management.

At Sewardstone limited removal of willow scrub which had developed over the orchid colony was undertaken, however numbers of plants have not increased and management ceased

The area at Amwell Nature Reserve is fenced to prevent damage by rabbits. The area is opened up and grazed by cattle, following flowering and setting of seed. This has kept the area free from rank growth and scrub encroachment but monitoring has concluded that more intense grazing will be needed in future to prevent domination by rank species. Damp conditions will be maintained on site by managing a ditch which connects the orchid meadow to Hollycross Lake.

A large colony was present at Rye House Power Station, just outside the Park boundary but within the valley, the current status is unknown. The site has seen considerable change in recent years with the building of a new gas turbine power station. A small amount of habitat management has been carried out by National Grid.

Research
Research has been undertaken by academics on North Metropolitan Pit investigating the on-going changes in the form and pH of the PFA to provide guidance on management of the site.

Action Plan Aim
To conserve and enhance Early Marsh Orchid populations of the Lee Valley.

Action Plan Objectives

- Retain viable populations of Early Marsh Orchid at all presently known locations
- Raise awareness of best practice management with landowners, managers and general public of Early Marsh Orchid populations

Associated Action Plans

- Grassland and fen

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Kingfisher Species Action Plan

Introduction

The Kingfisher (*Alcedo atthis)*, is a bird of shallow and slow moving water. They feed on small fish, caught by spectacular dives from perches such as tree branches above the water. They nest in a burrow which is normally excavated into a soft vertical bank. Although difficult to observe, in spite of their brilliant blue plumage, they often betray their presence by a loud piping call.

Kingfisher are excellent indicators of the quality of their wetland habitats. Their prey is very susceptible to water pollution and therefore those water bodies which do not support small fish populations will also be devoid of Kingfishers. In recent times pollution by both industrial and agricultural waste has resulted in loss of Kingfisher from a number of potentially suitable waterbodies.

Dependent as they are on shallow waterbodies, Kingfishers are susceptible to the effects of harsh winters, when many birds will starve, unable to gain access to their principal food source because of ice. Fortunately Kingfisher are prodigious breeders, with up to four broods of up to six young produced each year. As a result of this, numbers can fluctuate widely from year to year.

Current status

Kingfisher is included on the Amber list of species of conservation concern in Britain, having an unfavourable conservation status in Europe.

It is protected through its listing on Schedule 1 of the 1981 Wildlife and Countryside Act. It is also protected under Annex 1 of the EC Wild Birds Directive (79/409/EEC).

The British population of Kingfisher was estimated in 2000 to be between 4,800 and 8,000 pairs[30]. In the Lee Valley the population is static but with a concentration in the northern half of the Park where wetland habitats are widespread as a result of gravel extraction. The south of the Park contains numerous watercourses but many of these have been degraded due to industrial and commercial development and correspondingly, the Kingfisher is not as numerous as it might be. Records show that the population of Kingfisher in the valley have remained stable over the past five years[31].

Map Nine shows records of Kingfisher to a 1km grid square resolution in the Lee Valley Regional Park since 1980. (INSERT MAP)

Current factors causing loss or decline

Deterioration in water quality

Deterioration of water quality in watercourses within the Regional Park can result in a reduction or loss of small fish populations on which Kingfishers are reliant.

Occasional pollution incidents may also result in fish kills, thus removing the Kingfisher's food source on isolated watercourses.

[30] Baker, H., Stroud, D.A., Aebischer, N.J., Cranswick, P.A., Gregory, R.D., McSorley, C.A., Noble, D.G. & Rehfisch, M.M. (2006) Population estimates of birds in Great Britain and the United Kingdom. *British Birds* 99: 25–44. (APEP06)

BirdLife International (2004) *Birds in Europe: population estimates, trends and conservation status.* BirdLife Conservation Series No. 12. BirdLife International, Cambridge.

[31] BTO WeBS count data

Fragmentation and isolation of habitats
In the south of the Park water courses are often isolated from one another by main roads and urban development. Movement between watercourses therefore involves risks, particularly if birds have to negotiate busy roads.

Loss of nesting habitat
For breeding, Kingfishers rely primarily on vertical natural banks into which they can excavate their nesting burrow. Actively eroding river banks provide the ideal habitat for nesting Kingfishers as new bare faces are exposed regularly. Few stretches of river in the Regional Park retain features associated with a natural river system. In particular, the natural meandering of river channels where active erosion takes place, have been lost from all but a few sites. Development and straightening of river channels can result in the direct loss of nesting habitat.

Natural succession also results in banks becoming unsuitable for nesting. Vegetation develops preventing them from burrowing into the bank.

Deterioration of riparian habitats
Degradation of riparian habitats can result in loss of prey items. Removal of aquatic habitats will prevent the development and maintenance of fish populations. Development or re-grading of banks may remove perches from which Kingfishers hunt.

Dry summers and reduced recharge of water courses can lead to deterioration in water quality and therefore an effect on their food items. Lowering of water levels below nesting burrows makes them and their young more susceptible to predation.

Disturbance of riparian habitats

Constant disturbance of riparian habitats will result in Kingfishers deserting potentially suitable watercourses, particularly during the breeding season. This in turn may cause birds to use sub-optimal habitats or compete with other birds for suitable habitat.

Current action

Monitoring

Distribution and population of Kingfisher in the Regional Park is monitored via the Wetland Bird Survey (WeBS) organised by the British Trust for Ornithology. Not all the waterbodies in the Lee Valley are counted through this survey but it does give a good indication of population trends over time.

Habitat Creation

Habitat management and creation for the Kingfisher has been carried out on an ad-hoc basis throughout the Park. Of particular note is the creation of an artificial nesting bank at Rye Meads Nature Reserve. Since its creation it has been used successfully and numerous young have been fledged from burrows in this bank.

Artificial nest tunnels have also been installed at Stanstead Innings, adjacent to Rye Meads, although ongoing management of these is required to ensure they remain in suitable condition.

In the south of the Regional Park an artificial bank has been installed at WaterWorks Nature Reserve, to date there is no evidence of Kingfisher using the bank. On the

Queen Elizabeth Olympic Park two nest banks have been installed, there is also no evidence of use here to date.

Action Plan Aim:

To conserve the Kingfisher population of the Lee Valley and increase their range.

Action Plan Objectives

- Understand the current distribution of Kingfishers in the Lee Valley
- To facilitate the colonisation of new water bodies and courses through the enhancement and creation of suitable riparian habitats
- Use Kingfishers to raise awareness of the importance of water quality and wetland habitats for biodiversity

Associated Action Plans

- Rivers and streams
- Standing open water

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Creeping Marshwort Species Action Plan

Introduction

Creeping Marshwort *(Apium repens)* is one of the rarest plants in the UK. Until its discovery on Walthamstow Marshes in 2002 by local botanist Brian Wurzell, it was only known to be present in one other location, Port Meadow, in Oxfordshire. It is a low-growing, perennial plant which flowers in July. As well as spreading by its creeping runners it can also reproduce by seed. The plant relies on an open sward habitat to thrive and enlarge its territory. The use of Cattle grazing will help to provide this structure. ~~although this needs to be managed carefully to avoid compaction of the soil.~~

The plant flourishes in areas of plenty of light and can tolerate winter flooding, it is however less tolerant of early summer flooding where oxygen levels are low.

Current status

Creeping Marshwort is listed in Annex II and IV of the EC Habitats Directive, Appendix I of the Bern Convention, and is protected under Schedule 4 of the Conservation (Natural Habitats, etc.) and Regulations 1994 and Schedule 8 of the Wildlife and Countryside Act 1981. It is identified as a UK Priority Species.

Creeping Marshwort is only present in one localised area on Walthamstow Marshes. Surveys have been regularly undertaken to monitor the status of the plant, acknowledging its vulnerability. From its initial discovery in 2002 there was an expansion in range, although it was still localised, until in 2012 when following a dry spell it was only found sparsely distributed and no plants were evident at all by September. Repeat surveys following this in 2013, 2016, ~~and~~ 2017 and 2018 found no evidence of Creeping Marshwort in previously known areas. A separate additional visit to site in September 2016 did identify possible plants but as they were in a vegetative state it could not be verified.

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Map Ten shows records of Creeping Marshwort to a 1km grid square resolution in the Lee Valley Regional Park since 1980.

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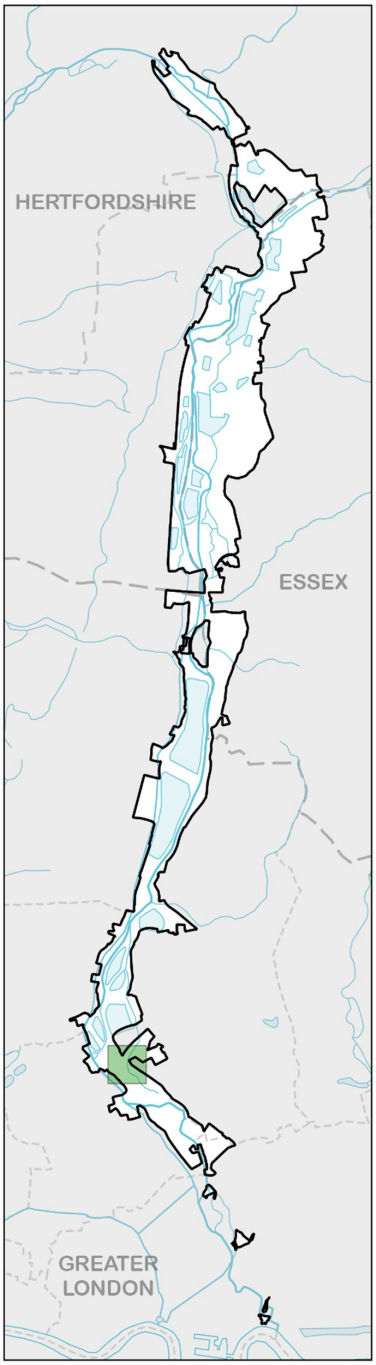

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Current factors causing loss or decline

Changes in water levels

Summer flooding can cause the loss of plants but is also beneficial because it opens the sward creating bare ground thus providing germination sites. Too many of these events may deplete the seedbank. General drying out of the site would also have a negative impact on its distribution.

Alteration of grazing regime
Carefully managed grazing is essential to maintain a low sward with open areas to provide plenty of light. Inappropriate or cessation of grazing may result in the habitat becoming unsuitable for Creeping Marshwort.

Competition from more vigorous vegetation
Creeping Marshwort can easily be out-competed by more vigorous plants and careful and on-going management of surrounding vegetation is required. It is especially at risk from colonisation from the invasive alien New Zealand Pygmyweed (*Crassula helmsii)* which is present in one of the diches on Walthamstow Marshes.

Current action
Grazing
The site is currently managed under a Higher Level Stewardship scheme and is grazed by Belted Galloway *(Bos Taurus)* cattle from Lee Valley Park Farm. The grazing and trampling effect of the cattle is beneficial to open up the sward for seedling germination. The grazing is supplemented with targets vegetation management by hand.

Excavations
Periodically shallow scrapes are re-excavated to knock back the effects of succession and reopen areas of bare soil to maximise opportunity for seedling germination.

Vegetation management
Vegetation around the key scrape areas are removed by hand each year to open up the areas.

Action Plan Aim:
To conserve and expand the Creeping Marshwort population in the Lee Valley through appropriate management regimes.

Action Plan Objectives

- Monitor the presence of Creeping Marshwort and assess habitat suitability
- To maintain and enhance the Creeping Marshwort habitat at Walthamstow Marshes to expand the current distribution
- Raise awareness of Creeping Marshwort, its protected status and best practice conservation management in conjunction with Natural England
- Investigate the feasibility of reintroducing the plant to other suitable sites in the Lee Valley

Associated Action Plans
- Grassland and fen
- Invasive non-native Species

Invasive Non-native Species Action Plan

Introduction

The GB Non-native Species Secretariat defines non-native species as:

> *'A species, subspecies or lower taxon, introduced (i.e. by human action) outside its natural past or present distribution; includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce.'*

Not all non-native species cause an issue to the natural environment and this plan only looks at those classed as invasive. The GB Non-native Species Secretariat defines non-native invasive species (INNS) as:

> *'any non-native animal or plant that has the ability to spread causing damage to the environment, the economy, our health and the way we live.'*

There are nearly 2000 species of non-native species ~~INNS~~ established in the UK with a trend of 10-12 new species becoming established each year. It is thought that 10-15% of these cause significant adverse impacts[32].

The impacts of INNS have been identified as[1]:

- **Environmental:** Disrupting habitats and ecosystems, preying on or out-competing native species, spreading disease, and interfering with the genetic integrity of native species.
- **Economic:** The cost of INNS in GB is at least £1.7 billion per year.
- **Social:** Some species cause problems to human health or are a nuisance to landowners.

Current status

To date no full survey of INNS has been undertaken in the Lee Valley and therefore response to issues has been on an ad hoc basis.

There are a number of species that have become widespread across the Lee Valley many associated with the waterways. American Mink *(Neovison vison)* are found throughout the many waterways of the valley and is of particular concern due to its impacts on the Water Vole *(Arvicola amphibius)* populations. Signal *(Pacifastacus leniusculus)*, Virile *(Orconectes virilis)*, Turkish *(Astacus leptodactylus)* and Spiny Cheeked Crayfish *(Orconectes limosus)* are found in the lakes and waterways, their burrowing of banks can cause issues with bank stability and water turbidity. Demon Shrimp *(Dikerogammarus haemobaphes)* have recently been recorded on the Old River Lea at Holyfield Weir and has the capability of rapid spread. Wels Catfish (*Silurus glanis),* a native of Eastern Europe and western Asia is also known to be present in a couple of the Park's waterbodies. They can be carriers of pathogens damaging to native fish and also they out-compete native European Eels *(Anguilla anguilla)* from their natural habitat. The Zebra Mussel *(Dreissena polymorpha)* has been established for a long time in the Lee Valley but this has since 2014 been joined by the Quagga Mussel *(Dreissena bugensis)* which has recorded at both Chingford and Walthamstow Reservoirs. They both can form dense stands, altering

[32] The Great Britain Invasive Non-native Species Strategy, DEFRA August 2015

the freshwater ecosystem with the Quagga Mussel being able to out-compete even the Zebra Mussel forming large encrusted masses on hard surfaces which can cause maintenance issues within reservoir waterbodies. Canada Geese *(Branta canadensis)* are found in large numbers across the Valley. Their grazing can cause problems on agricultural land and marginal areas. Ring-necked Parakeets (*Psittacula krameri)* have increased their distribution across the Lee Valley in recent years with numbers at their highest in the south of the Regional Park. Their impact on native birds is not fully assessed but there are concerns about potential impact on native bird species such as woodpecker, Starling and Nuthatch, through competition for nest holes.

Muntjac Deer (*Muntiacus reevesi)* have been present in the wild since the 1890s and are found throughout the Lee Valley. They cause browsing damage to trees which can have particular impact on regrowth in coppice woodland plots. ~~Ring-necked Parakeet *(Psittacula krameri)* have increased their distribution across the valley with numbers at their highest in the south of the Regional Park.~~ Oak Processionary Moth *(Thaumetopoea processionea)* was first reported at the Lee Valley Velopark in 2014 and is currently closely monitored and treated annually. The Oak Processionary Moth poses a risk to public health due to varying degrees of irritation caused by exposure to their hairs. Gypsy moth (*Lymantria dispar*) has also been recorded in the Lee Valley and can cause serious defoliation of trees, putting the tree under stress and possibly leading to its death.

There are a number of invasive non-native plant species including Japanese Knotweed *(Fallopia japonica)*, which has been well controlled using stem injection of herbicide on grassland areas but is still widespread along the waterways particularly in the south of the Regional Park and Giant Hogweed *(Heracleum mantegazzianum)* which can pose a risk to public health and is treated on land within the ownership of the Regional Park Authority. New Zealand Pygmyweed (*Crassula helmsii)* is an increasing issue with sites including Amwell Nature Reserve, Rye Meads Nature Reserve, Turnford and Cheshunt Pits, Cornmill Meadows, Knights Pits at Gunpowder Park and Walthamstow Marshes all affected. New Zealand Pygmyweed can form a blanket of cover so dense that little else can grow and previously exposed invertebrate-rich soil is covered limiting feeding opportunities for wading birds in particular. Canadian Waterweed *(Elodea Canadensis)* and Nuttalls's Waterweed *(Elodea nuttallii)* are both present in the valley in particular in the gravel pit lakes. They can form dense mats impeding flow and creating fluctuations in oxygen levels. Buttonweed *(Cotula coronopifolia)* is found along the reeded fringe of East India Dock Basin. Goats Rue (Galega officinalis) has encroached on much of the grassland of the Lee Valley; it quickly out-competes native vegetation altering the sward composition and increases nutrient levels to the detriment of wild flowers and ground nesting bird such as Skylark *(Alauda arvensis)* and Meadow Pipit *(Anthus pratensis)*. Floating Pennywort *(Hydrocotyle ranunculoides)* is found in the river system forming dense stands that prevent light penetrating into the river. The main concentrations are found in the south of the valley, but has also now established in the upper Stort Valley and has potential to float downstream and become established in the northern water bodies of the Park. Himalayan Balsam *(Impatiens glandulifera)* forms dense stands along the banks of waterways and wet grasslands and the annual growth out-competes native vegetation leaving bare, destabilised banks in winter months which are susceptible to erosion. Orange Balsam (*Impatiens capensis*), is increasing its distribution in the Valley, this expansion should be monitored.

With the effects of climate change, we should expect other invasive non-native species to become established and the key is to monitor the Park to ensure potential problems are identified and tackled quickly.

There is a range of legislation in place to try to limit the spread of INNS, the main ones are:

- EU invasive Alien Species (IAS) Regulation 1143/2015 which came into force in 2015. This imposes strict restrictions on a list of species know and 'species of Union concern'.

- The Wildlife and Countryside Act 1981 (WCA) as amended is the principal legislation dealing with non-native species.

    - Under Section 14(1) of the WCA it is illegal to allow any non-native species to escape or be released into the wild that is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state, or is listed in Schedule 9 to the Act. It is also illegal to plant or otherwise cause to grow in the wild any plant listed in Schedule 9 to the Act
    - Section 14ZA of the WCA, as inserted by section 50 of the Natural Environment and Rural Communities (NERC) Act 2006, creates an offence of selling, offering or exposing for sale, or possessing or transporting for the purposes of sale, non-native species that are listed in Schedule 9 to the WCA and are specified for the purposes of this section by the Secretary of State through secondary legislation
    - The Wildlife and Countryside Act 1981 (prohibition on Sale etc. of Invasive Non-native Plants) (England) Order 2014 prohibits a number of plants from sale in England due to their significant negative impacts on biodiversity and the economy

Map Eleven shows records of invasive non-native species to a 1km grid square resolution in the Lee Valley Regional Park since 1980. (INSERT MAP)

Current factors causing increase and spread

Connectivity of habitat
Whilst the network of waterways provides excellent habitat it does allow for the rapid movement of INNS. Plant seeds can travel long distances whilst still remaining viable and therefore can facilitate their movement through the valley.

Lack of cohesive management
A lack of co-ordinated management can negatively affect successful management of INNS. This is particularly important for species using the waterways for distribution for example management of Himalayan Balsam in the Middle Lea will be severely hampered if parallel management is not taking place in the Upper Lea to limit the mobilisation of the seed bank.

Insufficient biosecurity measures
Lack of sufficient biosecurity measures can easily increase the risk of both introducing and spreading INNS. Plants such as New Zealand Pygmyweed only need a small fragment transported to a new site for colonisation to occur, this can easily be done on footwear and machinery.

New species entering the wild

The list of INNS grows by an average of 10-12 species per annum; this means that there is always an increased risk of colonisation by new species.

Climate change
Changes to climate have the potential to allow species to increase their range or to possibly breed in the wild where once the climate prevented this.

Localised introductions
Even with robust biosecurity measures there is still the possibility that species can enter the natural environment through localised introductions to sites. This is often the case for the introduction into waterways of unwanted pets such as goldfish *(Carassius auratus)*, American Red-eared Terrapins *(Trechemys scripta elegans)* or snapper turtles and the movement of plant fragments by mobile species such as birds. Once established they are often very difficult to eradicate successfully.

Current action

Management
Across the Lee Valley there has been a varying response to management of INNS. Species such as American Mink have been tackled as part of a co-ordinated regional response although they still pose a significant risk to Water Vole populations. Japanese Knotweed has been treated successfully on Lee Valley Regional Park Authority land for a number of years; other plant species such as Giant Hogweed has also had ongoing management however the significant seedbanks in adjacent areas hampers its eradication.

The New Zealand Pygmyweed on Hall Marsh Scrape, Goosefield, Cornmill Meadows and Rye Meads Nature Reserve has been treated using various methodologies over the past few years. The results of these methodologies will inform future management. Water Fern *(Azolla filiculoides*) has occurred at a number of sites in the Lee Valley. Azolla Weevil *(Stenopelmus rufinasus)* was introduced onto Silvermeade in 2011 and since then whilst there have been further blooms they have been controlled and decreased without further intervention.

A number of management techniques have been trialled in order to manage Goats Rue including cutting, digging up and herbicide treatment. Spot treatment of herbicide whilst labour intensive has proven the most successful.

Biosecurity measures
In order to minimise the movement of species both on and between sites biosecurity measures based on 'Check, Clean, Dry'[33] best practice advice are being implemented.

Mapping
It is important to be aware of the location of INNS to ensure efficient management and control. Whilst some species have been mapped this should be extended to cover additional species including ones that may become an issue.

[33] Clean Check Dry Campaign - The Great Britain Invasive Non-native Species Secretariat

Action Plan Aim:
Take action to control INNS in the Lee Valley to prevent further spread and reduce the risk of their introduction.~~To minimise introduction and spread of INNS in the Lee Valley~~

Action Plan Objectives

- To understand the distribution of INNS across the Regional Park to enable an effective management strategy and dissemination of information with partners
- To minimise further spread of INNS to and from the Lee Valley through specific local action plans
- Where possible use biological control methods in the management of INNS
- To implement a robust biosecurity policy and procedure
- To raise awareness of the issues surrounding INNS within the Lee Valley

Associated Action Plans

- Grassland and fen
- Rivers and streams
- Standing open water
- Urban
- Woodland

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Otter Species Action Plan

Introduction

As a 'top predator' the Otter (*Lutra lutra*) is naturally scarce and also highly sensitive to the health of the whole ecosystem that supports it. As such, the Otter is an important indicator species in riparian habitats. As recently as the 1950s it was widespread, however, a significant decline in numbers took place in the 1960s and 1970s, which was attributed to the use of persistent organochlorine pesticides, especially Dieldrin and Aldrin. While other factors are likely to have been involved, such as habitat loss, the detailed reasons for decline are not fully understood.

The first national Otter survey was undertaken in 1977-79 by the Joint Nature Conservation Committee in response to the concern over their status and provided a baseline for distribution. This survey showed an actual or effective extinction over most of the Midlands and south-eastern counties as numbers reached an all-time low. Viable populations remained in Scotland, Wales and south-west England. In Hertfordshire, Otters disappeared from the main rivers first, with a few remaining in favoured localities, particularly along the tributaries of the River Lee. In the lower Lee Valley, records suggest that Walthamstow Reservoirs also appeared to be a refuge for the dwindling population. Otters finally became extinct in the area around the mid-1970s.

In 1991 three Otters (one male and two females) were re-introduced to the valley at Amwell Nature Reserve. Another three were released at Tednambury on the River Stort shortly afterwards.

The Otter has high public appeal. Otter-related events generally attract much attention. The value of such an animal in raising awareness generally about nature conservation, and the water environment in particular, is considerable.

Current status

The Otter is protected under the Wildlife and Countryside Act 1981 (Schedule 5) and is listed on Annexes 2a and 4a of the EC Habitats Directive, Appendix 2 of the Bern Convention and Appendix 1 of CITES.

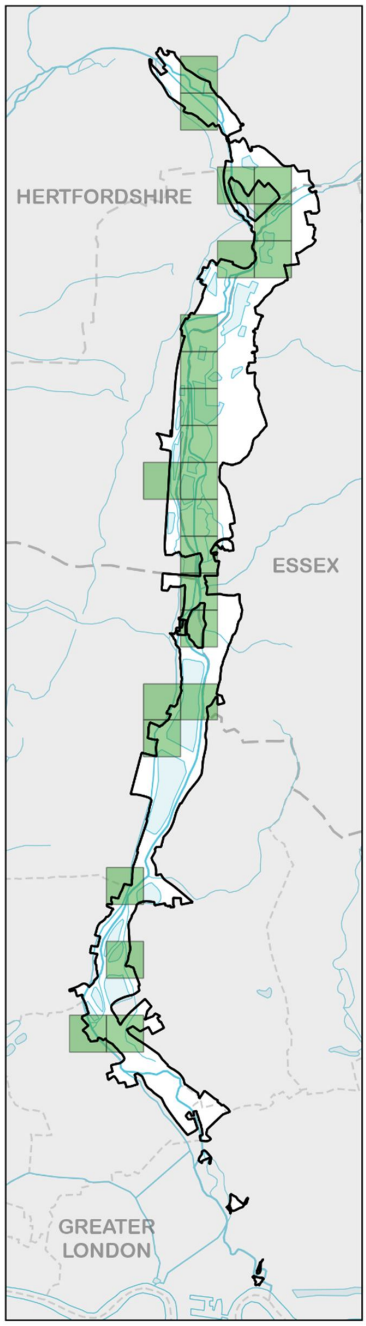
The most recent national survey carried out by the Environment Agency in 2009-10[34] has shown that in all of the England's 12 EA catchments and regions there has been an increase in the number of positive sites.

It is known that Otter now successfully breed in the Lee Valley. Surveys in the Lee Valley are undertaken every four to five years; the 2012 survey showed that signs of Otter had declined especially in the south of the valley. However the difficulties in surveying are noted and therefore the population may be underestimated. More recently the use of remote camera trapping has shown that a number of sites in the valley are regularly used and a wider and co-ordinated use of camera traps may improve monitoring success.

The increase in Otter also has the potential to conflict with private fisheries, in the Lee Valley some have fenced their sites to exclude the Otter preventing predation of fish stocks.

[34] Fifth Otter Survey of England 2009-10, Technical Report, Crawford A (Environment Agency)

Map Eleven shows records of Otter to a 1km grid square resolution in the Lee Valley Regional Park since 1980.



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Current factors causing loss or decline

Water quality
Pollution of water courses is thought to have been a major cause in the decline of Otter populations.

Insufficient food
Insufficient prey (low fish stocks) associated with poor water quality and poor river habitat quality may impact Otter numbers in some areas.

Loss of habitat
Impoverished bankside features needed for breeding and resting, due to the continuing fragmentation, loss, or degradation of wetland habitats, is likely to be a contributory factor.

Accidental death
Incidental mortality, primarily by road deaths but also by drowning in fish/eel traps, forms a significant issue in some areas.

Current action

Monitoring
National Surveys have been conducted at five to seven year intervals and may be repeated in the future. Surveys to monitor their status in the Lee Valley are undertaken every four to five years. This survey work has focused on the monitoring a series of 25 fixed sprainting locations. There are a number of remote wildlife cameras used to monitor Otter movements in the Lee Valley, this has proven to be a reliable methodology although suitable locations for cameras can be difficult to find.

Habitat management
Practical conservation management such as river enhancement schemes and creation of log pile and artificial holts are being carried out and included in wider development schemes. Otter holts have been installed on Tollhouse Stream and in River Lee Country Park and secluded areas in the south of the valley.

Action Plan Aim:
To conserve and enhance the Otter population of the Lee Valley, halt their decline and increase their numbers and range.

Action Plan Objectives

- Understand the current distribution of Otter in the Lee Valley
- To maintain and expand the current distribution and abundance of Otter in the Lee Valley
- To facilitate recolonisation of previously occupied sites within 10 years through enhancement of existing habitat and populations
- Raise awareness of Otters, their protected status and best practice conservation management amongst land owners and public

Associated Action Plans

- Rivers and streams
- Standing open water

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Bat Species Action Plan

Introduction

Bats can typically be seen flying along waterways, hedgerows and in woodlands. The basic requirements of bats are common to all bat species. They involve the need for breeding roosts, places to hibernate, suitable feeding habitats and connecting flyways.

Bats will shelter in a variety of places supporting suitable conditions, which may include tree cavities and built structures. During the summer months the female bats cluster together in a traditional nursery roost to give birth to their single young of the year. As the year progresses bats may move to autumn roosts and then to their hibernation areas. The loss of any one of these regularly used roosts may have an adverse impact on the local bat population.

Bats require access to feeding areas that provide a suitable number and variety of insect prey. The number of bats is related to the amount of quality feeding habitat within easy commuting distance of their roost.

Seven species of bat are listed as UK Priority Species of which three are found in the Regional Park these are the Soprano Pipistrelle (*Pipistrellus pygmaeus)*, Noctule *(Nyctalus noctula)* and Brown Long-eared *(Plecotus auritus)*.

The approach of dealing with bats in a collective Species Action Plan was considered to be the most appropriate for the Lee Valley due to the fact that:

- Those currently concerned with the conservation of bats deal with all species
- All bat species and their roosts and equally protected by law
- The conservation problems faced by all bats are believed to be generally similar, so measures proposed here are likely to be of benefit to a number of species.

Current Status

All bats and their roosts are protected by both national and European legislation. In England the relevant legislation is the Wildlife and Countryside Act (1981) (as amended); the Countryside and Rights of Way Act, 2000; the Natural Environment and Rural Communities Act (NERC, 2006); and by the Conservation of Habitats and Species Regulations (2010).

In the Lee Valley nine species of bat have been recorded, the Common Pipistrelle Bat *(Pipistrellus pipistrellus)* being one of the commonest species with some large nursery colonies recorded roosting in the buildings nearby. These bat populations will be heavily dependent on the quality of the feeding habitat within the Lee Valley. The Soprano Pipistrelle (*pipistrellus pygmaeus*) may be the most populous species within the Valley and certainly has the largest known roosts. Natterer's (*Myotis nattereri)* is virtually unknown from field surveys, although recently recorded at Royal Gunpowder Mills and is currently the bat most likely to be encountered in artificial hibernacula.

Small numbers of Brown Long-eared Bat have been recorded along the valley with roosts recorded in the Stanstead Abbotts area. This species of bat is heavily dependent on woodland areas for feeding. The larger species of bat (Noctule, Serotine *(Eptesicus serotinus)* and Leisler's Bat *(Nyctalus leisleri)* are known to be present but the Hertfordshire and Middlesex Bat Group records show them to be declining in the known Lee Valley sites.

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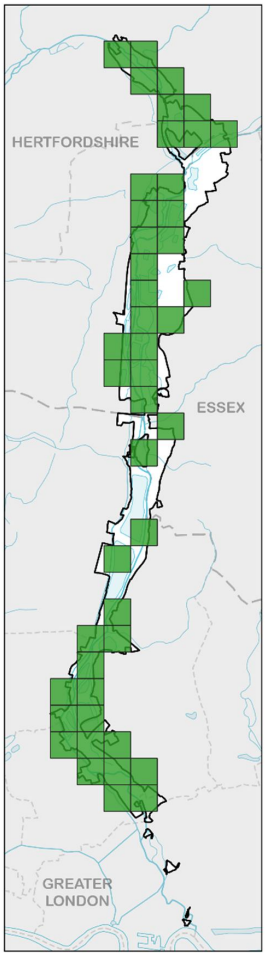
The Noctule Bat has been recorded feeding at Sheepcote Farm, Admirals Walk Lake, Rye House and Bowyers Water. Serotine and Leisler's bats have also been recorded at Admirals Walk Lake, an area recognised for its importance for a range of foraging bat species. Of the *Myotis* bats, the Daubentons Bat *(Myotis daubentonii)* has commonly been recorded feeding over the water of the River Lea and also over some of the lakes. No roosting site has been identified.

Map Twelve shows records of bats to a 1km grid square resolution in the Lee Valley Regional Park since 1980.



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Current factors causing loss or decline

Loss of suitable roosting sites

During ongoing tree management many old trees suitable for roosting bats may be felled or have their branches lopped particularly if they possess rot holes and are regarded as unsafe.

Many suitable roosting sites in built structures may be lost due to demolition or modifications; others may suffer from excessive disturbance. Constant disturbance in roost sites will result in bats abandoning the roost.

Fragmentation and isolation of habitats and populations
Fragmentation of colonies occurs if discouraged from using their traditional roosts. Isolated populations are very vulnerable with the result that breeding is unlikely to occur, leading to local extinctions. Loss and disruption of flight line features such as hedgerows can separate the roost from the feeding area affecting the survival of local colonies.

Loss and degradation of feeding habitats
Degradation of waterways, removal of trees (including standing and lying dead wood), loss of grazed pasture land all results in a reduction in the numbers and variety of insects available for hunting bats. The variety of species and the numbers of bats present in the valley will be dependent on the quality of the foraging habitat.

Light pollution
External lighting can have a severe impact on bat populations. The lighting of buildings with roosts can have detrimental impacts the bats as can the lighting of flight paths way from the roost.

Persecution
Since the introduction of The Wildlife and Countryside Act (1981) deliberate persecution of bats has decreased although does still occur mainly through ignorance of the law.

Some people still have the mistaken perception that bats are a nuisance or even a pest. Most issues stem from unfamiliarity and often have simple solutions.

Current Action

Habitat Creation
A number of WWII Pillboxes have been converted for use as hibernacula by bats. The boxes have been made secure and features installed to provide roosting opportunity. They are monitored by a licenced bat worker throughout the winter months.

A number of bat boxes have been installed at various locations around the Park to provide potential roosting sites.

Monitoring
There are a couple of on-going and successful monitoring programmes carried out by the Essex and London Bat Groups focusing on Nathusius' Pipistrelles *(Pipistrellus nathusii)*.

Local Bat Groups also assist in the monitoring of the bat boxes that have been installed on sites around the Park.

The need for surveys in development schemes is required through the planning system to comply with current legislation. Comments on proposed developments highlight the need to ensure the protection of suitable bat habitat and importance of minimising impacts of lighting schemes.

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Education
There is an interpretation panel at Gunpowder Park to engage with the public and encourage understanding. Annual bat events are also held.

Action Plan Aim

To conserve and enhance the bat population of the Lee Valley and increase their numbers and range.

Action Plan Objectives

- Increase understanding of the distribution and habits of individual bat species in the Lee Valley to guide future management
- To identify and protect key sites in the Lee Valley through appropriate management of bat roosts, commuting routes and key feeding areas ~~within the Lee Valley~~
- ~~Support the monitoring effort of local bat groups to increase understanding of their distribution and habits to guide future management~~
- To raise awareness of bats and promote their conservation with those people working within the Lee Valley and the general public

Associated action plans

- Woodland
- Rivers and streams
- Open water

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Barbel Species Action Plan

Introduction

Barbel (*Barbus barbus*) is a bottom dwelling fish closely associated with stretches of clean gravel and weed beds. They feed predominately on insect larvae and molluscs, rooting them out from the gravel beds. These gravel beds are also important for spawning, the eggs are deposited in a shallow excavation in the exposed gravel from May through to late June. They are a good indicator of habitat quality and are very sensitive to changes in their habitat.

They're found in rivers across England and eastern Wales and are considered to be a non-migratory species, they will, however exhibit localised changes in their habitat use over the course of the year.

Barbel fishing is very popular in the UK. During the 1960s and 70s fishing along the Lee Valley was considered one of the best in the country with people often travelling long distances to fish the waters. The stretch of river from King Weir to Fishers Green is still considered to be some of the best Barbel habitat in the area.

Current status

The strongest populations of naturally recruiting Barbel in the Lea Catchment are found in the Upper Lea between Batford and Hertford. This is probably attributed to the fact that flow velocities over available spawning gravels and connectivity between adult and juvenile Barbel habitat is much more suitable than seen typically in the middle and Lower Lea.

Barbel population distribution across the Upper and Lower Lea is relatively consistent excluding the navigable sections where habitats are far less suitable. Their stock densities in the areas where they are present varies depending on river morphology and available habitat.

Environment Agency fish population surveys show a drastic decline in Barbel populations through the Kings Weir and Fishers Green reach of the River Lea. This is considered to be due to a number of different contributing factors detailed below.

~~Where are Barbel found in the Lea Catchment~~

- ~~Highest concentration/best habitat?~~
- ~~EA data – population trends~~

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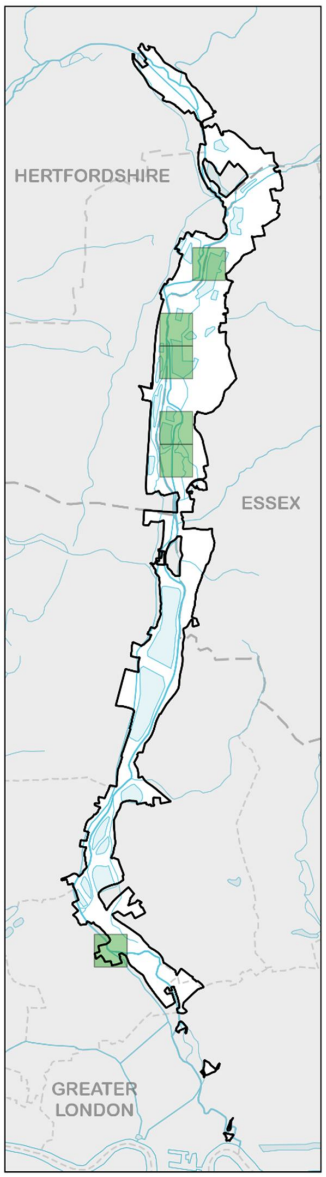
Map Thirteen shows records of Barbel to a 1km grid square resolution in the Lee Valley Regional Park since 1980.



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Current factors causing loss or decline

Invasive non-native species

Invasive Non-native crayfish species, notably the Signal Crayfish *(Pacifastacus leniusculus)* can impact on the recruitment of Barbel through predation of eggs prior to spawning. There is also the potential for high concentrations of crayfish to increase the turbidity of the watercourse due to the disturbance of silt resulting from burrowing action

and subsequent undermining of bank stability. This increased turbidity and input of fine sediments compacts gravel and causes overlying silt on Barbel eggs, impacting on the success rate of those fish making it to adults.

American Mink *(Neovison vison)* are known to be present in the area and whilst they may not take larger specimens they can predate or injure smaller fish.

Low flow in rivers

Low flow in rivers can impact the spawning success of Barbel. The reduction in flow and associated reduction in oxygen levels can have a negative impact on the development of their eggs. Lack of flow velocities over spawning gravels also decreases sediment transportation which in turn impacts on the quality and success potential of those areas.

Siltation of gravel beds

Increased turbidity of waterways can decrease the quality of Barbel habitat. Deposition of silt on the exposed gravel beds reduces both feeding and spawning opportunities. A contributing factor to this may be the increase in boat traffic seen in recent years on the Lee Navigation.

Water quality

High nitrate and phosphate cause the breakup and degeneration of floating reed-mats, and lead to anoxic sediments which do not support food or plant colonisation. Algal blooms can decrease feeding efficiency because of turbidity and direct fish kills. Pollution incidents can occur leading to fish mortality.

Loss of cover

Management of the riparian habitat can result in loss of cover for Barbel. This work is often a health and safety requirement associated with open public access.

Current action

~~In-channel habitat enhancement schemes~~

~~A number of in-channel geomorphological enhancement schemes have been carried out in the Lee Valley.~~

Fish stocking

Fish stocking has taken place over recent years with over 400 small Barbel released since 2012. In 2016, 100 Barbel were supplied to Kings Weir Fishery by the Barbel Society and Environment Agency, with an additional 200 bought by the fishery themselves to be grown on for release. These are currently held in a holding pool until they reach 2lb in weight and are ready for release into the system.

Monitoring

Monitoring of riverine fish populations is undertaken annually by the Environment Agency on the key Barbel site on the Old River Lea at Fishers Green with an~~.~~ additional investigative fish population survey undertaken in 2017. The biological water quality is also monitored through riverfly monitoring carried out monthly at a number of locations in the valley.

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Action Plan Aim
To conserve and enhance the Barbel population of the Lee Valley, improving habitat to increase their numbers and range to create a sustainable population.

Action Plan Objectives

- Understand the current population and distribution of Barbel and their associated habitat in the Lee Valley
- To maintain and expand the current distribution and abundance of Barbel in the Lee Valley through targeted habitat management of key watercourses
- Raise awareness of Barbel and best practice conservation management amongst landowners, anglers and public

Associated Action Plans

- Rivers and streams
- Invasive non-native species

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Appendix One: Breakdown of species groups recorded in the LVRPA statutory boundary

Species Group	Number of Species Recorded
Alga	2
Amphibians	6
Bacteria	2
Birds	305
Chromista	2
Fish - Bony	23
Fish - Jawless	1
Fungi	85
Higher Plants - Conifers	5
Higher Plants - Ferns	10
Higher Plants - Flowering Plants	933
Higher Plants - Horsetails	5
Invertebrates - Alderflies	1
Invertebrates - Ants, Bees, Sawflies & Wasps	246
Invertebrates - Beetles	687
Invertebrates - Butterflies	34
Invertebrates - Caddis Flies	2
Invertebrates - Centipedes	8
Invertebrates - Crustaceans	24
Invertebrates - Dragonflies & Damselflies	27
Invertebrates - Earwigs	2
Invertebrates - Flatworms	1
Invertebrates - Grasshoppers & Crickets	14
Invertebrates - Harvestmen	13
Invertebrates - Lacewings	9
Invertebrates - Mayflies	6
Invertebrates - Millipedes	10
Invertebrates - Molluscs	74
Invertebrates - Moths	710
Invertebrates - Roundworms	3
Invertebrates - Scorpion Flies	2
Invertebrates - Segmented Worms	8
Invertebrates - Spiders	214
Invertebrates - Ticks & Mites	7
Invertebrates - True Bugs	336
Invertebrates - True Flies	730
Lichens	80
Lower Plants - Liverworts	15
Lower Plants - Mosses	109
Lower Plants - Stoneworts	2
Protozoa	1

Reptiles	4
Slime Moulds	1
Terrestrial Mammals	33
Total Number of Species Recorded	**4782**

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Appendix Two: Lee Valley Regional Park Authority Priority Species List

Species Group	Scientific Name	Common Name	UK BAP 2007	Herts BAP	London BAP	Essex BAP	Associated LVRPA BAP Habitat
Amphibians	Bufo bufo	Common Toad	X	_	X	_	OW
Amphibians	Triturus cristatus	Great Crested Newt	X	X	X	X	OW
Amphibians	Lissotriton helveticus	Palmate Newt	_	X	_	_	OW
Reptiles	Anguis fragilis	Slow-worm	X	_	X	_	GF,W,B
Reptiles	Natrix natrix	Grass Snake	X	_	X	_	OW, RS, W, GF
Reptiles	Zootoca vivipara	Common Lizard	X	_	X	_	W,G,B
Birds	Stercorarius parasiticus	Arctic Skua	X	_	_	_	OW
Birds	Cygnus columbianus subsp. Bewickii	Bewick's Swan	X	_	_	_	OW
Birds	Botaurus stellaris	Bittern	X	X	X	X	GF
Birds	Phoenicurus ochruros	Black Redstart	_	_	X	_	B
Birds	Gavia arctica	Black-throated Diver	X	_	_	_	OW
Birds	Pyrrhula pyrrhula	Bullfinch	_	X	X	_	W
Birds	Melanitta nigra	Common Scoter	X	_	_	_	OW
Birds	Emberiza calandra	Corn Bunting	_	X	X	_	A*
Birds	Crex crex	Corncrake	X	_	_	_	GF
Birds	Cuculus canorus	Cuckoo	X	_	X	_	W
Birds	Numenius arquata	Curlew	X	_	_	_	GF
Birds	Branta bernicla subsp. bernicla	Dark-bellied Brent Goose	X	_	_	_	OW, GF
Birds	Prunella modularis	Dunnock	_	_	X	_	W
Birds	Anser albifrons subsp. albifrons	European Greater White-fronted Goose	X	_	_	_	OW, GF
Birds	Locustella naevia	Grasshopper Warbler	X	_	X	_	GF
Birds	Perdix perdix	Grey Partridge	X	X	X	X	GF
Birds	Coccothraustes coccothraustes	Hawfinch	X	X	X	_	W
Birds	Larus argentatus	Herring Gull	_	_	X	_	GF, OW, B
Birds	Passer domesticus	House Sparrow	X	_	X	_	W, B, A*
Birds	Alcedo atthis	Kingfisher	_	X	_	_	RS

Birds		Vanellus vanellus	Lapwing	X		X		GF
Birds		Acanthis cabaret	Lesser Redpoll	X		X		W, GF
Birds		Dendrocopos minor	Lesser Spotted Woodpecker			X		W
Birds		Linaria cannabina	Linnet		X	X		GF
Birds		Asio otus	Long-eared Owl		X			W, GF
Birds		Poecile palustris	Marsh Tit			X		W
Birds		Acrocephalus palustris	Marsh Warbler	X		X		GF
Birds		Luscinia megarhynchos	Nightingale		X			W
Birds		Caprimulgus europaeus	Nightjar	X				W
Birds		Falco peregrinus	Peregrine			X		GF, B
Birds		Aythya ferina	Pochard		X			OW
Birds		Lanius collurio	Red-backed Shrike	X				W, GF
Birds		Phalaropus lobatus	Red-necked Phalarope	X				OW
Birds		Emberiza schoeniclus	Reed Bunting	X	X	X		GF, W
Birds		Turdus torquatus	Ring Ouzel	X				GF
Birds		Sterna dougallii	Roseate Tern	X				OW
Birds		Riparia riparia	Sand Martin			X		RS
Birds		Aythya marila	Scaup	X				OW
Birds		Alauda arvensis	Skylark		X	X	X	GF
Birds		Gallinago gallinago	Snipe		X			GF
Birds		Turdus philomelos	Song Thrush		X	X	X	W, GF, B
Birds		Muscicapa striata	Spotted Flycatcher	X	X	X		W, B
Birds		Sturnus vulgaris	Starling			X		W, GF, B
Birds		Burhinus oedicnemus	Stone-curlew	X	X		X	G
Birds		Anthus trivialis	Tree Pipit	X		X		W, GF
Birds		Passer montanus	Tree Sparrow	X	X	X		W,B
Birds		Streptopelia turtur	Turtle Dove	X	X	X		W, GF
Birds		Rallus aquaticus	Water Rail		X			OW, GF
Birds		Phylloscopus sibilatrix	Wood Warbler	X		X		W
Birds		Lullula arborea	Woodlark	X				W
Birds		Jynx torquilla	Wryneck	X				GF
Birds		Motacilla flava subsp. flavissima	Yellow Wagtail	X		X		GF, RS

Birds		Emberiza citrinella	Yellowhammer	X		X		GF
Fish - Bony		Anguilla anguilla	European Eel	X				RS
Fish - Bony		Salmo trutta subsp. fario	Brown Trout	X		X		RS
Higher Plants - Flowering Plants		Apium repens	Creeping Marshwort	X		X		GF
Higher Plants - Flowering Plants		Bupleurum tenuissimum	Slender Hare's-ear	X				GF
Higher Plants - Flowering Plants		Carum carvi	Caraway	X				GF
Higher Plants - Flowering Plants		Centaurea cyanus	Cornflower	X	X			A*
Higher Plants - Flowering Plants		Galium parisiense	Wall Bedstraw			X		B
Higher Plants - Flowering Plants		Mentha pulegium	Pennyroyal	X		X		GF
Higher Plants - Flowering Plants		Oenanthe fistulosa	Tubular Water-dropwort	X				RS, OW, GF
Higher Plants - Flowering Plants		Oenanthe fluviatilis	River Water-dropwort		X	X		RS
Higher Plants - Flowering Plants		Populus nigra subsp. betulifolia	Black Poplar			X	X	GF
Higher Plants - Flowering Plants		Puccinellia fasciculata	Borrer's Saltmarsh-grass	X		X		GF
Higher Plants - Flowering Plants		Fritillaria meleagris	Snakes-head Fritillary		X			GF
Higher Plants - Flowering Plants		Viscum album	Mistletoe			X		W
Invertebrates - Ants, Bees, Sawflies & Wasps		Bombus (Thoracobombus) humilis	Brown-banded Carder-bee	X		X		GF,B
Invertebrates - Ants, Bees, Sawflies & Wasps		Odynerus (Odynerus) melanocephalus	Black-headed Mason Wasp	X				B
Invertebrates - Beetles		Brachinus (Brachynidius) sclopeta	Streaked Bomardier Beetle	X		X		B
Invertebrates - Beetles		Lucanus cervus	Stag Beetle	X	X	X	X	W
Invertebrates - Butterflies		Argynnis paphia	Silver-washed Fritillary		X			W
Invertebrates - Butterflies		Coenonympha pamphilus	Small Heath	X		X		GF

		pamphilus						
Invertebrates - Butterflies		Lasiommata megera	Wall	X		X		GF
Invertebrates - Butterflies		Limenitis camilla	White Admiral	X		X		W
Invertebrates - Butterflies		Polyommatus coridon	Chalk Hill Blue		X			GF
Invertebrates - Butterflies		Satyrium w-album	White-letter Hairstreak	X		X		W,B
Invertebrates - Butterflies		Thecla betulae	Brown Hairstreak	X	X	X		W
Invertebrates – Crustaceans		Austropotamobius pallipes	White-clawed Freshwater Crayfish	X	X		X	RS
Invertebrates - Dragonflies & Damselflies		Anaciaeschna isoceles	Norfolk Hawker	X				GF, OW
Invertebrates - Molluscs		Gyraulus (Gyraulus) acronicus	Thames Ramshorn	X				RS, OW
Invertebrates - Molluscs		Segmentina nitida	The Shining Ram's-horn	X			X	RS, OW
Invertebrates - Molluscs		Sphaerium solidum	Witham Orb Mussel	X				RS, OW
Invertebrates - Moths		Eugnorisma glareosa	Autumnal Rustic	X		X		W, GF
Invertebrates - Moths		Agrochola lychnidis	Beaded Chestnut	X		X		GF, W
Invertebrates - Moths		Timandra comae	Blood-Vein	X		X		GF, W
Invertebrates - Moths		Lycia hirtaria	Brindled Beauty	X		X		W
Invertebrates - Moths		Ceramica pisi	Broom Moth	X		X		W
Invertebrates - Moths		Agrochola litura	Brown-spot Pinion	X		X		W
Invertebrates - Moths		Spilosoma lutea	Buff Ermine	X		X		GF, W
Invertebrates - Moths		Atethmia centrago	Centre-barred Sallow	X		X		W
Invertebrates - Moths		Tyria jacobaeae	Cinnabar	X		X		GF
Invertebrates - Moths		Celaena leucostigma	Crescent	X		X		GF
Invertebrates - Moths		Mniotype adusta	Dark Brocade	X				GF
Invertebrates - Moths		Pelurga comitata	Dark Spinach	X		X		B
Invertebrates - Moths		Xanthorhoe ferrugata	Dark-barred Twin-spot Carpet	X		X		GF
Invertebrates - Moths		Aporophyla lutulenta	Deep-brown Dart	X		X		GF, W
Invertebrates - Moths		Melanchra persicariae	Dot Moth	X		X		GF, W
Invertebrates - Moths		Graphiphora augur	Double Dart	X		X		W
Invertebrates - Moths		Apamea remissa	Dusky Brocade	X		X		GF, W
Invertebrates - Moths		Ennomos fuscantaria	Dusky Thorn	X		X		W

Invertebrates - Moths		Cirrhia gilvago	Dusky-lemon Sallow	X		X		W
Invertebrates - Moths		Amphipoea oculea	Ear Moth	X		X		GF
Invertebrates - Moths		Arctia caja	Garden Tiger	X		X		GF, W
Invertebrates - Moths		Hepialus humuli	Ghost Moth	X		X		GF, W
Invertebrates - Moths		Allophyes oxyacanthae	Green-brindled Crescent	X		X		W
Invertebrates - Moths		Acronicta psi	Grey Dagger	X		X		GF, W
Invertebrates - Moths		Tholera cespitis	Hedge Rustic	X		X		GF
Invertebrates - Moths		Nemophora fasciella	Horehound Long-horn	X		X		GF
Invertebrates - Moths		Acronicta rumicis	Knot Grass	X		X		GF
Invertebrates - Moths		Malacosoma neustria	Lackey	X		X		W
Invertebrates - Moths		Apamea anceps	Large Nutmeg	X		X		GF, W
Invertebrates - Moths		Rhizedra lutosa	Large Wainscot	X				GF
Invertebrates - Moths		Chiasmia clathrata subsp. clathrata	Latticed Heath	X		X		GF, B, W
Invertebrates - Moths		Brachylomia viminalis	Minor Shoulder-knot	X		X		GF, W
Invertebrates - Moths		Caradrina morpheus	Mottled Rustic	X		X		GF
Invertebrates - Moths		Amphipyra tragopoginis	Mouse Moth	X		X		W
Invertebrates - Moths		Scopula marginepuncta ta	Mullein Wave	X		X		GF
Invertebrates - Moths		Watsonalla binaria	Oak Hook-tip	X		X		W
Invertebrates - Moths		Polia bombycina	Pale Shining Brown	X				GF, W
Invertebrates - Moths		Orthosia gracilis	Powdered Quaker	X		X		GF
Invertebrates - Moths		Litoligia literosa	Rosy Minor	X		X		GF
Invertebrates - Moths		Hydraecia micacea	Rosy Rustic	X		X		GF
Invertebrates - Moths		Hoplodrina blanda	Rustic	X		X		GF
Invertebrates - Moths		Cirrhia icteritia	Sallow	X		X		W, GF
Invertebrates - Moths		Ennomos erosaria	September Thorn	X		X		W
Invertebrates - Moths		Scotopteryx chenopodiata	Shaded Broad-bar	X		X		GF
Invertebrates - Moths		Leucania comma	Shoulder-striped Wainscot	X		X		GF
Invertebrates - Moths		Hemistola chrysoprasaria	Small Emerald	X		X		W

Invertebrates - Moths	Ecliptopera silaceata	Small Phoenix	X	_	X	_	GF, W
Invertebrates - Moths	Diarsia rubi	Small Square-spot	X	_	X	_	GF
Invertebrates - Moths	Eulithis mellinata	Spinach	X	_	X	_	W
Invertebrates - Moths	Asteroscopus sphinx	Sprawler	X	_	X	_	W
Invertebrates - Moths	Spilosoma lubricipeda	White Ermine	X	_	X	_	B,GF
Invertebrates - True Bugs	Ribautodelphax imitans	Tall Fescue Planthopper	X	_	_	_	GF, B
Invertebrates - True Flies	Dorycera graminum	Phoenix Fly	X	_	X	_	GF
Terrestrial Mammals	Arvicola amphibius	European Water Vole	X	X	X	X	RS, OW
Terrestrial Mammals	Eptesicus serotinus	Serotine	_	_	X	_	B, W
Terrestrial Mammals	Erinaceus europaeus	West European Hedgehog	X	_	X	X	B, W, GF
Terrestrial Mammals	Lepus europaeus	Brown Hare	X	X	X	_	GF, W
Terrestrial Mammals	Lutra lutra	European Otter	X	X	X	X	RS,OW
Terrestrial Mammals	Micromys minutus	Harvest Mouse	X	_	X	_	GF
Terrestrial Mammals	Mustela putorius	Polecat	X	_	_	_	GF, W
Terrestrial Mammals	Myotis daubentonii	Daubenton's Bat	_	_	X	_	W, OW
Terrestrial Mammals	Myotis nattereri	Natterer's Bat	_	X	X	_	W
Terrestrial Mammals	Nyctalus leisleri	Lesser Noctule	_	_	X	_	GF, W
Terrestrial Mammals	Nyctalus noctula	Noctule Bat	X	_	X	_	GF, W, OW
Terrestrial Mammals	Pipistrellus nathusii	Nathusius's Pipistrelle	_	X**	X	X	W, OW
Terrestrial Mammals	Pipistrellus pipistrellus	Common Pipistrelle	_	X**	X	X	GF, W, OW, B
Terrestrial Mammals	Pipistrellus pygmaeus	Soprano Pipistrelle	X	X**	X	X	GF, W, OW, B
Terrestrial Mammals	Plecotus auritus	Brown Long-eared Bat	X	_	X	_	W,GF

* Not a LVRPA Priority habitat but is found within the statutory boundary
** Listed as Pipistrelle species