The London Biodiversity Audit

Volume 1 of the London Biodiversity Action Plan

Contents

Preface

Our Green Capital, the introduction to the London Biodiversity Action Plan, describes a new vision for London where biodiversity conservation is integrated with social, cultural and economic values. Although biodiversity planning is essentially a process, a local plan provides the mechanism for implementing the UK plan in London and is vital to the identification of priorities and delivery of action across the capital.

The London Biodiversity Partnership decided that a picture of the biodiversity resource in London was required as the first stage in this process, through an audit of the habitats and species that occur across the Capital. This London Biodiversity Audit (Volume 1 of the London Biodiversity Action Plan) will provide a framework for stimulating discussion that will result in the formulation of habitat, species or land use action plans at the London and borough levels. The Audit will evolve and be updated as a result of comments from Partners and others and the production of more accurate and detailed information.

Fifteen habitats have been audited (Section 1) and there are four habitat statements for those habitats where information was scarce or not available (Section 2). These Sections define the habitat, describe the resource in London and identify the major threats and opportunities for conservation. Data sources are listed and the rationale and limitations of approach outlined.

The Species Audits (Section 3) identify by borough species that fit into one or more of the following categories: UK Biodiversity Action Plan Priority; Species of Conservation Concern; nationally or locally rare; culturally valued; declining; easy to monitor or characteristic of certain habitats. This has been done for nine major groups.

A suite of costed action plans for species and habitats, as well as functional action plans for target audiences, will form Volume 2 of the London Biodiversity Action Plan.

Framework: Habitat and Land Use Classification for London

The London Biodiversity Partnership identified twenty habitat or land use types for London, as listed in the Box below. These were considered to encompass the majority of land in London where biodiversity could be maintained or enhanced.

Twenty Habitat or Land Use Types for London

Woodland – all woodland and scrub habitats: ancient, secondary, 'recent', wet

Open Landscapes with Ancient/Old Trees – deer parks, old parkland, wood pasture, other areas with unimproved grassland and scattered old/ancient trees

Hedgerows – all boundary features with trees and shrubs

Acid Grassland – unimproved and semi-improved grassland on nutrient-poor, free-draining soils (e.g. sands and gravels)

Chalk Grassland – unimproved and semi-improved grassland on chalk

Grasslands, Meadows and Pasture – unimproved and semi-improved grassland other than acid grassland, chalk grassland or wet grassland, i.e. neutral grassland

Heathland – sites where heather occurs naturally

Grazing Marsh and Floodplain Grassland – sites where the habitat is dependent upon a combination of periodic wetting or inundation and grazing or cutting

Marshland – all wet terrestrial habitats e.g. fens, bogs, mires, swamps

Reedbed – sites where common reed is dominant.

Rivers and Streams – all free-flowing watercourses above the tidal limit

The Tidal Thames – all areas of the river Thames and its tributaries below the tidal limit

Canals – the London canal network

Ponds, Lakes and Reservoirs – all standing open water

Private Gardens – self-explanatory

Parks, Amenity Grasslands and City Squares – all formally managed amenity open space (including sports pitches, school grounds and landscaped areas around institutional buildings)

Railway Linesides – all vegetated or natural surfaces within railside boundary fencing

Churchyards and Cemeteries – all burial grounds

Urban Wastelands – semi-natural vegetation which has developed on an imported or artificial substrate resulting from previous development or disturbance

Farmland – arable fields and agricultural leys

The relationship between the London habitat and land use classification and the habitat types identified in *Biodiversity: the UK Steering Group Report* is shown in Table 1.

Table 1: Relationship between London BAP Habitat/Land Use Types and UK BAP Broad Habitat Types in *Biodiversity: the UK Steering Group Report* (as revised in *Tranche 2 Action Plans: Terrestrial and Freshwater Habitats*)

London Classification	Broad Habitat Type	UK Priority Habitat in London
Woodland	Broadleaved, mixed and yew woodland	Wet woodland, beech woodland
Open Landscapes with Ancient/Old Trees	Lowland wood pastures and parkland	Lowland wood pastures and parkland
Hedgerows	Boundary and linear features	Ancient and/or species rich hedgerows
Acid Grassland	Acid grassland	Lowland dry acid grassland
Chalk Grassland	Calcareous grassland	Lowland calcareous grassland
Grasslands, Meadows and Pasture	Neutral grassland	Lowland hay meadow
Heathland	Dwarf shrub heath	Lowland heathland
Grazing Marsh and Floodplain Grassland	Grazing marsh	Grazing marsh
Marshland	Fens, marsh and swamp	Fens
Reedbed	Fens, marsh and swamp	Reedbeds
Rivers and Streams	Rivers and streams	Chalk rivers
The Tidal Thames	Rivers and streams	Estuaries
Canals	Standing open water and canals	-
Ponds, Lakes and Reservoirs	Standing open water and canals	Eutrophic standing waters
Private Gardens	Built up areas and gardens	-
Parks, Amenity Grasslands and City Squares	Built up areas and gardens, improved grasslands	-
Railway Linesides	-	-
Churchyards and Cemeteries	Built up areas and gardens	-
Farmland	Arable and horticulture, improved grasslands	Cereal field margins

This Framework was used as a basis for identifying habitats for the London Biodiversity Audit.

HA1: Woodland

Definition

This audit includes all semi-natural plant communities dominated by trees or shrubs. Although there are a few intermediate habitats, the dominance of woody species generally distinguishes woodland and scrub from grasslands and marshes. London's better woodlands have been described before[a], but this audit can take account of more recent information on both the woodlands and their community types, provide borough by borough statistics and identify the issues that will need to be addressed in action for London's woodlands and scrub.

Most of London's woodland and scrub types can be found on railway linesides and in cemeteries, if not churchyards. While the statistics for these places are included in this audit, they are covered also in separate statements (HA 14 & 13 respectively) because of their special land use.

Heathland is included in a separate audit; it is distinguished from gorse scrub by the presence of heather or dwarf gorse, rather than just common gorse. Hedgerows are also included in a separate audit because of their unique structural rôle, although the better hedgerows all fall within the hawthorn and blackthorn scrub communities.

Some of the beech and hornbeam woodlands of north London were once wood pasture, with widely spaced pollarded trees, but most have been neglected for so long that they are now woodland and are included within this audit.

The various woodland community types of London are given in Table 1. Particular combinations of plant species distinguish them. The table arranges these by the two factors that have most influence on their composition. The columns group together woodland types according to their soil reaction. On the left are chalk and other base-rich soils, and on the right the sandy, stony and peaty acidic soils. The rows group together communities according to how well drained they are, and their successional stage. In the bottom two rows are the scrub communities dominated by hawthorn, gorse or bramble which, if left alone, will change by the slow natural process of 'succession' into woodlands. To the top are the well-drained woodland communities with yew and beech; in the middle are the wet communities with alder and willow. In between are the moist, but not waterlogged, woodlands with oak, ash, hornbeam, sycamore and field maple.

Although the table includes a large number of woodland and scrub communities that may occur in London, the next section of this audit shows most of them to be uncommon or rare.

London's Woodland Resource

The best statistics for London's woodland and scrub cover come from the London Wildlife Habitat Survey of 1984/85, held by the London Ecology Unit. While these statistics are known to be slight underestimates, and there will have been minor changes over the years since the survey, the errors should not be large as they result mainly from the exclusion of a number of very small blocks of woodland and scrub. The most significant exclusions were of the smaller areas on London's railsides and hedgerows distant from other valuable habitat. The majority of the area is found in large blocks that were all documented in the survey and almost all of which have not changed since the survey.

Table 1: Woodland Community Types in London

		Soil Reaction		
Drainage & Form	**Characteristic species**	**Base rich ('chalk')**	**Neutral**	**Acid ('sandy')**
Free-draining	Yew	Yew		
	Beech	Beech Hangers	Beech-bramble	Acid beech
Moist	Oak, ash, hornbeam, sycamore, maple	Ash-maple-sycamore	Oak-honeysuckle-hornbeam-sweet chestnut	Birch-oak
Wet	Willow	Nettle	Fen Carr	Grey willow carr Birch-purple moor grass
	Alder	Nettle & Alder flush	Swamp carr	
Scrub	Hawthorn & gorse	Hawthorn & blackthorn	Hawthorn & blackthorn	Gorse
	Bramble		Bramble-Yorkshire fog	Bracken-bramble

The following table illustrates the range of woodland and scrub plant community types found in London and Appendix 2 considers each in detail.

Table 2: Woodland and scrub in London (ha)

Borough	Native woodland	Non-native	Coniferous	Fen carr	Scrub
Barking & Dagenham	5.7	0.9	0.0	0.4	28.0
Barnet	277.6	66.3	8.3	-	126.0
Bexley	104.0	119.4	14.7	0.2	59.0
Brent	19.0	5.4	0.0	-	31.9
Bromley	1424.8	302.6	63.4	0.8	139.7
Camden	116.2	18.3	1.1	-	2.5
City Of London	-	-	-	-	0.2
Croydon	638.7	62.0	36.9	-	166.7
Ealing	69.8	11.1	0.6	-	64.6
Enfield	372.0	17.3	17.7	0.3	62.2
Greenwich	218.1	53.7	0.4	-	73.3
Hackney	6.3	9.8	-	0.2	1.4
Hammersmith & Fulham	1.0	8.0	-	-	8.5
Haringey	77.9	18.3	0.4	-	8.2
Harrow	218.5	25.2	8.8	1.3	51.5
Havering	307.5	55.7	0.3	10.5	122.4
Hillingdon	614.1	42.6	0.9	2.6	156.4
Hounslow	76.8	24.1	2.1	-	98.4
Islington	1.7	1.7	-	-	1.5
Kensington & Chelsea	3.9	11.1	-	-	3.3
Kingston	95.5	17.8	2.1	-	25.5
Lambeth	17.1	17.5	-	-	14.2

Borough	Native woodland	Non-native	Coniferous	Fen carr	Scrub
Lewisham	42.9	40.5	0.6	-	19.3
Merton	142.5	8.1	-	-	62.0
Newham	2.7	5.0	-	-	33.0
Redbridge	158.4	41.9	-	-	78.9
Richmond	396.2	78.0	0.9	-	35.2
Southwark	47.7	34.4	0.0	-	11.6
Sutton	36.5	57.0	2.6	-	42.8
Tower Hamlets	3.0	4.1	-	-	7.3
Waltham Forest	228.2	9.2	0.8	-	28.5
Wandsworth	169.4	37.2	-	-	14.4
Westminster	2.6	3.8	-	-	0.4
London Total (ha)	**5896**	**1208**	**163**	**16**	**1579**
% London land area	3.7	0.8	0.1	0.01	1.0

The 7,300 ha (4.5% of Greater London's land area) of woodland documented in the Wildlife Habitat Survey is known to be a good estimate of the total[b]. Woodland is the second most extensive natural habitat of London (after unimproved and semi-improved neutral grassland). Much of the woodland (5,900 ha or 3.7% of London) is native broadleaved woodland. There are some 1200 ha of non-native broadleaved woodland (predominantly sycamore, 0.8% of London) and small amounts of coniferous woodland (160 ha not native to the London area, 0.1% of London) and fen carr (16 ha, 0.01% of London). The area of scrub in London is some 1,600 ha (1% of London). This last figure is likely to be a less accurate estimate than the woodland figures, given the smaller size of most patches of scrub.

Figures 1, 2 and 3 give the distribution of native woodland, non-native broadleaved woodland and scrub from the Habitat Survey. These Figures are also presented as simpler maps, with the total amount of habitat in each borough represented by a dot of proportional size. There is a good correlation between the amounts of all four habitat types across London Boroughs, showing that a borough with much native broadleaved woodland tends also to have more non-native and coniferous woodland and much scrub.

Figure 1 shows that native woodlands are numerous and scattered over Greater London, so that few areas are further than two kilometres from a woodland. Good concentrations of woodland occur in the north of Hillingdon, at Hampstead Heath, Wimbledon Common and Richmond Park, Epping Forest, the north of Redbridge, Oxleas, Dulwich (remnants of the 'Great North Wood') and especially in the south of Croydon and throughout Bromley. Most of these concentrations are on high ground. There is a dearth of woodland in central London and on the low-lying land east of there and north of the Thames, and a similar void west of the Lea Valley. These areas are predominantly low ground and were easily worked for agriculture.

Figure 2 shows that the distribution of non-native broadleaved woodland, although still predominantly on higher less easily worked ground, is not so concentrated, so helping to fill the gaps in the distribution of the native woodland. Almost all the areas are small (less than 20 ha), with the notable exception of the sweet chestnut woodland of Lesnes Abbey Wood in northern Bexley.

Figure 3 shows that the very many small areas of scrub are even more widely scattered. Although they occur with the woodland, there are also concentrations in the river valleys of the lower Thames, Lea, Brent and Colne and a notable concentration at Mitcham Common.

The London Ecology Unit holds the parcel-by-parcel details of all the woody habitat summarised in Table 1 (and for many boroughs a more detailed re-survey). The most recent data should be the starting point for an individual borough audit.

When the Habitat Survey was undertaken the best classification of woodland types was that of Peterken[c], which largely employs the woody species. Since then the National Vegetation Classification, which is the basis for the communities in Table 1 and takes all plants into account, has been published, but much of the survey material for London pre-dates this time and presents difficulties in determining the NVC community types.

For this audit, the information on London's best woodlands, those included within a Site of Metropolitan Importance for nature conservation[d], was reviewed and the best approximation to the NVC types determined. The woodland in these sites totals 3,200 ha, nearly half of London's woodland, and so is a good sample, if biased towards the older and larger woods. This analysis is not yet complete, so that the following paragraphs will be subject to revision. Figure 4 shows the amount of each type in the Metropolitan Sites and Appendix 1 gives the data on which this is based.

Three woodland types comprise the majority of London's woodlands. The largest single category is the woods of moist neutral soils, the oak-honeysuckle-hornbeam-sweet chestnut woods. This type is found in most of the woodland Sites of Metropolitan Importance, except for some of those on chalk, Southeast of London. Within this category is the sweet chestnut woodland of Lesnes Abbey Wood and most of the hornbeam woodlands of Ruislip, Epping Forest and Hainault Forest. The hornbeam woodlands are distinctive of London and the nearby area of the Southeast.

The second largest category is the ash-maple-sycamore woodlands, and these are even more widespread in the Metropolitan Sites than the oak-honeysuckle woods. The older stands of these woodlands on the chalk in Croydon and Bromley can have a rich flora, but many of the recent secondary sycamore woodlands are botanically poor.

The third category is the oak-birch woodlands of acid soils. These tend to be on the old heaths and commons, such as Wimbledon Common, Epping Forest and Hampstead Heath and in other places on sandy and gravelly soil, such as on top of Croham Hurst, at Petts Wood, Ruislip woodlands and Lesnes Abbey Woods.

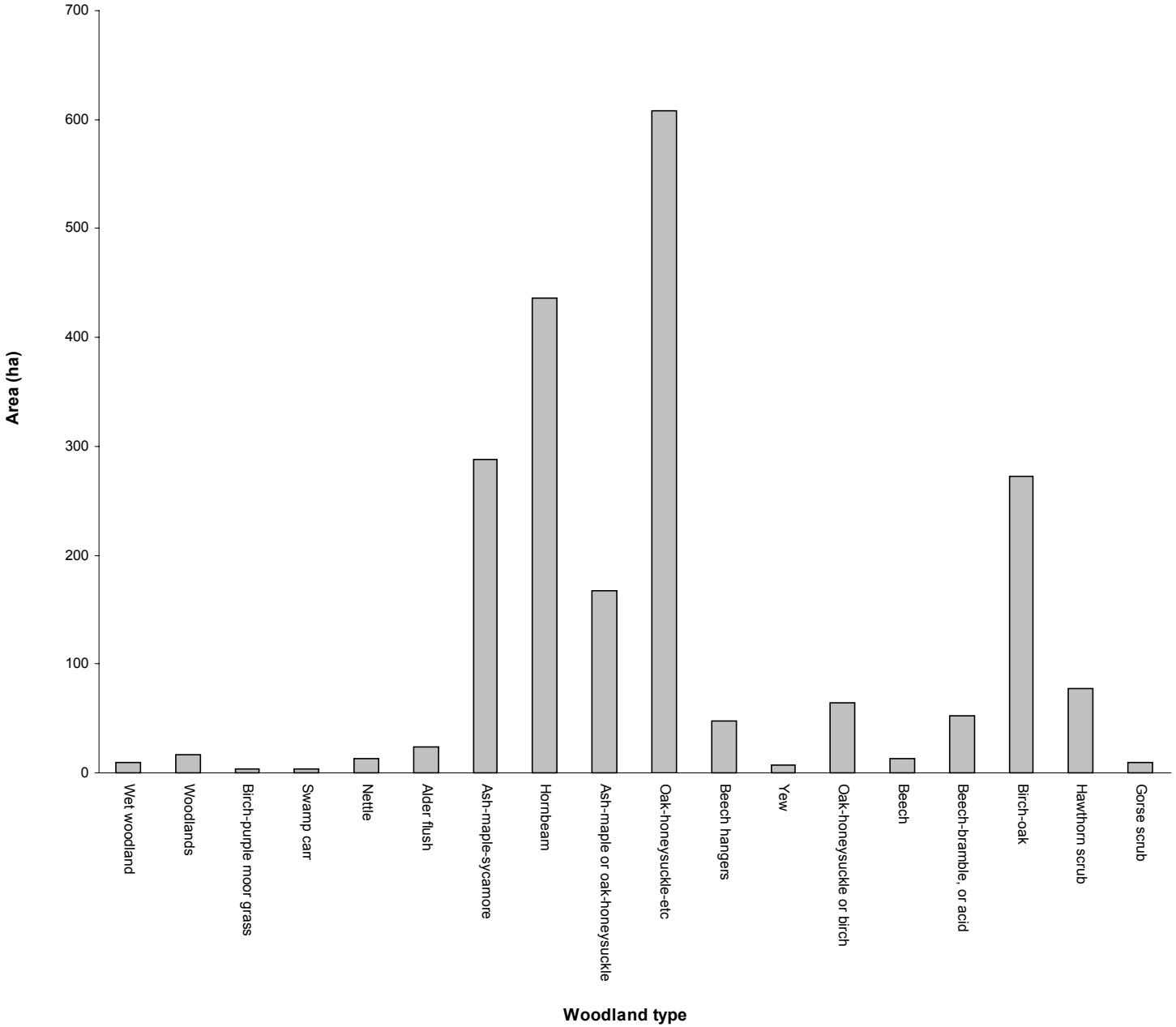
Hawthorn scrub is the next largest type, found in a wide range of sites, but especially in the Farthing Downs site in Croydon and in Epping Forest. The Metropolitan sites probably underestimate the amount of this habitat in comparison with the woodlands.

The beech woodlands come next in order of abundance. Many of these were difficult to classify by type, but there are certainly beech hangers on the chalk in Croydon and Bromley, which is where most of these three types are found. The beech woods of north London are beech-bramble and acid beech types.

There is very little yew woodland in London, Cudham Frith in Bromley having a small area on a steep chalk scarp and there just may be a small area also in the West Kent Golf Course Woods.

Wet woodlands in London are many, but small and scattered. The largest areas are found in the mid-Colne Valley and Ingrebourne Valley. The most widespread type is probably nettle woodland, but there is not much of this species-poor type in the Metropolitan Sites. Another species poor type, grey willow carr, occurs in and around old gravel workings in both valleys. There is a small area of swamp carr at Bewick Ponds on the Ingrebourne and small areas of Alder flush woodland where springs and flushes occur elsewhere in London's woodlands, as at Petts Wood. Birch-purple moor-grass woodland occurs on the plateau of Wimbledon Common.

Figure 4: The amount of different woodland types in London's Sites of Metropolitan Importance (incomplete analysis July 99)



Gorse scrub occurs on the old commons, such as Mitcham Common, Wimbledon Common and on other acid soils, such as at Epping and Hainault Forests and the Ruislip Woods.

Nature Conservation Importance

There is no doubt that London was very largely clothed in woodland before the activities of man induced the other ancient habitats. Even nowadays, after millennia of management, the composition of the ground flora of the older woodlands is derived from this wildwood. But there have been many losses, and the composition of woodland canopies more reflects their long history of management, so that species like hornbeam, sweet chestnut, field maple and hazel are more abundant than they would be naturally.

The value of ancient woodland[e] for nature conservation has long been recognised. The correlation between ancient status and nature conservation value in London is good. Most of the larger ancient woodlands in London are included in Sites of Metropolitan Importance and there are not many parts of the Metropolitan Sites that are not ancient. However, the correlation is not absolute, so it would be dangerous to assume that all valuable woodlands are ancient or that all ancient woodlands are valuable[f]. This audit considers survey data from woodlands in London and so enables a better evaluation than the simple two-way classification into ancient or not.

For plant community conservation, hornbeam woodlands must be important, given that London is in the centre of their restricted national distribution. The larger areas of these woodlands also support some uncommon species in London, such as the hawfinch, marsh tit and spotted flycatcher.

National priorities that should be considered in London are for wet woodlands[g] and beech yew woodlands[h] The national action plan considers wet woodlands important for the conservation of bryophytes, invertebrates[i] and the otter. In London their rarity should give them importance.

The national plan for beech and yew woodlands lists several rare species, some of which are found in the London examples. Coral-root bittercress occurs in Old Park wood on the chalk in northwest Hillingdon and bird's nest orchid is found in the deep shade of some of the beech hangers in Bromley, and there are records of violet helleborine from the beech woods across London's northern fringes. The national plan also identifies two priority fungi and a moss[j].

There is a valuable mosaic of chalk scrub, woodland and grassland on some sites in the south of London (such as Farthing Down), which not only holds many uncommon plant species, but provides a wide range of resources for uncommon animals.

The scrub and woodlands of moist soils are not included in national priorities, but they must be considered important in London, as they provide the majority of our valued woody cover. Woodlands like Oxleas, the National Nature Reserve Ruislip Woodlands, Lesnes Abbey Wood, Dulwich and Sydenham Hill Woods, Petts Wood and 60 Acre Wood are all on these soils. These soils, too, support almost all of the secondary woodland that plays a vital strategic rôle in areas otherwise deficient in woodland. These places help to sustain a wide variety of animal species that provide the everyday biodiversity for Londoners to enjoy, including birds like the nuthatch, woodpeckers, leaf warblers, tree creeper and bullfinch.

The scrub of London's railsides, commons and wastelands also plays a valuable role, providing nectar for butterflies and sustaining birds like the wren and dunnock, as well as less widespread species like whitethroats and linnets.

Most of the birds appreciated in the back gardens of suburban London are those of woodland and woodland edge: the tits, robin, chaffinch, dunnock, wren, greenfinch, song thrush and

even the blackbird. Garden invertebrates with a similar ecology include the holly blue and speckled wood butterflies. Even the stumps of dead trees support the stag beetle. It is the woody vegetation of gardens that helps to sustain London's populations of such species, so there is a strong link between London's scrub and woodlands and the everyday biodiversity conserved in gardens.

Some woodland and scrub sites of nature conservation value in Greater London

Bostall Woods and Heath, LB Greenwich

Denham Lock Wood, LB Hillingdon

Downe Bank and High Elms, LB Bromley

Ken and North Woods, LB Camden

Lesnes Abbey Wood, LB Bexley

Perivale Wood, LB Ealing

Ruislip Woods, LB Hillingdon

Sydenham Hill Wood, LB Southwark

Wimbledon Common, LB Merton and LB Wandsworth

Threats and Opportunities

Threats

All the woodland types are threatened with clearance to make way for other uses. Many are also damaged by management for amenity, or overuse by people and their pets. The old woodlands with rare plant species require a continuation of traditional management and protection from other disturbing influences, but it should be appreciated that the value of recent secondary woodland tends to be more as habitat for animals and that traditional management may not be appropriate for this purpose. Indeed woodland, as the 'climax' vegetation of London, requires no management to ensure its future.

Many wet woodlands have a dense structure, often with fallen trees, difficult ground conditions and mosquitoes. This makes them more difficult to enjoy and so less appreciated by the public than 'bluebell woods'. They are threatened with changes in the water regime through drainage or flood control work, succession to drier habitats and toxic water pollutants. The tradition of pond maintenance to arrest succession to wet woodland prevents the development of many small wet woodlands.

Opportunities

There has been a national drive for woodland planting, manifest in and around London in the Watling and Thames Chase projects. The aims of these projects extend far beyond biodiversity conservation, but they provide an excellent basis for the development of new woodlands for people to enjoy. The framework of Table 1 and Appendix 2 should provide a good basis for what it is sensible to create according to soil conditions. There are also less obvious opportunities, such as allowing wetlands to develop into wet woodland through natural succession, which would be appropriate in disused mineral workings.

Tree planting can, however, cause harm to nature conservation, as trees shade out other valuable plant communities in grassland, heath or marsh. It is vital therefore that new woodland planting is undertaken only after survey of the existing plant community confirms that it is of no special value for nature conservation.

The greatest need for new woodlands and scrub is in the heavily developed low land and inner boroughs of London, but it is there that space is at a premium. In such areas the natural succession to woodland that occurs on abandoned land or in the old cemeteries is a gift of woody vegetation that must be accepted. Such places provide some of the only woodlands in wide areas of London and a significantly better habitat than is available in ordinary amenity planting.

Where there is space in a wetland, allowing succession to wet woodland will provide a valuable habitat. Rather than reverse the succession in a pond, if there is room, it is preferable to create a new pond and allow the old one to become wet woodland.

Appendix 1

Table 4: Woodlands of Sites of Metropolitan Importance for Nature Conservation in London

		Area of woodland (ha)	Area of scrub (ha)	Area of wood pasture (ha)	Grid reference	Wet woodland (type?)	Woodland (type?)	Fen carr	Birch-purple moor grass	Swamp carr	Nettle	Alder flush	Ash-maple-sycamore	Hornbeam (type?)	Sweet chestnut (type?)	Ash-maple or oak-honeysuck	Oak-honeysuckle-etc	Beech hangers	Yew	Oak-honeysuckle or -birch	Beech (type?)	Beech-bramble, or acid	Birch-oak	Hawthorn scrub	Gorse scrub
	NVC woodland type																								
	Total	2027	87	2		9	17	0	4	3	13	24	288	436	0	168	608	48	7	65	13	52	273	77	9
									4	5	6	7	8			8-10	10	12	13			14/18	16	21	23a
M008	Perivale Wood	8	1		159 83	0							8											1	
M009	Ruislip Woods	243	3		077 895					1	1	1	1	220			+++	+					20	1	2
M010	Old Park Wood	22	0		044 915						4		7	+				4					7		
M011	Whitewebbs Wood	50	0										5				45								
M012	Epping Forest	244	28										82	94			64						4	21	7
M013	Hanault Forest	122	3		475 93	+					+		++	122			+	+					+	3	++
M014	Cranham Marsh	6	0		570 85	++				+	++	+	5			1	+							0	
M015	Lesnes Abbey Woods	115	9		481 785								15		+++		60						41	8	1
M016	Oxleas Woodlands**	77	0		440 759							1	2				74								
M017	Petts Wood	69	0		450 687				+	3		3				4				60					
M018	West Kent Golf Course Woods*	76	3	2	423 603		8						2				20		+	4	13	5	24	3	
M019	Cudham Frith	42	1		452 579								1				5	19	7			10		1	
M020	Cudham Valley*	45	1		437 608		1						13				5	16				10		1	
M021	Newyears & surrounding woods*	77	0		458 600		4						42	+		2	22	7							
M022	Ninehams & Lake woods	24	0				0					2	5			14	3								
M023	Crofton Wood	71	3		436 66	+						++	+				71							3	
M024	Scadbury Park	34	3	+	454 700								1			33								3	
M025	Brook, Scrogginhall & Barnet Woods	24	0		412 666							3	3			6	12								
M026	Bourne Wood	17	0		497 684							0	10										7		
M027	Spring Park & Threehalfpenny Wood	38	0		377 648			+					26		+		6						6		
M028	Kings Wood*	64	0		351 603											57	7								
M029	Farthing Downs, Devilsden Wood & Happy Valley*	51	29		309 568								20				30	1						29	
M030	Croham Hurst*	38	1		342 629								4					2				27	5	1	
M045	Mid Colne Valley	42	3		051 88	9	4				8	14	7											3	
M063	Selsdon Wood*	84	0		364 617								15				69								
M072	Hamptstead Heath	97	0		270 867											38							59		
M101	Wimbledon Common, etc	220	0		266 718				4		1						115						100		
M113	Sixty Acre and Jubilee Woods	29	0		164 622								15	+		12				1			1		

Habitat survey parcels were attributed to the nearest NVC woodland community type. In some cases the attribution was to a range of possible types (e.g. to W8 or w10) or to a broad category (e.g. wet) and, at worst as 'woodland'.

* Also surveyed by Cooke & Williams (1992) *London Chalk Woodland Survey,* EN - enabling a check on their composition. This study, however, examined a strange selection of woodlands of greatly varying importance.

** A survey by P. Williams of EN in 1992 confirms these.

Appendix 2

London's Woodland and Scrub Communities

1 Introduction

This report is based upon the National Vegetation Classification (NVC)[k], which provides general descriptions of the floristics of woodland and scrub plant communities occurring in London. Our operational definitions of woodland and scrub are the NVC communities included within volume 1 of the NVC[a]. The NVC descriptions are confirmed by the audit of data from London in the following sections of this report. The NVC sampled few woods in London[l], but the areas around London were well-sampled. This means that most of the more widespread and interesting woodland types of London are described adequately by the NVC, but there are problems with woodlands of recent origin on typically urban sites.

Climate is probably the largest natural influence on London's woodlands, as London lies near the extreme of three national trends:

- Decrease in rainfall and humidity towards the southeast of England,
- Increase in average temperatures towards the south of England, and
- Greater extremes of temperature in the inland east of England. Winter temperatures are ameliorated somewhat by the urban 'heat island' effect.

In combination, these climatic effects lead to several woodland species being concentrated in the lowland south or east of the UK. Among the canopy species these are: hornbeam, field maple, beech, yew and small-leaved lime. Shrubs include: buckthorn, wayfaring-tree, spindle and dogwood, and in the ground flora we find wood spurge, yellow archangel, early dog-violet and Lords-and-Ladies.

These have been listed in approximate order of decreasing concentration in and around London, but there is no single species that is widespread in London and not elsewhere; even hornbeam is widespread as a native tree in the counties adjoining London to the north, south and east.

Past coppice management has favoured species such as ash, field maple, hornbeam, beech, sweet chestnut and hazel over oak, birch, elm, rowan, holly and sycamore. In this regard many of London's recent secondary woodlands may have a more natural canopy than those with a history of traditional management.

Many of London's larger woodlands are accessible to the public and so have suffered from trampling, eutrophication and the clearance of the shrub layer to improve sightlines. In the extreme these woodlands have been degraded to mown grasslands with bare pathways and scattered trees. Conversely, many of the smaller woodlands are of recent origin through ecological succession on inaccessible land and suffer no such problems.

Finally, the absence of significant grazing and browsing in many of London's woodlands has favoured species such as holly and ivy.

2 The amount and distribution of woodland and scrub types in London.

The classification in the table below is designed to provide somewhat more friendly labels for the NVC woodland and scrub communities of London than those of the NVC itself.

Table 3: Simplified classification of London's woodland and scrub types.

	Soil Reaction		
Characteristic species	**Base rich ('chalk')**	**Neutral**	**Acid ('sandy')**
Yew	Yew (W13)		
Beech	Beech hangers (W12)	Beech-bramble (W14)	Acid beech (W15)
Oak, Ash, Hornbeam Maple & Sycamore	Ash-maple-sycamore (W8)	Oak-honeysuckle hornbeam-sweet chestnut (W10)	Birch-oak (W16)
Willow	Alder nettle (W6)	Fen carr (W2)	Grey willow carr (W1), Birch-purple moor-grass (W4)
Alder	Alder nettle (W6)	Swamp carr (W5)	Alder flush (W7)
Hawthorn & gorse scrub	Hawthorn hedge & scrub (W21), Blackthorn (W22b)	(W21), (W22b)	Gorse (W23a)
Bramble scrub		Bramble-Yorkshire fog (W24)	Bracken-bramble (W25)

In Table 3, the columns summarise the soil types on which the communities are found. The base rich soils (rendzinas and brown calcareous earths) in London occur on the chalk, but also on Boulder Clay and on the London Clay in places. The more neutral soils (brown earths of low base status) occur widely on the clays, and on the recent sands, gravels and alluvium. The acid soils (rankers, brown podsolic soils and podsols) occur on the older leached sands and gravels. The rows relate mainly to drainage and soil development, but also to succession in the case of scrub. At one extreme, the yew woodlands are on steep, thin soils over chalk, and at the other, the willow and alder woodlands have a permanently wet or water-logged soil. Beech tends to occur on better drained soils than do oak, ash and maple, although some regard beech woodland as a later successional stage to the other three trees, even in moister soils.

The NVC does not place London's hornbeam-dominated woodlands, into one community. Despite their ground flora being generally poor, they are seen as the product of historic management of ash-maple and oak-honeysuckle woods, but largely the latter. The many sycamore-dominated, recent, secondary woodlands in London span a wide range of soil types, but are mainly on the soils that would otherwise have ash-maple woodland.

The amount of each woodland and scrub type in London is summarised in Figure 1, to which the following accounts refer. More detailed information is given in Table 1, which gives the approximate amount of each type in each of the woodlands included within London's Sites of Metropolitan Importance[m] for nature conservation. There are about 7300 ha of woodland in London, a half of which is included within Sites of Metropolitan Importance for nature conservation. The distribution of this across the boroughs is given in Table 2.

Much of the information used to determine the community types in these woodlands was collected before the NVC methodology was available precluding many precise identifications of the communities, and some well-described woods did not appear to fit the classification very well. For these reasons some broad categories were employed, ranging from woodlands where no sensible community identification could be made, to some which appeared to be a mosaic of two or more types, or to fall between their communities.

2.1 ***Oak-honeysuckle (hornbeam, sweet chestnut) woodland*** (NVC W10). This woodland type is found on soils that are moist and of mid range pH, and is defined more for the lack of species indicative of drier, wetter, more acid, or more basic conditions, than for any particular preferential species. It is probably the most widespread woodland community in London's Sites of Metropolitan Importance, if one accepts that many of the unattributed hornbeam and some of the sycamore woodlands probably belong here, and almost certainly the commonest type in London. Typical trees are pedunculate oak and silver birch, while ash and maple are scarce. The best bluebell woods occur here, but moister soils have wood anemone instead, and creeping soft-grass, bracken and bramble are common. Most sweet chestnut woods belong here, as do many hazel coppices. The NVC describes five sub-communities, four of which appear to occur in London (W10e being the exception). We have identified this type provisionally in all of the Metropolitan sites except for some on the chalk in the south-east and on the fertile alluvium of the Colne Valley.

2.2 ***Ash-maple (sycamore) woodland*** (NVC W8). This woodland type is found on soils that are moist and base-rich. It has a very wide range of species and is one of the richest of London's woodland communities. It is the second commonest type in the Sites of Metropolitan Importance. Indicative species include field maple and ash, but also sycamore, elm, buckthorn, guelder rose, dog's mercury, wood sage, ramsons, lesser celandine and primrose. It shares pedunculate oak, birch, hawthorn, hazel, bramble, bluebell, wood anemone and ivy with oak-honeysuckle woods. Some of London's hornbeam woodlands belong here. Seven sub-communities are described all but two of which (W8f & g) occur in London. We have provisionally identified this community in almost all of London's Metropolitan sites. Most of the sycamore woodland in London should be classified here.

2.3 ***Birch-oak woodland*** (NVC W16a). This type is found on acid and nutrient-poor soils, usually as the result of succession on previously heathland or acid grassland sites, where the displaced habitat is often preferred. It is the third most abundant type in the Sites of Metropolitan Importance. The dominant trees are commonly pedunculate oak and silver birch, but sessile oak and downy birch may be dominant. Ash, hazel, sycamore, hawthorn and bluebells are uncommon and any bramble and honeysuckle sparse. Both Scots pine and sweet chestnut can occur in this type. It is species-poor and has few indicative species, but the presence of much heather, wavy hair-grass, purple moor-grass, rowan, gorse or bilberry distinguishes it from oak-honeysuckle woodland. Holly is prominent in the understorey of some stands. It shares bracken with oak-honeysuckle woodland. This woodland has few spring flowers, although lily-of-the-valley can occur. Two sub-communities are described, but just this one occurs in London.

2.4 ***Beech hangers*** (NVC W12). This type is the most abundant beech wood in the Sites of Metropolitan Importance, and is found mainly on the well-drained chalk in the south and east of London. It grows in similar places to ash-maple woodland, which it may replace through succession until beech becomes the sole dominant canopy tree. However, the beech tends to be on the steeper scarps and the ash-maple on the lower slopes. Few other trees occur, but there may be some ash, yew, silver birch, holly and whitebeam. The heavy shade and root competition from the beech restrict the diversity of ash-maple woodland species, all of which can occur in small quantities. Only dog's mercury, sanicle, ivy, bramble, and wall lettuce occur in any abundance where the beech canopy is mature. Characteristic species are yew, wall lettuce and sanicle. Three sub-communities are described and all occur in London.

2.5 ***Yew woodland***. (NVC W13). This type is rare (or absent) in London. It is found on dry and exposed chalk. It is a more extreme type than the beech hangers and, like them, few other species survive under the heavy shade.

2.6 ***Beech-bramble woodland***. (NVC W14). This is the beech dominated equivalent of the oak-honeysuckle woodland and, like it, is distinguished from related woodlands more by what it lacks than by any characteristic species. This community probably follows oak-honeysuckle woodlands in succession on better-drained sites. It proved difficult to identify in the London data, and there appears to be little of it in the Sites of Metropolitan Importance. However, if it was grouped with beech hangers or acid beech into one survey parcel, it could easily be overlooked. Pedunculate oak and silver birch are the only other frequent trees and, where there is little browsing, holly commonly forms a sub-canopy beneath the beech. The other species of oak-honeysuckle woodland are largely excluded by the heavy shade and root competition of the dominant beech. Bramble carpets the ground in the older stands, with a little bracken and honeysuckle. There are no recognised sub-communities.

2.7 ***Acid beech woodland***. (NVC W15). This is the beech dominated equivalent of the birch-oak woodland. It often has large amounts of the dominant species of the latter, pedunculate oak and silver birch, and of Scots pine. Also it often has much holly, some rowan and a scattering of bracken and wavy hair-grass. It might be better considered a sub-community of birch-oak woodland. Characteristic species include pill sedge, bilberry, heather, holly and more rarely common cow-wheat and wood sorrel. None of this community was positively identified within the Sites of Metropolitan Importance but, as with the previous community, it could have been subsumed into beech hangers, or in this case, into birch-oak woodland. Four sub-communities are described and all could occur in London.

2.8 ***Alder nettle woodland*** (NVC W6). This species-poor wet woodland type is probably the most widespread wet woodland community in London. It occurs mainly beside rivers and lakes where nutrient levels are maintained by periodic flooding. It is distinguished mainly by the abundance of nettle and scarcity or absence of species like common reed, lesser pond sedge, wild angelica, meadowsweet, purple loosestrife, common loosestrife, hemp agrimony, marsh marigold and common valerian. Usually it has a canopy of alder, but it may have crack willow, downy birch, osier willows or grey willow, and a little oak, ash or sycamore. The shrub layer may have grey willow, bramble, honeysuckle and elder. With the nettle may be cleavers, reed canary-grass, great willowherb, yellow iris, hedge bindweed and broad-buckler fern.

2.9 ***Swamp carr***. (NVC W5). This species-rich wet woodland comes about through succession in reedbeds and sedge fens. In the young stages it has much grey willow as well as alder, but the alder predominates later. There may also be a few ash, oak, downy birch, alder buckthorn, guelder rose and hawthorn. Bramble is the only frequent shrub, but there may be some honeysuckle. Reed eventually becomes shaded out by the tree canopy but lesser pond-sedge can survive under the mature canopy. Other fen species in this community include nettle, meadowsweet, common valerian, common marsh-bedstraw and water mint. This community is very likely to occur in London, but was not confidently identified in the Metropolitan Sites data. Characteristic species include lesser pond-sedge, remote sedge, marsh thistle, opposite-leaved golden saxifrage, hemp agrimony, alder buckthorn, yellow iris, gypsywort, purple loosestrife and bittersweet. Three sub-communities are described and two could occur in London.

2.10 ***Fen carr*** (NVC W2). This community too can be the result of succession in a fen community, but it can also result from the cessation of mowing of a marsh. Its national distribution is concentrated in East Anglia and the West Midlands and it may not occur in London. It is distinguished from alder carr by the infrequency of reed and frequency of bulky sedges, downy birch, grey willow and of sphagnum species in one sub-community.

2.11 ***Flush alder wood*** (NVC W7). This alder dominated woodland typically occurs on slope flushes within oak woodland types in north-west Britain and the Weald. It may occur in London. It is distinguished from swamp and fen carrs by the scarcity of sedges and other fen species. It may have nettle on the ground, but is distinguished from the nettle woodland by having more yellow pimpernel, meadowsweet, lady fern, remote sedge, grasses and creeping buttercup.

2.12 ***Grey willow carr*** (NVC W1). This species-poor woodland is dominated very largely by grey willow and marsh bedstraw is usually found in its ground layer. It is found on mineral soils around lowland water bodies and probably occurs in London. There may be a few trees of other wetland species, or hawthorns and brambles, and grasses, bittersweet, ivy, water mint and soft rush below, but sedges and tall grasses are generally absent.

2.13 ***Birch-purple moor-grass*** (NVC W4). This is a simple community of wet acid soils, usually dominated by downy birch. It may have some alder, silver birch and a little oak, but no ash. The understorey may have willows, especially grey willow. Beneath this is largely purple moor-grass, usually with some sphagnum. Different subcommunities may have bramble, honeysuckle, broad buckler fern, Yorkshire fog, tufted hair-grass, creeping soft grass, soft rush and heather. Probably all three subcommunities occur in London in association with heathland and mire.

2.14 ***Hawthorn hedge & scrub*** (NVC W21). The majority of London's scrub, woodland edge and hedgerows fall within this single community type, characterised by much hawthorn and bramble, some blackthorn and dog rose and, in London, by cherry plum and plum. Ivy and young trees of ash and sycamore are common. It is regarded as a successional stage to the oak, ash, sycamore, hornbeam and maple woodlands, except where management arrests succession (as in hedgerows). The ***chalk scrub*** subcommunity (NVC W21d) is found on dry, base rich soils, and may include much dogwood, wayfaring tree, roses, yew, elder, privet, black bryony and old-man's beard, wood false-brome beneath, and trees from the base-rich woodland types. Several orchids can occur in this scrub type and it often occurs in a mosaic with chalk grasslands. A poorer subcommunity of these soils, ***wood false-brome scrub*** (NVC W21c) is more common in the north of Britain, but may describe chalk scrub in places where colonisation by a variety of species is difficult because of isolation from sources. This community often has wild strawberry and common dog-violet. The ***ash-elm*** subcommunity (NVC W21b) is found on heavier basic soils and is the scrub equivalent of ash-maple woodland, sharing with it many trees, shrubs and ground flora. It may also succeed the other subcommunities as the scrub canopy closes. Much of London's suckering elm scrub falls here and other characteristic trees include field maple. On made ground and abandoned agriculture the ***elder-buddleia*** subcommunity (NVC W21a) is widespread in London and it covers such a range of composition that the NVC subcommunity probably should be further subdivided, it typically has much nettle and cleavers beneath and a good variety of other herbs, such as red dead-nettle, common chickweed, creeping thistle, lesser burdock, hogweed, hedge bindweed, false oat-grass, Yorkshire fog, couch, squirrel-tail fescue, hawkweed oxtongue, sterile brome and other wasteland species. On chalky rubble this community borders on pure buddleia scrub. On less extreme basic soils succession to ash-maple woodland occurs and on more mesotrophic soils succession is to oak-honeysuckle woodland. All the subcommunities may be found on London's railsides.

2.15 ***Blackthorn scrub*** (NVC 22b). This scrub community is typically dominated by blackthorn, but otherwise parallels the hawthorn hedge and scrub community. The dense canopy of blackthorn makes this community generally poorer in species compared with the hawthorn community. It is widespread on London's railsides.

2.16 ***Gorse scrub*** (NVC W23a). This scrub community is found on base-poor free-draining soils. Apart from common gorse, it may have broom and much bramble, young birch and oak. Very little grows on the ground below the gorse, but the community commonly occurs in a mosaic with grasslands having common bent and heath bedstraw. It occurs where the more acid woodlands have been felled, on woodland edges, or in succession to acid woodlands, but not in hedgerows. It is common where London's railsides pass through appropriate soils. Where there are appreciable amounts of heather or dwarf gorse the community is included in the heathland audit.

2.17 ***Bramble-Yorkshire fog scrub*** (NVC W24). This scrub type has elements of mesotrophic ('neutral') grassland and occurs on moist soils where woodland has been cleared, on rides and woodland edges or where bramble has invaded neutral grassland. Other common grasses are cock's-foot, red fescue and false oat-grass. There are often patches of nettle, hogweed, cow parsley, creeping thistle, spear thistle and rosebay willowherb. Underneath the bramble canopy are ivy and a scattering of woodland herbs. There are few or no other shrubs. The community is widespread on London's railsides and as a successional stage following garden use or wasteland.

2.18 ***Bracken-Bramble scrub*** (NVC W25). This is the equivalent of bramble-Yorkshire fog scrub on base poor freely draining soils. As there, this community has few or no other shrubs and few other associates, and occurs where woodland has been cleared, on rides and woodland edges or where bramble and bracken have invaded base poor grassland. It too is found on abandoned sites and on railsides where the soil is suitable.

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[a] Dr M. Game in Chapter 3 of the Greater London Council Ecology Handbook No.4, *A Nature Conservation Strategy for London: Woodland, Wasteland, the Tidal Thames and two London Boroughs.*

[b] The Institute of Terrestrial Ecology Land Cover Map of Great Britain (cited in *Focus on London 99,* Eds. Matheson, J. & Holding, A. 1999. The Stationery Office, London) found 8,000 ha of deciduous woodland in London by classifying each one kilometre square in the London area according to its majority habitat. These statistics will be biased high by the inclusion of all one kilometre squares that overlap London's boundary (whereas on average half of these are not in London), and biased low by the omission of many smaller woodlands that do not make up the majority of a one kilometre square. Given this, the coincidence with the Habitat Survey minimum figure of 7,100 ha of deciduous woodland is remarkably good. The statistics from a survey undertaken for *Task Force Trees* and published by the Countryside Commission (CCP 433, *Action for London's Trees, Investing in a leafy Capital,* 1993), however, are badly misleading, as 'stands' of trees (woodlands, orchards, etc.) were counted, but not otherwise documented and most of the statistics relate to individual trees standing as specimens in the open, not in a woodland community. The counts thus omit most of London's trees - those in woodlands. Unfortunately others (including some individual borough councils and London Planning Advisory Committee's *State of the Environment Report for London*) have taken the *Task Force Trees* statistics to be complete. The 4.5% woodland cover from the Habitat Survey compares with estimates by Dawson, D.G. & Warrell, A. 1992. *The amount of each kind of ground cover in Greater London.* London Ecology Unit 1992, which included woodland in three heterogeneous categories (golf courses 3.2%, nature conservation areas 2.4% and railway verges 1.0%) as well as woodland itself 1.9%. The different classifications of the two studies make comparison difficult, but the order of size appears about right.

[c] Peterken, G. 1981. *Woodland Conservation and Management.* Chapman & Hall, London.

[d] The non-statutory hierarchy of sites for protection in planning is described in *Policy, criteria and procedures for identifying nature conservation sites in London.* London Ecology Unit, 1994. Adopted by both the London Ecology Committee and London Planning Advisory Committee, and referred to in paragraph 7.25 of Regional Planning Guidance for London (RPG3). Metropolitan Sites include all biological SSSIs in London.

[e] Areas that have been continuously in woodland use since 1600 AD are considered ancient. Some of these have lost their semi-natural canopy through clearance and planting, but the more valuable ancient woodlands still have a semi-natural woody composition. It is believed that planting of new woodland was rare before 1600, so that most ancient woodlands have continuity through to the natural wildwood. Ancient planted woodlands also tend to be of high quality because they have had a long time to acquire species from nearby ancient woodland.

[f] For example much of 60 Acre Wood in Kingston and of Epping Forest is not ancient, yet these two are among the very best wooded areas in London. Conversely, some ancient woodlands have been subject to unsympathetic management for many years and are far from Metropolitan Importance (for example Biggin Wood in north Croydon or Barnet Gate Wood in Barnet).

[g] The Wet Woodland habitat action plan was published in 1998 (*UK Biodiversity Group. Tranche 2 Action Plans. Volume II - terrestrial and freshwater habitat,* English Nature). This includes all the wet woodlands described in this audit, except for the drier kinds of birch-purple moor-grass, and also wetter stands of the ash-maple-sycamore woodlands. We prefer to include all the birch-purple moor-grass, as the two NVC subcommunities excluded in the national plan are generally wet where they occur in London. Nationally there are estimated to be some 25,000 to 30,000 ha of wet woodland in ancient semi-natural woodland and as much again in secondary woodland.

[h] The Lowland beech and yew habitat action plan was published in 1998 (*UK Biodiversity Group. Tranche 2 Action Plans. Volume II - terrestrial and freshwater habitat,* English Nature). It includes all the beech and yew woodlands described in this audit. Nationally there are estimated to be 15,000 to 25,000 ha of ancient semi-natural woodland in these community types and a further 30,000 ha of recent beech woodland. Much of this is beech-bramble (45%) or beech hangers (40%) and only about 15% is acid beech woodland.

[i] It lists the weevils *Melanapion minimum* & *Rhynchaenus testaceus,* the craneflies *Lipsothrix escullata, L. nervosa, L. errans* & *L. negristigma,* and the netted carpet moth *Eustromia reticulata.*

[j] Devil's bolete *Boletus satanus,* a hedgehog fungus *Hericeum erinaceum* and the knothole moss *Zygodon forsteri.*

[k] Rodwell, J.S. (Ed) (1991). *British Plant Communities, Volume I, Woodlands and Scrub.* Cambridge University Press.

[l] Figure 7, page 21, of Rodwell (1991).

[m] These are adopted by the London Ecology Committee on the recommendation of the London Ecology Unit, following the *Policy, criteria and procedures for identifying nature conservation sites in London,* London Ecology Unit, 1994. They include all biological SSSIs in London.

HA2: Open Landscapes With Ancient/Old Trees

Definition

This audit includes the following habitats:

- Deer parks
- Wood pasture
- Other areas of unimproved grassland with scattered old trees (usually oak).

Old, mostly 19th century landscaped parklands are also included where these appear to have been superimposed on former wood pasture or deer parks.

These habitats are derived from medieval forests, wooded commons, parks and pastures with trees in them. Subsequently, some had a designed landscape superimposed; usually during the 19th century. A range of native species usually predominates amongst the old trees, together with non-native species that have usually been planted. The Royal Parks are classic examples.

Defunct wood pasture is found where the traditional management of stock grazing is no longer practised and where the trees are no longer pollarded to provide timber or fodder. They may include a landscape history of commoners' rights and forest rights. A typical example is Epping Forest.

Parklands are the typical open landscapes with scattered trees. They may include a history of having been enclosed and managed as deer parks, Royal hunting grounds or formal public and private open landscapes.

London's open landscapes with ancient/old trees resource

There have been no previous comprehensive surveys of this resource. There are many difficulties in trying to establish the extent of this habitat type due to it's complex composition. It has, therefore, been very difficult to identify discrete areas of open landscape with ancient/old trees. Many areas of former wood pasture, for example, have developed into closed canopy woodland since the cessation of grazing and the natural character of some former wood pasture or deer park has been lost as a result of subsequent landscape planting or conversion to more formal urban parks. On the rural fringes of London some of this habitat may have been lost via conversion to farmland. Table 1 and the Map summarise the extent of this resource within the limitations outlined above.

Although not included within this audit, the city squares in the City of London and boroughs such as Islington, Kensington and Chelsea and Westminster support significant numbers of mature trees, particularly London Plane *Platanus* x *hispanica*. This species is not noted for its nature conservation value.

It is important to stress that this audit deals specifically with ancient/old trees found *within open landscapes* as opposed to an audit of individual ancient/old trees. Clearly ancient/old trees occur within several other habitats, particularly within the more formal parks and open spaces which are not covered by this audit; in woodlands, old hedgerows and within larger gardens of low-density suburban housing.

Table 1: The Extent of the Open Landscapes with Ancient/Old Trees Resource in London

Borough	Area (ha)	Borough	Area (ha)
City of London	0	Hounslow	19
Barking and Dagenham	0	Islington	3
Barnet	41	Kensington and Chelsea	35
Bexley	4	Kingston	0
Brent	22 *(20)*	Lambeth	0
Bromley	0	Lewisham	41
Camden	(39)	Merton	75
Croydon	22	Newham	86
Ealing	31	Redbridge	52
Enfield	55	Richmond	974 *(80)*
Greenwich	65	Southwark	30 *(30)*
Hackney	*(21)*	Sutton	*(58)*
Hammersmith &Fulham	*(4)*	Tower Hamlets	0
Haringey	0	Waltham Forest	20
Harrow	93	Wandsworth	28 *(83)*
Havering	74	Westminster	*(375)*
Hillingdon	23	London Total	**1899** ***(720)***

NB: Figures in parentheses indicate areas which are open landscapes with old trees, but where the trees are predominantly exotics.

Nature Conservation Importance

The old trees and dead wood components of wood-pasture have some similarities to the original 'wildwood'. These sites are frequently of national, cultural and landscape importance. The great number and continuity of ancient/old trees and associated dead wood habitats within these areas are outstanding at a European scale and this habitat is most common in southern Britain. Pedunculate oak *Quercus robur* is the most common tree associated with this habitat although others, particularly sweet chesnut *Castanea sativa*, are associated with this resource in London. However, in former deer parks and wood pastures, which have subsequently been, landscaped, exotic tree species (particularly London plane) often greatly outnumber the native oaks.

Parkland and wood-pasture habitats are particularly of value for the fungi, lichens, and insects associated with ancient/old trees and decaying timber. Several species of insect such as the click beetle *Ampedus cardinalis* and the cranefly *Ctenophora pectinicornis* which are confined to the deadwood habitat in the trees. Isolated oak trees may also support colonies of the purple hairstreak butterfly.

Open landscapes with ancient/old trees support a wide variety of bird species that are typical of both woodland and grassland habitats. However, green woodpecker, kestrel and nuthatch are species with a particular affinity for this habitat type. Mature trees and open habitats may also be of significance to bats, which may utilise them as roosts sites and as flight line features in the landscape.

Some open landscapes with ancient/old trees of nature conservation value in Greater London

Barn Hill Open Space, LB Brent

Bedfords Park, LB Havering

Bentley Priory, LB Harrow

Greenwich Park, LB Greenwich

Richmond Park, LB Richmond upon Thames

Trent Park, LB Enfield

Threats and Opportunities

Threats

The major threat to open landscapes with ancient/old trees is the cessation of traditional management, particularly grazing. Most sites in London are no longer managed in this way although deer still graze Richmond Park and Bushy Park. The remainder of this habitat in London is maintained by mowing, which is a much less sympathetic management regime. In addition to the lack of grazing, many mature parkland trees are managed inappropriately from a nature conservation point of view, by the removal dead and decaying limbs and the clearance of fallen or standing dead wood.

Open landscapes with ancient/old trees are, by definition, habitats with a well-established presence in the landscape. This is itself a threat to their survival as it is often forgotten that they are essentially human-created landscapes that need to be maintained by human intervention. New generations of trees need to be planted (or naturally regenerating saplings protected from mowing or grazing) as long-term replacements for extant mature specimens.

A less obvious threat, but one which may adversely affect the diversity of sensitive species such as lichens and fungi living on the mature trees, is air pollution. It is well known that many lichen species are sensitive to air pollution and their loss, or failure to re-establish themselves, may have unforeseen consequences for a wider range of species which may be dependent upon the lichen communities.

Poor management of these sites is linked with a poor understanding of their nature conservation value and a concern for public safety. There is a widespread and mistaken belief that dead wood is bad for the tree and a public hazard.

Opportunities

Most of the resource in London lies within areas of protected open space. However, this does not necessarily ensure effective nature conservation management, as the protection is aimed mainly at maintaining the recreational and aesthetic attributes of habitat. However, under the auspices of the Veteran Trees Initiative, better management of ancient and old trees for nature conservation is being promoted. A number of sites around London provide examples of successful re-introduction of pollarding, planting of replacement trees, and resumption of grazing management. These techniques could be readily translated to sites within London.

The old parklands in London are among the most popular places visited by Londoners and tourists alike. Most informal recreational activity is compatible with maintaining the nature conservation of these sites and, therefore, there are opportunities for raising awareness about park management that integrates biodiversity conservation, landscape maintenance and recreational demand. Awareness-

raising programmes could focus on the conservation work for some high-profile species such as the stag beetle, bats and woodpeckers.

Local communities could become involved with the conservation of this habitat by collecting and propagating local seed (from oaks and other appropriate trees) for eventual planting out to provide future generations of parkland trees.

The moss and lichen communities on ancient and old parkland trees may provide a useful biological indicator for air quality in the city. Recovery of fungi, mosses and lichens on the trees is related directly to reductions in nitrogen dioxide and sulphur dioxide in the air. As a better understanding develops of the potentially damaging effects of climate change on trees (for example drought stress), people may develop a better appreciation of their own responsibilities in terms of air pollution and water consumption. This would provide a link between the London Biodiversity Action Plan and other environmental initiatives.

Data Sources

Alexander, K. (November 1998). National Trust personal communication.

Archer, J. & Yarham, I. (1991). *Nature Conservation in Newham.* Ecology Handbook Number 17. London Ecology Unit.

Bantock, C.R. (1984). *The Ecology of Open Spaces in Haringey.*Haringey Wildlife Group.

Bullock, D. J. & Alexander, K. (1998). *Parklands - the way forward* 19-21 May 1998, Hereford Proceedings. English Nature Research Report 295.

Clenet, D., Britton, B. & Game, M. (1988). *Nature Conservation in Croydon.* Ecology Handbook Number 9. London Ecology Unit.

Farino, T. & Game, M. (1988). *Nature Conservation in Hillingdon*. Ecology Handbook Number 7. London Ecology Unit.

Forbes, V. (1998). National Trust, Hatfield Park. Personal communication.

Game, M. & Whitfield, J. (1996). *Nature Conservation in Tower Hamlets.* Ecology Handbook Number 27. London Ecology Unit.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

Haringey Parks Service. (Undated). *Nature Conservation Strategy*. LB Haringey.

Key, R. (1998). English Nature. Personal communication.

Read, H.J. (1991). *Pollard and Veteran Tree Management*. Corporation of London.

Read, H.J. (1991). *Pollard and Veteran Tree Management Volume 2*. Corporation of London.

Reid, C. & Wilson, C. (1995). *The Parkland Inventory Project: A Pilot Study for an Inventory of Parklands.* English Nature Research Report No. 147.

Richardson, A. (1998). English Heritage. Personal communication.

Swales, S., Yarham, I. & Britton, B. (1992). *Nature Conservation in Kingston upon Thames.* Ecology Handbook Number 18. London Ecology Unit.

Waite, M. (1991). *Bexley Wildlife Survey Part 1: Schedule of Sites of Nature Conservation Importance.* London Ecology Unit.

Waite, M. (1998). *A revised Schedule of Sites of Importance for Nature Conservation in Enfield.* London Ecology Unit.

Waite, M. & Archer, J. (1992). *Nature Conservation in Islington*. Ecology Handbook Number 19. London Ecology Unit.

Yarham, I., Barnes, R. & Britton, B. (1993). *Nature Conservation in Sutton*. Ecology Handbook Number 22. London Ecology Unit.

Wicks, D. & Cloughley, P (Eds) (1997). *The Biodiversity of Southeast England: An Audit and Assessment*. Hampshire and Isle of Wight Wildlife Trust.

Rationale and limitations of approach

This audit was conducted as a desk top study, relying upon the best available data, the present day accuracy of which may vary from site to site.

The audit should be treated as a guide and not as a definitive statement of the extent of Greater London's Open Landscapes with Ancient/Old Trees. Each borough could refine the audit by co-ordinating a re-survey of the listed sites, thereby adding to, or reducing the number of sites or area of each site included.

The majority of the data collected has been taken from the London Ecology Unit (LEU) 'Phase 1' habitat survey of Greater London (1984). This survey represents the most fully comprehensive survey to date. It has been cross-referenced with re-surveys carried out by LEU. Further cross-reference was made with the Register of Parks and Gardens of Greater London compiled by English Heritage. Without visiting every site to assess whether or not each should be included within this audit, it is not possible at this stage to differentiate easily between parks with ancient/old trees but with no other notable habitat features and those parks with all these features. Therefore, some sites may have been included at this stage that do not possess all features, whilst others that do possess all features have been excluded.

A considerable amount of further research is needed to obtain a full audit of this resource. For example, difficulties may arise where ancient and old trees occur alongside rivers and streams; some opinion holds that this relationship should be treated as linear wood pasture. Further difficulties may arise where ancient and old trees occur at the edges of ancient woodland, where the distinction between woodland and open landscape may not be clear. At this stage of evaluation, it has not been possible to identify those pasture sites where the intervening hedgerows include ancient or old trees; this information is not yet included in the LEU data set. For example, there may be significant numbers of ancient hedgerows alongside hay meadows or pastures in several of the north London outer boroughs such as Havering and Barnet.

Whatever definitions are arrived at in future in London, a fundamental point must be maintained: namely that it is the wood decay caused by the symbiotic relationship between the tree and its fungi that is most important. This relationship gives rise to a 'deadwood' ecosystem where fungi, mosses and lichens thrive and provide a food source for an invertebrate food chain. Conserving deadwood will pose the biggest challenge to London's site managers.

Appendix

Table 2: Open Landscapes With Ancient/Old Trees By Borough.

Borough	Site Name	Grid Reference	Area(ha)
Barnet	Highwood Hill (Sellars Field)	222 935	7
	Hampstead Heath	260875	6
	Totteridge Common	230 939	3
	Prince's Park	243 885	1
	Friary Park	273 926	9
	Edgwarebury Park	190 934	15
	Borough Total		**41**
Bexley	Bigs Hill Wood	506 748	3
	Waring Park	5468 1724	1
	Borough Total		**4**
Brent	Barn Hill Open Space	194 875	22
	Gladstone Park	223 858	20
	Borough Total		**22 (20)**
Camden	Hampstead Heath	270 867	
	Waterlow Park	286 871	11
	Regent's Park	281 828	28
	Borough Total		**39**
Croydon	The Ruffets	349 633	1
	Beaulieu Heights	334 695	7
	Norwood Grove	310 700	14
	Borough Total		**22**
Ealing	Horsenden Hill		20
	Twyford Abbey	190 832	6
	Islip Manor Park	127 843	5
	Borough Total		**31**
Enfield	Trent Park	289 975	31
	Forty Hill Park and Estate	335 987	24
	Borough Total		**55**

Borough	Site Name	Grid Reference	Area(ha)
Greenwich	Greenwich Park	392 765	65
	Maryon Wilson Park		6
	Borough Total		**71**
Hackney	Clissold Park	327 865	21
	Borough Total		**21**
Hammersmith & Fulham	Fulham Palace and Bishop's Park	243 760	4
	Borough Total		**4**
Harrow	Bentley Priory	155 928	62
	Grounds of the Royal National Orthopedic Hospital	159 939	11
	Pear Wood and Stanmore Country Park	172 933	20
	Borough Total		**93**
Havering	Bedfords Park	523 919	12
	Dagnam Parkland Pastures and Woods	547 936	43
	Dagnam Park	552 932	16
	Latchet Shaw	590 891	3
	Borough Total		**74**
Hillingdon	Hillingdon Court Park	072 839	23
	Borough Total		**23**
Hounslow	Chiswick House Grounds	209 775	19
	Osterley Park	146 781	55
	Syon Park	173 767	47
	Borough Total		**266**
Kensington & Chelsea	Kensington Gardens	257 797 - 268 805	18
	Borough Total		**18**
Lewisham	Beckenham Place Park Golf Course	383 707	39
	Mayow Park	357 719	2
	Borough Total		**41**

Borough	Site Name	Grid Reference	Area(ha)
Merton	Morden Hall Park	261 687	20
	Wimbledon Park Golf Course	245 723	20
	Morden Park	246 675	35
	Borough Total		**75**
Newham	West Ham Park	401 842	31
	Borough Total		**31**
Redbridge	Claybury Hospital	429 917 - 440 908	8
	Woodford Green Cricket Ground	399 915 - 400 917	9
	Epping Forest - Whitehall Plain	400 940	35
	Borough Total		**52**
Richmond upon Thames	Hampton Court Park	165 685	188
	Bushy Park	155 698	240
	Old Deer Park	180 763	86
	The Copse and Holly Hedge Field	176 728	10
	Richmond Park	200 730	450
	Kew Gardens	185 770	80
	Borough Total		**974 (80)**
Southwark	Dulwich and Sydenham Hill Golf Course	340 727	30
	Dulwich Park	336 736	30
	Borough Total		**30 (30)**
Sutton	Beddington Park	292 654	58
	Borough Total		**(58)**
Waltham Forest	Highhams Park	395 922	9
	Epping Forest	392 892	11
	Borough Total		**20**
Wandsworth	Tooting Bec Common	287 715 - 296 720	16
	Wandsworth Common	266 745 - 278 734	12
	Battersea Park	280 767 - 286 775	83
	Borough Total		**28 (83)**

Borough	Site Name	Grid Reference	Area(ha)
Westminster	Regent's Park	274 832 - 285 835	74
	Green Park	287 799 - 291 798	62
	St. James' Park	295 798 - 290 799	49
	Kensington Gardens	260 803 - 268 805	190
	Borough Total		**(375)**
London total			**1899 (720)**

NB: Lambeth has no records, though Clapham Common and Brockwell Park have areas of similar habitat.

HA3: Acid Grassland

Definition

Acid grassland generally consists of fine-leaved grasses such as common bent and fescues, with typical herbs such as sheep's sorrel, tormentil and heath bedstraw. Acid grassland flora is sometimes associated with lowland heath and mire communities. This assemblage is commonly found on nutrient-poor, free-draining and acidic soils underlain by the sands of bagshot beds, gravels, sandstones and acid igneous rocks.

London's acid grassland resource

Although acid grassland is one of the most extensive semi-natural habitats in the United Kingdom, there are scant data on its true extent. Estimates suggest that there is in excess of 1,200,000 ha of acid grassland in the uplands but in the lowlands there is unlikely to be more than 30,000ha (HMSO 1995). The acid grassland resource in London covers an estimated 1,300 ha, which represents some 4% of the total in lowland Britain.

Acid grassland is widespread throughout London; only six out of the thirty-three London boroughs have no recorded areas of acid grassland. There are several quite extensive areas, particularly in the Royal Parks in west London, the southern part of Epping Forest in north London and Wimbledon Common; but in many boroughs the habitat is limited in extent and highly fragmented.

Richmond upon Thames has the largest total area of acid grassland in Greater London with 580 ha (mostly in Richmond Park). This accounts for almost half of this habitat in Greater London. Croydon has 130 ha of acid grassland, which although the second largest amount in London, is less than a quarter of Richmond's resource (see Table 1 and the Map). Merton has 109 ha of acid grassland, the third largest area within a London borough. The approximate figures for additional boroughs are also given.

Table 1: Acid Grassland Resource within Greater London

Borough	Total Acid Grassland (ha)	Percentage of London's resource (%)
City of London	0	0
City of Westminster	0.1	(0.01)
Barking & Dagenham	8	0.6
Barnet	26	2.1
Bexley	9	0.7
Brent	0	0
Bromley	59	4.7
Camden	38	3
Croydon	130	10.3
Ealing	2	0.1
Enfield	7	0.5
Greenwich	14	1.1
Hackney	0.5	(0.04)

Borough	Total Acid Grassland (ha)	Percentage of London's resource (%)
Hammersmith & Fulham	0	0
Haringey	3	0.2
Harrow	10	0.8
Havering	5	0.4
Hillingdon	22	1.7
Hounslow	25	2
Islington	0.5	(0.03)
Kensington & Chelsea	2	0.2
Kingston upon Thames	17	1.4
Lambeth	2	0.2
Lewisham	8	0.6
Merton	109	8.7
Newham	0	0
Redbridge	120	9.5
Richmond upon Thames	580	46
Southwark	0.5	(0.03)
Sutton	0	0
Tower Hamlets	0	0
Waltham Forest	44	3.5
Wandsworth	29	2.3
London Total	**1,264 ha**	

NB: Numbers have been rounded to two significant figures. The UK lowland acid grassland resource is an estimate. Taken from London Ecology Unit Survey Data, 1984, 1989, 1993, 1994, 1995 & 1997 and HMSO 1995.

Nature Conservation Importance

Lowland acid grassland is becoming increasingly rare in Britain. Although intrinsically less species-rich than neutral or chalk grassland of similar quality, acid grassland contains many characteristic species that do not occur widely in other grassland types. Nationally rare plants such as clustered clover *Trifolium glomeratum*, fine-leaved sandwort *Minuartia hybrida* and autumn squill *Scilla autumnalis* can all be found in acid grassland in London. Even within central London, in the City of Westminster, a tiny patch of acid grassland supports harebell *Campanula rotundifolia*. More typical acid grassland species include mat grass *Nardus stricta*, early hair-grass *Aira praecox* and sheep's sorrel *Rumex acetosella*.

Acid grasslands are also valuable for invertebrates, especially hymenoptera (ants, bees and wasps) such as the mining bee *Andrena florea*; and butterflies such as green hairstreak and small copper. Few bird species have a particular association with acid grasslands, but green woodpecker, meadow pipit and linnet are invariably present on the larger acid grassland sites.

Some acid grassland sites of nature conservation value in Greater London

Hounslow Heath, LB Hounslow

Leyton Flats, LB Waltham Forest

Richmond Park, LB Richmond upon Thames

Wimbledon Common and Putney Heath, LB Merton, LB Kingston upon Thames, LB Wandsworth

Threats and Opportunities

Threats

Lowland acid grassland is declining nationally. It is likely that the area has declined greatly within London with the loss of traditional management practices affecting core areas such as commons and heaths. The current threats to this habitat include:

- Loss of habitat through cessation of traditional management, especially grazing, causing encroachment by trees and scrub.
- Damage and erosion caused by increasing recreational pressure.
- Fragmentation and isolation of the remaining habitat.
- Direct loss of habitat due to 'improvement' of grassland for amenity purposes e.g. mowing and/or fertiliser application to produce a sward suitable for golf course fairways or sports pitches.

Opportunities

Although much reduced in area and distribution and varying in quality, acid grassland is still a significant habitat in Greater London, particularly in the many parks and commons. It is, however, a fragile habitat which requires careful management. Many formal parks and open spaces contain areas of acid grassland and relaxation of the mowing regime in these areas will quite quickly result in some enhancement of biodiversity – common blue, small heath and small copper butterflies could be encouraged to breed, for example. A considerable amount of acid grassland also occurs on some of London's older golf courses and a similar programme of identifying key areas and modifying mowing regimes could result in considerable benefit to biodiversity without seriously detracting from the primary purpose of the course.

Opportunities should be sought to enhance existing extensive areas of acid grassland through methods such as scrub clearance and the re-introduction of grazing. This should be carried out only after careful consideration of the value of alternative management options; some areas might be suitable for restoration to heathland and in other areas a scrub/grassland mosaic may be especially valuable for certain species of bird and invertebrate. Mowing may be the only practical management regime for most acid grassland.

Where recreational pressure is resulting in loss or damage to important acid grassland habitat, visitor management should be implemented in combination with a programme to raise awareness of the value of acid grassland sites. Erosion caused by recreational use of acid grasslands can, in some instances, be of benefit, creating bare areas which are favoured by some acid grassland invertebrates, particularly those that require exposed ground in which they can burrow.

Data Sources

Archer, J. & Curson D. (1993). *Nature Conservation in Richmond upon Thames.* London Ecology Unit.

Archer, J. & Robinson P. (1994). *Royal Borough of Kensington and Chelsea. Borough Ecological Survey.* London Ecology Unit.

Archer, J. Dawson, & D. Hewlett, J. (1995). *City of Westminster Nature Conservation Survey.* London Ecology Unit.

HMSO (1995). *Biodiversity: The UK Steering Group Report. Volume 2 Action Plans.* London HMSO.

London Ecology Unit, (1989). *Islington Wildlife Survey.* London Ecology Unit.

London Ecology Unit, (1997). *Redbridge Habitat Survey*. London Ecology Unit.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

Wicks, D & Cloughley, P (Eds) (1998). *The Biodiversity of Southeast England: An Audit and Assessment.* Hampshire and Isle of Wight Wildlife Trust.

Rationale and limitations of approach.

Data were taken from the London Wildlife Habitat Survey (1984/85) and selected re-surveys of individual boroughs. The choice of data used reflects both data availability and time constraints. The following re-survey data was used: Kensington and Chelsea (1994) Islington (1989) Westminster (1995) and Redbridge (1997).

It is likely that acid grassland is under-recorded owing to difficulties in locating all examples of this habitat. Furthermore, much acid grassland in heathland landscapes may have been recorded as heath.

HA4: Chalk Grassland

Definition

Chalk grasslands develop on shallow lime-rich soils, notably on the downland of south-east England. The habitat supports a wealth of wildflowers and a wide array of butterflies, grasshoppers and other invertebrates, many of which are restricted to chalk soils.

London's Chalk Grassland Resource

In London, chalk grassland is largely restricted to the southern edge of the metropolitan boundary. Here parts of the North Downs lie within the Boroughs of Sutton, Croydon and Bromley. Another area of chalk lies on the extreme north-western edge, in the Borough of Hillingdon, where outliers of the Chiltern Hills are just within the Greater London boundary. Further small patches of grassland containing species typical of the chalk can be found scattered throughout London growing on artificial calcareous substrates such as railway ballast and fly ash.

There are approximately 320 ha of calcareous grassland in Greater London. The approximate figures for each borough are given in Table 1and represented by the Map. There are approximately 9,560 hectares of calcareous grassland in south-east England.

Table 1: Chalk Grassland Resource in the United Kingdom, South-East Region and Greater London.

	Total Chalk Grassland Area (ha)	Percentage of London Chalk Grassland Resource (%)
Croydon	184	58
Bromley	92	29
Sutton	37	11
Hillingdon	6	2
Lewisham	0.52 (1 site)	n/a
London Total	319	
South East Region	9,509	
United Kingdom	45,000	

NB: Figures have been rounded to the nearest hectare and percentage with the exception of Lewisham

Table 2 breaks these totals down into individual sites within the 5 boroughs. For the purposes of future updates of the audit, a grid reference is included along with the LEU Habitat Survey Parcel number.

Table 2: Chalk Grassland Area in London by Borough

Croydon

Name of Site	Grid Ref.	Habitat Survey Parcel	Area (ha)
Montpelier Heights	5320 1625	20008	0.85
Foxley Down (wood)	5315 1605	20011	2.13
Riddlesdown and surrounds	5331 1600	20012	23.67
The Pit *	5337 1594	20014	2.31
Addington Golf Complex	5375 1624	20023	10.64
Happy Valley and Farthing Down	5310 1570	20038	36.34
Croham Hurst	5340 1632	20041	3.68
Coulsden Quarry	5303 1592	20046	0.55 **(0.88 ncc)**
Fairdean & Hooley Farm *	5299 1579	20047	37.72
Chipstead Chalk Pastures *	5290 1575	20048	13.82
Croydon Covered Res.	5316 1627	20061	1.70 **(1.9 ncc)**
Old Lodge Sports Ground	5308 1606	20065	0.3
Kenley Common	5331 1589	20067	3.70
Purley Downs	5327 1614	20083	7.95
Betts Mead Kenley *	5319 1585	20086	2.54
Coulsden Chalk Scrub *	5302 1590	20103	0.06
Star Shaw Field & Railway *	5292 1575	20104	0.53
Coulsdon Memorial Recreation Ground	5301 1490	20313	0.5
Hutchinson's Bank, Frylands Wood & Chapel Hill	5383 1615	20021	7.56
Coulsden Common	5332 1570	20069 (site data from CoL)	2
Roundshaw Open Space	5313 1627		20
Sub Total			***184 ha -*** *58% of London's resource*

Bromley

Name of Site	Grid Ref.	Habitat Survey Parcel	Area (ha)
Blackbush Shaw & Cudham Down *	5440 1591	19012	3.07
Salt Box Hill Rough *	5408 1615	19025	1.94 **(7.3 ncc)**
Jewel Wood Complex (inc Furze Bottom)*	5406 1613	19026	24.08
Sunnymede and Stud Farm Woods *	5426 1579	19052	0.39
Cudham Frith	5450 1582	19061	7.51
Church Hill *	5443 1603	19068	1.85
Lordfield Shaw	5442 1609	19070	4.96

Name of Site	Grid Ref.	Habitat Survey Parcel	Area (ha)
Pratts Bottom & Lattice Woods	5473 1614	19060	0.90
West Kent Golf Course	5427 1605	19071	5.01
Doctors Wood & Owen's Wood	5496 1645	19073	1.18
Hookspring & Tile Kilns Woods & Pastures *	5500 1678	19077	11.93
The Larches *	5433 1637	19085	0.75
Chelsfield Chalk Railway Cutting *	5474 1634	19090	1.08
Broom Wood	5458 1606	19094	1.56 **(2.8 ncc)**
Cuckoo Wood High Elms Golf Course	5443 1628	19097	6.56
Rushmore Hill *	5476 1616	19110	0.08
Sevenoaks Road	5464 1627	19111	0.28
West Kent Golf Course *	5423 1615	19116	1.68
Hazel Wood *	5444 1615	19121	0.44
Downe Bank	5437 1608	19122	0.25
Knockholt Station	5482 1630	19141	5.06
Farnborough Way Embankment *	5444 1646	19153	0.16
Chelfield Hill & Wood Pastures	5466 1632	19241	1.42
Ramus Wood & Scrub *	5452 1636	19244	0.27
Goddington Park	5474 1653	19101*	2.97
Sub Total			***92 ha -*** *29% of London's resource.*

Sutton

Name of Site	Grid Ref.	Habitat Survey Parcel	Area (ha)
Roundshaw Downs (Park)	5307 1631	21001	15
Carshalton Road	5278 1608	21011	5.90
Woodcote Park Golf Course	5286 1606	21014	0.72 (**7.8 ncc)**
Fairlawn Oaks Park & Golf Course	5273 1616	21021	0.30
Cuddington Golf Course &Cuddington Hospital	5242 1613	21041	1.5 **(ncc)**
Devonshire Avenue Playground	5262 1632	Su. BII 8	0.2
Banstead Downs	5259 1619	21161(?)	0.5
Water Gardens Bank	5262 1641		0.2
East Sutton Railway Line (The Warren)	5266 1640		5
Sub Total			***36 ha -*** *11% of London's resource*

Lewisham

Name of Site	Grid Ref.	Habitat Survey Parcel	Area (ha)
Hither Green Nature Reserve (Grove Park Railway Cutting & Allotments)	5402 1728	**7002**	0.52
Sub Total			***0.5 -*** *0.3% of London's resource*

Hillingdon

Name of Site	Grid Ref.	LEU Habitat Parcel	Area (ha)
Summer House Lane Chalk Pit *	5043 1916	26113	0.44
Springwell Chalk Pit *	5048 1926	26114	0.84
Coppermill Down	5043 1906	26059	4.40
Sub Total			***6 ha -*** *2% of London's resource*

NB: Sub Totals are rounded to the nearest hectare.
* Not shown in LEU 1984 data as CG. Data source Swales, 1992.

Nature Conservation Importance

Greater London's chalk grassland supports a number of nationally rare species. Many of these are continental in distribution and occur in Britain only on the downland of the Southeast, where climatic conditions are comparable to those of mainland Europe.

The London Boroughs of Sutton and Croydon support populations of the extremely rare and specially protected greater yellow rattle *Rhinanthus serotinus*. The populations found in Sutton, Croydon and in nearby parts of Surrey represent the national stronghold for this species. The London Borough of Bromley holds Britain's largest colony of the nationally rare Kentish milkwort *Polygala amarella*.

Greater London's chalk grassland also support a number of other rare or local plant species such as knapweed broomrape *Orobanche elatior*, lesser calamint *Clinopodium calamintha,* man orchid *Aceras anthropophorum* and fragrant orchid *Gymnadenia conopsea*. Other species typical of chalk grassland which are indicative of the habitat in Greater London are salad burnet *Sanguisorbia minor* ssp. *minor* and kidney vetch *Anthyllis vulneraria*.

This rich and diverse habitat supports numerous invertebrates, with some sites recording as many as 43 butterfly species, some of which are also nationally rare. These include the small blue and chalkhill blue. Most chalk grasslands also support a range of other uncommon or declining species such as skylark, linnet, goldfinch, slow worm and common lizard.

Some calcareous grassland sites of nature conservation value in Greater London

Cudham Frith, Downe Bank & High Elms and Salt Box Hill, LB Bromley

Coppermill Down, LB Hillingdon

Happy Valley and Farthing Down and Hutchinson's Bank, LB Croydon

Roundshaw Open Space and Woodcote Park Golf Course, LB Sutton

Threats and Opportunities

Threats

Traditionally, sheep grazing maintained a short sward and prevented scrub invasion, but with intensification of farming this traditional management practice has largely been abandoned in London. The decline in sheep pasturing and rabbit grazing (following myxomatosis) has resulted in many chalk grasslands succumbing to scrub invasion and natural succession to woodland. Other remaining chalk grassland sites have been modified by applications of fertiliser, partial reseeding and frequent mowing. The continued sprawl of urban London has led to large losses of habitat and conversion to arable has been a problem in the past.

All these factors have led to a reduction in the extent and distribution of this habitat and continue to threaten remaining chalk grassland. The fragmented, isolated nature of the remaining sites makes further decline in their nature conservation interest more likely, particularly the loss of small populations of vulnerable animal species.

Opportunities

Efforts to reverse this trend have been made on a number of sites with some success, particularly through the removal of invasive scrub and restoration of grazing. Where former chalk grassland has been lost to previous arable conversion, there is the potential for reversion to grassland which can become quite species rich. Arable reversion can provide an opportunity for linking together isolated chalk grasslands by providing stepping stones, habitat corridors or extensions to existing habitat.

Old mineral workings and quarries such as those found in Hillingdon and Croydon, may also contain valuable calcareous communities, With suitable management and protection, these often neglected sites represent considerable opportunity for the conservation of species associated with chalk grassland.

Protection from development should be ensured to prevent further losses of this valuable habitat and the UDP status of all chalk grassland sites should be assessed. The potential for LNR status (and SSSI status for all sites where greater yellow rattle occurs) should be fully investigated.

Data Sources

Clenet, D., Britton, B., & Game, M. (1988). *Nature Conservation in Croydon.* Ecology Handbook Number 9. London Ecology Unit.

English Nature (1995). *Grassland Inventory Greater London*. English Nature.

Farino, T., & Game, M. (1988). *Nature Conservation in Hillingdon.* Ecology Handbook Number 7. London Ecology Unit.

Hedley, S. (1988). *London Chalk Grassland Survey.* Project No. 92. England Field Unit. Nature Conservancy Council.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

Swales, S. (1992). *Ecological Audit of Land Owned and Managed by Leisure Services*. London Borough of Bromley Parks and Conservation. Unpublished.

Yarham, I., Barnes, R., & Britton, B. (1993). *Nature Conservation in Sutton.* Ecology Handbook Number 22. London Ecology Unit.

Rationale and limitations of approach

The audit was conducted using the best available data. Some figures used are estimates and the quality of the data may vary from site to site. For many of the sites there is no recent data; consequently the data will include some inaccuracies when compared with the present day situation. Habitat areas have been rounded to the nearest hectare to avoid misleading precision in the figures.

The audit should be used as a guide and not as a definitive statement of Greater London's chalk grassland resource. Each borough could refine the audit by comprehensive re-survey.

Much of the data collected was taken from the London Wildlife Habitat Survey (1984/5). This survey represents the most fully comprehensive survey to date. The survey data have been cross-referenced and updated by re-surveys carried out by the LEU and others.

The data was further cross-referenced with the 'Phase 2' chalk grassland survey undertaken by the Nature Conservancy Council (1988) and the Greater London Grassland Inventory (English Nature 1996). However, JNCC's 1988 survey used stricter criteria in identification of chalk grassland. The distinction between calcicolous and mesotrophic grassland can be uncertain and can lead to double accounting or even omission of sites which would benefit from the Chalk Grassland Habitat Action Plan.

In view of the above, the 1988 data has replaced the 1984/5 data when the area of chalk grassland had increased, but not when chalk grassland area had been reduced or sites omitted. Although this may lead to an inflated estimate of the resource, it is an attempt to provide a comprehensive list of Greater London's chalk grassland in its widest context and to include all potentially applicable habitat in the Habitat Action Plan.

HA5: Grasslands, Meadows and Pasture

Definition

This audit covers areas of unimproved and semi-improved neutral grassland. Traditionally, neutral grasslands were managed as hay meadows or pasture, but today these terms are used rather loosely to describe a variety of grassland types. Generally pastures are grazed for most or all of the year, whilst meadows are allowed to grow through spring and early summer and are then cut during June and July - the cuttings being dried and removed for hay (Hare 1988). In London many grasslands may also be managed for informal recreation or as playing fields.

The principle factors that determine the species composition of neutral grassland are soil type, moisture and management (past and present). Much of London's neutral grassland is found on London Clay sometimes overlain with the sands and loams of the Claygate Beds. The category of unimproved and semi-improved grassland covers a wide range of communities, from rye-grass leys which are floristically very poor, to traditionally managed 'old meadow' communities which are generally rich in species.

London's grassland, meadow and pasture resource

Thomas Milne's map of London (1800) shows much of the area surrounding what was then London (essentially what is now the City of London and the City of Westminster) to be meadows and pastures (Hare 1984). Although the area of neutral grassland has been considerably reduced over the years, it is still relatively widespread throughout London and is a significant habitat type in many outer London Boroughs. The City of London is the only borough that does not have any significant areas of neutral grassland.

There are approximately 11,000 hectares of neutral grassland in London - a considerable area when compared with the meagre acid grassland resource of just 1,200 hectares. Hillingdon has the largest total area of neutral grassland in Greater London with just over 2,000 ha, or 19% of the total for London. Bromley has 1,600 ha (15% of the London total) and Havering has 1,300 ha of neutral grassland (12% of the London total). The approximate figures for remaining boroughs are shown in Table 1 and represented by the Map.

Table 1: Grasslands, Meadows and Pasture Resource within Greater London

Borough	Total Grasslands, Meadows and Pasture (ha)	Percentage of London's resource (%)
City of London	0	0
City of Westminster	1.8	(0.02)
Barking & Dagenham	230	2.1
Barnet	850	7.9
Bexley	340	3.1
Brent	120	1.2
Bromley	1 600	15
Camden	50	0.5
Croydon	420	3.9

Borough	Total Grasslands, Meadows and Pasture (ha)	Percentage of London's resource (%)
Ealing	240	2.3
Enfield	510	4.8
Greenwich	190	1.8
Hackney	2	(0.02)
Hammersmith & Fulham	19	0.2
Haringey	76	0.7
Harrow	410	3.8
Havering	1 300	12
Hillingdon	2 000	19
Hounslow	390	3.6
Islington	8	(0.07)
Kensington & Chelsea	12	0.1
Kingston upon Thames	160	1.5
Lambeth	15	0.1
Lewisham	92	0.9
Merton	100	1
Newham	180	1.7
Redbridge	460	4.3
Richmond upon Thames	330	3
Southwark	43	0.4
Sutton	210	2
Tower Hamlets	16	0.2
Waltham Forest	250	2.4
Wandsworth	66	0.6
London Total	**11,000 ha**	

NB: Numbers have been rounded to two significant figures. From London Wildlife Habitat Survey, 1984/5 and Fuller 1987

The Southeast England regional biodiversity audit (Wicks & Cloughley 1998) recorded acid and neutral grassland together as one habitat type. The audit also excluded semi-improved neutral grassland. As such it was not possible to compare the two audits and place London's resource within a regional context.

In a national context, semi-natural grasslands now cover 600,000 hectares in lowland England and Wales (only 11% of the total lowland grassland area) (Fuller 1987). Unimproved (species-rich) grasslands total less than 12,000 ha. The semi-natural grassland resource in Greater London is therefore significant, especially when compared with the remaining resource in the arable eastern counties of England. However, the amount of unimproved (species-rich) neutral grassland in Greater London is, as nationally, a tiny fraction of the national total.

Nature Conservation Importance

It has been suggested that the loss of neutral grasslands in the lowlands represents the greatest reduction of wildlife habitat over the last 45 years (NCC, 1984). Between 1930 and 1984 semi-natural lowland grassland decreased by an estimated 97 in England and Wales (Fuller 1987), leaving just 3 undamaged by intensification (NCC, 1984). The extent and quality of the neutral grassland in London has shown a similar decline. Although neutral grasslands are still relatively common in London, unimproved (species-rich) neutral grasslands are particularly rare.

London's neutral grasslands can be rich in wildflowers and there may be more than a dozen species of grass. Commonly occurring grass species on London's neutral grassland include cocksfoot, Yorkshire fog, and sweet vernal grass. Nationally rare or declining wildflower species can be found amongst these grasses, including (in a handful of sites); meadow rue *Thalictrum flavum*, yellow vetchling *Lathyrus aphaca*, and chamomile *Chamaemelum nobile*. Other more typical neutral grassland species in London include pignut *Conopodium majus*, pepper saxifrage *Silaum silaus*, meadow vetchling *Lathyrus pratensis*, sneezewort *Achillea ptarmica,* black knapweed *Centaurea nigra* and cuckoo-flower *Cardamine pratensis*.

Several species of bird are also associated with neutral grassland habitat. The most evocative is perhaps the skylark, although this species, as well as short eared owl and meadow pipit which are also typical grassland species, require relatively large areas of grassland habitat and are not often encountered in the smaller patches of semi-natural grassland in London. Swallows, which regularly hawk for invertebrate prey over meadows and pastures, also require relatively large areas of habitat and are therefore largely confined to the outer London boroughs. The kestrel is less demanding and may hunt across widely scattered patches of grassland including road verges and uncut corners of playing fields and other amenity grasslands.

Neutral grasslands are also valuable for invertebrates. Several species of butterfly are dependent largely on semi-natural neutral grassland; meadow brown and common blue are relatively widespread, but small heath, small copper and Essex skipper are often confined to the better quality grassland sites. Many moth species occur in neutral grassland; the six-spot burnet moth is well distributed across London, whereas the chimney sweeper is restricted to a few sites which have never been subject to agricultural improvement. Perhaps one of the most characteristic grassland invertebrates is Roesel's bush cricket, which occurs widely in grasslands throughout London. Conversely, species such as the tube-web spider *Atypus afinis* is only known to occur in a single location on Hampstead Heath.

Some grassland, meadow and pasture sites of nature conservation value in Greater London

Arrandene Open Space and Featherstone Hill, LB Barnet

Belmont Pasture, LB Bromley

The Chase Nature Reserve, LB Barking and Dagenham

Islip Manor, LB Ealing

Pippenhall Meadows, LB Greenwich

Yeading Brook Meadows, LB Hillingdon

Threats and Opportunities

Threats

Lowland neutral grassland has declined in quality and extent. The main threats currently affecting the habitat include:

- Agricultural improvement such as fertiliser application, ploughing, drainage and reseeding.
- Mowing and draining rough grasslands on golf-courses, country parks and playing fields to expand opportunities for formal recreation.
- Lack of appropriate management neglect e.g. too frequent cutting, or over-grazing, resulting in a reduction of herb species in the sward; or lack of mowing or grazing resulting in reversion to rank grassland and scrub.
- Fragmentation and isolation of the remaining habitat, particularly where areas of relatively species-rich neutral grassland become isolated on road-verges, golf course roughs or within an intensively farmed landscape.
- Inappropriate tree-planting, particularly on rough grasslands which support important populations of invertebrates or grassland birds but may not be botanically diverse.
- Direct loss of habitat due to development, particularly where the value of the grassland has been masked by frequent cutting or over-grazing.

An important matter, particularly in London, is of the value of neutral grasslands being 'masked' by current management. It is likely that many potentially valuable areas of neutral grassland fall within frequently mown public parks and amenity open spaces, or in the many horse-grazed fields in London's Green Belt. Relaxation of mowing or grazing can reveal areas of quite species-rich grassland.

Opportunities

This habitat is a high priority for action due to the severe decline in quantity and quality of this habitat nationally and the relatively large neutral grassland resource found within London.

Several areas of relatively species-rich neutral grassland could be restored by relaxation of mowing regimes in some of London's older public parks and open spaces. Relaxation or modification of mowing regimes should be implemented after thorough survey to ensure that the areas that revert to a more natural sward are the most species-rich areas. Uncut areas of perennial ryegrass (the typical constituent of amenity swards) are of little value to people or wildlife. Rough grassland has already been restored in parts of some London parks with very beneficial results.

The restoration of a sympathetic grazing regime would be particularly beneficial to many neutral grassland sites. Although the botanical interest of several good quality grasslands in London is maintained by mowing or hay-making this is not usually the most beneficial management technique for biodiversity generally. Grazing is a more subtle form of management and creates a much wider range of micro-habitats which can be exploited by invertebrates and plant species which need gaps in the sward.

Making better use of grass as a crop (preferably hay) could encourage more sympathetic management. Presently the disposal of arisings is one of the main problems of managers of grassland sites where grazing is not an option. Encouraging machinery rings, where local authorities and private landowners share use of equipment such as cutters and balers, might help stimulate the restoration of some grassland sites to hay meadows. The meadows at Fryent Country Park in Brent are cut for hay and are certified under the Soil Association's organic standard.

Data Sources Grasslands

Fuller R.M. (1987). *The changing extent and conservation interest of lowland grasslands in England and Wales: A review of grassland surveys 1930-84.* Biological Conservation 40, 281-300.

Hare T. (1988). *London's Meadows and Pastures. Ecology Handbook 8.* London Ecology Unit.

HMSO (1995). *Biodiversity: The UK Steering Group Report. Volume 2 Action Plans.* London HMSO.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

NCC (1984). *Nature Conservation in Great Britain.* Shrewsbury. Nature Conservancy Council.

Wicks, D & Cloughley, P (Eds) (1998). *The Biodiversity of Southeast England: An Audit and Assessment.* Hampshire and Isle of Wight Wildlife Trust.

Rationale and limitations of approach

This audit covers areas of unimproved and semi-improved neutral grassland. The main area for potential overlap was with 'wet' grassland and marshes. These have been addressed within separate audits ('Floodplain Grassland and Grazing Marsh' and 'Marshland'; audits HA7 and HA8 respectively).

Where 'wet' grassland was present, the following procedure was employed to attempt to gain a good estimate of neutral grassland. Data was taken from the London Wildlife Habitat Survey (1984/5). For each wet site, habitat parcel sheets were used to find out the area of parcel and the percentage of neutral grassland within the parcel. It was then possible to remove wet neutral grassland from borough and produce total neutral grassland figures for London.

However the following limitations should be noted:

- The figure taken as wet grassland will be artificially enhanced due to an amalgamation with dry neutral grassland within the same habitat parcel.
- Sites with the wet overlay do not represent the full resource, as the wet overlay category was not a specified parameter within the 1984 Habitat Survey. Wet areas may have gone unrecorded.
- Wet grassland may also have been omitted due to the seasonal nature of the habitat.
- In addition, it is likely that neutral grassland is under-recorded owing to difficulties in locating all examples of this habitat.

This approach removed some of the wet grassland resource for inclusion in the Grazing Marsh and Floodplain Grassland Audit (HA7).

HA6: Heathland

Definition

For the purpose of this audit, heathland is defined as habitat characterised by the presence of heather *Calluna vulgaris* and gorse *Ulex Spp.* Heathlands usually occur on free-draining acid soils below 300m in altitude. Areas of good quality heathland consist of a shrub layer of varying height and structure, a scattering of trees and scrub, areas of bare ground, and occasional flushes and open water.

London's Heathland Resource

Only small fragments of heathland remain in Greater London. This resource has been much reduced in distribution and is of variable quality. However, heathland still represents a significant habitat in London, particularly because of its presence on Wimbledon Common and scattered patches on sites throughout the capital.

There are about 80 hectares of heathland remaining in Greater London in total. The approximate figures for each borough are shown below in Table 1. The Map represents the extent of heathland in the capital. There are estimated to be approximately 23,000 ha of heathland habitat in Southeast England. A list of sites is provided in Table 2.

Table 1: Lowland Heathland Resource in the United Kingdom, South-East Region and Greater London

Borough/Region/ Country	Total Heathland Area (ha)	Percentage of London's Heathland Resource (%)
Barnet	0.05	0.06
Bexley	1.9	2.4
Bromley	7.4	9.3
Camden	0.9	1.1
Croydon	8.3	10.4
Greenwich	1.1	1.4
Harrow	6.9	8.6
Hillingdon	8.5	10.6
Hounslow	2.4	3
Kingston	0.9	1.1
Merton	13.5	16.9
Richmond upon Thames	0	
Wandsworth	28	35
London Total	**80**	
South East Region	23 000	
United Kingdom	58 000	

NB: Sub totals may not add up to totals due to rounding.

Areas of 'potential' heathland are provided for four sites: Joyden's and Chalk Wood (L. B. Bexley), Croham Hurst (L.B. Croydon), Addington Hills (L. B. Croydon) and Bostall Heath (L. B. Greenwich). This amounts to a total area of approximately 15 ha. Two sites, Hounslow Heath (L. B. Hounslow) and Barnes Common (L. B. Richmond), have gorse stands highlighted separately.

Table 2*:* Heathland Areas within Greater London

Borough	Site	Heathland Area (ha)	Comments
L.B. Barnet	Rowley Green Common	0.05	plus two smaller patches
Bexley	Lesnes Abbey Wood	1.2	
	Joyden's and Chalk Woods	0.7	plus 6.3 ha. of 'potential' heathland
Bromley	Chislehurst Common	0.1	plus two smaller patches
	Crofton Woods	0	
	Hayes Common	4.8	plus several smaller scattered patches
	Keston Common	1.2	plus several smaller scattered patches
	St Pauls Cray Common Wood	1.3	
	Scadbury Park	0	
	Hampstead Heath (West, East and Sandy Heath)	0.9	in widely scattered patches
Croydon	Croham Hurst	0.3	plus 1.8 ha of 'potential' heathland
	Addington Golf Course & Shirley Heath	3.7	
	Addington Hills	4.0	plus 5.4 ha of 'potential' heathland
	Spring Park & Threehalfpenny Wood	0.2	
	Hall Grange	0.1	
Greenwich	Bostall Heath	1.1	Scattered plants within areas of acid grassland
Harrow	Grimsdyke Golf Course	-	No contact found
	Harrow Weald Common	0	
	Stanmore Common	6.9	
Hillingdon	Mad Bess Wood and Poor's Field	8.5	
Hounslow	Hounslow Heath	2.4	
Kingston upon Thames	Coombe Hill Golf Course	0.9	
Merton	Mitcham Common	1.5	
	Wimbledon Common	12.0	
Richmond upon Thames	Richmond Park	0	

Borough	Site	Heathland Area (ha)	Comments
	Barnes Common	-	Small patch
	East Sheen Common	-	Only 1 heather plant
	Bushy Park	0	
Wandsworth	Wimbledon Common	28.0	
London Total		**80 ha**	

NB: Sub totals may not add up to totals due to rounding. Sites with no heathland are included to highlight data received from site contact.

Nature Conservation Importance

Lowland heathland is a scarce and declining habitat in Europe and is of international importance. The UK has approximately 20% of the global resource of this habitat, of which the largest proportion (55%) is found in England.

In Greater London many of the plant species associated with this habitat, such as dwarf gorse *Ulex minor*, petty whin *Genista anglica* and cross-leaved heath *Erica tetralix*, are locally rare and threatened. Some, such as cotton grass *Eriophorum angustifolium,* are confined to a single site.

The varied topography and terrain of many heathland sites makes them especially attractive to a range of specialised invertebrates. The green tiger beetle *Cicindela campestris,* for example, and the mining bee *Andrena florea*, both require patches of open sandy ground, whilst the black darter dragonfly prefers pools on open heathland. Some of London's rarest butterflies and moths also have an association with heathland, notably the green hairstreak (a butterfly) and the beautiful yellow underwing (a moth).

Unfortunately, London's heathlands do not support any of the very rare bird species associated with heathlands elsewhere in southern England. However, stonechat and meadow pipit, which are relatively common on more extensive heathland sites outside of London, still occur as breeding species on the larger London heaths.

Some heathland sites of nature conservation value in Greater London

Addington Golf Course and Shirley Heath, LB Croydon

Hounslow Heath, LB Hounslow

Stanmore Common, LB Harrow

Wimbledon Common/Putney Heath, LB Merton and LB Wandsworth

Threats and Opportunities

Threats

Heathland has probably always been a relatively uncommon habitat in London. It is confined to the areas where sandy or gravely soil occurs and was reliant historically on grazing of livestock and clearance of invasive trees and shrubs to maintain the characteristically open nature of this habitat. Some areas of heathland arose as a result of turf-cutting which removed the fertile topsoil to expose areas of sand and gravel beneath.

Many areas of former heath in London were lost to development during the large expansions of London's urban areas in Victorian times and in the middle part of this century. Fortunately, some of the more important areas of heathland in London occur on historic common land or other protected open space which has prevented the loss of even more of this fragile habitat.

However, most heathland was formerly maintained by grazing and removal of timber (for firewood for example). As these traditional management techniques disappeared (no longer conforming to the management requirements of urban parks and commons), London's heathlands have declined in extent and quality. Furthermore some areas of heathland have been degraded by unsympathetic management such as mowing or fertiliser application, in response to the demand for more formal recreation areas.

Currently, the major threats to London's heathlands are:

- Lack of appropriate management (grazing and/or turf-cutting, the ideal management regime, is not practised on any London heathland except Poor's Field in Hillingdon)
- Recreational pressure (many of the remaining fragments of London's heathlands are subject to excessive trampling or, in the case of heathland on golf courses the habitat conflicts with sporting requirements)
- Inappropriate tree-planting in areas of acid grassland or other sites where there is potential for restoration of heathland
- Limited opportunities for expansion (many heathland species require extensive areas of heathland habitat in order to maintain viable populations)

Nutrient enrichment, including nitrogen depostion from car exhausts, is also having an adverse effect on London's remaining heathlands.

Opportunities

There are some opportunities available to extend the existing heathland resource by utilising heathland restoration and re-creation methods in suitable areas adjacent to existing areas of habitat, or where heathland was formerly known to exist. The main constraints are the loss of formal recreation areas, the loss of acid grassland that may have its own special interest, or the loss of secondary woodland (often much-valued by the public) which has replaced the former area of heathland. There may also be the potential for the restoration of mineral workings (sand and gravel pits) to heathland. Re-instatement of grazing may be feasible on the more extensive heathland areas.

Although some of the best quality patches of heathland in London are small areas on golf courses, or within public open space which is not managed primarily for nature conservation, these are more likely to be lost by changes in management or through fragmentation and isolation. Many of these smaller sites can be effectively managed by dedicated volunteers or site managers, although there are often constraints imposed by lack of funding, adverse reaction to tree and scrub removal, and lack of access to privately owned sites.

Data Sources

HMSO (1995). *Biodiversity: The UK Steering Group Report. Volume 2: Action Plans.* HMSO.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

Wicks; D & Cloughley, P. (1998). *The Biodiversity of Southeast England: An Audit and Assessment.* Published by the Hampshire and the Isle of Wight Wildlife Trust.

Williams; P. R. (1993). *Phase 2 Survey of Acid Grassland and Heathland in Greater London.* English Nature South East Region Reports.

Rationale and limitations of approach

Two heathland surveys exist for London, both of which use strict National Vegetation Classification (NVC) for heathland:

- London Ecology Unit Phase 1 survey of London (1984)
- English Nature Phase 2 survey of acid grassland and lowland heathland (1993).

However, use of this strict definition excludes other 'heathy-type' habitats. Therefore the following, broader, definition of heathland was used: heathland areas are those characterised by ericaceous dwarf shrubs and *Ulex* spp. The use of this broader definition enabled all sites applicable to the Lowland Heathland Biodiversity Action Plan to be included within the audit.

To enable a full audit of Greater London's Heathland, a 1:10,000 map was drawn of each site containing ericaceous dwarf shrubs, using the London Wildlife Trust's Geographical Information System (GIS). These maps were then sent to site contacts. The contact was asked to draw areas of heathland onto their maps and, if known, provide the size. The contacts were also sent a list of all the known sites which had been mapped and asked to note any omissions. The information from these site maps was then digitised onto GIS. This provided the area of heathland for each site. The heathland area maps will be tied to tabulated information on each site, such as ownership, current threats and management.

One of the drawbacks of this approach is the difficulty in delineating areas of habitat on the ground. As a result, a handful of the returned maps had crosses rather than clearly marked areas. In these cases the crosses were encircled and mapped, but the area of the circle was not included within the total heathland area for the site.

Although 'crossed' sites do not provide habitat parcel areas they do enable the location of heathland habitat within a site. Sites with crossed areas have been listed in Table 2 alongside the totals for habitat which have been delineated. Only one site, Grimsdyke Golf Course (LB Harrow), had no site contact and was not assessed within the current audit. One extra site was added to the original list: East Sheen Common. However, this site was not mapped as the site contained only one plant for which no location was provided.

Information on 'potential' heathland areas was provided by some site contacts. This included zones where restoration is already underway, as well as areas that have potential for restoration in the future. The information on 'potential' heathland areas has been mapped alongside heathland habitat parcels.

HA7: Grazing Marsh and Floodplain Grassland

Definition

Grazing marsh and floodplain grassland are concentrated in coastal levels and the floodplains of major rivers and are typified by gentle topography with impeded drainage. The habitat depends upon periodic inundation and grazing (or cutting). These assemblages are usually found on surface water gley, ground water gley and peat soils with a low to moderate fertility, usually underlain by clays and loams of mildly acidic to neutral reaction (Firbank et al 1993).

The principle factors that determine the species composition of wet neutral grassland are soil type, moisture and management (past and present). Floodplain grassland in London covers a wide range of communities; from the Yorkshire fog *Holcus lanatus* - tufted hair-grass *Deschampsia cespitosa* community, which can be floristically very poor, to the crested dog's tail *Cynosorus cristatus* – marsh marigold *Caltha palustris* community. The latter is a rare, species-rich type, particularly associated with old flood meadows.

London's grazing marsh and floodplain grassland resource

There are approximately 416 ha of estuarine grazing marsh and 432 ha of floodplain grassland in Greater London. Grazing marsh and floodplain grassland habitat in Greater London is limited in distribution, extent and quality, reflecting the national declines of these habitats. Estuarine grazing marsh has been recorded from three London boroughs: Barking & Dagenham; Bexley and Havering, which has the highest total area of estuarine grazing marsh (231 ha, or 56% of the total London resource). See column 'a' in Table 1 and Map a, which shows the extent of this habitat in the capital.

Havering also has the highest total recorded floodplain grassland (135 ha or 31% of the London total); followed by Hillingdon and Richmond upon Thames. These three boroughs contain 70% of London's floodplain grassland resource. Floodplain grassland has been recorded from 14 out of 33 London boroughs. See Table 1 column 'b' and Map b.

The exact extent of grazing marsh in the United Kingdom is unknown but estimates have suggested there may be a total of 300,000 hectares of grazing marsh, mainly coastal (HMSO 1995). At the current time the best estimate for the South East region is approximately 27,500 hectares of seasonally inundated grassland, most of which occurs as coastal grazing marsh (Wicks & Cloughley 1998). The combined floodplain grassland and grazing marsh resource in London is estimated at 848 hectares, which represents 0.3% of the estimated national resource and approximately 3% of the South East regional resource.

Nature Conservation Importance

It has been suggested that the national area of wet grassland declined by more than 40% between the 1930s and the 1980s (RSPB, EN, ITE, 1997). Indeed, Greater London lost 85% of grazing marsh on the Thames estuary between 1935 and 1989 (Thornton & Kite 1990). Although there are no figures available for the decline of floodplain grassland within Greater London it is thought to follow similar trends.

Floodplain grasslands support a wide range of plant, bird and invertebrate species, many of which are rare and declining. However, many floodplain grasslands in London are floristically poor and predominantly composed of Yorkshire fog and tufted oat grass. Other examples of floodplain grassland can be species-rich with damp loving plants such as sneezewort *Achillea ptarmica* and ragged robin *Lychnis flos-cuculi.* Typical bird species of this habitat type are yellow wagtail, sedge warbler and snipe, although the former is now a scarce breeder in Greater London and the latter occurs primarily as a winter visitor. Where there are ponds and ditches within the floodplain, great crested newts and grass snakes may be present. The majority of the dragonfly species recorded in London, including the emerald damselfly and the ruddy darter, also favour this habitat. Well-vegetated ditches can also support colonies of water vole. The rather scarce Daubenton's bat has a preference for feeding over rivers and associated bankside habitat.

Table 1: Grazing Marsh and Floodplain Grassland Resource within Greater London

Borough	a) Total Estuarine Grazing Marsh (ha)	% of London's Resource	b) Total Floodplain Grassland (ha)	% of London's Resource	c) Total Alluvium (ha)	% of London's resource
City of London	-	-	-	-	-	-
City of Westminster	-	-	-	-	-	-
Barking & Dagenham	3.9	0.9	14	3.2	56	**1.9**
Barnet	-	-	-	-	63	2.1
Bexley	181	44	24	5.6	370	13
Brent	-	-	-	-	17	**0.6**
Bromley	-	-	1.4	0.3	36	1.2
Camden	-	-	-	-	-	-
Croydon	-	-	-	-	-	-
Ealing	-	-	-	-	78	2.7
Enfield	-	-	30	6.9	-	-
Greenwich	-	-	-	-	107	3.6
Hackney	-	-	-	-	-	-
Hammersmith & Fulham	-	-	-	-	6	0.3
Haringey	-	-	9.4	2.2	140	4.8
Harrow	-	-	0.4	0.1	14	0.5
Havering	231	56	135	31	881	30
Hillingdon	-	-	107	25	226	7.7
Hounslow	-	-	20	4.6	73	2.5
Islington	-	-	-	-	52	1.8
Kensington & Chelsea	-	-	-	-	11	0.4
Kingston upon Thames	-	-	13	3	107	3.6
Lambeth	-	-	-	-	8	0.3
Lewisham	-	-	2	0.5	72	2.4
Merton	-	-	7.6	1.8	35	1.2

Borough	a) Total Estuarine Grazing Marsh (ha)	% of London's Resource	b) Total Floodplain Grassland (ha)	% of London's Resource	c) Total Alluvium (ha)	% of London's resource
Newham	-	-	-	-	125	4.2
Redbridge	-	-	-	-	131	4.5
Richmond upon Thames	-	-	59	14	221	7.5
Southwark	-	-	-	-	3	0.1
Sutton	-	-	-	-	14	0.5
Tower Hamlets	-	-	-	-	47	1.6
Waltham Forest	-	-	8.9	2.1	-	-
Wandsworth	-	-	-	-	53	1.8
London Total	**416 ha**		**432 ha**		**2946 ha**	

NB: Numbers have been rounded to two significant figures. Data from London Wildlife Habitat Survey, 1984/5; re-survey data 1990, 1991, 1992, 1994, 1995, 1997 & 1998.

London's remaining Thames-side grazing marsh supports nationally scarce plants such divided sedge *Carex divisa* and marsh dock *Rumex palustris* but is mainly characterised by large expanses of grassland interspersed with ditches supporting common reed *Phragmites australis* and sea club-rush *Scirpus maritimus*. On the north bank of the Thames these ditches provide habitat for the nationally scarce emerald damselfly. Grazing marsh is particularly important for birds such as waders and wildfowl. It provides breeding habitat for a number of species such as lapwing, redshank and skylark; in winter, grazing marsh is the favoured hunting territory for short-eared owl. The remaining grazing marsh on both sides of the Thames supports large populations of water vole.

Some floodplain grassland sites of nature conservation value in Greater London

Frays Farm Meadows, L.B. Hillingdon

Ingrebourne Marshes, L.B. Havering

Petersham Meadows, L.B. Richmond.

Two grazing marsh sites of nature conservation value in Greater London

Crayford Marshes, L.B. Bexley

Rainham Marshes, L.B. Havering.

Threats and Opportunities

Threats

Estuarine grazing marsh. Urbanisation has accounted for the greatest loss in grazing marsh, with residential, industrial development and land-filling accounting for 68% of loss (Thornton & Kite 1990). Creation of amenity open space and conversion to arable has also resulted in loss of grazing marsh. Current threats include:

- Development – some significant areas of the remaining Thames-side grazing marshes are allocated for commercial or industrial development in UDPs.
- Lack of management, particularly grazing.
- Inadequate water supplies to maintain optimal hydrological regime.
- Disturbance – particularly unauthorised motorcycle scrambling, shooting and falconry.

Floodplain grassland. Industrialisation and urbanisation has also led to large historical losses of flood plain grassland in Greater London. Many rivers and streams have been culverted or canalised as flood defence measures, thus eliminating seasonal inundation of the floodplain. As a consequence, much of the former floodplain associated with London's rivers and streams has been built upon. Current threats include:

- Continued development alongside rivers thus reducing the potential for floodplain restoration.
- Abstraction from rivers and ground water leading to low flows and reduced water levels.
- Eutrophication leading to changes in plant communities.
- Lack of traditional management, such as grazing.

Opportunities

Grazing marsh. The remaining areas of Thames-side grazing marsh require protection and management. There are few, if any, opportunities to restore or enhance Thames-side grazing marsh in London outside of existing sites. In addition to securing long-term protection, the re-instatement of appropriate grazing and hydrological regimes would greatly enhance the existing value of this habitat. Initial management on Wennington and Aveley Marshes (that part of the Inner Thames Marshes Site of Special Scientific Interest outside the Greater London boundary) has shown that appropriate grazing and flooding can significantly enhance the habitat for breeding waders and wildfowl. Partnerships between key players could also provide new opportunities for public access and appreciation of the Thames-side grazing marshes.

Floodplain grassland. There is significant potential for enhancement and restoration of floodplain grassland habitats in Greater London by modification and alteration of existing flood defences. Many flood defences alongside rivers in London were installed without consideration of the impact on biodiversity or the impact on the natural dynamics of the river. As flood defences are refurbished or replaced there are opportunities to restore the natural dynamics of the river system where this would not increase the flood-risk to private property. Indeed restoration of floodplain grassland and other riverside habitats can reduce the flood risk by slowing and reducing the level of water in the main channel. Potential sites should and are being highlighted within catchment LEAPS (Local Environment Agency Plans).

Where sites can be restored or enhanced, provision should be made for long-term management. Like many aquatic or grassland habitats, floodplain grassland can succeed to willow scrub quite quickly without a constraining factor such as grazing or mowing. In some cases, allowing some existing areas of floodplain grassland with limited nature conservation vale to succeed to willow scrub may be beneficial as wet woodland is also a scarce habitat type in Greater London.

Data Sources

Archer, J. & Robinson P. (1994). *Royal Borough of Kensington and Chelsea. Borough Ecological Survey.* London Ecology Unit.

Archer, J., Dawson, D. & Hewlett, J. (1995). *City of Westminster Nature Conservation Survey 1995.* London Ecology Unit.

Archer, J. & Mullin, M. (1997). *Redbridge Wildlife Habitat Survey*. London Ecology Unit.

Firbank, L.G. Arnold, H. R. Eversham, B. C. Mountford, J.O. Radford, G L. Telfer, M. G. Treweek, J.R. Webb, N. R. C. & Wells, T. C. E. (1993). *Managing set –aside land for wildlife.* ITE research publication no. 7. NERC. London: HMSO.

HMSO (1995). *Biodiversity: The UK Steering Group Report. Volume 2 Action Plans.* London HMSO.

London Ecology Unit (1990). *Haringey Map and Schedule.* LEU.

London Ecology Unit, (1997). *Redbridge Habitat Survey*. LEU.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

RSPB, EN, & ITE (1997). *The Wet Grassland Guide: Managing floodplain and coastal wet grasslands for wildlife.* RSPB.

Thornton, D. & Kite, D.J. (1990). *Changes in the extent of the Thames Estuary Grazing Marshes.* Nature Conservancy Council.

Urban Design Alliance (undated) *Liquid Assets: Making the most of our urban watercourses.* Instituition of Civil Engineers

Vickers, D.J. (1992). *Wildlife Habitats in Wandsworth.* London Ecology Unit.

Waite, M. (1991). *Bexley Wildlife Habitat Survey.* London Ecology Unit.

Waite, M. (1998). *Enfield Wildlife Habitat Survey.* London Ecology Unit.

Wicks, D. & Cloughley, P. (Eds) (1998). *The Biodiversity of Southeast England: An Audit and Assessment.* Hampshire and Isle of Wight Wildlife Trust

Rationale and limitations of approach

Data for the Thames Estuary grazing marsh audit was taken from the Nature Conservancy Council report 'Changes in the extent of the Thames Estuary Grazing Marsh' (Thornton & Kite, 1990). The study encompassed an area stretching from the Tower of London to the Greater London boundary, and included all the land between the River Thames and the 25 feet contour line. The report provided the extent of grazing marsh in 1989 and therefore represents a dated account of the resource. It is however the most recent, comprehensive account available.

The Floodplain Grassland Audit was based upon data taken from the London Wildlife Habitat Survey (1984/5). Wet grassland sites already highlighted from the 'wet overlay' (see Rationale and Limitations section of the Grasslands, Meadows and Pasture Audit, HA5) were included within this audit if adjacent to a river.

As many wet grasslands were not identified on the 'wet overlay', additional riverine grassland parcel data was obtained from London Ecology Unit Handbooks, Schedules and Habitat Survey maps. Habitat parcel descriptions were used to decide if the area was indeed floodplain grassland.

Habitat parcel descriptions also provided area of parcel and percentage of neutral grassland within each parcel. The percentage area was taken as an estimate of the floodplain grassland resource within each site. For limitations of this approach refer to Rationale and Limitations of the Grasslands, Meadows and Pasture Audit (HA5).

Staff at the London Ecology Unit assisted with clarifying floodplain grassland areas for a handful of difficult sites; those that had changed markedly since the last survey or had no indication of areas in survey data. These sites fell in the following boroughs: Hillingdon, Enfield and Barking and Dagenham.

Further to the assessment of the current resource, geological maps of London (British Geological Survey 1:50,000 Series Solid and Drift Geology, sheets: 255,256,257,271, 287,286,269, 270) were used to measure alluvium deposits with a dot matrix to assess potential area of floodplain grassland. Each borough was counted independently and a total for London taken. Areas shown as built upon were excluded. However, this still led to an artificially enhanced figure, as some areas displayed as alluvium are now urbanised.

HA8: Marshland

Definition

The term 'marshland' has been chosen to cover the following wet terrestrial habitats: bog, swamp, fen, wet marginal vegetation, wet marshy grassland and ditches. These are further defined below:

Bog: Dominated by *Sphagnum spp.* mosses (greater than 50% cover) with the water table at, or just below the surface.

Wet marginal vegetation: Emergent vegetation with a permanently high water table in strips less than five metres wide on the margins of water bodies. Contains species such as yellow iris *Iris psuedacorus,* fool's watercress *Apium nodiflorum,* and yellow-cress *Rorippa* sp. May be dominated by common reed *Phragmites australis,* reedmace *Typha sp.* and reed sweet-grass *Glyceria maxima*.

Fen: Stands of herbaceous vegetation where the water table is above the ground for much of the year, often with less than 75% dominance of reed*,* reedmace*,* reed sweet-grass*,* or reed canary-grass *Phalaris arundinacea*. Distinguished by width from wet marginal vegetation. Excludes reedbeds.

Wet marshy grassland: Grassland where the water table is at or above the surface for much of the year. Supports species such as marsh foxtail *Alopecorus genuculatus*, rushes *Juncus* spp. and meadowsweet *Filipendula ulmaria*

Ditches: Wet ditches.

The following habitats also occur in association with marshland but are covered by other audits: fen carr (Woodland HA1); floodplain grassland (Grazing Marsh and Floodplain Grassland HA7); and reedswamp (Reedbed HA9).

London's Marshland Resource

Situated at the inland extremity of an estuary and within the catchment of several tributaries of the Thames, the surroundings of London must have supported large areas of wetland habitat including extensive areas of marshland, prior to its development as a major centre of population.

Many of these areas may have been brought into agricultural production in the early periods of London's history. However, it is likely that many valuable semi-natural habitats would have remained in the form of flood meadows, reedbeds, ditches and ponds, even though this would have led to a loss of prime habitat. Even these features were gradually eliminated in the central areas of London, as springs, streams and rivers were culverted to provide additional building land and a measure of flood control.

Marshland habitat within London is now relatively rare and fragmented. Marshland areas are more frequent in outer London boroughs and are effectively absent from the inner London boroughs of City of London, City of Westminster, Hammersmith & Fulham, Islington, Lambeth, Southwark, Wandsworth and Kensington & Chelsea. Some small areas of wet marginal vegetation, however, are associated with waterbodies in some of these boroughs.

There are approximately 273 ha of marshland in Greater London. The approximate figures for each Borough, with a breakdown by the habitats defined above, are shown in Table 1 below. The extent of marshland in London is represented by the Map. The diverse nature of the wetland habitats covered within this category, coupled with the number of vegetation classifications which could be used, has led to difficulties in assessing the full extent of these habitats regionally and nationally. This has led to further difficulties in placing the local resource in a regional and national context.

Table 1: Area of Marshland within Greater London (To nearest 0.5 ha)

Borough	Bog	Fen & Wet Ditches	Wet Marshy G'land	Wet Ditches	Total	Percentage of London's Total Marshland Resource (%)
City of London	0	0	0	0	0	-
City of Westminster	0	0	0	0	0	-
Barking	0	8	3.5	6	17.5	6
Barnet	0	1	3	5	9	3
Bexley	0	0	2.5	9	11.5	4
Brent	0	0	5	0	5	2
Bromley	0.5	0	7.5	6	14	5
Camden	0.5	0	1	0	1.5	1
Croydon	0.5	2	0.5	1	4	2
Ealing	0	1	1.5	2	4.5	2
Enfield	0	0	5.5	14	19.5	7
Greenwich	0	0	1.5	1.5	3	1
Hackney	0	0	2.5	0	2.5	1
Hammersmith & Fulham	0	0	0	0	0	-
Haringey	0	0	2.5	0	2.5	1
Harrow	0	0	2	3.5	5.5	2
Havering	0	11	51	6	68	25
Hillingdon	0	10	14	13	37	14
Hounslow	0	4	4	1.5	9.5	4
Islington	0	0	0	0	0	-
Kensington & Chelsea	0	0	0	0	0	-
Kingston upon Thames	0	0.5	0.5	1.5	2.5	1
Lambeth	0	0	0	0	0	-
Lewisham	0	0	1.5	0	1.5	1
Merton	0.5	1	0.5	0	2	1
Newham	0	0	3	3	6	2
Redbridge	0	2	2	3	7	3
Richmond upon Thames	0	2	4.5	9	15.5	6
Southwark	0	0	1	0	1	-
Sutton	0	0	1	3	4	1
Tower Hamlets	0	0	0.5	0.5	1	-
Waltham Forest	0	12	3	1.5	16.5	6
Wandsworth	0	0	1	0	1	-
London Total	**2**	**54.5**	**126**	**90**	**272.5**	

No figures are available for the extent of marshland in the UK. There are estimated to be approximately 1,825 ha of 'combined wetland habitat' in south-east England. This figure includes reedbeds (which exist as a separate audit category, HA9) but does not include bogs and is therefore not directly comparable.

Nature Conservation Importance

Marshland habitat has been highlighted as a priority for nature conservation in the UK due to dramatic declines in area and distribution throughout Europe during the last century. It is a rare resource in London. Two boroughs, Havering and Hillingdon, account for over one third of London's marshland, with a scattering of smaller areas throughout other outer London boroughs. The remaining habitat is of high nature conservation importance in both a local and regional context.

London's marshlands support a rich diversity of plant and animal communities. They are particularly important for breeding birds such as sedge warbler, reed warbler, reed bunting and water rail, and wintering species such as teal and snipe. Plants species associated with marshlands include marsh dock *Rumex palustris*, marsh marigold *Caltha palustris*, yellow iris *Iris pseudacorus* and common spike rush *Eleocharis palustris*, as well as rarities such as cotton grass *Eriophorum angustifolium*.

Marshlands support a particularly diverse range of invertebrates, the most noticeable of which are the dragonflies including species such as ruddy darter, emperor and southern hawker. Other notable species associated with marshland habitat in London include water vole, grass snake, common frog and serotine bat.

Some marshland sites of nature conservation value in Greater London

Ingrebourne Marshes, LB Havering

Denham Lock wood, LB Hillingdon

Farm Bog, LB Merton

Walthamstow Marsh, LB Waltham Forest

The Chase Nature reserve, LB Barking & Dagenham

Threats and opportunities

Threats

The main present day threats to London's marshland resource are development, water abstraction, pollution and lack of, or inappropriate, management. The apparent higher incidence of hot dry summers will also have a negative impact if this proves to be a long-term climatic change resulting from global warming. Development adjacent to marshland sites can also be a threat if the existing hydrology is adversely affected.

Many marshland sites in London are small and fragmented, which may limit the possibility of species movement between similar areas of habitat and reduce the ability of species to colonise new areas.

The threats described above will vary relative to each habitat. Fen and bogs will be particularly threatened by drying out and succession to woodland, whereas wet marginal vegetation can be seriously affected by water-borne pollution, development and unsympathetic maintenance, for example vegetation clearance at inappropriate times of the year. Wet marshy grassland can be very easily damaged or destroyed by relatively minor drainage schemes, particularly those associated with 'improvements' to agricultural land, golf courses, parks and other amenity land.

Opportunities

The Environment Agency has a considerable array of powers and advisory services which can be utilised to maintain or enhance marshland habitats. Local Environment Agency Plans (LEAPs) which seek to provide an integrated approach to environmental management within river catchments can help to identify potential areas for wetland rehabilitation and restoration. For example, existing degraded marshland habitats can be enhanced or new marshland habitats created when designing new flood-defence projects or refurbishing existing ones by incorporating schemes which aim to reduce the incidence of flooding by reducing direct run-off through containment of floodwaters in balancing ponds and flood-storage lagoons.

Existing high quality marshland habitats can be conserved by the preparation of Water Level Management Plans which identify the water budget for a particular site and how this can be effectively managed with respect to conflicting demands.

Marshlands can also be restored or rehabilitated as part of the after use of mineral workings. At present many existing gravel pits are restored as deep-water pits or returned to agricultural use.

At many smaller sites, the biggest threat to marshlands – drying out and succession – can be tackled relatively inexpensively by control of water levels. Often, this only necessitates the installation of simple dams or sluices at the main drainage points. Furthermore, small-scale marshland habitats can be created as part of development proposals, by designing surface-water drainage systems that have marshland habitat incorporated into the design.

Data Sources

Clenet, D., Britton, B. & Game, M. (1988). *Nature Conservation in Croydon.* Ecology Handbook Number 9. London Ecology Unit.

Farino, T. & Game, M. (1988). *Nature Conservation in Hillingdon.* Ecology Handbook Number 7. London Ecology Unit.

Hedley, S. (1988). *London Chalk Grassland Survey.* Project No. 92. England Field Unit. Nature Conservancy Council.

London Ecology Unit (1994). *Habitat Survey for Greater London.* LEU.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

Wicks, D., & Cloughly, P. (1998). *The Biodiversity of Southeast England: An Audit And Assessment.* Hampshire and Isle of Wight Wildlife Trust.

Yarham, I., Barnes, R. & Britton, B. (1993). *Nature Conservation in Sutton.* Ecology Handbook Number 22. London Ecology Unit.

Rationale and limitations of approach

The data were collected from the 1984/85 London Wildlife Habitat Survey. This survey represents the most fully comprehensive survey to date. The marshland audit is collated from data on the following habitat categories: bog, swamp, fen, wet marginal vegetation and wet/marshy grassland (those grassland areas identified as wet on the Wildlife Habitat Survey maps).

The audit should be used as a guide and not as a definitive statement of Greater London's marshland resource. Each borough could refine the audit with a comprehensive re-survey.

HA9: Reedbed

Definition

Reedbeds are wetlands dominated by stands of common reed *Phragmites australis*, where the water table is at or above ground level for most of the year. Reedbeds occur at the margins of lakes, pools, rivers or reservoirs in water that is less than 1 metre deep. Due to the dominance of common reed, reedbeds are often botanically poor (although they can support a variety of rare wetland plants) but are very rich in invertebrates. There are a number of bird species that are closely associated with reedbeds.

For the purposes of this audit, reedbeds are identified as stands (or continuous belts) of common reed which exceed 0.5 ha in extent.

London's reedbed resource

Common reed occurs along the edges of lakes, reservoirs and rivers throughout London and is particularly common along the ditches that are all that remain of the once extensive grazing marsh in east London. However, in many of these sites common reed occurs as a narrow fringe or small patches on lakes or rivers which are therefore more appropriately identified as wet marginal vegetation and included within the marshland audit (HA8).

Despite London's wetland heritage, most estuarine habitats (including extensive reedbeds) have been lost as river walls were erected to reclaim the watery wastes and enable further expansion of the city. Most naturally occurring reedbeds are now largely confined to a few sites along the tidal Thames (and its tributaries) in the easternmost boroughs and in areas of old gravel workings and shallow reservoirs. Although there is a scarcity of naturally occurring reedbeds a number of new reedbeds are being created as gravel workings are restored, or redundant reservoirs are developed for nature conservation and recreation.

Reedbeds over 0.5 ha are given in Table 1 below and the extent of this habitat in London is shown in the Map.

Table 1: Reedbeds over 0.5 hectares in extent in Greater London

Borough	Location	Approx. area of reedbed (ha)	Total (ha)
Barking & Dagenham	Chase Nature Reserve Goresbrook Dagenham Breach Roding (north of Barking)	0.5 1.0 0.5 0.5	2.5
Bexley	Crayford Creek Thames Crossness Thamesmead/Crossness	1.0 0.5 3.0 (inc. ditches)	4.5
Brent	Brent Reservoir	1.0	1.0
Greenwich	Tump 53/Thamesmead	1.0 (inc. ditches)	1.0
Havering	Berwick Ponds	3.0	13.5

Borough	Location	Approx. area of reedbed (ha)	Total (ha)
	Ingrebourne Marshes	4.0	
	Rainham Marsh	6.0 (inc. ditches)	
	Thames (east of Fords)	0.5	
Hillingdon	Springwell Lake	2.0	2.0
Hounslow	Bedfont Lakes	1.0	1.0
Newham	Roding Creek	7.5	8.0
	Bow Creek	0.5	
Richmond upon Thames	Pen Ponds	0.5	3.0
	Londsdale Road	0.5	
	Wetland Centre (Barn Elms)	2.0	
Waltham Forest	Walthamstow Marsh	6.0	7.0
	Essex Filter Beds	1.0	
London Total			**43.5**

Nature Conservation Importance

Despite covering only a tiny proportion of London's surface area, reedbeds are of special nature conservation value. By their very nature most reedbeds are uncommon and transient features of the natural landscape. The right conditions for reedbed establishment occur infrequently. Where reedbeds do become established they are prone to succession to willow scrub and wet woodland unless there is some constraining factor. Drainage and development of wetlands have exacerbated the natural scarcity of this habitat.

Some reedbed sites of nature conservation value in Greater London

Goresbrook, LB Barking & Dagenham

Rainham Marsh, LB Havering

Roding Creek, LB Newham

Walthamstow Marsh, LB Waltham Forest

Although reedbeds are naturally scarce, there are many animal species which are wholly dependent upon this habitat. In London these include reed warbler, water rail, and the fen wainscot moth. At least five other species of moth in London are dependent upon reed as a larval foodplant.

London does not support populations of rare birds that are reedbed specialists (i.e. bittern and bearded tit), however, bitterns are regular winter visitors to small reedbeds in the Lea Valley in Essex and Hertfordshire, and bearded tits are regular winter visitors to reedbeds throughout London. Reedbeds are also used as roost sites for a wide variety of birds including migratory

species and raptors such as short-eared owl. The tidal reedbeds in the Thames are particularly valuable as sheltered feeding areas for fish fry.

Threats and Opportunities

Threats

The major threats to reedbeds are drainage and lowering of water tables; lack of, or inappropriate management; and loss to development.

Common reed is a very robust plant and can survive in quite dry conditions once established. However, in dry conditions terrestrial plants soon grow and will eventually dominate. Seasonal (or regular, as in the case of tidal reedbeds) inundation is a necessity to maintain high quality reedbed habitat. Many reedbeds are lost as a result of drainage of nearby areas, resulting in the gradual lowering of the surrounding water table.

Reedbeds along lakes, rivers and ditches frequently undergo succession to scrub and woodland (or are shaded out by bankside trees) unless there are factors which arrest the successional process. Historically in the traditional farmed landscape, reed and invasive willow scrub would have been cut as feed or bedding for livestock; alternatively, livestock would have been allowed to graze the reed as water levels receded during the summer months. The lack of grazing animals in urban London has prevented this traditional form of management from being practiced for many years.

Succession is not usually a problem associated with tidal reedbeds in the Thames, as regular inundation with brackish water usually prevents the establishment of scrub. One of the main threats to tidal reedbeds is dredging of the main river channel nearby, which may result in the erosion of the accumulated silt upon which the reedbed is established.

Loss of reedbed or reed-fringed ditches to built development still occurs, particularly in sites along the tidal Thames and its tributaries in east London. Other small areas of reed are removed to accommodate anglers, who often require swims to be cut through reedbed or clear larger areas of reed to create additional swims.

Opportunities

The scope for the restoration of reedbeds in London is perhaps limited considering the lack of extensive areas of undeveloped riverside or semi-natural lakeside. However, there are considerable opportunities for the creation of reedbeds as part of flood defence and river enhancement schemes and gravel pit restoration. Furthermore, as the amount of dredging required on the Thames declines or is better targeted as a result of fewer movements of large ships, there are possibilities for re-establishing tidal reedbeds on exposed mud-banks at the rivers edge.

Further opportunities arise as a result of the ability of reedbeds to attenuate storm-water run-off and remove certain pollutants. There is a growing interest in incorporating constructed reedbeds into surface water and grey water drainage systems for this purpose. These could result in the creation of relatively large reedbeds, which may provide valuable wildlife habitat. However, there is not yet sufficient evidence to indicate their value in maintaining or enhancing biodiversity. Similarly, there have been projects to establish reedbeds in watercourses and lakes in London’s parks as part of a management regime aimed at reducing the highly eutrophic condition of many of these urban wetlands.

Data sources

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

Rationale & Limitations

Reedbed sites were identified from the London Wildlife Habitat Survey (1984/5) and data on the size of each reedbed were provided by site managers or other local authority staff. As the habitat is scarce, it is unlikely that any reedbeds over 0.5ha were missed.

However, stands of continuous reed less than 0.5 ha in size are not included in the audit. These areas may nevertheless represent an important resource, particularly as most reedbed sites cover less than 1 ha. The relatively transient nature of the habitat and the threat o f succession along narrow strips of reedbed also serves to highlight the importance of continuing re-surveys and appropriate management measures being taken to conserve remaining areas.

HA10: The Tidal Thames

Definition

The Thames and its tidal creeks encompass the entire length of the river in London and the tidal limit of its tributaries. In many cases this tidal limit is artificially restricted by the operation of various barriers and weirs.

The Greater London Tidal Thames resource

The River Thames runs 42 miles through Greater London from Hampton in the west to Dartford Creek in the east. For much of its length it is tidal, the tidal influence reaching as far upriver as Teddington Lock. There are several tributaries of the Thames which enter the river within Greater London, a number of which (notably the Wandle, Ravensbourne, Lea, Roding, Darent and Ingrebourne) have tidal creeks.

The Thames in London covers an area of approximately 2400 ha, about 1.5% of London's surface area. At low tide the river comprises c2050 ha of open water (85% of the river's surface area), 310 ha of intertidal mud, sand or shingle (13% of the surface area) and 17 ha of saltmarsh (0.5%). The remaining area comprises patches of neutral grassland, woodland and scrub associated with the islands in the Thames, and remains of former river walls that are within the existing flood defence. Several areas of tidal reedbed have developed in recent years, particularly in areas such as Barking Creek and Bow Creek (see Reedbed audit, HA9).

Areas of intertidal habitat occur along the entire length of the tidal Thames, but where the flood defences have particularly restricted the natural extent of the river channel the intertidal habitat is necessarily limited - although still of importance, particularly for fish and invertebrates. The most extensive areas of intertidal habitat occur downstream of Tower Bridge where the flood defences are set further back from the main channel. The areas of intertidal habitat are identified in Table 1 and displayed in the Map.

Table 1: Extent of intertidal habitat by borough

Borough	Extent (ha)	Borough	Extent (ha)
City of London	2.5	Kensington & Chelsea	4
City of Westminster	3	Lambeth	4
Barking & Dagenham	45	Lewisham	1.5
Bexley	42	Newham	74
Greenwich	31	Richmond upon Thames	21
Hammersmith & Fulham	16	Southwark	17
Havering	27	Tower Hamlets	9
Hounslow	13	**London Total**	**310**

NB: Based on data held by LEU

The flood defences (river walls) on the Thames vary in nature and characterise the different reaches of the river. Upstream of Putney Bridge much of the flood defence is sloping revetment, often vegetated, which softens the river's edge and riverbank. Between Wandsworth Bridge and the Greenwich Peninsula the river is largely constrained between vertical concrete and sheet metal piled walls (although areas of mud, sands and gravel are exposed at low tide). Downstream of the Greenwich Peninsula, despite much of the flood defence still consisting of vertical concrete walls and sheet-metal piling, it is set further back from the main river channel thus exposing extensive areas of intertidal mud at low tide. An analysis of the composition of the river walls is provided in Table 2.

Table 2: Type and Length of River Wall by Borough

	River Wall Type				
Borough	**Natural/Earth Embankment (m)**	**Sloping (m)**	**Vertical (m)**	**Mixed (m)**	**TOTAL (km)**
City of London	-	-	2300	300	**2.6**
City of Westminster	-	-	4400	300	**4.7**
Barking & Dagenham	1200	900	5200	-	**7.3**
Bexley	3500	1300	5600	-	**10.4**
Greenwich	-	1500	13100	-	**14.6**
Hammersmith & Fulham	-	-	5600	1500	**7.1**
Havering	600	3500	1500	-	**5.6**
Hounslow	1200	3900	2400	2000	**9.5**
Kensington & Chelsea	-	-	2500	-	**2.5**
Kingston upon Thames *	-	-	-	-	**4.5**
Lambeth	-	-	3200	-	**3.2**
Lewisham	-	-	1800	-	**1.8**
Newham	1100	3900	7200	1900	**14.1**
Richmond upon Thames **	-	17500	2800	2300	**33.3**
Southwark	-	-	7100	-	**7.1**
Tower Hamlets	-	300	14800	-	**15.1**
Wandsworth	-	600	6800	-	**7.4**
TOTAL (km)	**7.6**	**33.4**	**86.3**	**8.3**	**150.8**

* river walls not included in survey
** includes 10700m where type of river wall is unknown
Based on analysis of data from *Tidal Thames: Landscape Assessment and Design Guidelines*. (1996) EA.

Management of the Thames rests primarily with two organisations; the Port of London Authority (PLA) and the Environment Agency (EA). The PLA is concerned primarily with navigation, pollution control and land-use planning issues related to the river; the EA has responsibilities

covering flood defence, pollution control, fisheries, water quality, environmental protection and nature conservation.

Nature Conservation Importance

The Thames represents the largest continuous natural habitat in Greater London. The whole of the Thames and its tidal tributaries has been identified by the London Ecology Unit as a Site of Metropolitan Importance for nature conservation.

The transition of the Thames in London from a fresh water channel to a brackish estuary is reflected in the species that are found in the river. Plant species such as sea aster *Aster tripolium* and sea club-rush *Bolboschoenus maritimus*, which prefer the saline conditions of the estuary, occur as far upriver as Battersea but are only found in any abundance below Tower Bridge. It is also only in the downriver reaches that occasional patches of saltmarsh are able to develop, mainly on areas of sloping revetment at the base of the river walls. Upstream, in the freshwater reaches, the aquatic plant community includes species such as hemlock water-dropwort *Oenanthe crocata* and purple loosestrife *Lythrum salicaria.*

The invertebrates found in the intertidal mud of the river are also good indicators of the changes from fresh to estuarine waters. A variety of molluscs, worms, and crustacea occur in the mud and shingle along the foreshore. This diversity of species includes the German hairy snail *Perforatella rubiginosa,* which occurs in the freshwater tidal region of the Thames (between Kew and Teddington) and the brackish water-snail *Pseudamnicola confusa.* As its name suggests, this species occurs in more saline waters of the Thames and has been recorded from Barking Creek.

More than 100 fish species have been recorded in the Thames estuary over the past 30 years, many of these in the river within London. Of these species dace is the dominant freshwater fish, occurring as far downstream as Battersea. The more estuarine part of the river hosts species such as smelt (which spawn in the river at Wandsworth), sea bass (whose fry penetrate as far upstream as Chelsea) and, possibly, twaite shad, a species which historically spawned at Greenwich.

The birds of the River Thames are less influenced by the salinity gradient of the river and more by the extent of foreshore exposed at low tide. Birds such as dunlin, ringed plover and shelduck, which feed on invertebrates in the intertidal mud, are largely confined to the more extensive mudflats downstream of the Thames Barrier. Less specialised feeders such as teal and pintail (which is now rare in London) can occur on any suitable, undisturbed part of the river. Two fish-eating species, cormorant and grey heron, frequent the entire length of the river and can often be seen fishing the Thames in the centre of London.

Although there is very little natural riverbank along the Thames and its tidal tributaries (the only significant stretch being the riverbank at Syon Park), several quite large stretches of riverbank consist of earth embankment set back from the river. These sites have allowed saltmarsh, tidal reedbeds and other intertidal habitats to develop. Furthermore, the sloping revetment that forms the flood defences in certain stretches of the river provides an opportunity for aquatic vegetation to become established along the river's edge. Downstream of Tower Bridge, sloping revetment provides an opportunity for the establishment of saltmarsh.

Even the vertical walls that flank most of the river in Greater London are not totally devoid of nature conservation interest. Brick and timber-faced flood defences provide opportunities for plants to become established, which in turn provide a niche for a variety of invertebrates. Concrete walls and sheet-steel piling, on the other hand, provide few opportunities for plants and animals to become established.

Some stretches of the tidal Thames and tributaries of nature conservation value in Greater London

Chelsea Creek, LB Hammersmith and Fulham

Deptford Creek, LB Lewisham and LB Greenwich

Thames at Barking Reach, LB Barking and Dagenham

Thames at Gallions Reach and Tripcock Ness, LB Greenwich

Thames Tide Meadow, Syon Park, LB Hounslow

Threats and Opportunities

Threats

The two most significant threats to the biodiversity of the Thames in London are pollution and the loss of intertidal habitat by the encroachment of built development.

Although the severe pollution of the river in the 19th and early 20th centuries is now a thing of the past, because it flows through the largest conurbation in Europe the potential for pollution of the Thames is ever present.

Two large sewage works (Beckton and Crossness) discharge into the Thames, but these operate within discharge consents which limit any serious harm to the biodiversity of the river. The most significant potential pollutant is now the huge organic load that enters the river from storm drains during heavy summer rainfall. During severe episodes this influx of organic material can result in oxygen levels plummeting, resulting in multiple fish deaths. The 'Thames Bubbler' – a vessel operated by Thames Water - can pump oxygen directly into the river reducing the impact of these periods of oxygen deficit. A more permanent solution requires significant reconstruction or refurbishment of much of London's sewerage system which currently relies heavily on a network of Victorian sewers which combine as storm drains.

The importance of industry and shipping on the Thames has declined in recent decades, but pollution in the form of accidental oil or chemical spillage (or illegal discharge) is still a potential threat to biodiversity. Even minor amounts of oil can be particularly harmful to waterbirds if their feathers become fouled or they ingest any of the material. Spills of harmful chemicals can lead to direct mortality of fish and invertebrates. The subsequent loss of the invertebrate resource can have an important adverse effect on waterfowl and waders if it occurs within important feeding areas. Both the EA and the PLA have contingency plans to deal with pollution incidents. Decline of riverside commerce has also resulted in some reaches becoming havens for birds sensitive to disturbance by people. As these areas are redeveloped for residential use or non-river related commercial use, the establishment of riverside walks can result in increased disturbance, which is a deterrent to sensitive species of wader and wildfowl.

Encroachment of built development on the river corridor is the other major threat to biodiversity in the Thames. The river, particularly in the central London reaches, has already been severely constricted so that at low tide only a very narrow fringe of foreshore is exposed. Further encroachment is likely to prevent or hinder fish movements and restrict opportunities for diversifying riverside habitats.

The river walls are subject to a cycle of repair, refurbishment and replacement to maintain their primary role as flood defences. Older river walls constructed of timber or brick provide far greater opportunities for the establishment of plants and animals; their replacement with new

concrete or sheet-piled defences results in a loss of biodiversity. Furthermore, reconstruction of river walls in front of the existing river wall results in incremental encroachment onto the tidal foreshore.

Opportunities

Opportunities exist for retreat from the river as riverside sites are redeveloped, enabling the establishment of sloping embankments. With appropriate design riverside walks can enable people to enjoy the river without undue disturbance of birdlife.

There is a significant potential for restoring and recreating some of the habitats along the Thames which were lost when flood defences were installed without due regard to biodiversity. The process of restoring river's edge habitats has already begun, with creation of shingle beaches in the central reaches of the Thames and the creation of new areas of saltmarsh on specially constructed terraces adjacent to the Millennium Dome in Greenwich. Additionally, many smaller patches of saltmarsh or marginal aquatic vegetation have established naturally at the base of sloping river walls or where some other structure sits at the appropriate level within the river channel. Other river's edge habitats have become re-established in areas where dredging has been curtailed, reduced or modified as a result of the decline in shipping – the expansion of the tidal reedbeds at Barking Creek is a prime example.

Further innovative approaches to enhancing the value of the river corridor for wildlife include installing timber cladding on concrete and sheet-steel flood defences to provide niches for plants and invertebrates and stepping back (or otherwise adapting) flood defences to enable habitat enhancement.

The Thames, as a familiar feature of London, provides great potential for raising awareness of the biodiversity of the river and beyond. Illustrating the value of the Thames and its tributaries as a nationally important corridor for migrant birds, for example, will be an important element of an Action Plan. Hundreds of thousands of people a day cross the river or travel along its banks. Some of London's major areas of open space (Kew Gardens, Battersea Park and Greenwich Park) and some of its major attractions (The Millennium Dome and the Wetland Centre - both opening in 2000 - and the Tower of London) adjoin, or lie adjacent to the river. Furthermore, the seats of both central government and the new local government for London are, or will be located alongside the Thames in central London.

Data Sources

Archer, J. & Curson, D. (1993) *Nature Conservation in Richmond upon Thames*. Ecology Handbook 21. London Ecology Unit

Archer, J. & Yarham, I. (1991) *Nature Conservation in Newham*. Ecology Handbook 17. London Ecology Unit

Curson, D., Britton, B. & Game, M. (1992). *Nature Conservation in Barking and Dagenham*. Ecology Handbook 20. London Ecology Unit

Environment Agency (1996) *Tidal Thames: Landscape Assessment and Design Guidelines (Final Report).* Compiled by Cobham Resource Consultants/Llewelyn Davies.

Environment Agency (undated) *The Thames Tideway and Estuary Fact File.*EA.

GLC Ecology Section (undated) *A Nature Conservation Strategy for London: Woodland, Wasteland, the Tidal Thames and two London Boroughs.* GLC.

London Wildlife Habitat Survey (1984/85). Held by LEU, includes habitat dot distribution maps, aggregated area figures and many individual parcel forms.

Rationale and Limitations

Data concerning the length and type of riverbank were extracted from maps identifying river channel types in the EA 'Tidal Thames Landscape Assessment and Design Guidelines Manual'. This document gives a fairly accurate assessment of river wall types but does not provide information about the nature conservation value of the different types. The assumptions made above are that natural and earth embankments will be of the most value for nature conservation, sloping banks the next most valuable and vertical banks of least value. However, some areas of intertidal habitat adjacent to vertical walls will be of value to birds and invertebrates.

The assessment of mud and intertidal habitats was based on the London Wildlife Habitat Survey in addition to work by Leona Nield at the London Ecology Unit. Due to the methodology employed by these surveys and because parts of the Thames are inaccessible, many small areas of saltmarsh, reedbed and stands of aquatic marginal vegetation may have been missed.

HA11: Canals

Definition

Canals are artificial waterways constructed for purposes of inland navigation. In London these include The Grand Union Canal (Main Line and Paddington Arm), the Regent's Canal, and the Lee Navigation (incorporating the Hertford Union Canal and the Limehouse Cut).

London's Canal Resource

The London canal network was cut during between 1767 and 1830 to provide a transport link both across London and between London and the industrial towns of the Midlands and the north. Although initially a success, their importance waned with the advent of railways in the latter part of the 19th Century.

Although built primarily as arteries for commerce and trade, the creation of a canal system resulted in a network of linear wetlands that provide habitat for a range of wetland species and, in recent years, an increasingly important amenity and recreational resource.

London has approximately 80km of canal corridor covering an area of about 270 ha (see Table 1 and the Map). This land area includes the canal itself (and various basins/marinas) and the adjoining towpath and adjacent bankside. The entire canal network, including the Lee Navigation, is managed by British Waterways.

Table 1: Extent of the Canal Resource by Borough

Borough	Approximate area of canal including tow path and banksides (ha)
Brent	12
Camden	7
Ealing	47
Enfield	25
Hackney	21
Hammersmith & Fulham	6
Haringey	11
Hillingdon	64
Hounslow	10
Islington	4
Kensington & Chelsea	4
Tower Hamlets	36
Waltham Forest	4
Westminster	19
Total	**270**

Nature Conservation Importance

Part of the nature conservation interest of the canals arose as a consequence of their decline as corridors of trade and commerce. At the peak of their industrial usage, most of the canal system was likely to have been inimical to wildlife due to the frequent passage of boats and barges and the considerable pollution of the impounded water. Declining canal use at the turn of the century and the more recent implementation of measures to combat pollution, has enabled wildlife to colonise the canal system.

The entire London canal network has been designated a Site of Metropolitan Importance for nature conservation as a result of its intrinsic value for wildlife and because it provides public access to nature; the latter is particularly important where canals pass through inner city boroughs.

Most of the canal network does not support extensive areas of vegetation, but a wide variety of wetland plants occur where conditions are suitable. These include the following: spiked water-milfoil *Myriophylum spicatum,* rigid hornwort *Ceratophyllum demersum,* hemlock water dropwort *Oenanthe crocata,* yellow iris *Iris pseudacorus* and, in the more rural stretches of the system, arrowhead *Sagittaria sagittifolia*, yellow water-lily *Nuphar lutea* and stands of common reed *Phragmites australis.*

The canals also support a wide range of wetland invertebrates. Where there are larger stands of marginal vegetation along canals in outer London boroughs, the emerald damselfly may be present. Less demanding species of dragonfly, such as the emperor and blue-tailed damselfly, occur throughout the canal system.

Sand martins have taken to nesting in old pipes alongside canals and kingfishers are frequently present, although less likely to find suitable nest-sites. Grey herons are virtually ubiquitous.

A diverse range of fish is present in the canals, some being populations of fish which have entered the canal network from the main rivers which supply the system, others being deliberate introductions by anglers. Roach, bream, gudgeon, carp and tench are typical species. Eels are also present.

Canalside buildings and infrastructure (e.g. buildings and tunnels) may provide roost sites for bats. Water voles are still present in a few locations.

In addition to the wetland communities present in and alongside the canal, stretches of grassland, scrub and woodland can be found adjacent to the towpath. This is more extensive where canals flow through the open spaces and countryside of the Colne Valley and the Lea Valley Park, although even in the inner city the canals often adjoin parks and other areas of green space, for example Camley Street Natural Park behind King's Cross station.

Some canals and canal stretches of nature conservation value in Greater London

Hertford Union Canal and Limehouse Cut, LB Tower Hamlets

Lee Navigation, LB Hackney

Grand Union Canal, LB Hillingdon

Grand Union Canal, LB Ealing

Regent's Canal, LB Camden

Threats and Opportunities

Threats

The London canal network is currently experiencing a revival, partly as a result of a renewed interest in water-borne transport, but also as a focus for regeneration (primarily in the urban area) and as an increasingly valued recreation resource. Redevelopment of canalsides poses an obvious threat if existing habitat is lost to built development or new development results in the replacement of naturally occurring vegetation with unsympathetic landscaping schemes. Increased recreational use of the canals and their environs could result in the threat of increased disturbance to canalside wildlife.

The need to maintain the waterway for boat traffic may also increase the threat to wildlife habitat as existing desilting and vegetation clearance regimes may need to be augmented. Repair and repointing of canal walls and other infrastructure prevents plants from gaining a foothold and may reduce the availability of nest sites for birds and roost sites for bats. As with any wetland habitat, pollution of the waterway can result in harm to wildlife.

Opportunities

The London's Waterway Partnership, a consortium of businesses, local authorities, statutory agencies and voluntary sector organisations, has developed a programme to promote and enhance the London canal network. Although its focus is primarily on the regeneration opportunities provided by London's Waterways, environmental protection is one theme of the initiative.

Habitat creation and habitat enhancement schemes have already been implemented throughout the London canal network but many further opportunities exist or may arise as a result or canalside repair, maintenance or redevelopment. A number of publications (e.g. *Partnership in Planning: Riverbank design guidance for the Tidal Thames*. Environment Agency. Undated) provide advice on the opportunities for enhancement of riverside walls which could be adapted for canalside enhancement.

The canals link a large number of open spaces and provide a corridor from the Green Belt in to the urban centre of London. Establishing a footpath network along the towpath has increased the opportunity for people's use and enjoyment of this corridor. It could be further enhanced as a wildlife corridor by sympathetic enhancement of the canal corridor and adjoining open spaces.

The accessibility and extensive recreational use of the London waterways provides valuable opportunities for raising awareness of biodiversity issues amongst audiences such as anglers and boaters, who need to be brought into Partnerships to ensure biodiversity conservation is integral to the management of the waterways.

Data Sources for Canal Audit

British Waterways (undated) *Explore London's Canals*. Information booklet.

Farino, T. & Game, M. (1988) *Nature Conservation in Hillingdon*. Ecology Handbook 7. London Ecology Unit

Game, M. & Whitfield, J. (1996) *Nature Conservation in Tower Hamlets*. Ecology Handbook 27. London Ecology Unit

LEU Sites of Metropolitan Importance base maps. Unpublished reference material.

London's Waterways – a catalyst for regeneration. Single Regeneration Budget Delivery Plan, Year 2:1998 –1999. London's Waterway Partnership

Rationale and limitations of approach

Data on the London canals were taken largely from material held by the London Ecology Unit. As the entire canal network is identified as a Site of Metropolitan Importance, the area of canal within each borough was calculated by measuring the length of the canal in each borough and multiplying by an average width. This provides a good approximation to the extent of the canal corridor but is not precise and includes areas of hard surface that may be of limited nature conservation value.

HA12: Lakes, Ponds and Reservoirs

Definition

Lakes, ponds and reservoirs include all areas of standing open water. Reservoirs, by definition, are artificially created water-bodies, some of which enclose a very large area of water. All of London's lakes are also likely to be artefacts resulting from the damming of streams to create water features in parks and other formal landscapes, or as a consequence of mineral extraction (sand and gravel pits). Some of London's ponds may have natural origins but most extant 'natural' ponds are likely to be former farm ponds or marl and clay pits. In more recent years many new ponds have been dug for aesthetic or nature conservation ponds in parks, gardens and amenity open spaces; many of these newer ponds have artificial liners as they do not naturally hold water.

London's Lakes, Ponds and Reservoirs Resource

The total area of open water documented in the London Wildlife Habitat Survey 1984/85 is provided in Table 1. This figure is based mainly on the larger water-bodies (lakes and reservoirs) and excludes the majority of smaller ponds. Boroughs such as Enfield, Waltham Forest and Hillingdon have a particularly high proportion of standing open water because of the presence of large reservoirs (in Waltham Forest and Enfield) or extensive former gravel workings (in Hillingdon). The map provides a picture of the resource across the capital.

Table 1: Area of Standing Open Water in Greater London

Borough	Area of Standing Open Water (ha)	Percentage of Standing Open Water Resource in London (%)
City of London	0.5	-
City of Westminster	31	2
Barking & Dagenham	40	2
Barnet	47	2.5
Bexley	18	1
Brent	29	2
Bromley	45	2.5
Camden	16	1
Croydon	8	0.5
Ealing	6	0.5
Enfield	320	18
Greenwich	7	0.5
Hackney	20	1
Hammersmith & Fulham	1	-
Haringey	25	1.5
Harrow	16	1
Havering	110	6.5
Hillingdon	299	17

Borough	Area of Standing Open Water (ha)	Percentage of Standing Open Water Resource in London (%)
Hounslow	68	4
Islington	2	-
Kensington & Chelsea	0.5	-
Kingston upon Thames	5	-
Lambeth	1.5	-
Lewisham	4	-
Merton	20	1
Newham	100	6
Redbridge	45	2.5
Richmond upon Thames	130	7.5
Southwark	14	1
Sutton	12	1
Tower Hamlets	58	3.5
Waltham Forest	230	13
Wandsworth	16	1
London Total	**1744**	

NB: The above figures exclude canals (but include docks) and have been amended to take account of changes in borough boundaries that occurred subsequent to the 1984/85 habitat survey.

Table 2 shows the number of water-bodies identified within each borough. These figures include ponds and other small water-bodies in open landscapes (but excludes garden ponds and the like). Havering has 343 sites, the largest number recorded, representing approximately 19% of the London total. Barnet has 191 sites (10% of the London total) and Hillingdon has 153 sites (8.3% of the London total). These outer London boroughs have higher total numbers due to the farm ponds remaining in the more rural parts of the Green Belt. Conversely, inner London boroughs have far fewer water-bodies; Tower Hamlets, for example, has 13 recorded sites (0.7% of the London total) and Kensington and Chelsea has only 6 recorded sites (0.3% of the London total). Inner London borough site totals would significantly increase with the inclusion of private garden ponds.

Areas of the main reservoirs in London are shown in Table 3.

It is difficult to put the extent of open water in London into any national or regional context. The UK Steering Group report does not attempt to give any indication of the area covered or distribution of any of these open water habitats. However, the concentration of large reservoirs in and around London is significant.

Table 2: Number of Lakes and Ponds by Borough

Borough	Number of lakes and ponds	Borough	Number of lakes and ponds
City of London	8	Hillingdon	153
City of Westminster	14	Hounslow	47
Barking & Dagenham	38	Islington	3
Barnet	191	Kensington & Chelsea	6
Bexley	44	Kingston upon Thames	30
Brent	35	Lambeth	23
Bromley	114	Lewisham	39
Camden	26	Merton	45
Croydon	29	Newham	18
Ealing	57	Redbridge	47
Enfield	111	Richmond upon Thames	102
Greenwich	43	Southwark	29
Hackney	9	Sutton	23
Hammersmith & Fulham	12	Tower Hamlets	13
Haringey	13	Waltham Forest	54
Harrow	90	Wandsworth	25
Havering	343	**London Total**	**1, 834**

Data from Langton 1984 and LEU

Table 3: Area of Major Reservoirs within Greater London

Borough	Reservoir	Area (ha)
Barnet	Brent	26
Brent	Brent	28
Enfield	William Girling	149
	King George's	142
Hackney	Stoke Newington	17
Hounslow	Kempton Park (East)	16
Richmond	Stain Hill & Sunnyside	20
	Londsdale Road	9
	Barn Elms	(35)*
Waltham Forest	Walthamstow	176
	Banbury	37
London Total		**697**

*Barn Elms reservoir is now The Wetland Centre, owned by WWT

Nature Conservation Importance

Ponds, lakes and reservoirs make an important contribution to London's biodiversity. However, these habitats generally differ in their nature conservation interest.

Smaller water bodies tend to provide valuable habitat for amphibians such as common frog, palmate newt, great crested newt and many species of dragonfly. Where there are dense stands of emergent vegetation such as greater reedmace *Typha latifolia,* a diverse range of other invertebrates are supported, such as the hoverfly *Parthelophilus versicolor*, a soldier fly *Odontomyia tigrina* and the bulrush wainscot moth.

Larger water-bodies (lakes and reservoirs) are noted especially for their wildfowl. Most larger lakes in London will support species such as pochard and tufted duck, and where fish are present, cormorants are now regularly seen. Better quality waterbodies support additional species including gadwall, shoveler and great crested grebe. In winter the large reservoirs provide important feeding and roosting sites for wildfowl and they can hold huge numbers of the aforementioned species as well as many others. Although the numbers of birds utilising London's lakes and reservoirs declines during the summer months, many lakes and reservoirs have breeding common tern and, where there is dense emergent vegetation, reed warbler, water rail and mute swan. Lakes and reservoirs are also favoured feeding locations for house martin and sand martin.

Water bodies can contain a variety of marginal and submerged vegetation. Nationally scarce plant species such as mudwort *Limosella aquatica* and marsh dock *Rumex palustris* occur in ponds around London (although the former is only known from one site in Richmond upon Thames. More typical components of London's pond flora include yellow iris *Iris pseudacorus*, greater pond sedge *Carex riparia* and lesser reedmace *Typha angustifolia*. The larger deeper water-bodies contain a variety of submerged or floating aquatics including spiked water-milfoil *Myriophyllum spicatum*, rigid hornwort *Ceratophyllum demersum* and yellow water-lily *Nuphar lutea*.

Some Ponds, Lakes and Reservoirs of nature conservation value in Greater London

Bennett's Hole and The Watermeads, LB Merton

Fairlop Water, LB Havering

Islip Manor, LB Ealing

Kempton Waterworks, LB Hounslow

King George's and William Girling Reservoirs, LB Enfield and LB Waltham Forest

Stoke Newington Reservoir, LB Hackney

Wynter House Pond, LB Lambeth

Threats and Opportunities

Threats

The most apparent threats to all areas of standing water are direct loss (redundancy of reservoirs, infilling of ponds), pollution (especially nutrient enrichment) and conflicting use (many of London's larger water bodies have a recreational and/or water supply function).

Ponds Small ponds are most susceptible to direct loss through deliberate infilling, or neglect resulting in the pond becoming silted, choked with marginal vegetation and eventually developing into willow carr. Although the latter scenario results in the loss of the pond it can

sometimes result in a habitat or habitats which may be equally important from a nature conservation perspective. Other ponds may suffer from being over-managed, with aquatic vegetation and accumulated silt and detritus being cleared too regularly at the expense of some species of invertebrate that may require these habitat features. Ponds in more rural parts of London may be polluted by fertilizer or pesticide run-off and ponds adjacent to roads, are often polluted by run-off of oils and other pollutants.

Many species that are dependent upon ponds for part of their life cycle (e.g. amphibians and aquatic invertebrates), are threatened by loss of terrestrial habitat surrounding their breeding ponds. Frogs and newts spend the majority of their adult life away from ponds, feeding and finding hibernation sites in adjacent terrestrial habitat. Similarly, several species of adult dragonfly hunt their prey in grasslands and along woodland rides away from their natal ponds.

Lakes Most of London's lakes are highly eutrophic because of the build up of organic material such as leaves, wildfowl excrement, fishing bait and run off from land drains. The problem of gross eutrophication is often exacerbated by stocking lakes with bottom dwelling fish, which constantly stir-up silt at the bottom of the lake and topping up lakes with mains water (which is high in phosphorous) or river water (which may be nutrient rich). Highly eutrophic lakes are usually turbid, thus limiting the growth of submerged aquatics and are subject to algal blooms, which reduce oxygen levels resulting in fish mortality.

Lakes are also subject to intense recreational pressure ranging from angling to boating and sailing. Lakesides are also a favoured location for walking and exercising dogs; indeed in many parks the lakeside is either paved or tarmaced to allow access, or the banks are seriously eroded or compacted as a consequence of the desire to access the water's edge. As well as causing disturbance to wildfowl, access to the water's edge often limits the potential for marginal vegetation to become established.

Reservoirs Most of London's larger reservoirs were built to supply London with drinking water. One exception is Brent Reservoir, which was constructed to provide a top-up supply for London's canals. The need for large reservoirs has diminished in recent years with the construction of the London ring main and therefore some reservoirs are becoming operationally redundant. Loss of some of the larger reservoirs would result in a loss of significant areas of wildfowl habitat.

Reservoirs are very much multi-functional sites, able to provide valuable recreational facilities in the urban area. Several of the London reservoirs are fished and some have canoeing and sailing facilities. Intensive recreational use can provide severe constraints on maintaining or enhancing biodiversity.

The operational requirements of reservoirs limits the amount of habitat enhancement which can be implemented with respect to encouraging marginal vegetation and other water's edge habitats. The need to maintain the integrity of embankments and other structures often negates the possibility of encouraging vegetation at the margins or along the banks.

Opportunities

Water bodies, whether ponds, lakes or reservoirs, are one of the most popular landscape features; there are few parks in London which do not contain a pond, lake or formal water feature. Likewise the larger lakes and reservoirs attract anglers, boating/sailing enthusiasts and bird-watchers. Consequently, the awareness-raising opportunities are huge.

Restoration of neglected ponds is a task that can be achieved with relatively little input. In many cases a few days of volunteer effort or a day with a earth-mover can restore ponds or create new ones. Ponds can also be restored or created during the alteration or modification of flood-defence works along rivers or as flood storage lagoons or balancing ponds in flood relief schemes. The Countryside Stewardship scheme and environmental awards provided by local authorities and others often highlight ponds as a habitat that could be restored or re-created in the landscape. Garden ponds are thought to be an important resource for amphibians and sound practical advice on construction and planting of garden ponds could dramatically increase the number of wildlife-friendly garden ponds.

All new development schemes could be encouraged to include ponds (and other wetland habitats) as part of surface water and grey water drainage schemes.

The London Lakes Project (1993-1996), managed by Wandsworth Council and part funded by the European LIFE fund, investigated the problem of London's highly eutrophic lakes and suggested methods to enhance their aesthetic and nature conservation value. Recommendations included the following: planting aquatic plants and reedbeds and fencing these areas to protect vegetation from grazing by wildfowl and trampling by humans; removing populations of bottom-dwelling fish and restocking with species which are less likely to disturb silt and uproot plants; reducing the numbers of feral geese by a variety of techniques including egg-pricking, fencing at the water's edge and eliminating large areas of mown grass adjacent to the water; and identifying a better quality water supply with which to top-up lakes - groundwater from boreholes for instance. The project also noted that awareness-raising was an essential part of any proposal to enhance the lake habitat. If park users could be encouraged to desist from providing excessive amounts of food for wildfowl, using too much ground bait; and allowing their dogs to enter the water they could contribute to improving the ecological value of the lake.

New lakes can be created as the result of the restoration of mineral workings and many water-bodies of value for nature conservation have been created in the past as a result of flooding of gravel pits. Restoration techniques have been refined to allow for the creation of a wide range of habitats ranging from islands to reedbeds to nest sites for sand-martins.

Redundant reservoirs can be enhanced to create new and very valuable wildlife habitat. The transformation of Barn Elms reservoir into the Wetland Centre is a perhaps the most impressive example. Although this is unlikely to be repeated on quite the same scale, new wetland habitats can be created within redundant reservoirs, or a compromise can be effected where the reservoir can be used for recreation with appropriate restrictions to maintain existing nature conservation interest.

Management of the recreation/nature conservation conflict of the operational reservoirs is likely to be the main opportunity for further progress in the future.

Data sources

Archer, J. & Robinson P. (1994). *Royal Borough of Kensington and Chelsea. Borough Ecological Survey.* London Ecology Unit.

Archer, J., Dawson, D. & Hewlett, J. (1995). *City of Westminster Nature Conservation Survey 1995.* London Ecology Unit.

DETR (1998). *Lowland Ponds Survey 1996, Final Report.* Department of the Environment, Transport and the Regions.

Guest, P. (1996). *LA21 Pond Survey*. Merton Environment Forum. Unpublished.

Hatto, J. (1998). *Richmond Upon Thames: Garden Pond Survey for 1998.* London Borough of Richmond Upon Thames. Unpublished.

Langton, T. (1984). The Greater London Pond Survey. Data held by the London Ecology Unit.

Langton, T. (1985). *The London Pond Survey.* Oryx Vol. 19, No. 3, pp163-166.

LB Wandsworth (1997) *London Lakes Project: an overview of works and results of the project.*

London Ecology Unit Handbooks 1-29.

London Ecology Unit (1990). *Schedule of Sites of Nature Conservation Significance in the Borough of Haringey.* LEU.

London Ecology Unit (1998). *A Revised Schedule of Sites of Importance for Nature Conservation in L.B. Enfield.* London Ecology Unit.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

McMauchlin, J. & Jennings, M. (1998). *The Flora of Croydon's Ponds.* The London Naturalist, No. 77, pp73-81.

Plummer, B. & Shewan, D. (1992). *City Gardens. An Open Spaces Survey in the City of London.* Corporation of London.

Ward, D. & Pilcher R. (1989). *The Nature Conservation Value And Management of Redundant Reservoirs in the London Area. Volume 1: Identification of the Sites and Site Descriptions.* Nature Conservancy Council and the Royal Society for the Protection of Birds.

Vickers, D. (1992). *Wildlife Habitats in Wandsworth, Borough Habitat Survey of 1992.* London Ecology Unit.

Rationale and limitations of approach

Data in Table 1 is based on the London Pond Survey (Langton 1984). Langton's survey (1984) cross-referenced water bodies shown on Ordnance Survey maps produced in the 1860s (at the scale of 25 inches to the mile) with modern maps and aerial photos. The survey represents the most comprehensive data on London's water-bodies but unfortunately does not provide area measurements for the listed sites.

The Lakes, Ponds and Reservoirs audit data should be used as a guide and not as a definitive statement of Greater London's water body resource. Many of the sites that have been included within the audit have no recent data; consequently the audit will include some inaccuracies when compared with the present day situation.

Information on Table 1 data was gained by cross-referencing the name and grid references of all water bodies included in the LEU data against Langton's (1984) data. If the waterbodies highlighted in the LEU data were not included within the Langton data, the new sites were added - see Table 2 for details.

Whilst carrying out this process, some Langton sites where found to have incorrect grid references. However, due to time constraints it was impossible to check grid references for each site. It is likely that there are remaining anomalies in this data set in terms of grid references and names given to water bodies. This may be rectified over the next year by the Environment Agency project.

Small ponds, such as garden ponds, are not highlighted on the OS maps and as such will not be included within this audit. The boroughs of Merton, Newham, and Richmond upon Thames have carried out garden pond surveys. The data from these garden pond surveys has not been included. Survey methodology and return rates will vary preventing any direct cross-Borough comparison of results. Had the garden pond data been included with the London-wide data it would have led to misleading trends, as the other 28 London Boroughs do not hold garden pond data.

As such the pond resource in Greater London will only represent a fraction of London's resource. The fact that the London Boroughs of Merton and Richmond each had over 100 returned garden pond questionnaires highlights the extent of this untapped resource. However, it is hoped that a garden ponds will be addressed within a Garden Habitat Action Plan.

Further research is required to identify the full resource. The Environment Agency have recognised this as a research need and are about to commence a full audit of all standing water bodies within Greater London. Each borough could contribute to the biodiversity action planning process, through a comprehensive re-survey, recording any new sites.

HA13: Cemeteries and Churchyards

Definition

Churchyards are burial grounds encompassed within the walled boundary of a church. During the latter half of the eighteenth century some churches, especially in central London, established extramural burial grounds due to the shortage of space within their churchyards. Many of these 'church gardens' have since been turned into public gardens. Where information exists these sites are included within the churchyard element of this audit.

Cemeteries are burial grounds outside the confines of a church. These include private burial grounds (mostly constructed during the Victorian era) and more recently established local authority burial grounds.

London's Cemeteries and Churchyards Resource

Churchyards and burial grounds fulfilled most burial needs in the central part of the city up until the early 19th century. As these sites became over-burdened, larger public cemeteries on the edge of the urban area where proposed. Seven major sites were identified during the early part of the last century and the first of the so-called 'Magnificent Seven' Victorian cemeteries - Kensal Green Cemetery - was opened in 1832. The other six are West Norwood, Highgate, Nunhead, Abney Park, Brompton and Tower Hamlets.

Many other cemeteries were established during the Victorian era and the early part of this century. Burial space in London is again in short supply and new cemeteries are being proposed or established. However, few new cemeteries are likely to be established in London in the future because of the limited availability of suitable land.

Cemeteries in London cover approximately 1300 hectares, just under 1% of Greater London's land cover. Cemeteries are predominately situated in outer London boroughs with the largest areas of cemetery land being in Newham (153 ha) and Barnet (142 ha). In comparison, Hackney (13 ha) and Kensington & Chelsea (16 ha) have relatively small amounts of cemetery land (see Table 1). In Newham, which has the largest area of cemetery space and Kensington & Chelsea, which has one of the smallest areas of cemetery space, cemeteries provide over one third of the available public open space (LPAC/Halcrow Fox, 1997). The Map represents the extent of the resource in London.

Until further research is carried out it is not possible fully to ascertain Greater London's churchyard resource (see 'Rationale and Limitations of Approach'). However, from the little data that is available, it is clear that churchyards represent a relatively minor resource in terms of the land which they encompass, but they are a significant potential resource with respect to their distribution. Their distribution throughout London contrasts with the cemeteries that are confined largely to outer London boroughs. Churchyards that have been identified by the London Ecology Unit for their nature conservation importance, cover approximately 88 ha (see Table 2). This does not represent the full potential resource – many other churchyards have been managed in a way that has limited their nature conservation value.

Table 1: Cemetery and Designated Churchyard Data by Borough

Borough	Area of Cemetery (ha) and number of sites (in brackets)	Area of Churchyards identified as sites of nature conservation importance (ha) and number of sites (in brackets)
Barking & Dagenham	22 (3)	6.8 (2)
Barnet	142 u* (8)	-
Bexley	20 (4)	2.8 (2)
Brent	34* (7)	1 (1)
Bromley	28 (7)	-
Camden	30 (2)	4.6 (4)
City of Westminster	-	7.34 (9)
Croydon	25 (2)	-
Ealing	53 (7)	1.2 (2)
Enfield	63 u* (10)	-
Greenwich	53 (7)	1.5 (1)
Hackney	13 (1)	-
Hammersmith & Fulham	55 (4)	-
Haringey	24 (2)	-
Harrow	19 (7)	-
Havering	39 (5)	-
Hillingdon	23 c* (7)	2.7 (2)
Hounslow	41 (9)	-
Islington	-	4.9 (4)
Kensington & Chelsea	16 (1)	1 (3)
Kingston Upon Thames	13 (2)	-
Lambeth	17 (1)	0.7 (2)
Lewisham	51 (5)	0.8 (1)
Merton	79 (7)	5.6 (3)
Newham	153 (8)	4.4 (2)
Redbridge	13 (4)	0.6 (1)
Richmond Upon Thames	71 (10)	1.3 (2)
Southwark	51 (3)	1.1 (2)
Sutton	16 (3)	4.7 (4)
Tower Hamlets	13 (1)	2.7 (2)
Waltham Forest	39 u* (4)	1.5 (2)
Wandsworth	78 (6)	2.8 (6)
London Total	**1,294 ha**	**60ha**

Source: LPAC/Halcrow Fox, 1997

NB: Sub totals may not add up to totals due to rounding. * = Missing information

u = figure given is likely to be an under-estimate, C = CIPFA Cemeteries Statistics 1994/5 Actuals.

Table 2: Chuchyards with existing nature conservation value identified by LEU as Sites of Importance for Nature Conservation

Borough	Name of Site	Grid Reference	Area (ha)
Baking & Dagenham	Barking Abbey Ruins & St Margarets Ch	441 839	5.9
	St Peters & St Paul's	550 844	0.9
Bexley	St Mary's Ch	499 734	0.8
	Crayford Parish Ch	511 752	2
Brent	Old St Andrews ChY	207 869	1
Camden	Hampstead Parish Ch	263 856	0.7
	St Andrew's Gdn	308 824	0.6
	St George's Gdns	305 825	1.1
	St John's Gdn	293 827	1.2
City of Westminster	St Stephen Gdn/Pk	252 814	0.13
	St James' Gdn	293 805	0.17
	St Anne's Ch Gdn	296 809	0.20
	St Marylebone Gdn/ChY	283 820	0.37
	St Augustines (grounds)	255 831	0.73
	St Mary's ChY	266 817	0.50
	Westminster Cloisters Gdn	300 794	1.21
	St Mary's Gdn	226 818	1.67
	St John's Wood Gdn/Chy	270 829	2.36
Ealing	Holy Cross	145 831	1
	St Mary's	177 797	0.2
Greenwich	St John the Baptist ChY	426 746	1.5
Hillingdon	Harfield Ch	055 896	1.7
	St Mary's Wood End	097 813	1
Islington	St Mary's Ch Gdns	317 836	1.5
	Bunhill Fields Burial Ground	327 822	1.5
	St John's Gdns	316 819	0.2
	St Mary Magdalene Gdn	312 849	1.7
Kensington & Chelsea	Moravian Burial Ground	267 776	0.4
	Royal Hospital Old Bural Grounds	280 782	0.4
	Western Cemetery	267 782	0.2
Lambeth	St Leonard's	299 717	0.4
	St Paul's	292 761	0.3
Lewisham	St Mary's	379 748	0.8
Merton	St Mary's	250 693	1.8
	St Mary's	245 715	0.9

Borough	Name of Site	Grid Reference	Area (ha)
	St Peter and St Paul	270 687	2.9
Newham	All Saints Ch	394 839	0.6
	East Ham Nature Reserve- St Mary Magdalene	429 823	3.8
Redbridge	St Mary's Ch	449.867	0.6
Richmond	St James	140 713	0.9
	St Mary's and St Albion	165 712	0.4
	St Mary's Gdns	351 798	0.4
	St Mary Magdalene ChY	333 794	0.7
Southwark	St Mary's	292 654	2
Sutton	All Saints	279 645	5
	All Saints	258 652	0.8
	St Nicholas	257 642	0.3
Tower Hamlets	St George	348 808	0.7
	St Dunstans	359 814	2
Waltham Forest	St Mary's	378 892	1
	St Mary the Virgin	377 868	0.5
Wandsworth	Putney Old Burial Ground	361 750	0.3
	St Michael's Church Field	247 739	0.8
	St Nicholas ChY	279 712	0.7
	St Anne's Church Grounds	660 744	0.3
	St Barnabas Ch Grds	253 730	0.3
	All Saints	231 757	0.4
London Total			**88 ha**

NB: Due to rounding, sub totals from Table 1 may not add up to totals in Table 2

Nature Conservation Importance

Cemeteries and churchyards make a significant contribution to the provision of urban green space in London, sometimes providing a sanctuary for wildlife in urban areas devoid of greenspace. Although many have restricted access they still provide a useful resource for the local community, particularly within inner London Boroughs.

A wide variety of habitats can be found in Greater London's cemeteries. This is demonstrated by St Pancras and Islington Cemetery in Barnet, which supports areas of neutral grassland, wetland, scrub and secondary woodland. Due to the antiquity of many churchyards and cemeteries they can support habitats which are relics of former countryside and may, therefore, support a range of rare or uncommon plant species. The only known London site for green-winged orchid *Orchis morio*, for example, is Morden Cemetery in Merton. Other more commonly occurring plants, which are indicative of the countryside within which many of these cemeteries were formerly located, include cuckoo-flower *Cardamine pratense*, harebell *Campanula rotundifolia* and crested dog's-tail *Cynosorus cristatus*.

The older cemeteries, in common with mature suburban gardens, often support animal species that are essentially species of open woodland or woodland edge. These include spotted flycatcher, song thrush, tawny owl and stag beetle. Holly blue, gatekeeper and speckled wood butterflies often occur, as well as most of the commoner species that occur in our parks and gardens.

Apart from a few unusually large sites, churchyards tend to have a more limited diversity of habitats – mature trees and small areas of grassland (occasionally quite species rich) being the main features of interest. Yew *Taxus baccata* and ivy *Hedera helix* are frequent components of the churchyard flora. In addition, churchyard walls, monuments and gravestones may support unusual plant communities with species such as hart's-tongue fern *Phyllitis scolopendrium*, wall rue *Asplenium ruta-muralis,* pellitory-of-the-wall *Parietaria judaica* and various lichens and other lower plants. The church buildings themselves may also be of special nature conservation interest if they contain bat roosts.

Isolated cemeteries and churchyards can provide sheltered habitat in spring and autumn for migrant birds, providing an important link in the network of open space that provides these species with temporary refugia. Within central London, churchyards are often among the few areas of greenspace where the local community is able to have some contact with the natural world.

Some cemeteries and churchyards of nature conservation value in Greater London

Highgate Cemetery, Camden

St Mary's Churchyard, Sutton

Kensal Green Cemetery, Hammersmith & Fulham

Abney Park Cemetery, Hackney

Tower Hamlets Cemetery, Tower Hamlets

Harefield Churchyard, Hillingdon

Threats and Opportunities

Threats

While churchyard/cemetery status confers protection from certain forms of development, loss of existing habitat may occur as a result of increasing pressure for burial space. Twenty one of the thirty eight cemeteries with recognised nature conservation value in London have been identified as sites for potential re-use (Bailey 1998). The notable nature conservation value of these sites is often due to their antiquity and the current laws preventing the disturbance of human remains. Re-use could result in the loss of the tree and scrub cover that has developed over many of these older cemetery sites.

The responsibility for management of many cemetery sites has been given to various local authority departments who are often ill-equipped to advise on ecological management, or are reluctant to accept nature conservation value. In an attempt to avoid affronting the perceived sensitivities of relatives of the interred, most land management in operational cemeteries is aimed at maintaining a well-ordered, 'tidy' appearance which limits the opportunities for biodiversity conservation and enhancement.

Opportunities

In London, there is considerable potential for increasing the nature conservation value of many of the extensive cemetery sites. Simple measures such as a reduction in mowing frequency where the sward is species-rich, or tree and shrub planting where existing habitat is of low value would do much to increase their ecological value. Placing bird and bat boxes in sites with trees would provide a very public indication of support for biodiversity conservation. The growing interest in 'green burials' may also create an opportunity to incorporate enhancement or creation of wildlife habitat within existing or newly created cemeteries.

By recognising the existing and potential value of cemeteries and churchyards these sites can provide an educational resource which encompasses biodiversity, history and other disciplines. For example,

the relic flora of the site, in addition to dates on headstones, can provide evidence as to the history of the site. Lichens on walls and monuments can be related to air quality.

Although perceived as a threat to existing habitats within cemeteries, re-use could provide an opportunity to create new habitats or restore open habitats which have been lost to scrub or secondary woodland. Indeed a London Planning Advisory Committee report, '*Burial Space Needs in London*', specifically refers to the need to conserve biodiversity within any re-use strategy. Sites such Tower Hamlets, Abney Park and Highgate Cemeteries demonstrate the potential for incorporating biodiversity objectives into the management of cemeteries and churchyards.

Data Sources

Bailey, R. (1998). *Re-Use of Graves Threatens London's Valuable Wildlife Sites.* MSc Project, University College London.

The Confederation of Burial Services and The Institute of Burial and Cremation Administration, Inc.

Halcrow Fox (1997). *Burial Space Needs in London.* LPAC.

London Ecology Unit Handbooks nos.: 5, 7, 9-13,15-21, 24-28.

London Ecology Unit Schedules: Bexley, City of Westminster, Enfield, Kensington & Chelsea, Southwark and Wandsworth.

Mellor, H. (1981). *London Cemeteries.* Avebury.

Rationale and Limitations of Approach.

Data on the distribution and extent of cemeteries came from the London Advisory Planning Committee's (LPAC) Report 'Burial Space Needs In London' (1997). The report contains the most comprehensive audit of London's cemeteries to date, although not all cemeteries responded to the survey. A full audit of churchyards was not possible as the data is not yet available. The figures provided in this 'preliminary' audit represent the churchyard resource with the Sites of Importance for Nature Conservation identified by the London Ecology Unit (LEU). This is not a definitive representation of Greater London's churchyard resource.

The list includes churchyards of nature conservation importance for most boroughs (those with LEU handbooks/schedules). The data for these sites was collected from a database at the Unit and checked against each borough handbook and schedule. No churchyards are listed for boroughs that are not members of the London Ecology Committee: City of London, Havering, Bromley and Hackney.

Although lists of churches with churchyards are available for approximately half of London there are no available data on the size of these churchyards. There are six Church of England Diocese which cover the Greater London area: London, Rochester, Southwark, Guildford, Chelmsford and St Albans (Table 2). Available lists provide the names of churches without giving their exact locations. The Diocesan handbooks could be used to identify each church and would need to be purchased at a cost of £3-5. The Dioceses of Chelmsford and Southwark do not have a list of churches with churchyards. The Diocesan handbook could be used to contact each parish individually.

Roman Catholic churches in Greater London fall under two Archdiocese (Westminster, Southwark) and a smaller Diocese (Brentford). The structure of the Methodist church in London is based on the boundaries of Greater London with four divisions forming the four quarters of the city; NW, NE and so on. No preliminary research has been carried out for other denominations. However, in context of ecclesiastical land use history these will, perhaps, represent a small resource proportion of the Church of England, Roman Catholic, and Methodist churchyard resource.

HA14: Railway linesides

Definition

For the purposes of this audit railway linesides are the vegetated lands that lie adjacent to operational above-surface railways. Closed railway routes – those that are no longer in railway ownership – are not included. Vegetated lineside land may include embankments, cuttings, areas around stations and by junctions, above tunnel-mouths, and derelict sidings and marshalling yards. The habitats present are predominantly grassland, scrub, woodland and ruderal vegetation – wetlands are noticeable by their virtual absence – the key link is that they are all on land owned and/or managed as part of the railway network.

London's Railway Lineside Resource

The railway network in London was largely created between 1836 and 1936, both stimulating and reacting to the rapid urban growth of the capital. Although the network cut rudely into open countryside when it was first built, most has subsequently become part of the urban landscape and, through the process of natural colonisation, now provides significant areas of wildlife habitat.

There are approximately 795km (492 miles) of open operating railway corridors in London, not including closed railway lines such as Horniman Railway Trail in Lewisham and Parkland Walk in Haringey, which are managed for nature conservation and/or amenity. The open corridors are owned predominantly by two companies; Railtrack Plc and London Underground Limited (LUL) and a number of corridors are used by both underground and surface rail trains. Smaller lengths of railway are owned and/or managed by Docklands Light Railway (DLR), Tramlink in Croydon and a few private industries. Most London boroughs contain between 10 and 35km of railway corridor; see Table 1 and Map b. Only four contain more than 40km (Bromley, Croydon, Lewisham and Brent), whilst two contain less than 5km (Westminster and City of London). Some boroughs have larger lineside networks than others proportional to their area. The best include Lewisham, Tower Hamlets (although much of this is raised DLR), and Newham; the poorest include Westminster, Redbridge and Camden. The total area of railway corridors has yet to be calculated, as has the total area of linesides of wildlife value.

Table 1: Lengths of Railway Corridor and Extent of Sites of Importance for Nature Conservation by Borough

Borough	Railway corridor (Railtrack/ LUL/ Tramlink/ DLR) (km)	Railway lineside SINCs (ha) a	Borough corridor as % of total London resource
Barking & Dagenham	15.74	2.4	2.0
Barnet	34.89	28.5	4.3
Bexley	24.86	N	3.1
Brent	41.40	93.0	5.2
Bromley	51.12	N	6.4
Camden	18.57	25.1	2.3
City of London	1.80	N	0.2
Croydon	49.69b	31.3	6.2
Ealing	33.03	162.7	4.1
Enfield	34.74	45.2	4.4
Greenwich	19.94	N	2.5
Hackney	10.66	5.1	1.3

Borough	Railway corridor (Railtrack/ LUL/ Tramlink/ DLR) (km)	Railway lineside SINCs (ha) a	Borough corridor as % of total London resource
Hammersmith & Fulham	17.22	25.0	2.2
Haringey	19.20	12.3	2.4
Harrow	22.70	17.1	2.8
Havering	28.50	N	3.6
Hillingdon	27.69	5.3	3.5
Hounslow	22.52	2.5	2.8
Islington	10.07	34.2	1.3
Kensington & Chelsea	6.56	24.6	0.8
Kingston upon Thames	15.99	1.9	2.0
Lambeth	23.41	28.9	2.9
Lewisham	41.86	86.0	5.3
Merton	28.70	53.0	3.6
Newham	37.47	50.0	4.8
Redbridge	13.43	41.0	1.7
Richmond upon Thames	25.73	2.9	3.2
Southwark	22.23	27.2	2.8
Sutton	17.92	17.8	2.2
Tower Hamlets	22.07c	0.0	2.8
Waltham Forest	25.27	2.0	3.2
Wandsworth	27.51	13.3	3.4
Westminster	4.08	0.0	0.5
London Total	**796.57 ha**	**838.3 ha**	

a = Areas identified by the London Ecology Unit
b = Includes over 8km of new Tramlink corridors, but not street lines
c = Includes over 8km of the raised tracks of the Docklands Light Railway
N = Linesides not surveyed; to be identified.

In inner London the railways are mostly elevated on viaducts or in deep cuttings and hence support very limited biodiversity. Further than 5km from the city centre, the linesides become broader (usually as they meet ground level) and begin to support vegetation. Towards the London borders quite significant areas of semi-natural habitat can be included within the railway corridor. Lineside habitats are largely a legacy of the countryside they were originally built through, their subsequent management, together with the indirect impacts of railway operation. Linesides were once managed intensively and although in certain areas trees were planted to screen residential properties, the 'railway' poplar, *Populus x canadensis* 'Regenerata' for example, the majority were maintained as grassland. From the 1920s, with the change to electrification and the ever-increasing labour costs, management became more relaxed, especially so after the Modernisation programme of 1955. From the 1970s scrub and woodland began to appear on the more rural stretches, to the extent where many of today's railsides support recent sycamore woodlands – often the only significant stands of woodland in many inner London areas.

Changes to the railway network and land area have been significant since the mid-1980s, and with privatisation development pressure may result in further land-take, particularly on derelict marshalling yards (although the growing trend for increased rail freight traffic may prevent this on certain routes). New railway projects have led to corridors being created, often at the expense of semi-natural habitat (e.g.

Addington Hills in Croydon), but such projects now require environmental assessments and with heightened public sensitivity are unlikely to proceed without considerable ecological compensation.

Nature Conservation Importance

The railway network supports significant areas of biodiversity importance in London. A total of 838 ha of lineside have been identified as Sites of Importance for Nature Conservation to date by the London Ecology Unit (LEU) (see Map a). The range of habitats (from chalk cliffs to early successional wastelands), together with their relative lack of human disturbance, provides a diversity of fauna and flora that in some areas can be relatively rich. In inner London they often support the only significant woodlands and rough grasslands. Sunny grass embankments may be havens for butterflies, grasshoppers, slow-worm and kestrel, whilst woodlands can support great tit, great spotted woodpecker and sparrowhawk. Derelict marshalling yards with a free-draining, alkaline substrate often support a diverse range of ruderal plants, before succeeding towards birch scrub and woodland. Temple Mills and Feltham are two fine examples, with a new species of spider to the UK, *Zodarion rubidum*, being recorded at the former site in 1999.

A number of plants and animals are characteristic of London's linesides. Plants such as everlasting sweet-pea, rosebay willowherb and Oxford ragwort have spread through the development and operation of railways, whereas sycamore is the predominant tree species. *Buddleia* occupies lineside ballast and cracks in railway structures. Some 'pest' species such as Japanese knotweed and giant hogweed have also taken root, often in large monocultures.

Well-vegetated linesides will act as 'green corridors' and the combined network of railways will help to permit movement of some species along them between adjoining sites – either through direct movement (e.g. mammals) or dispersal assisted by the movements of trains (e.g. seeds of plants). Thus railway linesides will add to and benefit from the ecological integrity of adjacent SINCs and other open green space. The value of green corridors has been recognised in PPG9, in that they "*help form a network to ensure the maintenance of the current range and diversity of our flora [and] fauna*" (para. 15).

A few lineside areas such as Gunnersbury Triangle in Chiswick, Gillespie Park in Islington and New Cross Gate Cutting in Lewisham are actively managed as nature reserves. Work by Railtrack and London Wildlife Trust to identify further nature reserves as well as priority 'conservation zones' began in 1997, but requires further development. LB Lewisham is also seeking to create a large railside Local Nature Reserve. A leaflet, 'W*ild Linesides'*, was published in 1998 to promote the ecological interest of London's railways to the travelling public.

Some Railway Linesides of nature conservation value in Greater London

Tall vegetation between Wembley Park and Preston Road, Metropolitan Line

Scattered trees and tall vegetation between Brent Cross and Hendon Central, Northern Line

Grassland between Dagenham Heathway and Elm Park, District Line

Woods between Cockfosters and Oakwood, Piccadilly Line

Woods at Sydenham Hill Nature Reserve, Sydenham Hill station, Connex Southeastern

Threats and Opportunities

Threats

The two most significant threats to the biodiversity of London's linesides are loss of habitat through development (and occasionally operational requirements), and under-management.

Although the development of railway land began in the 1960s on a number of closed lines, it sharply increased during the 1980s, with the loss of large marshalling yards such as Bricklayers' Arms and the reduction of space around junctions to housing, for example near Drayton Park, Islington. With privatisation this may set to increase; Railtrack has an obligation to maximise its assets, and this will include selling off redundant land for development. Some railway corridors will be exempt due to their slope, structure or narrowness, but larger areas of flat land (especially those adjacent to existing residential areas) will be under increasing pressure. Only a few railway sites are 'protected' in London borough's Unitary Development Plans (UDPs), and efforts should be made by organisations to seek inclusion of the most important areas in the UDP reviews.

The importance of railway linesides lies with the mosaic of habitats that they support. However, rough grasslands and ruderal habitats, by virtue of their decline elsewhere in London, are relatively important in the lineside context. Management to meet operational standards is geared to the prevention of trees growing too near the tracks, especially those with a mucilaginous leaf litter (e.g. sycamore and ash), and a 15m swathe is regularly clear-felled. This is not enough to maintain existing grassland, nor enough to restore grassland that has since turned to scrub and woodland. The likelihood is that on all but the poorest of soils, linesides will become predominantly low sycamore/ash scrub, banking onto stands of oak/sycamore woodland, and maintained as such. Additional management in areas of existing grassland will be required in order to maintain their biodiversity interest; how this will be undertaken in areas not within nature reserves is not known.

Less direct threats include the in-built bias against vegetation within the railway industry, the use of contractors for lineside management and the results of weaknesses in communication and control. In addition, the existing management of the permanent way (through herbicide treatment), potential for widening the rail corridor for new strategic rail links (e.g. the Central Railways proposal of 1996/7), garden encroachment and fly-tipping all threaten lineside biodiversity.

Opportunities

Although it is unlikely that any of London's railway corridors will be managed primarily for wildlife, there is significant room to enhance their value for biodiversity. In recent years, management guidance produced by the railway companies has begun to take account of ecological issues (e.g. *Maintaining the Track Environment*, LUL, 1995), and this should be encouraged to progress further. Seeking to restore grassland habitats and manage graded woodland edges, for example, need not compromise the railway companies meeting their operational standards and obligations. Therefore identification of the most important stretches for nature conservation (which will require some further survey) and preparing 'Conservation Zone Plans'as guidelines for their management by contractors, should be seen as priorities. This would help to target limited management resources effectively. However, the screening and landscape value of tree stands and woodlands should not be under-estimated, and a Habitat Action Plan should take these into account where appropriate. There has been some limited tree-planting on railway land in recent years (e.g. Wandsworth Common), but in light of the priorities to expand the grassland element this should be restricted to identified areas. There may also be opportunities for habitat creation similar to the new ponds created by Railtrack for amphibians at Selhurst.

There is also the potential to seek the creation of more lineside nature reserves managed in partnership between railway companies and conservation groups. These can provide local involvement in lineside habitat management. A number already exist, but there is the opportunity for more throughout London, although it must be recognised that local groups are rarely in a position to manage them without adequate resources.

Railway linesides are seen by many hundreds of thousands of travellers on a daily basis, and for many they are places where they can see the colour and spontaneity of wildlife. Their linear character emphasises the feeling of more or less uninterrupted countryside, almost into the centre of the city. However, there is very little information on railway wildlife or the value of London's linesides and the potential for raising the awareness of their biodiversity is considerable. This may be through on-train information, station interpretation, lineside signs and leaflets.

Data sources

Anon (1990). *A Schedule and map of sites of Nature Conservation Importance in Haringey*, London Ecology Unit (unpublished).

Anon (1997), *Nature Conservation in Westminster*, City of Westminster and London Ecology Unit

Ordnance Survey (1996), 1:10,000 Raster data

Ordnance Survey (1998), Meridian data

McCaskie, J. (1987) *Wildlife Habitats in Hackney*, London Wildlife Trust

Newton, J., Nicholson, B., & McCaskie, J., (1993), *Nature Conservation in Hackney*, Hackney Council

Parks, R., (1997), *Ecological report for Northern Line* (3 volumes), Paul Norton Associates, for London Underground Limited.

Various (1988-98), *Nature Conservation in...* Ecology Handbooks 5-29, London Ecology Unit

Various (1998-99), *Nature Conservation in Lewisham*; *Brent*, Ecology Handbooks 30; 31, London Ecology Unit (unpublished consultation drafts)

Vickers, J. (1992), *Wildlife Habitats in Wandsworth; a report on the borough habitat survey of 1992*, London Ecology Unit (unpublished)

Waite, M., (1991), *Bexley Wildlife Survey; Part 1: Schedule of Sites of Nature Conservation Importance*, London Ecology Unit (unpublished)

Rationale and Limitations of Approach

Although the ecological interest of London's railsides has long been recognised (e.g. Fitter, 1945), strategic survey only began with the 1984/5 London Wildlife Habitat Survey. Much has subsequently been reviewed through the work of the LEU, though access to linesides is difficult and, bar the few areas where survey has been more than that viewed from a bridge, platform or moving train, the quality of existing information is poor. An exception is London Underground Limited's Ecological Report for the Northern Line (1997) and survey of LUL's above-surface linesides by LEU during 1999. Not all of London's linesides have been surveyed since 1985, however. The audit has been prepared from stretches identified in the LEU handbooks and other existing information. Therefore, it is not an exhaustive audit and will benefit from more detailed research.

There is further disparity between railside SINCs in these boroughs, as railside land began only to be considered after 1992. Borough surveys prior to this date (e.g. Greenwich, Hillingdon) have virtually no railway land included. Boroughs that have not been surveyed by the Unit (e.g. Bromley, Havering) probably support significant lengths of railside of nature conservation importance; a few are probably some of London's best (e.g. Elmstead Woods in Bromley). There are therefore opportunities to identify more railway lineside SINCs.

HA15: Farmland

Definition

Farmland can be broadly defined as land under cultivation that is tilled at least once every five years (Wicks & Cloughley 1998). This can include land in set-aside, or temporary grassland (an agricultural ley).

London's farmland resource

The data used for audit purposes fell under the following MAFF land use headings: arable, 'other' (e.g. vegetables and feed), bare fallow, grassland (excluding rough grazing), rough grazing, set aside and woodland on agricultural land. Orchards have also been identified.

In 1997 MAFF estimated approximately 12,872 ha of farmland in Greater London (seeT*able 1*), 529 ha of which was under set-aside. The total area of farmland in London represents 8% of the total area of Greater London. There are estimated to be 1,156,114 ha of farmland in Southeast England; London accounts for just 1% of this. MAFF's 1997 figures show that the majority of farmland in London is made up of arable (27%) and grassland (44%, excluding rough grassland).

The overall farmland resource in London declined by 30% between 1965 and 1997. This included declines in arable of 42%, orchards 90%, bare fallow 75%, grassland (excluding rough grazing) 22% and rough grazing 39% (see Table 1).

Data is available for the farmland resource in the following boroughs: Barnet, Bromley, Enfield, Havering, and Hillingdon. Bromley contains approximately 30% of London's agricultural land followed by Havering (24%), Hillingdon (13%), Enfield (12%) and Barnet (6%) (see Table 2 and the Map). Approximately 85% of Greater London's farmland resource is contained within these five boroughs.

Nature Conservation Importance

The intensification of farming over the last 20-30 years (and the reduction in farmed land in London) has led to significant nation-wide declines in many species dependent upon habitats associated with 'traditionally' farmed landscape. This has led to farmland habitats being highlighted as a priority for nature conservation by the UK Biodiversity Steering Group (1995). Of particular nature conservation importance are traditional hay meadows, old hedgerows and ponds, and farmland birds such as tree sparrow and skylark.

Although most of the modern-day farmed landscape supports far fewer species than unimproved pasture and traditionally farmed arable land (which allowed for a fallow period and was less dependent upon pesticides and artificial fertilisers), there are still a number of species which are associated with farmland. In London several bird species are, in part, dependent upon farmland; corn bunting, yellowhammer and wintering golden plover are largely confined to the capital's remaining farmland. Farmland also supports important populations of tree sparrow, grey partridge, lapwing and skylark. Most of these species are especially dependent upon hedgerows and other features such as small woodlands, rough headlands and ditches within the farmland matrix.

Table 1: Audit of Greater London Farmland Holdings in 1997, 1985, and 1965.

Year/Greater London and South East Region	Total Tillage					Total Grassland (not rough grazing)	Rough Grazing	Woodland	Set Aside	Total
	Total Arable	**Total Orchards**	**Other (e.g. Veg, /Feed.**	**Bare Fallow**	**Sub Total**					
1997 Greater London	3,486	39	1,893	155	5, 573	5,656	733	381	529	12,872
1997 South East Region	407,687	13,911	169,717	4,354	595,669	412,300	32,547	66,697	48,901	1,156,114
1985 Greater London	5,045	51	1, 710	275	7,081	7,037	1,320	895	-	16,333
1985 South East Region	807,276	20,790	150,122	9,651	987,839	567,275	43,408	103,235	-	1,701,757
1965 Greater London	5,971	390	2,995	610	9,966	7,284	1,200	-	-	18,450
1965 South East Region	455,943	33,530	77,318	15,105	581,896	429,279	43,010	-	-	1,054,185

NB: Sub totals may not add up to totals due to rounding. Data taken from final results of the June 97, June 85 and June 65 MAFF Agricultural and Horticultural Census.

Table 2: Available Farmland Holdings Audit Data for Five London Boroughs

Land Use	**London Borough Holdings (ha)**					
	Barnet	**Bromley**	**Enfield**	**Havering**	**Hillingdon**	**Total**
Total Crops and Fallow (tillage)	197	1,994	626	1,922	296	5,035
Recent and Temporary Grassland (<5 years)	***	224	262	138	118	***
Permanent Grassland (> 5 years)	449	1,078	415	580	864	3,386
Rough Grazing (sole rights)	***	121	31	107	236	***
Woodland	***	153	28	54	***	***
Set - Aside	***	183	59	142	***	***
All Other Land	8	95	55	140	62	360
Total Area on Holdings (ha) (% Total Resource).	783 (6%)	3,848 (30%)	1,475 (12%)	3,084 (24%)	1,624 (13%)	10,814 (84%)

NB: *** To prevent the disclosure of information about individual holdings the number of holdings has been suppressed and the data averaged over a wider area. Sub total may not add up to totals due to rounding. Data taken from MAFF Agricultural and Horticultural Census: 2 June 1997. Parish Group Data (excluding minor holdings).

Although most mammal species are found within a range of habitats in London, the remaining populations of brown hare are virtually confined to arable areas on the fringes of the Capital.

There are few plant species with specific associations with agricultural land which still occur in London, largely due to the use of herbicides. However, some of these species (such as poppy *Papaver rhoeas*) are making a welcome comeback as a result of Countryside Stewardship and set-aside schemes. Rarities such as Deptford pink *Dianthus armeria* may survive as viable seed in the seed-bank in the margins of arable land on the chalk. It is perhaps interesting to note that many plant species formerly regarded as weeds of arable land are now more often encountered on wasteland sites across the Capital.

Much of the nature conservation value of 'active' farmland has become concentrated in the field margins, headlands and along field boundaries, particularly hedgerows. These remaining semi-natural habitats often support populations of common grassland butterflies such as gatekeeper and a host of other invertebrates which are an important food source for farmland birds, particularly during the breeding season.

Some farmland areas of nature conservation value in Greater London

Arkeley South Fields. Set-aside with breeding skylarks, LB Barnet

Fairlop Plain. Arable farmland complex with species such as brown hare and wintering golden plover, LB Redbridge

Several farms with arable reversion schemes, LB Bromley

Threats and Opportunities

Threats

The threats to farmland biodiversity have been well documented; indeed the rapid decline in once familiar farmland birds was one of the main catalysts for the biodiversity action planning process in the UK.

In recent years the primary threat to farmland biodiversity in London, in common with the rest of the UK, has been continued agricultural intensification driven by advances in technology and falls in farm incomes. Application of artificial fertiliser and the widespread use of herbicides and insecticides have resulted in a severe decline in the biodiversity of intensively farmed fields. Simplification of the crop rotation cycle - including the decline in the use of root crops in stock rearing areas, use of pre-emergence weed killers, rapid re-seeding of grassland in rotation cycles, change from spring to autumn sown cereals and the switch from hay to silage production – has taken its toll on farmland wildlife.

However, these widespread changes in farming practice are not the sole threat to farmland biodiversity. Loss of farmland to outdoor leisure activities (e.g. golf courses) has become a significant issue in recent years and the need for new cemetery space may impinge upon the farmed landscape in the years to come. The rise of 'horsiculture' in London's Green Belt has caused many pastures to be subdivided, frequently resulting in severe overgrazing.

In addition to the above threats, which are driven largely by strategic policy decisions, farmland biodiversity is threatened at a more local scale by a variety of small-scale impacts with a significant collective effect on certain habitats or species. These include:

- Ill-considered tree planting schemes. These are often targeted at marginal agricultural land, rough grazings etc. with little consideration of the nature conservation value of the existing habitat.
- Various 'urban fringe' pressures such as illegal motorcycling rubbish dumping and disturbance.

- Continuing small-scale loss of remnant semi-natural habitats by, for example, regular flailing of hedgerows or neglect of hedgerows; drying out or over-shading of ponds; tidying of headlands and marginal areas and over-deepening of ditches, etc.

A more subtle threat, perhaps, is the lack of awareness and understanding of farming and the agricultural landscape (and, thereby, the biodiversity which still occurs there) amongst the increasingly urban perspective of the majority of London's population.

Opportunities

The opportunities for effecting biodiversity conservation and enhancement on farms are almost as well documented as the litany of losses of biodiversity throughout the agricultural landscape. Various agri-environment schemes across the UK, such as set-aside and Countryside Stewardship, ensure that some farmland areas are maintained more favourably for wildlife. In addition, some areas of intensively farmed land have been targeted for reversion to more 'traditional' farming methods including organic farming, in an attempt to restore priority habitats and species.

Countryside Stewardship and other agri-environmemt schemes are in place on some farmland in Greater London – there has been a particularly good uptake in Bromley for example. Promotion of these schemes and targeting of important sites in the urban fringe needs to continue. A review of current agri-environment schemes might be beneficial, with a view to identifying mechanisms for combining opportunities for biodiversity conservation and recreation/amenity in the urban fringe.

The recent economic crises in the farming industry and the ongoing debate concerning the perceived need for a large number of new homes (particularly in and around London) has highlighted the potential resource provided by London's farmland. These agricultural landscapes could provide tremendous potential for biodiversity conservation as part of a holistic approach to the management and enhancement of London's Green Belt. The two Community Forests on the fringes of London (Thames Chase in the east and Watling Chase in the north) provide a model for this approach, although biodiversity has not been an integral theme in the respective 'Forest Plans' to date.

Data Sources

Archer J. & Curson D. (1993). *Nature Conservation in Richmond upon Thames.* Ecology Handbook 21, London Ecology Unit.

Association of London Government (1997). *Association of London Government Directory 1996-1997.* Published by ALG.

Farino, T. & Game, M. (1988). *Nature Conservation in Hillingdon.* Ecology Handbook 7, London Ecology Unit.

Farino T., Pagendam C. & Swales S. Frith M. (1989). *Nature Conservation in Harrow.* Ecology Handbook 13, London Ecology Unit.

Hewlett J., Yarham I. & Curson D. (1997). *Nature Conservation in Barnet.* Ecology Handbook 28, London Ecology Unit.

London Planning Advisory Committee (1994). *Advice on Strategic Planning Guidance For London.* Published by LPAC

London Research Centre (1999). *Focus On London.* LRC.

Ministry of Agriculture, Fisheries and Foods (1965). *Agricultural and Horticultural Returns- Final Results Of The June 1965 Census In England And Wales.* MAFF Statistics.

Ministry of Agriculture, Fisheries and Foods (1985). *Agricultural and Horticultural Returns- Final Results Of The June 1985 Census In England And Wales.* MAFF Statistics.

Ministry of Agriculture, Fisheries and Foods (1995). *Agricultural and Horticultural Returns- Final Results Of The June 1995 Census In England And Wales.* MAFF Statistics.

Ministry of Agriculture, Fisheries and Foods (1998). *Final Results of the June 1997 Agricultural and Horticultural Census: England and Wales, Regions and Counties.* MAFF Statistics.

Ministry of Agriculture, Fisheries and Foods (1998b). *The Digest of Agricultural Census Statistics United Kingdom 1997.* MAFF Statistics.

Ministry of Agriculture, Fisheries and Foods (1999). *Agricultural and Horticultural Census: 1 June 1998 United Kingdom.* MAFF Statistics News Release (Stats 8/99).

The UK Steering Group (1995). *Biodiversity: The UK Steering Group Report. Volume 2: Action Plans*. HMSO.

Wicks, D. & Cloughley, P. (1998). *The Biodiversity of Southeast England: An Audit And Assessment.* Hampshire and Isle of Wight Wildlife Trust.

Farmland Audit: Rationale and limitations of approach

The farmland audit should be used as a guide and not as a definitive statement of Greater London's farmland resource. Data was provided by MAFF. This data represents the most fully comprehensive data available. Totals were available for farmland in London as a whole (see Table 1), which provides an overview of the resource. The data provided by MAFF has enabled land use comparisons to be made between 1997, 1985 and 1965 for both Greater London and the Southeast Region.

Individual totals were not available for each borough due to data protection mechanisms (where land holdings within a parish are too small or farmers may have requested a non- release of data policy). However, data for the following boroughs was available: Barnet, Bromley, Enfield, Havering and Hillingdon. The borough data provides an indication of the outer London farmland resource.

The Institute of Terrestrial Ecology holds satellite data on land uses in Greater London. This data has been used by the London Research Centre (LRC) in the production of their Focus on London Report (1999). In this report, percentages of land cover types were estimated for each 1 km grid square. However, there are drawbacks to this approach caused by limited resolution and inclusion of land outside of the Greater London boundary (data from entire grid squares was included even when it fell outside the Greater London boundary). The latter results in exaggerated figures for Greater London. This can be illustrated by comparing the LRC total for agriculture, which is 13,600 ha and the total for agriculture taken from 1997 MAFF data - 12,872 ha.

Satellite data is useful for gaining a quick overview of Greater London land use but does not enable the more detailed assessment provided by the MAFF data. Furthermore, MAFF data is based upon the 1997 'returns' and provides the most up to date view available, the satellite data dating from 1988 and 1991.

Coverage of the MAFF Census The 1997 annual June survey covered 237,720 agricultural holdings in the United Kingdom. In England only main holdings were surveyed. The MAFF definition of a 'holding' is "*land on which agricultural activities are carried out and which is by and large farmed in one unit having regard to such supplies as machinery, livestock, feeding stuffs and manpower, and to the distance of any separate areas of land involved and their type of farming*" (MAFF 1998b).

The survey aimed to estimate the aggregates of individual items collected. To this end, 'minor' holdings are excluded in England as they contribute only a small proportion of the totals and are therefore considered statistically insignificant.

A holding is classified as minor if all the following criteria are true:

- The total area is less than 6 hectares

- There is no regular whole time farmer or worker
- The estimated annual labour requirement is less than 100 days (of 8 hours productive work by an adult worker under average conditions)
- The occupier does not farm another building
- The glass house area is less than 100 square metres

If any of these conditions are not satisfied the holding is considered as 'main'. So although the MAFF data represents the most comprehensive and up-to-date data available there will still be a shortfall in terms of the farmland resource represented by these statistics. As the LRC data over-estimates the resource it is fair to say that the total for farmland within Greater London lies somewhere between the LRC figure of 13,600 ha and the MAFF figure of 12,782 ha.

SECTION 2

Introduction to Habitat Statements

Where insufficient data was available to provide figures beyond an estimate and description of the London-wide resource, a 'Habitat Statement' was produced in place of a 'Habitat Audit'. Habitat Statements are briefer sections, which nevertheless follow the rationale and layout described for the Habitat Audits (Section 1).

The intention is to identify some of the threats and opportunities for habitat conservation in order to encourage debate and comment that will inform the next stage of the biodiversity action planning process.

Statements produced for Volume 1

HS1: Private Gardens

HS2: Parks, Amenity Grasslands and City Squares

HS3: Urban Wastelands

HS4: Hedgerows

HS1: Gardens

Definition

For the purposes of this statement, gardens are defined as the private open space surrounding residential dwellings, with the householder having sole responsibility for management. This statement does not include communal open space surrounding residential dwellings, as this is usually managed by an outside agency – a contractor employed by a local authority or private landlord for example.

London's Garden Resource

An analysis of aerial photographs of Greater London undertaken by the London Ecology Unit in 1992 suggests that the gardens of private dwellings comprise about 20% (31,600 ha.) of the city's surface area.

A similar analysis undertaken by the Waltham Forest Biodiversity Partnership suggested that 7.3% of that borough's land surface comprised 'gardens (with some value for wildlife)'. Only gardens that appeared to contain tree cover were included in this analysis. The total garden resource of the borough is therefore greatly underestimated.

Naturally, not all gardens will be of equal importance in terms of nature conservation value. The majority of gardens in areas of high-density housing are small plots with very little diversity (or opportunities to promote diversity) in vegetation structure. At the other end of the spectrum are the gardens of houses in some of the more exclusive parts of suburban London. These contain small pockets of woodland, ponds and other features which might well be managed as nature reserves in their own right if they were in the public domain. However, most gardens, particularly in suburban London, probably consist of the archetypal lawn with flowerbeds and borders, often with a fringe of semi-mature trees or hedgerow shrubs at the boundaries.

Nature Conservation Importance

In nature conservation terms the value of gardens has not been properly recognised, beyond their importance as a feeding station for garden birds and thereby, as a very personal point of contact with the natural world. The wider value of gardens has not been appreciated mainly due to the perception that this resource is composed largely of exotic plants under a management regime primarily dictated by human needs.

However, a range of species has become synonymous with gardens, particularly in urban areas. The most obvious are the 'garden' birds including blackbird, song thrush, robin, blue tit and house sparrow. These can occur in all but the smallest of gardens if suitable habitat and/or an artificial food supply is present. Similarly, several butterflies are considered to be 'common or garden species'; the holly blue may be present in gardens containing its food plant (holly trees) and peacock visits gardens with an abundant supply of nectar-producing plants.

Garden biodiversity is dramatically increased where a number of larger gardens adjoin each other, where features such as mature trees have been maintained within gardens or where ponds have been created. Larger gardens with mature trees can support a wide range of woodland or woodland edge species, including greater spotted woodpecker, stag beetle, hedgehog, noctule bat and speckled wood butterfly. Where there are ponds, common frog and both southern and brown hawker dragonflies may be present.

There is little doubting the value of gardens in conserving many of these species in London. Research by the London Ecology Unit suggested that bird numbers and diversity decrease as residential density (i.e. reduction in garden size) increases. Ongoing surveys of stag beetles in London co-ordinated by the London Wildlife Trust (LWT) for the People's Trust for Endangered Species (PTES) have elicited numerous records of this beetle from private gardens. Garden ponds are now thought to be an important refuge for common frogs and the suburban parts of London may support higher densities of common frogs than surrounding rural areas.

Threats and Opportunities

Threats

The most important threat to the biodiversity of gardens is a lack of appreciation of its importance in the conservation of London's wildlife. Although a great many members of the public manage their gardens with wildlife in mind, most probably do so for aesthetic reasons rather than as a concerted effort to conserve biodiversity. The vast majority of householders with gardens probably have very little awareness of the role of gardens in biodiversity conservation. This lack of awareness results in unwitting damage to the wildlife interest of gardens. Cutting hedgerows and shrubs during the bird breeding season, removing leaf-litter, dead wood and other organic detritus which harbours a variety of invertebrates and over-tidying can reduce wildlife value. Replacing soft surfaces with hard surfaces, by creating off-street car-parking in front gardens for example, has resulted in a major loss of vegetation in some areas.

Although numerous gardeners do manage, maintain, or create wildlife-friendly gardens, many of these wildlife oases are temporary in nature. Features attractive to wildlife such as ponds, bird tables and 'wild' areas may be removed or modified as houses change hands. This may be especially true in those parts of the city where a significant portion of the population is transient.

Reduction in garden size resulting from backland development and infilling also significantly reduces the biodiversity interest of gardens. Backland development and infilling invariably results in the reduction of mature tree cover, overgrown shrubberies and old lawns, thus dramatically reducing the structural diversity provided by older, larger gardens.

The use of chemical pesticides in gardens may also pose a threat to non-target species. It has been suggested that the decline in the national population of song thrushes, for example, may be partly linked to the use of molluscicides on farmland and in gardens.

Opportunities

Gardening is still one of the most popular recreational activities and in London and other large conurbations in particular, the private garden is often a cherished space where it is possible to retreat from the hustle and bustle of city life. In this sense at least, the garden provides a point of direct contact with the natural environment.

Forms of gardening that express the aspirations and character of the gardener are becoming increasingly popular. Gardeners are 'designing' their outdoor space in much the same way as interior space is designed to fulfil personal tastes and preferences. One such gardening trend is the desire to make the garden wildlife-friendly, particularly by people who want to actively express environmental concern. Gardening for wildlife can be linked to other environmental issues such as reduction in water use, planting trees and shrubs as filters of noise and air pollution, and growing organic produce.

Gardens form a vast and intricate network of green corridors which can facilitate the movement of certain species between adjacent areas of open space and which can support populations of common woodland edge species. By identifying where mature garden habitats might provide such links, areas of open space with little existing nature conservation interest can be targeted for enhancement.

Data Sources

Dawson D. & Gittings T. (1990). *The effect of suburban residential density on birds*. LEU.

Dawson, D. & Worrell, A. (1992). *The amount of each kind of ground cover in Greater London*. LEU.

Langton, T. (1991). *Distribution and status of reptiles and amphibians in the London area*. LNHS.

Waltham Forest Biodiversity Partnership (1999). *Land use data for Waltham Forest.*

HS2: Parks and Amenity Grasslands

Definition

For the purposes of this statement parks, amenity grasslands and city squares are those areas of open space which are, by and large, publicly accessible or managed primarily for formal recreation. Formal parks, sports pitches, landscaped areas around institutions, and school playing fields are some examples. This audit excludes golf courses, as many of these will include habitats covered by woodland, grassland and heathland audits.

In this audit parks are defined as those amenity open spaces which are formal, managed landscapes consisting of extensive mown grassland, avenues of trees, copses, shrubberies, flower beds and formal water features. This category includes the larger city squares. Some parks may also support quite large areas of semi-natural habitat such as woodland. This audit does not include 'parkland' such as old deer parks, wood pasture or 'old' parks with many mature trees (e.g. Greenwich Park). These parkland areas are covered by audit HA2: Open Landscapes with Ancient/Old Trees.

London's Parks and Amenity Grassland Resource

There have not been any London-wide surveys of this resource and therefore there are no comprehensive figures for the extent of parks, playing fields, sports pitches and other amenity grassland.

Previous London Planning Advisory Committee (LPAC) surveys which have attempted to identify the amount of publicly accessible land (often referred to as parks) do not provide useful data for this statement. LPAC's hierarchy of open spaces includes land which falls outside the definition of parks applied here, for example Hounslow Heath is recorded as a Regional Park although it consists largely of semi-natural habitats which are covered by separate audits this document (such as Heathland, HA6).

An approximate figure is available for the amount of this habitat present in London as a whole. A sample of aerial photographs of Greater London which was analysed by the London Ecology Unit in 1992, suggested that 'parks' as defined by this audit comprise 8% (12,500ha) of London's total land area. 'Sports pitches' cover approximately 3% (4,700 ha) of the total land area, 'grounds of schools & other institutions' 1.5% (2,400 ha) and 'common green spaces around flats' a further 1.1 % (1,700 ha).

Therefore, the total figure for the extent of parks and amenity grasslands in London is approximately 21,000 ha - 13% of Greater London's surface area.

Nature Conservation Importance

Parks, playing fields and amenity open space together constitute one of the largest categories of habitat/land use in Greater London. Many sites have relatively little intrinsic nature conservation value (i.e. they do not often support any rare or uncommon habitats or species), mainly because of the need to implement fairly intensive maintenance regimes. However, playing fields, formal parks and amenity space (in addition to private gardens) are places where many Londoners have most frequent contact with the natural world. Unsurprisingly, formal parks assume greater nature conservation importance in the more urbanised central areas of London where there is far less semi-natural habitat.

Playing fields in particular are often regarded as inimical to wildlife, because of the need for very regular mowing of the playing areas. However, even these fairly featureless 'green deserts' support a variety of common bird species (gulls, starling, blackbird and pied wagtail, for example) and occasionally uncommon species such as lapwing and golden plover. In recent years, both of the latter species have established daytime roosts on school playing fields adjacent to the Chase Nature Reserve in Dagenham.

Formal parks (and amenity open space) tend to support a wider range of biodiversity, because they have a greater degree of structural diversity (i.e. trees and shrubberies are scattered throughout the mown grassland) and many support a diversity of habitats including ponds, lakes and copses.

The vegetation of many formal parks is comprised mostly of non-native species and common, ruderal or 'weed' species. However, formal parks which have been established upon former meadows or parkland often contain relics of these habitats, such as old oak trees, copses and hedgerows and plants such as birds-foot trefoil *Lotus corniculatus* which survive in less intensively managed areas of grass.

Typical bird species of formal parks include blue tit, great tit, pied wagtail, song thrush, blackbird and robin. Where there is greater habitat diversity and lakes, ponds or mature trees occur, additional species such as great spotted woodpecker, long-tailed tit, moorhen and grey heron are likely to be found.

The invertebrate assemblages in formal parks tend to comprise primarily of common, ubiquitous species, again because the diversity of habitats (particularly micro-habitats) is limited. Nevertheless, butterflies such as holly blue and peacock are often present and, where there are areas of wooded habitat, speckled wood butterflies are increasingly common. The commoner dragonfly species (southern hawker, brown hawker and blue-tailed damselfly) are also likely to occur where there are ponds or lakes with some areas of marginal vegetation.

Some parks and amenity grasslands of nature conservation value in Greater London

Brockwell Park, LB Lambeth

Holland Park, LB Kensington and Chelsea

Ravenscourt Park, LB Hammersmith and Fulham

Regent's Park, City of Westminster and LB Camden

Threats and Opportunities

Threats

The most significant threat to the biodiversity of formal parks, playing fields and amenity open space is unsympathetic management. Intensive management is required to maintain recreational areas, attractive flower beds, sports pitches and other amenity features. However, a more integrated approach to the management, which pays attention to the needs of wildlife and which regards the maintenance of biodiversity as a key management aim, could be introduced in many parks.

Even though the vast majority of playing fields, parks and other amenity open spaces are protected through open space policies in boroughs' Unitary Development Plans (UDPs) there has been a tendency in recent years to dispose of parts of playing fields (especially school playing fields) for development. In addition, there has been a trend of replacing grass sports pitches with artificial turf.

Opportunities

The extensive area of playing fields, formal parks and amenity open space provides enormous potential for habitat enhancement and habitat creation within the limits imposed by the needs of formal recreational and amenity areas. Many parks have been created on areas of open space that once supported semi-natural habitat and this habitat may still survive in certain areas. These relic features can provide the resource from which more extensive areas of grassland or woodland habitats can be restored or recreated. Where there are no remnants of former habitats, habitat creation techniques can be applied to make new habitats (such as ponds or wildflower meadows). Alternatively the existing park maintenance regime can be amended to allow greater structural diversity. Relaxing mowing regimes, cutting hedges less frequently or delaying the removal of accumulated leaf litter are some options.

Many formal parks and playing fields are an important part of open space corridors connecting extant areas of semi-natural habitat. Appreciation of the formal open spaces' context within a corridor can inform decisions about its management that in turn will enhance its value as a green corridor for wildlife.

A significant opportunity for awareness-raising arises as a result of the popularity of parks ands open spaces. A far greater number of people are likely to visit their local park or playing field than their local nature reserve. Providing information about the biodiversity of the local park is the first step in promoting a greater appreciation of biodiversity generally.

Data Sources

Carruthers, S., Smart, J., Langton T. & Bellamy, J. (1996). *Open Space in London.* Habitat Handbook 2. GLC.

Dawson, D & Worrell, A (1992). *The amount of each kind of ground cover in Greater London*. LEU

LPAC (1995). *State of the Environment Report for London*.

HS3: Urban Wastelands

Definition

For the purposes of this statement, urban wastelands are defined as those sites that support semi-natural vegetation that has developed over an imported or artificial substrate, subsequent to previous development or disturbance. Such sites include disused railway sidings, demolition sites, redundant industrial land and derelict land. It is noted that Urban Wastelands are not synonymous with 'brownfield land', which includes a much wider range of 'previously developed' land and can encompass sites which are now essentially the semi-natural woodland, grassland or other habitats covered in Section 1 of this document.

Greater London's Urban Wasteland Resource

It has not proved possible to assess the extent of London's urban wasteland resource. Urban wastelands were severely under-sampled in the London Wildlife Habitat Survey 1984/85 and more recent assessments of urban wasteland, derelict land and brownfield land, undertaken by other agencies, have used various incompatible definitions.

The London Wildlife Habitat Survey's underestimation was partly the result of the exclusion of many wasteland sites. These were the sites which did not fall within the size threshold for inclusion in the survey (1 ha in the outer London boroughs and 0.5 ha in the inner London boroughs).

Whatever the true extent of London's urban wasteland resource in the mid-1980s, there is no doubt that there has been a substantial reduction in its extent within the last decade. London's former docklands contained a significant proportion of the capital's urban wastelands, but most of this area has been redeveloped to accommodate London's burgeoning service sector industries. Other large areas have been lost in more recent years to provide land for new housing.

Despite the losses to some of the most extensive areas of urban wasteland in London, new sites, albeit smaller and more widely dispersed, are constantly being created as a result of abandonment – a feature of the development cycle in a major conurbation.

Nature Conservation Importance

As a whole, urban wastelands may be one of the most diverse of London's habitats. They encompass a wide range of sites with varying substrates, topographies and other factors that determine the distribution of plant and animal species. The variation in other habitat types such as grassland and heathland may be rather subtle, as a result of minor changes in soil chemistry and hydrology, for example. However, the variation amongst urban wasteland communities can be quite striking, because of the different substrates and the source of primary colonisation.

Some of the most important attributes of urban wasteland habitats are essentially ephemeral. Micro-topographical features and microclimatic effects are rapidly created as land is disturbed or surrenders to natural processes after abandonment. However, they are rapidly destroyed when land is recycled for new development or natural succession leads to eventual dominance by secondary woodland or *Buddleia* 'scrub'.

A common feature of many urban wastelands is the dominance of species that are considered to be 'weedy', ruderal or pioneer species. These species are best able to colonise disturbed or hostile environments, but often succumb to competition once conditions ameliorate or stabilise. For this

reason many of the species that flourish in urban wastelands are exotics which would normally be out-competed by native species, or are species which have exacting climatic or biological requirements that are rarely available except in the unusual conditions which arise on urban wastelands.

The characteristic plant species of urban wastelands is perhaps the butterfly bush *Buddleia davidii*, which is almost ubiquitous in wasteland sites across London. Despite the prevalence of this species a number of rare and unusual plants also occur. Many are exotics which are often distributed close to their source of colonisation (ports, goods yards etc.) but others, such as false London rocket *Sisymbrium loeslii* and lucerne *Medicago sativa* have become firmly established throughout. Several native species normally associated with more natural habitats are now often more likely to be encountered on urban wastelands than elsewhere in London. These include white mullein *Verbascum lychnitis*, bee orchid *Ophrys apifera* and teasel *Dipsacus fullonum*.

The importance of urban wastelands for invertebrates is becoming increasingly apparent. The varied micro-topography of these sites may be particularly important, producing hollows, banks, eroded areas, suntraps and crevices which can be exploited by a wide variety of different invertebrates. Dog's tooth and buttoned snout moths; long-tongued bumble bee *Bombus humilis*; striped-winged grasshopper *Stenobothrus lineatus;* and bombardier beetle *Brachinus crepitans* are all species that are associated with urban wastelands in London.

In inner London, birds such as linnet, goldfinch and whitethroat are often confined to urban wastelands or areas of railway corridor, canalside or parks that have a wasteland character. The bird most often cited as a wasteland species - the black redstart – does indeed occur on urban wasteland sites, but can be found in less derelict areas where the characteristics of the habitat are very diffuse.

Some Urban Wastelands of nature conservation value in Greater London

Feltham Marshalling Yards, LB Hounslow

Gillespie Park, Islington

Mudchute Park and Farm, LB Tower Hamlets

Wandle Meadow Nature Park, LB Merton

Threats and Opportunities

Threats

The single most prominent threat to urban wastelands is redevelopment. All urban wastelands are previously developed land, or land which has had an industrial use (usually the disposal of waste material). As such, urban wastelands are usually subject to redevelopment or decontamination proposals. Redevelopment of land or the restoration of contaminated land frequently results in the almost total loss of species present on the site, as there is often a requirement for the complete removal or capping of the existing surface material and vegetation. Although this will result in local extinctions of some species, many other species will maintain local populations if there are adjacent wasteland habitats or incipient wasteland habitats (newly cleared or abandoned sites) nearby. However, in modern day London the loss of urban wastelands far outstrips the creation of new ones. The debate concerning the environmental benefits and losses attributable to

redevelopment or restoration of urban wastelands cuts to the quick of the sustainability debate in London.

The lack of awareness of the nature conservation value of urban wastelands is a secondary, but related, threat. Many sites are comprehensively redeveloped simply because there is no consideration of the biodiversity value of urban wastelands, whereas a development which may impact upon a seemingly more 'natural' habitat is more likely to be conditioned to ensure appropriate protection or mitigation. Similarly, many good wasteland sites are subject to programmes of enhancement to 'improve' their nature conservation value without first appreciating or ascertaining existing value. Often the only enhancement required is improvements to interpretation and public access.

Opportunities

Many sites in London have been identified as being of nature conservation value due, at least in part, to the ecological interest of their wasteland flora and fauna. However, few urban wasteland sites have been protected as nature reserves, and fewer still managed to maintain their urban wasteland character, with the exception of a handful of sites such as Wandle Meadow Nature Park in Merton and the extension to Gillespie Park in Islington. The establishment and management of urban wasteland nature reserves presents a major opportunity for awareness-raising and advancing the cause of biodiversity conservation in urban areas. It also provides opportunities for research into methods for retaining, restoring or creating appropriate conditions to enable biodiversity to flourish in the built environment.

Most urban wasteland flora and fauna will still need to secure opportunities outside protected sites. Indeed the very processes that produce diversity in urban wasteland wildlife are dependent upon a turnover of sites or other disturbance factors. The advent of 'green' buildings and other initiatives to green the city are efforts to reinstate the processes which give rise to urban wastelands. Rooftop 'urban wastelands' could help offset habitats currently being lost to built development. Creating appropriate conditions to encourage natural colonisation by wasteland flora and fauna could also be encouraged in open spaces with limited existing nature conservation value, as a new means of enhancing biodiversity and a step away from the current orthodoxy of creating imitation 'flower-rich meadows' or 'bluebell woodlands'.

Data Sources

Greater London Council (undated). *A Nature Conservation Strategy for London: Woodland, Wasteland, the Tidal Thames and two London Boroughs.* Ecology Handbook No.4. GLC

Gilbert, O. (1992). *The flowering of the cities: the natural flora of urban 'commons'* English Nature.

Box, J., & Shirley, P. (1999). Biodiversity, Brownfield Sites and Housing: Quality of Life Issues for People and Wildlife. Urban Wildlife Partnership and UK-MAB Urban Forum.

HS4: Hedgerows

Definition

Hedgerows are linear features composed of woody species. Ancient hedgerows are those which were in existence before the Enclosures Acts (passed between 1720 and 1840 in Britain). Species-rich hedgerows are those which contain 5 or more native woody species on average in a 30 m length, as defined in Wicks & Cloughley, 1998.

In urban areas many hedgerows are of relatively recent origin, having been planted along the boundaries of gardens, parks or open space around schools and other institutions. These hedgerows are frequently composed of non-native coniferous or evergreen species.

London's hedgerow resource

The 1984/5 London Wildlife Habitat Survey documented native-species hedgerows only where these were within survey parcels. Therefore native-species hedgerows which fell outside survey parcels, such as those hedgerows traversing areas of arable farmland or close-mown amenity grassland; or isolated within the urban fabric, were not documented. This restricted data resulted in only 369 ha of native-species hedgerow being identified in London. This is undoubtedly a serious underestimate. However, when the amount of documented native-species hedgerow is identified by borough, as a percentage of the total native-species hedgerow resource in London, it does give an indication of the distribution of this resource (Table 1). Unsurprisingly, the bulk of this habitat is found in those outer London boroughs with extensive areas of countryside.

Other studies have been undertaken in an attempt to estimate the native-species hedgerow resource in London. A study by Vickers for the London Biodiversity Partnership estimated a total native-species hedgerow resource of 705 km. A study undertaken to estimate the extent of rural hedgerows in the London Borough of Brent found 31km.

None of the above studies have taken into account the extent of non-native hedgerows which, although of less intrinsic nature conservation value, are likely to account for most of the hedgerow resource in London.

Table 1: Native-species hedgerows in Greater London

Borough	Percentage of London's resource (%)	Borough	Percentage of London's resource (%)
City of London	0	Hillingdon	14.2
City of Westminster	0	Hounslow	4.2
Barking & Dagenham	0.3	Islington	0
Barnet	17.8	Kensington & Chelsea	0
Bexley	0.9	Kingston	1.5
Brent	0.9	Lambeth	0
Bromley	10.8	Lewisham	0
Camden	0	Merton	0

Borough	Percentage of London's resource (%)	Borough	Percentage of London's resource (%)
Croydon	1.7	Newham	0.1
Ealing	2.1	Redbridge	1.9
Enfield	3.3	Richmond	0.4
Greenwich	1.1	Southwark	0.8
Hackney	0	Sutton	0.4
Hammersmith & Fulham	0	Tower Hamlets	0
Haringey	0.6	Waltham Forest	0.1
Harrow	4.7	Wandsworth	0
Havering	32.3		

From London Wildlife Habitat Survey 1984/85

Nature Conservation Importance

The hedgerows with most intrinsic nature conservation value are mainly those that predate the Enclosures Acts. Many of these hedgerows are remnants of ancient woodland, retained to mark boundaries. They consist of species such as hazel *Corylus avellana*, oak *Quercus robur*, hornbeam *Carpinus betula* and field maple *Acer campestre* and harbour woodland or woodland edge flora including bluebell *Hyacinthoides non-scripta*, primrose *Primula vulgaris*, wood anemone *Anemone nemerosa* and honeysuckle *Lonicera pericylmenum*.

The Enclosures Acts resulted in the planting of many hundreds of hedgerows which, although composed predominantly of quick-growing hawthorn *Crataegus monogyna* and therefore less diverse, can provide important nesting sites for a wide range of birds such as turtle dove, bullfinch, whitethroat, song thrush and greenfinch. During the breeding season, grey partridge and corn bunting are likely to find much of the insect prey with which they feed their chicks in the grasses and herbs at the base of hedgerows in arable fields.

Hedgerows, as boundary features, are ecologically important for a diverse range of invertebrates. The orientation of the hedge can provide varied micro-climates and associated features such as banks and ditches create additional habitat diversity.

Several butterfly species may also have an association with these older native-species hedgerows. White-letter hairstreak occurs in some hedgerows with regenerating elm suckers (the remnants of the mature elm trees which succumbed to Dutch elm disease) and gatekeeper is often numerous where hedgerows border meadows and areas of rough grassland.

As corridors, hedgerows allow species of small mammal such as wood mouse and bank vole to move between nearby wooded habitats. This helps to prevent local extinctions through the isolation of small populations. Bats will also use hedgerows as flight line features and the loss or fragmentation of the hedgerow can result in a reduction in a bat's range.

Old hedgerows are also important from a cultural perspective, often marking boundaries of historical significance or the line of historic green lanes and other rights of way.

Although of less intrinsic nature conservation value than the older native-species hedgerows, mixed and non-native species hedgerows around parks and gardens can provide nest-sites for

common garden birds and habitat for a variety of common species of invertebrate as well as some that are rare or declining. The privet hawk-moth, for example, is now rare in London, despite the caterpillar feeding on garden hedgerow shrubs such as garden privet, lilac and forsythia.

Some native hedgerows of nature conservation value in Greater London

Arkley Lane, LB Barnet

Fryent Country Park, LB Brent

Ickenham Marsh, Austin's Lane Pastures and Freezeland Covert, LB Hillingdon

Threats and Opportunities

Threats

Most old hedgerows in London, particularly in the arable farmland of the Green Belt or within the mostly densely urbanised parts of the city, no longer serve their original purpose as stock-proof barriers or markers of parish or property boundaries. Consequently they are subject to 'grubbing out' where their presence hinders agricultural operations, development or expansion of recreational areas - or neglect where they no longer delineate a recognised boundary. Even where a hedgerow may still prove useful as a stock-proof barrier (e.g. where livestock, particularly horses, are paddocked - a relatively common occurrence throughout London's Green Belt) it is often removed – either to expand the effective grazing area, or because of the difficulties of hedgerow maintenance.

Fortunately, complete removal of hedgerows is no longer the most serious threat to hedgerows. The 1990 DoE Countryside Survey suggested that there had been a 23% national decline in hedgerows between 1984 and 1990. Of the hedges that were lost, only 10% were actually removed, suggesting that the remaining 90% were lost through neglect or mismanagement. (Wicks & Cloughley, 1998). This is likely to be the major threat to hedgerows in London.

The most prevalent form of mismanagement is flailing or cutting too frequently. Hedges which are cut or flailed to the same width and height on an annual basis rarely flower or fruit (depriving animal species of a food supply) and become too dense and compact to provide suitable nesting habitat for many birds. Conversely, a hedgerow that has not been managed (cut, coppiced or layed) for many years eventually loses the essential characteristics of a hedgerow and becomes a line of trees. This habitat is usually considerably less valuable to wildlife.

Other commonly encountered examples of unsympathetic hedgerow management are mowing, spraying or ploughing vegetation at the base of a hedgerow; and filling gaps in native-species hedgerows with quick-growing conifers.

Opportunities

Hedgerows have become something a cause célèbre, in part because of their historical associations and as symbols of a romanticised view of the English countryside. This cultural value of hedgerows ensures that there is considerable public interest in hedgerow conservation and protection.

Better hedgerow management in London's farmland and semi-natural open spaces can be promoted through targeted advice and incentive schemes such as Countryside Stewardship. The

restoration of neglected hedgerows can also be addressed through incentive schemes linked to a growing interest in the traditional skills of hedgelaying and coppicing.

Although never a replacement for existing hedgerows, new hedges can be planted and can be particularly valuable in restoring links between isolated areas of semi-natural woodland or scrub habitats.

Traditional hedgerows were a functional element in the landscape. Therefore, restoring a 'purpose' for hedgerows might prove an effective tool for ensuring the management and restoration of existing hedgerows and the establishment of new ones. The Metropolitan Police Crime Prevention Unit has advised that planting thorny hedgerows along boundaries provides a deterrent to burglars. Furthermore, establishing or restoring hedgerows along the boundaries of parks and other open spaces provides a visual barrier to the urban landscape and may filter noise and other pollutants. Hedgerow restoration and management can also be a catalyst for restoring neglected rights of way or re-establishing a sense of neighbourhood by rediscovering and redefining old parish boundaries.

Data Sources

Department of the Environment (1990). *Countryside Survey*. DOE.

London Wildlife Habitat Survey (1984/5). Held by LEU, includes habitat dot distribution maps, aggregated area figures and standardised information on every survey parcel.

Vickers, D. (1995) *Regional Biodiversity Audit, Habitats in London. London Biodiversity Partnership* (unpublished).

Wicks, D & Cloughley, P (Eds) (1998). *The Biodiversity of Southeast England: An Audit and Assessment.* Hampshire and Isle of Wight Wildlife Trust.

Williams, L.R. (1989) The Survival of Rural Hedgerows in a London Borough. The London Naturalist No. 68.

SECTION 3

Introduction to the Species Audit

The London Species Audit indicates a range of species that occur in London which the Partnership would like to be considered for inclusion in the London Biodiversity Action Plan.

The London Species Audit has attempted to identify species that will serve a number of purposes within the Action Plan. It was considered especially important that the capital's particular circumstances were reflected in the London Species Audit and that locally distinctive species and those that are characteristic of London habitats were well represented. These audit criteria will ensure that a diverse range of species is selected for the 'long list' of the London Biodiversity Action Plan. Consequently the London Biodiversity Audit has selected species that fulfil at least one of the following categories (with some minor variations depending upon taxa):

1. UK Biodiversity Action Plan Priority Species, or Species of Conservation Concern
2. Rare in London (occurring in less than 5% of Greater London tetrads or equivalent)
3. Indicative of typical habitats
4. Characteristic of London
5. Culturally valued
6. In decline
7. Easy to monitor

UK Biodiversity Action Plan Priority Species or Species of Conservation Concern are those species for which the UK has some special responsibility. These include:

- Threatened endemic species
- Species where the UK has more than 25% of the world or appropriate biogeographical population
- Species where numbers or range have declined by more than 25% in the last 25 years
- In some instances, species that are found in fewer than 15 ten kilometre squares in the UK
- Species which are listed in the EC Birds or Habitats Directives, the Bern, Bonn or CITES Conventions, or under the Wildlife and Countryside Act 1981

Data were collected on the presence or absence of each of these species in each borough across London. New and previously published data were supplied by recorders from the London Natural History Society (LNHS) and other organisations such as Butterfly Conservation. Species of vascular plants that have become extinct in recent years were also noted.

However, not all species that fulfill one or more of the London Biodiversity Action Plan criteria have been included in the species audit. A pragmatic approach has been taken which excludes, for example, most non-native plant species and bird species that are passage migrants or very occasional winter visitors. Many moth species have not been included in the final audit list for purely practical reasons as many are, or appear to be, rare in London. The list of other invertebrates is necessarily idiosyncratic because of the lack, or paucity, of records for most invertebrates other than butterflies, moths and dragonflies.

Species Audits Produced for Volume 1

SA1: Vascular Plants

SA2: Birds

SA3: Butterflies

SA4: Macro-moths

SA5: Dragonflies

SA6: Other Invertebrates

SA7: Mammals, Reptiles & Amphibians

As in the case of the Habitat Audits (Section 1) and Habitat Statements (Section 2), the London Biodiversity Partnership hopes that the publication of the Species Audits will elicit further data and stimulate critical comment that will inform future reviews of the London Biodiversity Audit.

Key to Species Audits

X	Present
?	possibly present or possible criteria
Z	very old record or record not supported by specimen
r	known roost sites
i	recent introduction
e	recently extinct
bg	bare ground

Criteria

Priority	Priority Species (UKBAP)
SCC	Species of Conservation Concern UKBAP
Rare	rare in London (of restricted distribution)
Indicative	indicative of typical habitats
Characteristic	characteristic of London
Culturally valued	culturally valued/species with public appeal
Decline	past decline
Easy	easy to monitor

Habitats and corresponding Audit number

1 - Woodland and Scrub	HA1
2 - Open Landscapes with Old/Ancient Trees	HA2
3 – Hedgerows	HS4
4 - Acid Grassland	HA3
5 - Chalk Grassland	HA4
6 - Grasslands, Meadows and Pasture	HA5
7 - Heathland	HA6
8 - Grazing Marsh and Floodplain Grassland	HA7
9 – Marshland	HA8
10 - Reedbed	HA9
11 - Rivers and Streams	-
12 - The Tidal Thames	HA10
13 – Canals	HA11
14 - Lakes, Ponds and Reservoirs	HA12
15 - Private Gardens	HS1
16 - Parks, Amenity Grasslands and City Squares	HS2
17 - Railway Linesides	HA14
18 - Churchyards and Cemeteries	HA13
19 - Urban Wastelands	HS3
20 - Farmland	HA15

Vascular Plants

Latin-Name	Name	Species-Type	Priority-SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Dianthus armeria	Deptford pink	r2	1	1										E						?																E							3, 6
Cardamine bulbifera	coralroot	r2	1	1					1																	X																	1
Cardamine impatiens	narrow-leaved bittercress	r2	1	1									X																														3
Clinopodium calamintha	lesser calamint	r2	1	1								X																															5
Fallopia dumetorum	copse bindweed	r2	1	1																												X											3,6
Limosella aquatica	mudwort	r2	1	1																															X								14
Tulipa sylvestris	wild tulip	r2	1	1					1																	X																	1
Arabis glabra	tower mustard	r2	1	1																															X								4
Scilla autumalis	autumn squill	r2	1	1	1																														X								2, 4
Orchis mascula	early purple orchid	r2		1	1		1							X			X												X												1
Epipactus phyllanthes	green-flowered helleborine	r2		1	1		1										X									E																1
Chrysosplenium oppositifolium	opposite-leaved golden saxifrage	r2		1	1	1					X	X		X												X	X															11
Eriophorum angustifolium	cotton grass	r2		1	1									X																												9
Geum rivale	water avens	r2		1	1																				X	X																9, 11
Vaccinium myrtillus	bilberry	r2		1	1									x	X		X																								7
Dipsacus pilosus	small teasel	r2		1																						X																1, 11
Sonchus palustris	marsh sow-thistle	r2		1								X																														12
Orobanche elatior	knapweed broomrape	r2		1	1												X																				X					5
Gymnadenia conopsea	fragrant orchid	r2		1	1		1							X			X																									5
Oenanthe fluviatilis	river water dropwort	r2		1	1		1												X				X			X																11
Erica tetralix	cross-leaved heath	r2		1	1									X	X																									X		7
Helleborus viridis	green hellebore	r2		1	1		1		1					X			X	X																								1
Paris quadrifolia	herb paris	r2		1	1												X									E																1
Ranunculus sardous	hairy buttercup	r2		1	1							X								X							X															8
Equisetum sylvaticum	wood horsetail	r2		1											E									X																		1
Hypericum montanum	pale St John's-wort	r2		1										X			X																										?
Lathraea squamaria	toothwort	r2		1					1					x			X									X																1, 5
Spiranthes spiralis	autumn lady's-tresses	r2		1			1							x			E																				X					6
Smyrnium perfoliatum	perfoliate alexanders	r2		1		1					X				X								X					X								X				E	Xp?	16
Thalictrum flavum	meadow-rue	r2		1	1									X											X	X																6
Cephalanthera damasonium	white helleborine	r2		1	1			1						X			X																									1
Orchis morio	green-winged orchid	r2		1	1		1																									X										6, (18)
Epipactis purpurata	violet helleborine	r2		1	1		1							X			X												X												1
Blechnum spicant	hard fern	r2		1								X			X		X		E				X	X		E										X				X		1
Genista tinctoria	dyer's greenweed	r2		1			1				X			E				E							X	E	X						E		X							7
Verbascum lychnitis	white mullein	r3	1	1	1									X			X			X																						5, 19
Trifolium glomeratum	clustered clover	r3	1	1	1							X		X			X																			X						4
Rhinanthus serotinus	greater yellow rattle	r3	1	1			1							X			X												E								X					5
Rumex palustris	marsh dock	r3	1	1		1				X	X	X	X							X			X		X	X				X				X	X	X	X	X		X	X		8, 9, 11, 12,1
Populus nigra ssp. *betulifolia*	black-poplar	r3	1	1		1				X	X	X		X				X						X	X											X				X			11, 14
Hyacinthoides non-scripta	bluebell	r3	1	1			1			X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X			X	X	X		X	X	X	X	X	X	X	X	1
Sisymbrium irio	London rocket	r3	1	1		1	1								X	X	X				X								X									X			X	16

Latin-Name	Name	Species-Type	Priority-SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Chamaemelum nobile	chamomile	r3	1	1			1																				X						X			X					X	X	6
Lathyrus aphaca	yellow vetchling	r3	1	1								X					X		X				X									E			X		X			X		6
Salvia verbenaca	wild clary	r3	1	1	1							X														X			X						X		E					?
Minuartia hybrida	fine-leaved sandwort	r3	1	1	1			1						X			X								E										X		X	X				4, 5
Aceras anthropophorum	man orchid	r3		1	1		1							X			X																		X						5
Anthyllis vulneraria	kidney vetch	r3		1	1		1					X		X			X																		X						
Caltha palustris	marsh marigold	r3		1			1	1	1		X	X		X	?p?		X	X	X						X	X	X						X		X			X				9, 11
Ophrys apifera	bee orchid	r3		1	1						X	X	X	X			X		X				X			X	X		X	X					X		E	X				5, 19
Carex divisa	divided sedge	r3		1	1			1		X		X						X							X										X							8, 9
Scutellaria minor	lesser skullcap	r3		1	1									E										X						X			X								9 (wooded)
Anacamptis pyramidalis	pyramidal orchid	r3		1	1		1					X		X	X		X									X	X			X			X			X		X				5, 19
Schoenoplectus tabernaemontani	grey club-rush	r3		1	1	1						X													X		X							X								12
Carex paniculata	greater tussock sedge	r3		1	1							X		X												X													X			11, 14
Salix repens	creeping willow	r3		1	1									X	X																	X		X	X				X	X		7
Serratula tinctoria	sawwort	r3		1	1						X			x												X																6
Torilis nodosa	knotted hedge-parsley	r3		1	1							X							X								X							X		X		X	X			8
Ceratocapnos corydalis	climbing fumitory	r3		1								X		X																		X						E			1, 4
Oenanthe pimpinelloides	corky-fruited water-dropwort	r3		1	1						X			X						X									X							X					6
Erica cinerea	bell heather	r3		1	1									X			X									E	X			X			X									7
Genista anglica	petty whin	r3		1	1										E											X	X						X		X					X		7
Ranunculus hederaceus	ivy-leaved water-crowfoot	r3		1	1									E						X						X							X			X						11
Viscum album	mistletoe	r3		1			1		1		X	X		X			X	X	X				X	X	X	X	X		X	X	X					X	X		X		X	X		1, 2, 16
Solidago virgaurea	goldenrod	r3			1							X		X			X			X			X			X	X			X		X										1
Convallaria majalis	lily-of-the-valley	r3		1	1		1		1		X	X		X	X		X							Xp?									Xp?			Xp?						1
Melampyrum pratense	common cow-wheat	r3		1	1			1	1			X		X						X			X		X	X								X					X			1
Rumex pulcher	fiddle dock	r3		1								X					X		X	X					X	X	X				X		X		X						19
Sagittaria sagittifolia	arrowhead	r3		1				1											X		X					X	X								X	Xp?		X	X			11
Saxifraga tridactylites	rue-leaved saxifrage	r3		1	1							X		X			X	X		E						X									X		X					bg/walls
Epipactis helleborine	broad-leaved helleborine	r3		1	1		1				X	X	X	X	X		X	X	X				X	X		X	X			X			X		X	X						1
Ulex minor	dwarf gorse	r3		1			1							X	X		X							X	X	X	X				X	X		X	X						7
Aster tripolium	sea aster	r3		1			1			X		X								X					X			E			X		X	X	E			X		E		12
Hydrocotyle vulgaris	marsh pennywort	r3		1	1									X			X							X		X							X		X	X		X		X	X	X	11, 14 shade
Dactylorhiza praetermissa	Southern marsh-orchid	r3		1			1			X		E	X	E			E		E						X	E	E					E	X						E	E		5, 8, 19
Myriophyllum spicatum	spiked water-milfoil	r3		1				1		X	X	X			X		X	X	X						X	X	X			X			X				X		X	X	11, 13, 14
Asplenium adiantum-nigrum	black spleenwort	r3		1	1							X		X		X	X	X	X	X	X	X		X		X		X		X	X	X		X		X	X	X	X		X		walls/bridges
Juncus squarrosus	heath rush	r3		1	1			1						X										E			X						X		X	X			X			7
Primula veris	cowslip	ir			1		1	1			X	E	X	X			X		X	X			X	X	X	X	X			X			X	X	X	X	X	X			Xp?		5, 6
Dactylorhiza fuchsii	common spotted-orchid	ir			1		1			X	X	X	X	X			X	X	X	X		X	X	X	X	X	X			X				X	X	X		X		X			2, 5, 6,
Succisa pratensis	devil's-bit scabious	ir		1	1		1			X	X	X	X	X	X		X		X	X				X	X	X				X			X										4, 6
Sanguisorba officinalis	great burnet	ir		1	1	1					X		X	X								X		X			X		X														6
Bolboschoenus maritimus	sea club-rush	ir			1			1		X	X	X	X					X	X	X			X		X	X	X							X	X	X				X	X	12, 14
Campanula rotundifolia	harebell	ir			1		1		1		X	X	X	X			X	X	X					X	X	X	X			X			X		X	X		X		X	X	4
Conopodium majus	pignut	ir			1		1		1		X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X		X	X		X	X	X		X	X	X	6
Listera ovata	twayblade	ir			1		1	1	1			E		X			X									X	X			X			E			E		X				5

Latin-Name	Name	Species-Type	Priority-SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Nuphar lutea	yellow water-lily	ir			1		1	1	1	X	X	X		X			X	X	X					X	X	X	X			X					X	X				X	X		14
Primula vulgaris	primrose	ir			1		1	1	1	X	X			X			X			X				X		X	X			X		X	X				X	X					3, 6
Sorbus torminalis	wild service tree	ir			1		1	1			X	X	X	X	X		X	X	X	X			X	X	X	X					X			X		X			X	X		1
Asplenium ruta-muraria	wall-rue	ir			1						X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X		X	X			X		X				walls/bridges
Asplenium trichomanes	maidenhair spleenwort	ir			1							X		X	X	X		X		X			X			X	X	X		X		X	X			X	X		X	X	walls/bridges
Calluna vulgaris	heather	ir			1						X	X		X			X			X				X		X	X			X	X		X		X	X			X			7
Ceratophyllum demersum	rigid hornwort	ir			1			1		X	X	X		X			X	X	X		X		X	X	X	X	X								X	X			X	X		13, 14
Nardus stricta	mat grass	ir			1			1		X	X																X						X		X	X				X		4
Silaum silaus	pepper-saxifrage	ir			1			1			X	X	X	X				X	X			X		X	X	X			X				X										6
Typha angustifolia	lesser reedmace	ir			1			1		X	X	X	X	X				X					X	X	X	X	X			X					X		X			X			14
Viola reichenbachiana	early dog-violet	ir			1			1				X		X			X	X	X	X			X	X	X	X	X			X		X				X	X	X				1 (on chalk)
Buddleia davidii	butterfly bush	I				1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15, 16, 19
Chamerion angustifolium	rosebay	I				1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1, 17, 19
Dipsacus fullonum	teasel	I					1	1	1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	6, 17, 19
Medicago sativa	lucerne	I				1	1	1		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17, 19
Sisymbrium loeselii	false London rocket	I				1	1			X	X	X			X			X		X			X		X						X		X			X			X		X	17, 19
Carpinus betulus	hornbeam	I				1		1			X	X	X	X	X		X	X	X	X			X	X	X	X	X			X		X	X		X	X	X	X		X		1
Galega officinalis	goat's rue	I				1		1		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17, 19
Iris pseudacorus	yellow flag	I						1	1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X		8, 9, 14
Oenanthe crocata	hemlock water-dropwort	I				1		1			X	X	X		X			X	X	X	X	X	X	X	X	X	X	X		X		X		X		X	X	X	X	X	X	11, 12, 13
Rorippa amphibia	great yellow-cress	I				1		1		X	X		X				X	X		X	X	X	X	X	X	X	X		X	X		X		X	X	X	X	X	X			11
Allium ursinum	ramsons	I					1	1	1		X	X	X	X			X	X	X	X			X	X	X	X	X			X		X			X	X	X	X		X			1
Anemone nemorosa	wood anemone	I					1	1			X	X	X	X	X		X	X	X	X			X	X	X	X	X			X		X			X	X	X	X	X	X			1
Cardamine pratensis	cuckoo-flower	I					1	1	1		X	X	X	X	X		X	X	X	X			X	X	X	X	X			X			X		X	X	X	X		X			6
Filipendula ulmaria	meadowsweet	I					1	1	1	X	X	X	X	X	X		X	X	X				X	X	X	X	X			X		X	X	X	X	X		X		X		X	6, 11
Lotus corniculatus	bird's-foot trefoil	I					1	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	4, 5, 6
Lychnis flos-cuculi	ragged robin	I					1	1	1		X	X	X	X				X	X	X				X	X	X	X			X						X							6
Lythrum salicaria	purple loosestrife	I					1	1	1	X		X	X	X	X			X	X	X			X	X	X	X	X	X			X		X	X	X	X	X		X	X	X		X	11
Oxalis acetosella	wood sorrel	I					1	1	1	X	X	X		X			X		X	X			X	X		X				X					X		X						1
Parietara judaica	pellitory-of-the-wall	I					1	1		X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X		X	X	walls/bridges
Phragmites australis	common reed	I					1	1	1	X	X	X	X	X	X		X	X	X	X	X		X		X	X	X	X		X	X	X	Xp	X	X	X		X	X	X	X	Xp	10
Phyllitis scolopendrium	hart's tongue fern	I					1	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	walls/bridges
Pulicaria dysenterica	common fleabane	I					1	1	1	X	X	X	X	X			X	X	X	X				X	X	X	X			X			X	X		X		X	X				6
Quercus petraea	sessile oak	I					1	1			X	X		x	X		X		X	X			X	X			X			X		X			X	X	X	X		X			1
Quercus robur	pedunculate oak	I					1	1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1
Typha latifolia	greater reedmace	I					1	1	1	X	X	X	X	X	X		X	X	X	X			X	X	X	X	X			X		X	X	X	X	X		X	X	X	X		14
Achillea ptarmica	sneezewort	I						1			X		X	X				X	X	X				X	X	X	X			X			X		X	X				X			6
Adoxa moschatellina	moschatel	I						1				X		X			X									X						X					X						1 (on chalk)
Aira praecox	early hair-grass	I						1		X	X	X	X	X	X			X	X	X	X		X	X	X	X	X			X	X	X	X	X	X	X			X	X		4
Alopecorus geniculatus	marsh foxtail	I						1		X	X	X	X	X			X	X	X	X			X	X	X	X	X			X			X		X	X		X		X	X		6
Arum maculatum	lords-and-ladies	I						1	1	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	1
Carex riparia	greater pond sedge	I						1				X	X	X				X	X				X	X	X	X	X			X		Xp?	X		X	X				X	X	X	14
Carex sylvatica	wood sedge	I						1			X	X	X	X			X	X	X	X			X	X	X	X				X		X	X		X	X		X		X	X		1
Centaurae nigra	black knapweed	I						1		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	6

Latin-Name	Name	Species-Type	Priority-SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Cynosurus cristatus	crested dog's-tail	I						1		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	6
Eleocharis palustris	common spike-rush	I						1		X	X	X	X	X	X			X	X					X	X	X	X			X			X	X	X	X			X	X			9
Galium saxatile	heath bedstraw	I						1			X	X	X	X	X		X	X	X	X				X		X	X		X	X			X	X	X	X		X	X			4, 7
Glyceria maxima	reed sweet-grass	I						1		X	X	X	X	X	X		X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X		X	X	X		9, 10, 14
Lathyrus pratensis	meadow vetchling	I						1	1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		6
Lonicera per˜clymenum	honeysuckle	I						1			X	X	X	X	X		X		X	X			X	X	X	X	X			X	X	X	X		X	X	X	X	X			1
Potentilla erecta	tormentil	I						1	1		X	X	X	X	X		X	X	X	X				X	X	X	X			X			X		X	X			X	X			4
Rumex acetosella	sheep's sorrel	I						1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	4
Sanguisorba minor subsp. *minor*	salad burnet	I						1	1			X		X			X	X	X			X		X		X	X						X			X		X				5
Sparganium emersum	unbranched bur-reed	I						1				X							X				X			X	X									X			X				11
Stachys officinalis	betony	I						1			X	X	X	X			X	X	X				X	X	X	X	X			X			X									1 (edge), 3
Teucrium sco˜odonia	wood sage	I						1		X	X	X	X	X	X		X	X	X	X			X	X	X	X	X			X	X		X		X	X	X		X	X		1

Birds

Name	Species-Type	Priority	SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Grey partridge	p	1		1				1		bw									bw						bw	bw	w							bw								3, 20
Tree sparrow	p	1		1				1									bw		bw?				w?		bw	bw								bw			bw		bw			2, 20
Turtle dove	p	1		1				1	1	b	b?	b?		b			b		b						b	b								b			b					2, 3
Bullfinch	p	1					1	1		b	b	b	b	b			b	b	b	b			b?	b	b	b	b		b	b		w	b		b	b		b	b	b	1, 3, (scrub)
Corn bunting	p	1					1	1		w	bw	w													bw	bw									bw								20
Linnet	p	1					1	1		bw	bw	bw	b	b			bw	b	bw	bw	b	b?	b	b	bw	bw	b			b		bw	b	bw	bw	b	b	b	bw	bw	b		3, 4, 17, 19
Reed bunting	p	1			1			1		b	b	b	b	b			b		b	b			b	b	b	b	bw					b		b	b		b		b	b		10, 14
Skylark	p	1			1		1	1	1	bw	bw	bw	b?	b			b		b	bw			X	b	bw	b	bw					b	b	bw	b		bw			b		6, 20
Song thrush	p	1			1		1	1	1	b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	1, 2, 15, 16, 18
Spotted flycatcher	p	1			1		1	1							b			b		b			b	b	b		b		b	b						b				b?		2, 3, 18
Hawfinch	p		1	1	1			1						b									X	w	bw									bw								1
Marsh tit	p		1	1				1						b																				b					b			1
Pintail	p		1	1				1	1			w					w								w											w							12, 14
Black redstart	p		1	1		1						b	b		b	b		b	b	b	b	b			b			b	b?			b		b		b	b		b	b	b	b?	19, plus built environment
Little ringed plover	p		1	1		1			1	b		b							b	b					b	b	b			b			b	b	b		b	b				14
Nightingale	p		1	1			1		1										b						b									b?					b				1
Peregrine	p		1	1						sb?										w													b?			X				b			12, plus built environment
Short eared owl	p		1	1	1	1			1	w							w		w						w								w									6, 8
Stonechat	p		1	1	1				1			wb?								w					bw		w								bw								2, 6, 8
Yellow wagtail	p		1	1	1												b		b				b		b	b							b			b						6, 8, 20
Long eared owl	p		1	1						w	w	w							w						bw	w	w																1, 2, 3
Hobby	p		1	1							b	b		b	b		b		b					b	b	b	b							b	b								1, 2, 20
Water Rail	p		1	1	1				1	bw	bw	bw	bw				bw		bw	w			b		bw	bw	bw								bw		w		bw				9, 10
Ringed plover	p		1	1(b	1				1	w		wb?								bw					w								w										12
Pochard	p		1	1(b	1	1	1		1				w							w	w		b		b	w	bw						w	w			b		w	w	bw	10, 14
House martin	p		1				1	1		b				b						b			b	b			b				b	b		b		b	b	b		s	b	
Lapwing	p		1		1		1	1	1	bw		b?w					b			w					bw		w								bw	bw		bw					8, 12
Redshank	p		1		1			1	1	bw		w													bw								w				b					8, 12
Sand martin	p		1					1		b									b				b		b	b							b	b					b?			12, 13, 14
Shelduck	p		1		1			1	1	bw		bw							b?	w					bw								bw	b			b		b?			8, 12, 14
Yellowhammer	p		1				1	1			b			b					b?				b	b	b									b								3, 20
Swallow	p		1				1	1	1	b	b	b		b			b		b	b			b	b	b	b			b			b	b		b			s		6, 20
Lesser whitethroat	p		1					1		b	b	b		b			b	b	b	b			b	b	b	b			b			b	b		b		b	s		(scrub)
Dunlin	c		1			1	1		1	w		w								w					w								w		w							12
Golden plover	c		1				1		1	w															w		w							w									20
Cormorant	c		1			1	1	1																w			w								w				b	w		12, 14
Kestrel	c		1				1	1	1	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	6, 20 plus built environment
Tufted duck	c		1		1	1	1		1	b	bw	b	bw		b		b	b	b	b	bw		b	b	bw	bw	bw	b				bw	bw		bw		bw	bw	w	bw		14
Mallard	c		1		1	1	1		1	b	b	b	b	b	b	b	b	b	bw	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	11, 12, 13, 14
Gadwall	c		1		1	1			1		w		w				w		w		w		w		bw	w	w								w		w		w				14
Shoveler	c		1		1	1			1	w	w	w	w				w		w	w	w		w		bw	w	w					w					w		w	w	w	14
Herring gull	c		1			1			1						b					b				w			w						b			b		b		w	b	12, 14 plus built environment
L.b-b gull	c		1			1			1						b					b				w			w						b					b		w		12, 14 plus built environment
Pied wagtail	c		1		1	1			1	b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	13, 14, 16
Grey wagtail	c		1		1	1			1	b	b	b	b	b	b			b	b	b		b	b	b	b	b				b	b	b		b		b	b	b	X	b	**11**
Blue tit	c		1		1		1			b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	1, 15, 16, 17, 18
Chiffchaff	c		1		1		1			b	b	b	b	b	b		b	b	b	b	b		b	b	b	b		b	b		b	b	b	b	b	b	b	b	b	b	b	1
Common tern	c		1		1		1		1	b	b		b						b	b?			b?		b	b	b						b	b?	b	b		b	b				12, 14

Name	Species-Type	Priority	SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Goldfinch	c		1		1		1			b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b			b	b	b	b	b	b	b	b	b	b	b	b	17,19, 20
Great spotted woodpecker	c		1		1		1			b	b	b	b	b	b		b	b	b	b	b		b	b	b	b	b		b	b		b	b		b	b	b	b?	b	b	b	1, 2, 15, 16
Great tit	c		1		1		1			b	b	b	b	b	b			b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	1, 2, 3, 15, 16
Green woodpecker	c		1		1		1		1	b	b	b	b	b	b		b	b	b	b			b	b	b	b	b			b		b	b		b	b	b	b		b	b	b	1, 4
Kingfisher	c		1		1		1		1	b	b		b		b			b	b	b	b?		?	b	b	b	b			b		b	b	b?	b		b	b	b?		11, 13, 14
Mute swan	c		1				1		1	b	b	b	b	b			b	b	b	b	b		b	b	b	b	b						b	b	b				b	b	b	12, 14
Tawny owl	c		1				1		1		b	b	b	b	b		b	b	b	b	b		b	b	b	b	b		b	b		b	b		b	b	b	b	b	b	b	1
Blackcap	c		1		1					b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	1
Dunnock	c		1		1					b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	3, 15, 17, 18
Meadow pipit	c		1		1					b	b?	b	b?				b		b	b			b?	w	b	b	b						b	b?	b	b		b			b		2, 6, 8
Nuthatch	c		1		1						b	b	b	b	b		b		b	b			b	b	b	b	b		b	b		b	b		b	b	b	b		b	b	b	1
Snipe	c		1		1					w		w	w				w		w	w				w	w	w	w			w							w		w			9, 10, 14
Sparrowhawk	c		1							b	b	b?	b?	b	b		b	b	b	b	b?		b	b	b	b	b		b	b		b	b		b	b	b	b	b	b	b	1, 2, 15, 17
Teal	c		1		11				1	w	w	w	w				w		w	w				w	w	w	w					w		w		w		w				12, 14
Sedge warbler	c		1		1				1	b	b	b	b				b	b?	b	b	b?				b	b	b						b?	b	b	b		b	b?	b			9, 10
Reed warbler	c		1		1				1	b	b	b	b		b		b		b	b	b?		b		b	b	b							b	b?	b		b	b?	b	s		9, 10
Greenfinch	c		1							b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	2, 3, 15, 17, 18
Treecreeper	c		1		1						b	b		b	b		b	b	b	b			b	b	b	b	b		b?	b		b	b		b	b	b	b		b	b?	b	1
Lesser spotted woodpecke	c		1		1						b	b		b	b		b		b	b			b	b	b	b	b			b		b?	b		b	b	b	b		b	b		1
Coal tit	c		1		1						b	b	b?	b	b		b	b	b	b			b	b	b	b	b		b	b		b	b		b	b	b	b		b	b	b	1
Willow warbler	c		1		1				1	b	b	b	b	b			b	b	b	b			b	b	b	b	b			b		b	b	b?	b	b	b	b		b	b	b	(scrub)
Garden warbler	c		1							b	b	b	b?	b			b		b				b	b	b	b	b			b		b			b	b	b	b		b	b		(scrub)
Whitethroat	c		1							b	b	b	b	b			b	b	b	b			b	b	b	b	b			b		b	b	b	b		b	b?	b	b		scrub
Blackbird	v				1		1			b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	2, 3, 15, 16, 17, 18, 19, 20
Cuckoo	v						1			b	b	b	b	b	b		b		b	b				b	b	b	b							b	b								6, 9, 10
Great crested grebe	v				1		1		1	b	b	b	b	b	b		b	b	b	b	b		b	b	b	b	b			b			b	b	b				b	b	b	14
Grey heron	v						1		1			b		b	b											b	b			b			b			b	b				b	b	b	11, 12, 13, 14
Jay	v				1		1			b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	1, 17,18
Robin	v				1		1			b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	1, 3, 15, 16,17,18
Starling	v					1				b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	2, 6, 8, 15, 16, 20
House sparrow	v					1				b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	15,16,19, 20 plus built enviro
Wren	v				1		1			b	b	b	b	b	b		b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	1, 15, 17, 18

Butterflies																																							
Name	**Species-Type**	**Priority/SCC**	**Rare**	**Indicative**	**Characteristic**	**Culturally-valued**	**Decline**	**Easy**	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Purple Emporer		1	1	1		1	1									X?																									1 (ancient)
Brown hairsteak		1	1				1																					x?													1, 3 (blackthorn)
Small blue		1	1	1		1	1	1					X			X									X?											x					5
Chalkhill blue		1	1	1			1	1					X			X																									5
Silver-washed fritillary		1	1	1			1	1					X																X												1
White-letter hairstreak			1						X?	X	X		X	X		X?		X				X	X	X?	X	X						X			X		X			X		1, 3 (elm)
Dingy skipper			1	1			1?	1					X			X									X																5
Green hairstreak			1	1			1	1			X?		X			X	X?															X		X								4, 5, 7
Purple hairstreak				1						X	X	X	X	X		X	X	X	X			X	X	X?	X	X			X		X	X		X	X	X?	X		X	X		1 (oak)
Brown argus				1						X?			X			X	X?	X?	X			X	X		X?	X						X		X			X		X			5, 6, 19
White admiral			1	1			1?	1					X												X				X												1 (ancient)
Marbled white			1	1				1	1		X			X			X							X		X	X															5
Grizzled skipper			1				1						X			X?																X?										5
Small copper								1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X		4, 6, 7, 19
Common blue				1		1		1	X	X	X	X	X	X	x	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	4, 5, 6
Holly blue						1		1?	X	X	X	X	X	X	x	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1, 3, 15, 16, 18
Peacock						1		1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1, 3, 15, 16, 18, 19
Dark green fritillary			1				1						X			X															X?										5 (scrub/woodland edge)
Speckled wood				1				1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1,16
Gatekeeper						1		1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	3, 6
Small heath							1?	1	X?	X	X	X?	X	X?		X	X	X	X			X	X	X	X			X		X		X	X	X	X		X		X	X		6
Ringlet								1		X	X		X	X?		X	X	X				X	X	X	X	X			X			X			X		X		X	X?		1

Macro-moths

Name	Priority/SCC	Nationally-Scarce-	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Star-wort	1		1	1			1?	1	X		X		X											X																	1, 12
Buttoned Snout	1				1		1			X	X		X			X		X			X		X	X	X	X			X			X	X	X	X		X					3, 19
Four-spotted	1		1				1																								X					X					4, 5
Double Line	1		1				1																						X			X									1, 2
Red-belted Clearwing		1	1			1				X	X		X			X		X			X	?		X							X							X		X	1, 15
Yarrow Pug		1		1					X		X		X																			X	X			X		X			6, (mostly Thames-side)
The Wormwood		1			1?			1	X		X		X	X	X	X				X	X	X		X	X		X		X			X	X				X					6, (Thames-side), 19
Pale-lemon Sallow		1	1	1										X		X					X				X							X					X		X			2, 16
Waved Black		1	1		1											X									X							X										1
Six-spot Burnet				1		1		1	X	X	X		X	X		X		X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X			6
Grass Emerald				1				1	X	X	X		X	X		X								X	X						X	X	X	X					X			4, 7
Small Scallop				1						X	X		X			X		X					X	X	X	X			X			X		X	X							1, (wet)
Dog's Tooth				1	1		1	1	X		X		X			X		X	X	X				X	X	X					X?		X	X		X	X	X			8, 19
Bulrush Wainscot				1				1	X	X	X		X			X		X		X			X	X	X	X			X			X	X			X		X			9, 14
Chimney Sweeper			1	1			1			X		X		X?				X																				X?	X		6
Privet Hawk-moth				1		1	1			X		X	X			X															X	X	X	X		X	X		X			15, 16, 18
Beautiful Yellow Underwing			1	1		1										X															X								X		7
Fen Wainscot			1	1				1	X	X	X					X		X		X				X	X						X	X				X		X			10
Merveille du Jour			1	1				1		X			X			X		X					X										X					X				1
Pretty Chalk Carpet			1	1				1			X		X			X									X																	5
Hawk-moths (Lime, Poplar, Elephant)					1	1		1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15, 16, 18
Garden Tiger					1	1			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15,16, 17, 19

Dragonflies

Name	Species-Type	Priority/SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Scarce emerald damselfly		1	1	1					?															X																		8
Black darter			1	1																								X			X			X								4, 7, (ponds)
White-legged damselfly			1															X										X					X	X				X			11, 14
Red-eyed damselfly			1				1		X	X			X	X				X					X		X	X							X	X	X						14
Emerald damselfly			1								X												X		X	X						X			X				X			14
Ruddy darter				1	?				X		X	X	X					X	X			X			X							X		X					X	X		14
Black-tailed skimmer				1					X	X		X												X	X				X			X		X					X	X		14, (gravel pits)
Emperor dragonfly						1			X	X	X	X	X	X		X		X	X	X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		14
Banded demoiselle				1		1			X		X	?						X		X		X		X	X									X	X				X			11, (silty bed)
Southern hawker				1					X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X		X				X		X	X	X	X	X	X	X		14, (incl. garden ponds)
Brown hawker				1					X	X	X	X	X	X		X		X	X	X		X	X	X	X	X	X					X		X	X	X	X	X	X	X		14, (incl. urban ponds)
Blue-tailed damselfly						1			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14, (almost all ponds)

Other Invertebrates

Name	Species-Type	Priority/SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Glow-worm			1	1		1	1			X			X			X									X																3, 5, 6
Stag beetle		1			1	1		1	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	1, 2, 15, 18
Bloody-nosed beetle				1						X			?			X																									4, 5, 7
A click beetle		1	1	1																								?						X							1, 2
Brown tree ant			1	1			1																X	X									X	X				X			1
Yellow meadow ant				1					X	X	X	X					X		X			X	X	X					X				X	X				X	X		2, 4, 5, 6, 16, 17, 18
Wood ant			1	1				1			?												X																			1
Robber-fly		1	1						X															X												X						4, 6
Mining bee			1																					X							X										4
Long-tonged bumble-bee		1	1						X		X																															19, (near to Thames)
A cranefly		1	1	1								X							X					X																		1, (damp/shady)
A hoverfly			1	1				1															X																			1, 2
A hoverfly				1						X		X											X			X																14, 10
A hoverfly				1	1					X		X	X	X			X						X	X	X														X	X		1, 2, 15, 17
A soldier fly			1				1			X		X																						X					X			8, 9, 14
A spider			1	1		1		1						X																												6
A spider			1	1																		X																				4,6
A spider			1	1										X																												4, 6
A spider			1	1					X	X	X			X					X			X		X				X					X		X			X			4, 5, 6, (with ants)
A spider			1		1	1		1							X											X									X						X	16, 17, 18, 19, (on walls)
Roesel's bush-cricket					1				X	X	X	X		X			X		X			X	X	X			X		X					X	X			X	X		6, 17, 19
Striped-winged grasshopper					1									X								X																				19
Brackish water-snail		1	1	1					X																																	12
Roman snail *Helix*		1		1		1		1					X			X						X														X						1, (on chalk)
Two-lipped Door Snail			1	1																						X			X						X							11
Green tiger beetle			1	1												?															?				?			?				4, 7
Bombardier beetle			1																?																			?				17, 19
A ground beetle			1																													?					?				1

Mammals, Reptiles & Amphibians

Name	Species-Type	Priority	SCC	Rare	Indicative	Characteristic	Culturally-valued	Decline	Easy	Barking-Dagenham	Barnet	Bexley	Brent	Bromley	Camden	City-of-London	Croydon	Ealing	Enfield	Greenwich	Hackney	Hammersmith-Fulham	Haringey	Harrow	Havering	Hillingdon	Hounslow	Islington	Kensington-Chelsea	Kingston	Lambeth	Lewisham	Merton	Newham	Redbridge	Richmond	Southwark	Sutton	Tower-Hamlets	Waltham-Forest	Wandsworth	Westminster	Habitats
Badger	mam		1	1			1		1			X		X			X		X					X	X	X	X			X			X			X		X		X	?		1, 2, 15
Brown hare	mam	1		1	1			1	1		X	X		X					X						X	X				X					X								8, 20
Hedgehog	mam		1				1			X	X	X	X	X	X		X	X	X	X	X		X	X	X	X				X			X		X	X	X	X	X	X		1, 6, 15, 16, 18
Water shrew	mam		1	1	1						X			X					X						X	X				X								X		X?			9, 11, 14
Water vole	mam	1		1	1		1	1		X	X?	X						X	X	X	X?		X	X	X	X	X			X					X	X			X				9, 11
Dormouse	mam	1		1			1							X			X?													X?													1
Pygmy shrew	mam		1		1					X	X	X		X			X	X	X	X			X	X	X	X	X			X			X		X	X		X				1, 3, 6
Brown-longed eared bat	mam		1	1			1				r	r		r			X		X	X			X	X	X	X	r			X			X		X	r			X	r		1, 2
Daubenton's bat	mam		1				1				X	X		X	X			X					X	X	X	r	X			X			r		X	X		X		X	r		11, 12, 14
Noctule bat	mam		1					1		X	X	r	X	r	X		X	X	X	r	X		r	X	X	r	X						X		X	X	X	X		X	X	r	1, 2, 15, 16, 17
Pipistrelle bat(s)	mam	1					1			X	X	X	X	r	X		X	X	X	X	X	X?	X	X	X	X	X	X?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1, 2, 15, 16, 17, 18
Serotine bat	mam		1	1						X		X		r			X							X			X							X?			X		X	X		2, 14
Adder	rep		1	1								X		X			X								X	X								X?								4, 5, 7
Common lizard	rep							1		X	X	X	X	X			X		X	X		X		X	X	X	X			X		X	X		X	X		X		X			4, 7, 17
Grass snake	rep		1		1			1		X	X	X		X			X		X	X			X	X	X	X	X						X	X	X	X			X			8, 9, 11
Slow-worm	rep		1					1		X	X	X	X	X			X	X	X	X			X	X	X	X	X			X		X	X	X	X	X	X	X	X	X	X	6, 15, 17, 18
Common frog	amp		1		1		1			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	9, 14, 15
Great crested newt	amp	1		1	1		1			X	in	X	in	X				X	X	X				X	X	X	in							X	in		X		X				14
Palmate newt	amp		1	1								X?		X						X					X																		

Acknowledgements

Representatives from the wide range of organisations in the London Biodiversity Partnership contributed to the production of this document. Many of the ideas underpinning the philosophy espoused in *Our Green Capital: Introduction to the London Biodiversity Action Plan*, were generated by debate and discussions within the London Biodiversity Partnership during the meetings of the Steering Group and its various Topic Groups. Meetings of the many Biodiversity Action Plan partnerships at the borough level provided useful insights, which further informed the process. A number of individuals deserve special mention, as follows.

Alex Colón undertook the painstaking work of researching and writing the majority of the habitat audits.

The following provided expert opinion on the species audits: Rodney Burton, Ruth Day, John Dobson, Clive Griffin, Dan Hackett, Peter Harvey, Ruth Kirk, Paul Mabbott, Des McKenzie, Edward Milner and Colin Plant (LNHS); Clive Herbert (London Mammal Group); Gail Jeffcoate, John Maddocks, Iris Newberry and John Stevens (Butterfly Conservation); Martin Weaver (London Amphibian & Reptile Trust); John Archer, Jan Hewlett (LEU); Richard Barnes and Peter Grainger (LB Sutton); and Leslie Williams (LB Brent) provided

We acknowledge the following representatives of Partnership organisations, past and present:

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The Royal Parks	Jennifer Adams, Mike Fitt	Ann Page
Royal Society for Protection of Birds	Paul Outhwaite	Chris Corrigan, Steve Gilbert, David Payne
Thames Estuary Partnership	Caroline Davis	

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Our Green Capital (Introduction to the London Biodiversity Action Plan) and the London Biodiversity Audit (Volume 1) were co-ordinated by Peter Massini and prepared for publication by James Farrell, consecutive London Biodiversity Project Officers.

Cover photos by

UK Biodiversity Action Plan Publications

Biodiversity: The UK Action Plan. Cm 2428. HMSO, 1994

Biodiversity: The UK Action Plan (Summary Report) HMSO, 1994

Biodiversity: The UK Steering Group Report. Volume 1: Meeting the Rio Challenge. HMSO, 1995

Biodiversity: The UK Steering Group Report. Volume 2: Action Plans. HMSO, 1995

UK Biodiversity Group: Tranche 2 Action Plans. Volume I – vertebrates and vascular plants. English Nature, 1998

UK Biodiversity Group: Tranche 2 Action Plans. Volume II – terrestrial and freshwater habitats. English Nature, 1998

UK Biodiversity Group: Tranche 2 Action Plans. Volume III – plants and fungi. English Nature, 1999

UK Biodiversity Group: Tranche 2 Action Plans. Volume IV – invertebrates. English Nature, 1999

UK Biodiversity Group: Tranche 2 Action Plans. Volume V – maritime species and habitats. English Nature, 1999

UK Biodiversity Group: Tranche 2 Action Plans. Volume VI – terrestrial and freshwater species and habitats. English Nature, 1999

Acronyms

CITES	Convention on International Trade in Endangered Species
DETR	Department of Environment, Transport and the Regions
DLR	Docklands Light Railway
DOE	Department of the Environment
EA	Environment Agency
EN	English Nature
GIS	Geographical Information System
GLC	Greater London Council
HMSO	Her Majesty's Stationery Office
ITE	Institute of Terrestrial Ecology
JNCC	Joint Nature Conservation Committee
LB	London Borough
LEAP	Local Environment Agency Plan
LEU	London Ecology Unit
LNHS	London Natural History Society
LNR	Local Nature Reserve
LPAC	London Planning Advisory Committee
LRC	London Research Centre
LUL	London Underground Limited
LWT	London Wildlife Trust
MAFF	Ministry for Agriculture, Fisheries and Food
NCC	Nature Conservancy Council
NVC	National Vegetation Classification
OS	Ordinance Survey
PLA	Port of London Authority
RSPB	Royal Society for the Protection of Birds
UDP	Unitary Development Plan
SCC	Species of Conservation Concern
SINC	Site of Importance for Nature Conservation
SSSI	Site of Special Scientific Interest
WWT	Wildfowl and Wetlands Trust