



Linford Wood Management Plan

Published July 2014

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July 2014

LINFORD WOOD MANAGEMENT PLAN 2014

Site Summary

Site name:	Linford Wood & Stanton Wood
Location:	Linford Wood is 1 km north of central Milton Keynes. Stanton Wood is south-west of Linford Wood and separated from it by the V7 grid-road, Saxon Street
Grid reference:	Within OS grid squares: SP: 844408, 844398, 851398
Area:	41.1 ha (101.5 acres) of woodland in two tracts: <ul style="list-style-type: none">• Linford Wood: 39.3ha (97.1 acres)• Stanton Wood: 1.8ha (4.4 acres) and associated grid-road corridor landscapes (V7: Saxon Street & H4: Danstead Way)
Height:	Between 101 and 110 metres above sea level
Age:	At least 700 years old. Most of Linford Wood is 'Ancient Woodland' (i.e. continuous woodland since before 1600) enclosed as a deer park in 1284 and coppiced from before 1531
Designations:	Buckinghamshire & Milton Keynes Local Wildlife Site (Site of Importance for Nature Conservation)

Aim

The management aim is to maintain and enhance the Semi-Natural Ancient Woodland character, biodiversity conservation interest, recreational and landscape value of the woodland and edge environs of Linford Wood and Stanton Wood.

Summary of Objectives

These cover:

- Conservation of habitats and biodiversity.
- Maintaining and enhancing the wood's character, along with its landscape value and visual appeal.
- Providing access for relaxation and enjoyment.
- Enabling the wood to be used as an educational resource and to provide information about them.

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Review Date:	January 2020

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Section 1: Site Description and History

1.1 Ownership

Since 1992 Linford Wood (including Stanton Wood) has been owned and managed by The Parks Trust, the self financing charity dedicated to caring for over 5,000 acres of parks, woods, lakes and landscapes in Milton Keynes. The Wood is held on a 999 year lease from the freeholder, Milton Keynes Council. Previously the land was owned by Milton Keynes Development Corporation who purchased it in 1971 as part of their city-wide land holdings to develop the New Town of Milton Keynes. See plans 1 and 2 for boundaries of the plan and ownership.

1.2 Location

Linford Wood is 1 km north of Central Milton Keynes within 'Linford Wood grid-square'. The woodland has been surrounded by the development of Milton Keynes (*Plan 1*). It is the most substantial part of the 'Linford Wood grid-square' which otherwise includes office and industrial units. The grid-square is surrounded on all sides by four of the city's main grid-roads. The grid-squares beyond these roads are largely residential: to the north, Stantonbury; to the south, Conniburrow; to the west, Heelands; and to the east, Neath Hill. To the immediate west of Linford Wood is the city's TV mast and a petrol station. Stanton Wood is south-west of Linford Wood, within the Heelands grid-square, and separated from it by the V7 grid-road, Saxon Street; it is flanked on its south-west side by playing fields and to its north by a hotel.

Linford Wood should not be confused with Little Linford Wood (OS maps show both as Linford Wood). Little Linford Wood is about 5km north of Linford Wood, to the north of Little Linford village, and is also semi-natural ancient woodland. Little Linford Wood is owned and managed by BBOWT (Buckinghamshire, Berkshire & Oxfordshire Wildlife Trust).

1.3 Size and structure

Linford Wood is 39.3ha (97.1 acres). Stanton Wood is 1.8ha (4.4 acres). This management plan covers Linford Wood, Stanton Wood and also parts of the grid-road landscape alongside V7 (Saxon Street) and H4 (Dansteed Way) the boundaries are shown in *Plan 2*. These landscape corridors are adjacent to the woodland boundary and relate directly to the woodland. In the grid-road corridor to the south of the woodland, on the northern edge of Dansteed Way, there is a wildflower meadow and new pond which were created in 2004. The western part of what is now Linford Wood (Compartment 13) was previously part of Stanton Wood (Compartment 15) and was separated from Linford Wood by its woodbank & ditch and by a woodland ride. Construction of a grid-road in the 1970s separated most of Stanton Wood from Linford Wood.

1.4 Topography, geology, hydrology

The woodland is on a high plateau with terrain that is relatively flat and slopes very gradually upwards from the south-west to the north-east corner at a mean gradient of around 1:100, from 101 metres to 110 metres above sea level, but it is domed so the highest point is close to the centre of the wood.

The substrate is chalky Boulder Clay over Oxford Clay. This gives rise to a clay-loam soil with a narrow band of humus on the surface. The associated soils are inherently fertile but this high fertility is frustrated by a high water table. Generally the soils are gleyed below 300mm and mottled above this due to the fluctuating water table. The subsoil is alkaline but the topsoil is mostly between pH 5.5 and 6.6. The dense, heavy clay affects drainage and as a consequence impedes the root growth of trees and shrubs. Rooting is therefore shallow and rarely penetrates below 450mm. Tree establishment is affected by the high water table in winter and the occasional soil shrinkage and desiccation in

summer, which can tear young roots. Soil quality improves slightly towards the south of the Wood, where the soil is more of a brown earth.

Historically there were three streams which took water away from Linford Wood (*Plan 6*). One ran northwards from the north-west corner through Stantonbury with a remnant of this emerging further north along the south side of Stonepit Field, then running under the canal and road to join the Linford Lakes. The main stream was Springhill Brook, the route of which still runs eastwards through Neath Hill then under the canal at Pennyland to Tongwell. The third stream, Tongwell Brook ran in the valley now occupied by the north side of Conniburrow to join Springhill Brook at Tongwell, then beside Tongwell Lane to join the River Ouzel at Tickford. These watercourses still exist, though modified and in culverts and pipes for some of their lengths.

The woodland contains six ponds and several seasonally wet depressed areas which may have been ponds. One of these shallow wet areas was shown in a 1678 estate plan as a pond at the headwater for Springhill Brook. This pond and the upper sections of this Brook through Linford Wood have yet to be definitively rediscovered. *Plan 6* shows ponds, ditches and watercourses, with directions of flow.

When the Development Corporation installed paths in the late 1970s they constructed ditches, mostly on both sides of each path. The ditches take water to culverts and pipes at the north, north-east and south sides of Linford Wood. Run-off from Stanton Wood was piped under V7 Saxon Street to join the Linford Wood ditch system just south of the petrol station. These ditches bisected natural water courses and have had some effect on the overall hydrology of the wood, though soils remain relatively wet because of the clay soil.

1.5 Woodland history and archaeology

Linford Wood has been woodland for at least 700 years. It was enclosed as a deer park in 1284 with a bank, ditch and fence, providing for hunting, pig pannage and other grazing and was managed for several centuries as part of the Great Linford Manor Estate. The wood was connected to its north-east by a tree-lined lane to Great Linford village and the Manor House. There is no specific record of these woodlands in the Domesday Book (1086) so it is uncertain whether it was wooded before 1284, or whether the deer park was developed from wood-pasture with occasional trees, or perhaps had more dense woodland at the time its boundary woodbank was constructed. Some of the woodbank and its ditch can still be seen around the edge of the original woodland area. These remnant mediaeval woodbanks and associated ditches are an important historic feature and are to be carefully conserved, as they are the oldest remaining feature from the 13th century.

The date when Stanton Wood was planted is not known. It is not shown as woodland on the 1678 estate map, but is represented as woodland on the Ordnance Survey map dated 1833-1835. There are remnants of ridge and furrow farmland under the original areas of Stanton Wood on both sides of Saxon Street.

1.6 Compartments

From 1974 to 1990, Linford Wood was managed in 30 sub-compartments, numbered: 1 to 15 on its east side and 1a to 15a on its west side (shown in *Plan 9*). Stanton Wood was a single compartment (No. 16a). From 2000, the 30 sub-compartments of Linford Wood have been managed as 13 compartments (see *Plan 3*) and Stanton Wood was renumbered as compartment 15. Table 1 illustrates the compartments and their individual areas, as measured in hectares.

1. (2.89)	2. (2.19)	3. (3.63)	4. (2.83)	5. (3.26)
6. (1.51)	7. (3.88)	8. (2.02)	9. (2.68)	10. (1.98)
11. (1.27)	12. (2.55)	13. (3.06)	14. (1.88)	15. (3.49)

Table 1. Compartments and their subsequent areas (hectares)

1.7 Tree species

The canopy of Linford Wood and Stanton Wood is predominantly Ash *Fraxinus excelsior*, Pedunculate Oak *Quercus robur* and Field Maple *Acer campestre*. Mature tree cover in 1984 was: Ash 60%, Oak 31%, Field Maple 8%, Norway Spruce *Picea abies* 1%.

Planting of trees in the 1970s & 80s included: Yew *Taxus baccata*, Pedunculate Oak *Quercus robur*, Red Oak *Quercus borealis* var. *maxima*, Turkey Oak *Quercus cerris*, Southern Beech *Nothofagus* sp., Aspen *Populus tremula*, Birch *Betula* sp., Hornbeam *Carpinus betulus*, Wild Cherry *Prunus avium*, Lime *Tilia x vulgaris*, Goat Willow *Salix caprea*, European Larch *Larix decidua* and Lawson Cypress *Chamaecyparis lawsoniana*. Some of these have since been removed.

In 1984 the shrub layer was mainly comprised of Bramble *Rubus fruticosus*, Hawthorn *Crataegus monogyna*, Midland Hawthorn *Crataegus laevigata*, Blackthorn *Prunus spinosa* and some Holly *Ilex aquifolium*, with coppiced Hazel *Corylus avellana* and Ash. Remnant Elm *Ulmus* sp. remained in a few areas and there was natural regeneration of Ash and some Wild Privet *Ligustrum vulgare* and Sycamore *Acer pseudoplatanus*. Smaller species present in the canopy and sub-canopy in lower numbers included: Crab Apple *Malus sylvestris*, Wild Service-tree *Sorbus torminalis*, Wild Cherry *Prunus avium*, Goat Willow *Salix caprea*, Grey Willow *Salix cinerea* and the introduced Alder *Alnus glutinosa*.

The most abundant shrub species in the underwood was Hazel *Corylus avellana*, followed by Hawthorn *Crataegus monogyna*. Also present were: Elder *Sambucus nigra*, Blackthorn *Prunus spinosa* and Dogwood *Cornus sanguinea*. In moister areas and at low frequency there were: Spindle *Euonymus europeus*, Wild Privet *Ligustrum vulgare* and Guelder-rose *Viburnum opulus*. Plan 3 shows the vegetation zones.

1.8 Woodland characteristics and NVC

Linford Wood is mostly (80%) remnant Semi-Natural Ancient Woodland. The rest of it: compartments 9, 13, and 14 (Stanton Wood) is predominantly long-established secondary woodland planted over ridge and furrow fields, with an additional area (compartment 8) at the southern edge, planted in the 1930s and 1940s.

Under the National Vegetation Classification (NVC) the main areas of woodland are 'W8: *Fraxinus excelsior*-*Acer campestre*-*Mercurialis perennis* Woodland' (Ash, Field Maple, Dog's Mercury Woodland) which are typically wet woodlands on clay; with some areas of W22: *Prunus spinosa*-*Rubus fruticosus* Blackthorn-Bramble scrub community, mostly in the secondary woodland compartments. More specifically, some compartments are in NVC sub-communities: W8a, W8b and W8c as a result of different management regimes.

1.9 Woodland management

At some stage, the management regime for Linford Wood became coppice with standards. There is evidence of a system of coppice management in 1531, but it may well have been in operation long before this. Before the 20th century the Wood had become neglected. It is thought that most of the remaining standard Oak were removed during the First World War, though active management had probably ceased well before this. Compartment 8 was outside the original Linford Wood and was planted in the 1940s under a Forestry Commission dedication scheme.

After Milton Keynes Development Corporation purchased the woodland in 1971 they made fundamental changes as the New Town was developed. The most active elements of woodland for much wildlife are at its edges and along its rides, where there is a graduated transition from woodland to shrub and scrub to tall herbs and plenty of sunlight. These areas provide habitats of considerable ecological value, but, unfortunately some planners view the edge of the high canopy trees as the edge of a woodland. In consequence Linford Wood was shorn of much of its ecologically effective outer edges. Roads and development were placed too close to the woodland edge as were hard-surfaced paths and close-mown grass. Linford Wood and the remnant of Stanton Wood were also severed from each other.

It is not known what site management plans were used in the periods before the Development Corporation purchased the wood, but their initial work was shaped by a management plan dated 1971. The Development Corporation embarked on a 15-year woodland rejuvenation scheme in 1974 to open up most of the relatively dark and neglected woodland for public use. A network of surfaced and unsurfaced paths and horse-riding trails was inserted (see *Plan 4*), as were picnic areas, benches and signage (*Plan 5*). A decade later, in 1984, the Development Corporation commissioned an independent report, the 'Linford Wood Management Plan 1985-1989' which provided a detailed assessment of both woods and made proposals for significant changes to the way in which the wood should be managed, which would be more appropriate to its Ancient Woodland characteristics. A modified version of these management proposals formed the basis of the management of these woods by the Development Corporation and, since 1992, by The Parks Trust after it inherited these woods. The aim has been to restore the woodland to a more mixed aged structure of trees by thinning of upper and middle canopy trees (standards), coppicing of lower canopies and the creation of coupes and by encouraging natural regeneration, to benefit the Semi-Natural Ancient Woodland flora and fauna. Appendix 1 summarises 'The 20th Century Woodland Management of Linford & Stanton Woods'.

1.10 Landscape character

As Linford Wood is on a high plateau, it is visible from much of the surrounding area. The wood is a mature landscape feature of significant visual conservation value set in an overall area of much younger landscapes and woodland. Where it is visible from the adjacent grid-roads it forms part of an important landscape corridor, particularly on its west and south sides. It also contributes to the attractive landscape setting of the industrial and office units found in the same grid-square. At a distance it provides a strong wooded aspect to views of the city from the surrounding countryside.

1.11 Management for landscape and visual value

The Wood's principal and more obvious visual attributes include mature Pedunculate Oak *Quercus robur* and Ash *Fraxinus excelsior* standard trees with occasional Field Maple *Acer campestre*, together with wild flowers, which are at their most prolific during the spring. The opening up of the woodland to public access in the 1970s by the construction of a network of paths, enabled people to enjoy varying woodland views as they walk or ride through these woods. A broad horse-riding trail runs from north to south through the heart of the woodland and provides a long and impressive vista the entire length of the woodland. The paths enable users to view and experience the mature woodland with its noteworthy attributes including mature standard Oaks and impressive multi-stemmed Ash trees arising from large previously-coppiced Ash stools. In spring there are swathes of Bluebells *Hyacinthoides non-scripta*, a good population of Wood Anemones *Anemone nemorosa*, small patches of several Violet species *Viola spp.* and other wildflowers. Autumn brings gold and brown leaves and bright red berries of Holly *Ilex aquifolium* and White Briony *Bryonia dioica*, with pink and orange berries of Spindle *Euonymus europaeus*.

A lot of the pedestrian paths meander in ways that enable constantly varying but closer views of the woodland and ground flora, while maintaining good forward views, but retaining a sense of distance from nearby urban development. At various points, where paths intersect, longer views into the woodland are achieved. At some points, views focus on trees of unusual form or substantial trees noted for their size and obvious age. Over some lengths of path good visual access is provided to spring wildflower areas. Some scalloping either side of paths enables more ground flora to be seen at certain locations. Orchids grow alongside a couple of the unsurfaced paths which provide visual interest of a different landscape character from the surfaced paths. Some ponds are close to paths and provide a focal point of landscape interest. The dominant tree canopy species vary across the woodland, as does the presence of older trees and these, as well as variations in the shrub layer, bring different visual characteristics to each compartment.

In addition to the natural features there are numerous wooden sculptures (see *Plan 5*) within the woodland. These have been created since 1990, and continue to be created by local amateur artist Jack Stephenson. Jack has had a close association with the woodland for eight decades. He was born and brought up within a few hundred metres of the woodland and has continued to live within walking distance.

1.12 Biodiversity and ecology

The recent and current state of the biodiversity of Linford Wood reflects the long period of neglect followed by decades of restoration management and also since the 1970s, the transition from largely rural surroundings to urbanisation. Linford Wood has been detached from long-established landscapes of which it was once a part. The grid-roads on all four sides disconnected the woodland from hedges and landscapes in adjacent grid-squares, despite pedestrian underpasses and Redways making almost continuous connections with these surrounding areas. The woodland edge of Linford Wood has been severely reduced by development of the New Town, though remnants exist on its east and south side. Stanton Wood is bounded to its west by a hedgerow containing remnant Elm *Ulmus spp.* and by amenity grassland used as playing fields.

The ecology of the woodland has been the subject of much research, survey and investigation, with 26 professional ecological studies undertaken, of which 17 are specific either to Linford Wood or that and Shenley and Howe Park Woods (providing useful comparisons) and some also cover Stanton Wood. A full list of these reports is provided in Section 7 'Reports & Publications' as well as a summary of those of most significance for an understanding of the Wood's ecology and consultants' recommendations for ongoing management in Appendix 2. Surveys have included: field layer vegetation, trees and shrubs, birds, moths, butterflies, dragonflies, beetles and bats. There have been no studies of pollinators such as ants, bees, wasps (hymenoptera), hoverflies or other flies (*diptera*), or of spiders (*arachnida*), or mammals other than bats, or of bryophytes or lichens. Generally, surveys have found that the woodland is ecologically relatively rich and is of significant wildlife conservation value, and have made specific recommendations for future management.

1.13 Woodland flora and fungi

The woodland flora and field layer is generally considered the most important aspect of the woodland's ecology aside from the older trees. Surveys undertaken in the Linford Wood have recorded 184 vascular plant species. Of the species recorded, 29 are Ancient Woodland Indicator (AWI) species including strict ancient woodland specialists such as Herb-Paris *Paris quadrifolia*, Wood Anemone *Anemone nemorosa*, Early-purple Orchid *Orchis mascula* and Greater Butterfly-orchid *Platanthera chlorantha*. Some of these AWI specialists – for example Yellow Archangel *Lamium galeobdolon* – are found in only a few areas of the wood. The remarkably thorough 'Linford Wood Vegetation Survey 1993' carried out by Dr Joanna Francis contains a list of all the plant species with a thorough analysis of the characteristics of the woodland flora and its relationship to this historic woodland. A full summary of this report is provided in Appendix 3.

The 'Linford Wood Vegetation Survey 1993' report also contains maps of the distribution of many tree, shrub and other plant species, including six rarer species. Three species of fern were found, but in small numbers and scattered in a few locations across the wood. The report found that the amount of deadwood was relatively low, with a mean coverage of only 5.9%.

As the woodland generally holds water, mosses and liverworts (Bryophytes) cover substantial area of the woodland floor, an average of 39% cover, but with a few large areas of the woodland having over 80% ground cover by bryophytes, aside from mosses growing on the bark of trees.

When a survey of fungi was carried out across Milton Keynes in 1982 and 1983 the richest site for fungi was Linford Wood. It held 114 species which was more than half of the species found across the sites of potential mycological interest surveyed: 46 of these species were not recorded elsewhere in Milton Keynes. Many of those found in Linford Wood are commonly found on deadwood in deciduous woodland. Some were found where leaf litter had accumulated, others on bare soil alongside paths, though the hard-surfaced paths and deep ditches of Linford Wood may have reduced this potential. Stanton Wood had far fewer fungi species, only 26.

1.14 Insects

Initial studies of Linford Wood's butterflies and moths were carried out in 1981. Two further studies were carried out around two decades later. These were of moths in 1999 and butterflies in 2002/03.

The 1999 survey of moths found fewer species and numbers in Linford Wood than in Shenley and Howe Park Woods. 199 moth species were found in Linford Wood compared with 225 in Shenley Wood and 217 in Howe Park Wood. This was thought to relate to a need for more longer-grass and shrub margins in sunlight at the edges of the Wood and alongside the rides and paths. On the other hand, several moth species were found only in Linford Wood, including the Pale Oak Beauty *Serraca punctinalis*, Dark Marbled Carpet *Chloroclysta citratra* and Ingrailed Clay *Diarsia mendica*.

The survey of butterflies in 2002/03 found that the Wood contained 21 UK resident species and two migrant species. There was thought to be potential for another species. In recent years one other, the Silver Washed Fritillary *Argynnis paphia* has been recorded in the Wood. This lays its eggs in the crevices of trees near to Common Dog-violet *Viola riviniana* on which its caterpillar feeds. It is possible that White Admiral *Limenitis camilla* may be found there in future as its foodplant, Honeysuckle *Lonicera periclymenum*, is present in the Wood. A greater variety of butterflies was found on one flowery bank outside the Wood than all those found in the wood, which shows the potential for greater numbers in sunny open areas within the Wood and at its edges.

The importance of deadwood ecology has become increasingly recognised by ecologists and woodland managers. A 1996 study of beetles in Linford Wood found 143 species but no rare saproxylic species of beetle and recommended further study of fly species, such as hoverflies, and bee and wasp species. The survey concluded that Linford Wood had the lowest level of deadwood resource compared with the Trust's two other ancient woodlands, so the increase of this habitat type was seen as a priority.

1.15 Birds

Common Bird Census surveys carried out in 1984, 1987 and 2007 found fewer species than might be expected for this size of ancient woodland, even allowing for decline in particular species nationally. In 1987 the number of bird species breeding in Linford Wood was 27, compared with the two smaller woods: 36 in Howe Park Wood and 35 in Shenley Wood. A later survey in 1993 showed some recovery in Linford Wood with more species and additional breeding territories.

Further comparisons were made by the Common Bird Census carried out in 2007. This showed that Linford Wood then contained only 27 breeding species, but these included:

- Two National Biodiversity Action Plan species – Bullfinch *Pyrrhula pyrrhula* and Song Thrush *Turdus philomelos*.
- Three Red List Species of Conservation Concern – Marsh Tit *Poecile palustris* as well as Bullfinch and Song Thrush.
- Four Amber List Species of Conservation Concern – Dunnock *Prunella modularis*, Goldcrest *Regulus regulus*, Woodpecker *Picus viridis* and Stock Dove *Columba oenas*.

A further explanation of this Common Bird Census can be found in appendix 3

1.16 Bats and other mammals

Linford Wood has been the subject of several bat surveys, most recently in the 2009 'Ecological Studies in Milton Keynes' report by Bernwood Ecology. Bat species recorded included: Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Brown Long-eared bat *Plecotus auritus*, Natterer's bat *Myotis nattereri*, and Noctule bat *Nyctalus noctula*. It is suspected that the rarer Serotine bat *Eptesicus serotinus* is present but this has not been confirmed. 39 bat boxes were installed in 2008 throughout the Wood at an approximate density of 1 box per hectare. Box inspections in 2009, 2010 and 2011 showed very low occupancy but the boxes are to be monitored again from 2014 onwards. In addition to the boxes, a tree roost occurs roughly in the centre of Linford Wood, which is known to support roosting Pipistrelles. This is also where Serotines are thought to be present.



Picture 1; A 'standard' sized Ash tree (alongside one of the green rides) that is a known Noctule Bat roost.

No specialist survey has been undertaken of terrestrial mammals in either Linford or Stanton Wood, so there are no comprehensive records of small mammals that may be present in these woods. Badgers appear to be absent and there are no badger setts, nor are any known within close range of these woodlands. The introduced Muntjac Deer *Muntiacus reevesi* are sometimes seen in these woods in ones and twos. These can be a serious pest species and can have a substantial impact on wild flowers. However, some vulnerable herb species appear to be increasing, for example Greater Butterfly-orchid *Platanthera chlorantha*, so it may be that the Muntjac population has stabilised or has even declined. These woods have a large population of Grey Squirrel *Sciurus carolinensis* which can cause significant damage by bark-stripping of trees, which is addressed elsewhere in this management plan.

1.17 Amphibians and reptiles

There are several well-established ponds in and around the Wood and all of these support some amphibian life. The locations of these are shown on *Plan 6*. Of particular importance is the pond (Danstead Pond) found just beyond the southern edge of the Wood close to the H4 grid-road, with a species-rich meadow between it and the road. The meadow and surrounding vegetation provide valuable habitat. In relation to the size of the pond, it supports a very large population of breeding Common Toads *Bufo bufo* together with Great Crested Newts *Triturus cristatus* and Smooth Newts *Lissotriton vulgaris*. Three other ponds at Linford Wood were last surveyed in 2012 and are known to hold Great Crested Newts. During that survey a pond closer to the south-western edge of Linford Wood, close to the petrol station, was found to be over-shaded, so management in 2013/14 opened it up to create more favourable light conditions. Common Frogs *Rana temporaria* breed in all the ponds in Linford Wood. Grass Snakes *Natrix natrix* were known to occur in Linford Wood in the 1990s but there have been no positive records of these since 2000.

1.18 Legislation and Protected Species

1.18.1 Legal protection

Legal protection is provided for some species and habitats found in Linford Wood, under:

- The Wildlife and Countryside Act 1981 (as amended).
- The Countryside & Rights of Way Act 2000.
- The Conservation of Habitats and Species Regulations 2010.

It is an offence to take, damage or destroy the nest of any wild bird while that nest is in use or being built. All wild birds, their eggs, nests and chicks are protected from disturbance, whether “intentionally”, or by “reckless disturbance” (an additional offence under The Countryside & Rights of Way Act 2000).

Other animals are provided with protection, as listed in Schedule 5 of the Wildlife and Countryside Act 1981, which includes protection from injury and death, from being taken from the wild, and for the places they use for shelter, as well as protection from disturbance to an animal occupying such a place. This applies to: Common Frog, Toads and all Newt species and a number of other relevant species.

1.18.2 Bats

All of the UK’s bat species enjoy full protection under UK and European law. Under the Wildlife & Countryside Act 1981 it is an offence not only to take, injure or kill bats but also to wilfully damage their roosts and habitats, and under the Countryside & Rights of Way Act 2000 to “cause reckless disturbance” to such Protected Species. It is essential that all woodland operations in Linford Wood are bat-friendly. For example, any tree containing deadwood and woodpecker holes, or other holes or cavities, could potentially hold a bat roost. If such trees need to be felled or reduced, they must first be surveyed by staff trained in accordance with The Trust’s ‘Code of Practice for Bat Habitats’ (February 2012 or later editions) and with the relevant Natural England licence. Similarly, the locations for bat boxes have been carefully selected to ensure at least 50% canopy cover where they are located, therefore works to thin the canopy in the immediate vicinity of boxes should be minimal.

1.18.3 Great Crested Newts

Several ponds and their surroundings in Linford Wood support this protected amphibian. All ponds and their surrounds should be managed with this species and other amphibians in mind and should not be allowed to become over-vegetated or over-shaded. It is equally important that the ditches and watercourses flowing to and from these ponds do not become blocked, to avoid the ponds drying out, particularly in the breeding season (March-June). The ponds should be monitored often enough to ensure their continued suitability for this species.

1.19 Access, signage, structures, economic use & utilities

The accessibility of the wood allows users and more occasional visitors to view and experience the mature woodland from the network of paths; but the ditches prevent too much pressure on areas off the paths.

One of the primary objectives of Milton Keynes Development Corporation was to enable extensive public access through the woodland and this has been continued by The Parks Trust. It was achieved



by installing a network of paths (*Plan 4*) with three types of surface, these being: metalled (tar spray and chip), grass and woodchip. The footpath layout forms a series of circuits of different lengths allowing users a choice of walk and length of visit. There are also un-adopted horse riding trails that run through and alongside the wood, which connect to the city’s adopted bridleway system and are surfaced with wood chip.

Picture 2; One of the hard surface paths constructed in the 1970s, with supporting ditch (surrounding vegetation cut every 2nd year). On the left hand side of the path is a section of ground vegetation that is cut each autumn (long grass spec.). The ‘entrance’ sign was installed in 2013.

Deep ditches on both sides of paths and rides serve to keep these paths relatively dry but also limit public access to some areas of woodland so that the wood and associated wildlife can benefit from limited intrusion. Benches and picnic tables were also installed. A 'Trim Trail' was removed because it was little-used and had deteriorated, though access 'bridges' to these sites across ditches remain in place. The woodland paths connect to the city's network of adopted Redways, managed by Milton Keynes Council, which provide for pedestrians and cyclists; such as those found along the eastern and southern flanks of the woodland, another to the western edge of Linford Wood. The length of woodland paths in Linford Wood is:

- Tar-spray and chip footpaths (2-3m wide): 2,875m
- Unsurfaced woodland paths: 560m
- Horse-riding trails of hoggins, subsequently surfaced with woodchip: 2,500m.

There are 19 benches close to the surfaced paths and a set of two picnic tables with benches at the north of Linford Wood (Plan 5).

A range of new signage was installed in 2013 (Plan 5), including: entrance signs with a plan of the woods showing paths; name signs around the edges; direction signs; and lectern signs explaining how the wood is managed, as well as information on features such as the sculptures and species of interest.

In any such woodland, some anti-social activities take place which have to be managed. Dropped litter is picked up on weekly and monthly cycles of varying intensity, supplemented by volunteer litter-picking and action by Rangers when more significant littering or dumping takes place. Woodland like this attracts illicit camping or fires, which the Trust's staff also address.

Linford Wood is served by a car park to the west and roadside parking opportunities, but Stanton Wood is accessible only from Redways and has a circuit of wood-chip paths. The original Linford Wood car-park at the northern end of Breckland was too remote from the woodland so was replaced in the 1980s by the current car-park beside the TV mast, accessed direct from V7 Saxon Street.

When woodland management is carried out, some of the felled material is cut to 2.2 metre lengths and sold as firewood.

A food trader is licensed to operate in the car-park in the evenings and the Ambulance Service is permitted to station their on-call vehicles here.

The only known utility within Linford Wood is the main sewer running in a deep tunnel under the Wood (under the main 'north to south path found in the centre of the wood), connecting the city's sewers between the Loughton Brook at Bancroft and the Cotton Valley sewage treatment works at Pineham.

1.20 Education

These woodlands have had some use as an educational resource through guided walks and school visits. In 2013 a 'Forest School' Project was started within Stanton Wood by a local voluntary organisation with the support of The Parks Trust.

The Ecological Studies are made available on request for those wanting to understand the ecology of the woodlands more fully; their titles are listed on The Parks Trust's website.

Section 2: Aim and Objectives

2.1 Aim

The management aim is to maintain and enhance the semi-natural ancient woodland character, conservation interest, recreational and landscape value of the woodland environs (including edges) of Linford Wood and Stanton Wood.

This overall aim is to be achieved by pursuing the following complementary objectives. A fundamental requirement of any implementation is that any works or operations carried out should fulfil as many of these objectives as possible and not focus on achieving individual aspects in isolation.

2.2 Objectives

a) Conservation: To maintain, extend and enhance habitats and biodiversity within and around Linford and Stanton Woods, particularly those necessary to promote the conservation of the essential character of this kind of woodland as well as less common and rare species; also to protect historic features such as the wood-banks.

b) Landscape value, ancient woodland character and visual appeal: To maintain and improve the overall landscape value and visual appeal of Linford and Stanton Woods and their woodland edge *through continued management as semi-natural ancient woodland* and to provide a distinctive area for public enjoyment.

c) Access and recreation: To provide an accessible, stimulating and varied environment in Linford and Stanton Woods for relaxation and enjoyment.

d) Education: To enable Linford and Stanton Woods to be used as a valuable educational resource and provide information to assist this.

2.3 Discussion of the objectives

a) Conservation: To maintain, extend and enhance habitats and biodiversity within and around Linford and Stanton Woods, particularly those necessary to promote the conservation of the essential character of this kind of woodland as well as less common and rare species; also to protect historic features such as the wood-banks.

The essential ecological character of these woodlands is primarily as semi-natural ancient woodlands with an assemblage of trees and flora characteristic of the NVC W8: *Fraxinus excelsior-Acer campestre-Mercurialis perennis* type of woodland. Continued management of these woodlands should be done in ways that protect the distinctive ancient woodland trees and enhance growing conditions for this flora, which includes flowering plants, grasses, sedges and rushes, mosses, fungi and lichens. An important aspect of ancient woodland is the sustained activity of particular mycorrhizal associations between specific fungi and the roots of specific tree and other plant species. This will be best sustained by natural regeneration.

The woodland has a known assemblage of breeding birds which is relatively limited for this kind of woodland, possibly because of its limited connections with surrounding countryside and urban green corridors, but also because of its neglect in the early 20th century and the necessity of disruptive restoration management for some decades from the 1970s. There have also been downward trends nationally for some woodland bird species. Now that 30 years of reinstatement and initial coppicing cycles is largely complete, it should be possible for future management to maintain and increase the range and number of breeding bird species in these woodlands as a specific management aim for future woodland management. Some species feed primarily on seeds or berries so plants plentiful in these – mainly in the ground-layer, shrub-layer and under-storey – will assist these birds, as will retention of trees with holes and gaps for hole-nesting species. Many woodland birds feed on

caterpillars and adult invertebrates, for which the woodland canopy, other trees, the shrub layer, some scrub, deadwood, leaf litter and upper levels of the soil are all important.

One objective over recent decades has been to leave some trees to age in ways that increase niches for woodland invertebrates and particularly for saproxylic species for which rot-holes, red-rot, dying trees, fallen deadwood and fungi are essential. Achieving a well-balanced age-structure of trees will ensure a continual progression of ageing trees which have these assets. Holes and cracks in trees are essential for several bird species and many bats. A dense woodland floor including rotting leaf-litter can benefit many of the smaller invertebrates at the base of the food-chain, such as springtails, so providing food for larger invertebrates such as ground beetles and for animals such as birds and mammals further up the food-chain.

Bats, various other mammals and amphibians are all present in the wood, and Grass Snakes *Natrix natrix* may also be present. Operations undertaken should take all these species into consideration and opportunities should be taken to preserve or increase habitat potential for these and other species by such measures as: retaining deadwood and trees with habitat potential, and maintaining ponds appropriately. Operations should also maintain the wood in mixed layers, for example by providing non-intervention and other scrub areas, irregular forest, coppiced areas of various ages, areas of grassland, and by channelling public access away from certain sections of the woodland.

Much ecological monitoring and survey was carried out in these woods by the Development Corporation when they needed to understand the ecological character of the woods to guide their woodland management. Now that a more settled state has been reached in the life of the woodland, further monitoring will be needed to establish what progress is being achieved and to provide more specific information to shape future plans for woodland operations. This information will also have an educational value.

b) Landscape Value and Visual Appeal: To maintain and improve the overall landscape value and visual appeal of Linford and Stanton Woods and their woodland edge to provide a distinctive area of parkland for public enjoyment.

This objective can be interpreted in two ways.

1. Continue to manage Linford Wood as semi-natural ancient woodland by applying traditional systems of coppice with standards, incorporating irregular shelterwood with mixed age classes and non-intervention belts.
2. Retain Linford Wood as a significant mature landscape feature that is found on top of a plateau which is visible from some distance, by not undertaking significant felling operations or removals other than necessary for its management as coppice with standards Ancient Woodland. Continuance of the current silvicultural and conservation management practices is designed to ensure the long term visual benefit.

Linford Wood is situated on top of a plateau and is mature woodland which is visible from some distance, therefore to retain this as a landscape feature (and to meet other objectives) significant felling operations and removals should not be undertaken. Continuance of the current silvicultural and conservation management practices is designed to ensure the long term visual benefit.

The landscape value from the perspective of someone walking in the wood is more involved but, provided the woodland management systems are applied in a sympathetic and appropriate manner this will be assured. Vegetation management needs to be applied to provide:

- A good length of view into the woodland from the path or ride network and a good forward length of view along paths but avoiding views out of the woodland to built development.
- Views towards, and framing, trees of unusual form or substantial trees remarkable for their size and obvious age.
- Providing good visual access to wildflower areas especially in spring to flowers such as Primrose, Violets, Wood Anemone, Lesser Celandine and Bluebell.



Picture 3; Three 'standard' sized Pedunculate Oak (known locally as 'The three sisters'), found on a sweeping corner of a path, that helps them become visually framed, along with the wild flowers and ground fauna that benefit from a bi-annual cutting operation of the ground vegetation.

c) Access and recreation: To provide an accessible, stimulating and varied environment in Linford and Stanton Woods for relaxation and enjoyment.

Access into and through the wood is provided by a network of surfaced, woodchip and grass paths. There is one picnic area and many seats and benches located adjacent to the path network.

There has not been any recent survey of user or visitor numbers but surveys in the mid 1990's show that usage amounted to approximately 80,000 visits a year. Undoubtedly the number has increased and it would be useful if the survey information could be updated.

The use of the woodland by this number of people could have a disastrous effect if not carefully managed on the conservation value, especially by the human trampling of the valuable and sensitive field layer. The path network largely serves to avoid this type of damage by guiding and directing people through and around the woodland (though activities such as orienteering involve off-path use). Whilst the path system generally protects the conservation value it produces an experience which is sometimes more like walking past a wood than walking in a wood. So, although the overall area is generally referred to as public open space, it is channelled rather than entirely open. Any further extension of access would have to be done in ways that minimise impacts on the ecology of the wood.

The main exception is compartment 8 which has been developed over the last 20 years to facilitate more extensive public use. This Ash, Oak and Spruce plantation, which extended the woodland in the late 1940's, does not generally have a valuable field layer, aside from a few plants at its northern edge.

Since 1990, small amounts of underplanting have been undertaken in this compartment to diversify the age and species structure and create an area that could be used in a different manner from the rest of the wood. The underplanting consists of a mix of different and unusual species which are generally non-native that have been selected for their visual appeal and interest. Species include Wild Service-trees *Sorbus torminalis* (of exceptional form), Hornbeam *Carpinus betulus*, Grand Fir *Abies grandis*, Douglas Fir *Pseudotsuga menziesii* as well as unusual forms or species of Maple *Acer spp.* and Beech *Fagus spp.* Much of this plant material is now well established and the area is now increasingly being opened up (e.g. extra grass cut paths) to allow it to be more suitable for greater public use.

d) Education: To enable Linford and Stanton Woods to be used as a valuable educational resource and provide information to assist this.

The area is available as a resource for environment education and study and information about the wood will be made available for the purposes of education. Educational aspects include:

- Interpretation boards describing various aspects of the environment including its history.
- Guided walks at various times of the year but particularly in spring when the effects of hundreds of years of human activity on the plant ecology are best observed.
- Making available environmental and ecological information from the many ecological studies of the area.
- Volunteer groups helping with the re-stocking of the Wood through the encouragement of natural regeneration or the use of layering (e.g. of Hazel).
- Help develop a population of young Oak (*Quercus robur*) in the wood. Acorns will be gathered from selected Oak trees in the wood, propagated, grown on and then planted back in the wood in appropriate locations.

The ability to 'read' the landscape and environment is not a widespread or innate attribute so informative signs and other forms of information can help to increase enjoyment and understanding of the wood. New signage to meet this need was installed in 2013. There is a wealth of information about the woodland which probably rivals many famous sites elsewhere in the UK. As studies have been repeated over the years the incremental effect of urbanisation of the surrounding area and the changes that have occurred in the wood following the reversal of its decline are potentially measurable.

Section 3: Site Assessment and Discussion

3.1 Implications of 'Ecological Studies in Milton Keynes' reports

From the mid-1970s Milton Keynes Development Corporation commissioned ecological reports which were published as 'Ecological Studies in Milton Keynes' and The Parks Trust has continued the series. Seventeen of these Ecological Studies are primarily about Linford Wood or contain substantial content about it. A further nine studies have content which includes Linford Wood. The full list of these studies up to 2009 is provided in Appendix 2 'Reports and Publications'. In Appendix 3 a summary is provided of ten of the studies and their specific recommendations for management of the woodland. These recommendations were considered at the time and many of them have influenced subsequent site management, though in some cases competing proposals had to be prioritised. The preparation of a new management plan is a good opportunity to review these recommendations to see if they shed fresh light on the management of the woodlands through the 21st century.

3.2 Management of Ancient Woodland

An Ancient Woodland of this kind – NVC W8: Ash, Field Maple, Dog's Mercury, wet woodland on clay – requires careful management of light and shade and of hydrology and soils. The most important aspects relating to its age are to maintain the Ancient Woodland Indicator flowering plants and other significant plants in the field layer, and a management regime to sustain shady and sunlit areas in a progression relating to coppicing of underwood and maintenance of the tree canopy. This needs to be done by achieving a balanced age-structure of the overstorey of canopy trees, as well as permanently lighter areas along rides and paths and at widenings along them. There is a need to minimise trampling of the ground flora and soil compaction, which can be difficult to achieve when coppicing and scrub management is carried out. The hydrology of Linford Wood was changed by the construction of a comprehensive network of ditches in the 1970s, though these feed into the three streams whose origins were within or near to the Wood and eventually lead to the Rivers Ouse and Ouzel. It is not clear how much this changed the wetness of the Wood; it may be drying some areas of the wood excessively in summer which will affect rooting of young trees. This may be exacerbated if predictions of hotter drier summers as a consequence of climate change are borne out. This kind of woodland has its own distinct mix of fauna, so proper awareness of the habitat requirements of these species will enable the beneficial diversity of invertebrate, bird, mammal and reptile species to be maintained, or even increased.

3.3 Canopy trees

A major task of the last forty years has been to restore a woodland structure of well-spaced canopy trees of appropriate species helping to provide the environment to create a diverse age-structure as well as development of some 'over-mature' trees. This has been done to ensure the longevity of the woodland as mainly 'Coppice with Standards', but with a few dense non-intervention areas and a mixed underscrub, as well as a deadwood resource. Some replanting of the three main tree species – Ash, Pedunculate Oak and Field Maple – was needed, but exotic tree species were inappropriately planted during the 1970s & 80s (many of these have since been removed, as was recommended by some of the ecological studies).

The 'Vegetation Survey' 1993 report concluded that some new tree planting had been needed to rejuvenate and enhance the genetic stock, but there should be no more planting of exotic species or indigenous species not previously found in this woodland. Examples of those of which no more should be planted were Hornbeam *Carpinus betulus* and Lime *Tilia* species. Where Hornbeam had already been planted, it was suggested that these should be coppiced as this would also benefit the field layer in these areas.

Ash trees seed easily, so need control rather than new planting, which is being done by coppicing some Ash alongside other underwood trees and retaining others to maturity. Some Pedunculate Oak may need to be planted to maintain an appropriate percentage of these long-lived trees, and some planting of Field Maple and other species has also been required. Sycamore *Acer pseudoplatanus* was present and seeds prolifically, so is removed wherever it appears as it has no place in this kind of woodland. Some Aspen *Populus tremula* was introduced and has been retained as it is a minor

element of some NVC W8 woodlands and is a specific foodplant of some moths and butterflies (Lepidoptera).

There are contrasting views about Elm *Ulmus* species present in these woods. The 1993 'Vegetation Survey' recorded: Wych Elm *Ulmus glabra*, Plot's Elm *U. plotii*, English Elm *U. procera* and other uncertain Elm species or hybrids. These are species that spread rapidly through suckering and can dominate the ground layer and there was evidence of this, particularly in the western edges of Linford Wood. Where they spread, they rapidly gain height and overtop other trees. They also increase the level of calcium in the soil which contributes to rapid nutrient turnover, so species such as Elder *Sambucus nigra* and Nettle *Urtica dioica* then become prominent in the underwood near them, which is not desirable as they compete with the characteristic flora of the Wood. On these grounds the spread of Elms should therefore be checked; however these species were devastated by Dutch Elm Disease (*Ophiostoma novo-ulmi* fungi) in the 1960s and 1970s so most trees now mature for only a few years before succumbing to the disease. The dilemma therefore is how much to control its growth. It may be that it is best retained where it is at the woodland edge alongside paths, on the south of Linford Wood and along the south-western edge of Stanton Wood. The three main canopy trees continue to be: Ash, Pedunculate Oak and Field Maple, but with the occasional presence of other species appropriate to NVC W8.

The 1998 study of 'The Effects of Coppicing' recommended a density of upper canopy standards of 8-12 per acre. It also said that no more Ash should be planted, but that Pedunculate Oak and Field Maple should be favoured.

3.4 Coppicing of underwood and thinning of scrub

The restoration work of the 1970s & 80s strengthened the underwood by the planting of species such as Hazel *Corylus avellana* which were suited to coppicing, alongside canopy species which can be coppiced, such as Ash and in wetter areas Willow species appropriate to such areas in this type of woodland: Goat Willow *Salix caprea* and Grey Willow *S. cinerea*.

An intricate and prescriptive scheme of five woodland management systems was proposed to restore Linford Wood, in the management plan prepared in 1984 by Cobham Resource Consultants as 'Ecological Studies in Milton Keynes' No. 89. This was for 'Irregular Shelterwood' for some compartments, 'Coppice with Standards' for others, some 'Single-storied High Forest' compartments, 'Rotational Scrub Cutting' in a few compartments and some 'Non-intervention' areas to provide scrub of habitat value (to be reviewed every ten years). The Shelterwood system was intended to achieve a gradual restoration by which older trees would provide protection for younger ones. At the initial stages coppice management was to be applied to limited areas only, where the coppice stool potential was high, and coppicing and associated thinning was to be on an approximate 15-year cycle. A different mix of these techniques has been applied with the aim of gradually bringing the wood back to a long-cycle of predominantly Coppice with Standards of mixed age and class, while retaining some long-term non-intervention areas.

The 1993 'Vegetation Survey' recommended that coppice areas should be larger, about 1 hectare, in order to increase local homogeneity of plants by enabling those characteristic of this woodland type to spread more widely.

The 'Effects of Coppicing' study (1998) made a specific recommendation to assist conservation of some bird species by protecting them from a potential detrimental effect of coppicing. This was for a vegetation 'edge' of shrubs and some trees, a few metres wide, to be left where newly-coppiced areas were close to paths; and for small 'islands' of denser shrubs and trees to be left within the heart of new coppicing. These would provide protective habitat for breeding birds and feeding areas.

A difficult balance has to be struck with scrubby shrub species such as Blackthorn and Bramble as they can dominate and spread to the detriment of other species and the growth of young trees, but they are an essential part of the habitat. Their shade benefits some ground flora and they are an important food source, provide nest sites for birds and habitat for insects. Since the 1990's, when coinciding with the development of understories and upper canopies, mainly due to available light levels and the re-establishment of competition, bramble has become less dominant on the woodland floor.

3.5 Ancient trees and deadwood

Several studies emphasised the lack of deadwood in Linford Wood and the importance of increasing this substantially. The issue was wider than deadwood, as it applied to the need for more Ancient and Veteran trees and dying wood, to provide rot-holes, sap-runs and habitat on which fungi and plants could grow. The need was for standing and fallen deadwood. A case was made for the felling of younger & healthier trees – where they were not otherwise needed – to be left to rot on the woodland floor, and for old and dying trees to be left standing wherever possible. Holes in trees are an absolute requirement for many species, ranging from some bird species to bats, mammals and insects. For example, one of the preferred nesting sites for Marsh Tit *Poecile palustris* is a hole less than 3m from the ground in trees or stumps. Willow Tit *Poecile montanus*, which is no longer thought to be present in Linford Wood, prefers sites even closer to the ground in a rotten tree or stump. Old coppice stools should also be left even if they are no longer producing poles as these also provide valuable habitat. Fallen deadwood is an important substrate for many fungi, so consideration should be given to leaving fallen branches in such locations. Fires should be avoided wherever possible as they change the local habitat and certainly should not be used close to old coppice stools or fallen wood.



Picture 4: More lying dead wood such as pictured here is required throughout the wood to help support various beetle species and

other invertebrates.

3.6 Field layer

Seeds of Ancient Woodland Indicator (AWI) plant species are not generally found in the dormant seed store in the soil and these species are poor at spreading and colonising. Where groups of these plants are found, small 'islands' of trees and dead and dying timber should be left to continue to provide them with shade. The 'Effects of Coppicing' study (1998) also noted that in some parts of the woodland Tufted Hair-grass *Deschampsia cespitosa* was the dominant ground layer species. In those compartments with only a few standards and poor coppice regrowth this was likely to affect the growth of AWI plants. In these cases hand-cutting around the base of trees should be used to control *Deschampsia cespitosa*.

Many of the rarer field layer species exist vegetatively in shady, undisturbed areas, but can proliferate for a while in recently-cleared areas before competition from other plants builds up. Some are maintained by the coppicing cycle but cannot readily spread; these include Early-purple Orchid *Orchis mascula*, Herb Paris *Paris quadrifolia*, Greater Butterfly Orchid *Platanthera chlorantha*. Where certain areas are found good for these rarer species, they can be enhanced by reducing competition from other plants through keeping these competitors down by an early and late cut. These and other rarer plants can then spread vegetatively or seed, whichever is their usual strategy, bearing in mind that many are long-lived but easily damaged, and many are slow or poor colonisers with little of their seed retained as a seed-bank in the soil. Broad-leaved Helleborine *Epipactis helleborine* is found mainly along the paths and rides and should benefit from management of competitors in this vegetation. Sanicle *Sanicula europea* is characteristic of the field layer of W8, but is very scarce in Linford Wood.

It is slow-growing with weak seedlings, but should be encouraged by careful clearing or coppicing. Surprisingly some of the Sanicle was found in the north of the plantation in Compartment 8, where it may need surrounding grasses to be controlled.

A single plant of the Narrow-leaved Everlasting-pea *Lathyrus sylvestris* [then described as Wood Pea] was found in Linford Wood in 1980 and 1981 but has not been recorded since, though it is still found in Shenley Wood. This is relatively rare in Buckinghamshire so there is a Species Action Plan for it in The Parks Trust's Biodiversity Action Plan. It is a plant of woodland rides and edges.

The 1993 'Vegetation Survey' contains much important information about the plants of Linford Wood, including five rarer plants and all the Ancient Woodland Indicator Plants, so needs to be consulted fully. A summary of it is included in Appendix 3.

3.7 The threat of indigenous Bluebell hybridisation and spread of non-indigenous ground flora species.

Britain is a hot-spot for the indigenous Bluebell *Hyacinthoides non-scripta*, which is present in relatively few other northern European countries. Two other Bluebell species have been introduced to gardens and woodlands in the UK: they have become naturalised and have spread. Even more intrusive is a hybrid of one of these which has been even more widely introduced and even planted in woodlands. All three can hybridise with the one Bluebell species indigenous to Britain, so risk the decline of the native Bluebell. The indigenous species is more delicate, has a drooping shape, and tubular rather than bell-shaped flowers which are deeper blue. There is no case for planting any Bluebell in any of the ancient woodlands in Milton Keynes; nor should any be planted near these woodlands. Unfortunately, the hybrid *Hyacinthoides non-scripta* x *H. massartiana* and possibly the Italian Bluebell *Hyacinthoides italica* and the Spanish Bluebell *Hyacinthoides hispanica* are present along the western fringe of Linford Wood alongside Breckland and risk causing the spread of hybrids and non-native species into the woodland at the expense of the AWI *Hyacinthoides non-scripta*. Care should be taken not to introduce other non-native ground layer plants into these ancient woodlands or near to them, as there are other examples of non-native species similar to AWI plants; for example there is an introduced sub-species of Yellow Archangel *Lamiastrum galeobdolon* which is found in the wild in Milton Keynes: *Lamiastrum galeobdolon* sub-species *argentatum* has whitish blotches or marbling on its leaves.

3.8 Soil moisture levels

The 1993 'Vegetation Survey' report also said that soil moisture levels need to be maintained, stating that "... current drainage is possibly too severe ... allowing areas of standing water to dry up in summer ..." and "Damp and wet areas are a distinct feature of this woodland type, and diversity should be maintained by reducing water loss". It reported that the construction of drainage ditches had reduced moisture levels. An indicator of the woodland becoming dryer had been the wider spread of Dog's Mercury *Mercurialis perennis*, which is characteristic of dryer aerobic soils. Although this is an Ancient Woodland Indicator, other AWI species in the woodland such as Herb Paris *Paris quadrifolia* require wetter conditions and can be out-competed by Dog's Mercury where soils dry out.

3.9 Rides, paths and ditches

Of the 184 plant species found in Linford Wood, 130 were recorded along rides and ditches, where there is more light. Mowing and clearing regimes in these areas should be maintained to preserve species diversity within these locations. Some of the rides provide examples of unimproved grassland with flowering plants such as Greater Bird's-foot trefoil *Lotus uliginosus* and Purple Loosestrife *Lythrum salicaria* both of which are attractive to insects. A few Broad-leaved Helleborine *Epipactis helleborine* were also found. Ride cuts should be less intensive. A single cut of the grass in these locations in September would promote these plants better than more frequent cuts.

Existing practice is to create uneven widths and heights to plants at the edge of paths and rides by leaving graded 'scalloped' areas. As the purpose of this is to create broader sunlit areas in which flowering plants can thrive and insects such as butterflies can bask, it was thought desirable to create much larger clearances in some areas with the specific purpose of creating broad sunlit clearings to support more diversity of species.

The ditches support a wide diversity of flowering plants and provide nesting and overwintering sites for some invertebrates, such as some of the Bumble-bees *Bombus spp.* The '1992 'Effects of Coppicing' study said that ditches should be maintained by clearing of only the base and lower slopes, with the material piled on the woodland side of the ditch, rather than clearance of all the vegetation. It also said that consideration should be given to less frequent ditch clearance, and of cutting either one side of a ditch at a time or shorter lengths in a particular year, so that plants and invertebrates that use these locations are enabled to survive and reproduce.

3.10 Birds and bats

There are existing bat and bird boxes in the woods which were intended to compensate for the relatively low number of mature trees with suitable holes for nests and roosts, until these boxes are no longer needed.

3.11 Pests and diseases

There are many pests and diseases that at different levels may have a detrimental effect on the woodland, but the two currently affecting the woodland most are Grey Squirrels *Sciurus carolinensis* and Honey Fungus (various species of *Armillaria*). The other disease to be aware of is Ash Dieback *Chalaria fraxinea*.

Until the early 1990s Grey Squirrels had, over a period of years, caused great damage in the woodland, bark-stripping many of its trees as they reached the pole stage (including planted Pedunculate Oak and Field Maple). From the mid-1990s Squirrel numbers have been controlled



annually using baited hoppers containing Warfarin. With the reduction in Squirrel numbers the stripping damage has reduced considerably. There is a possibility that use of Warfarin for these purposes may be restricted, in which case alternative control measures will need to be used.

Picture 5; A baited squirrel hopper in place up against an old coppiced Ash stool

Honey Fungus *Armillaria spp.* is present in the wood. It attacks and kills roots of many woody and perennial plants. Trees can be infected by Honey Fungus, particularly those under stress from other pests and diseases, which can bring about early deterioration or death of individual trees. Its most characteristic symptom is white fungal growth between the bark and wood, usually at ground level and clumps of honey-coloured toadstools sometimes appear briefly on infected stumps in autumn. Honey Fungus is seen to be part of the woods' natural environment and there are no plans to try to control it (which would be extremely difficult), other than ensure any infected trees are not a danger to the general public.

In 2014 Ash dieback *Chalara fraxinia* had yet to reach the wider environment in Milton Keynes, although it had been imported to new plantations in Buckinghamshire from which newly-planted trees have since been removed and destroyed. Woodland managers need to be aware of its presence and spread in the UK and its potential effects on woodlands. If the disease were to infect Linford Wood in an aggressive way the effect would be devastating as Ash *Fraxinia excelsior* is the most numerous species in the woodland at canopy and understorey level and as a coppiced tree. One way to tackle the anticipated spread of the disease is to encourage a different mix of tree species in the woodland

by favouring the other tree species associated with Linford Wood for retention when undertaking thinning or felling operations, particularly Pedunculate Oak *Quercus robur* and Field Maple *Acer campestre* and to a lesser extent other species that are a minor feature of NVC W8 semi-natural ancient woodlands. A problem of such a strategy is that Pedunculate Oak (the second most dominant high canopy species in the wood after Ash) is itself under threat from various diseases including acute and chronic decline. Oak decline is a complex disorder or syndrome in which bacteria, along with other damaging agents such as insect infestation or weather damage, interact to bring about a serious decline in tree condition. The woodland's managers need to regularly assess disease progress and develop strategies, to combat them. In the future this may include looking at the limited use of native species of the area, that perhaps have not been traditionally associated with Linford Wood, i.e. Small leaved lime *Tilia cordata*, Alder, *Alnus glutinosa* and Hornbeam *Carpinus betulus*.

3.12 Information and monitoring

Inevitably, many of the ecological studies recommended follow-up studies to evaluate the effects of the gradual restoration of the woods. These recommendations included:

- A follow-up vegetation study to the 1993 study to show the effects of the last 21 years of woodland management.
- A first study of pollinators and associated insects: bees, wasps, hoverflies, and ants.
- Butterfly and moth studies to make comparisons with the 1999 and 2003 reports and previous studies.
- A Common Bird Census study to show changes since the 1987, 1993 and 2007 studies.

Section 4: Management Prescriptions and Summary of Actions

To achieve the overall aim and objectives of this management plan the following prescriptions are to be applied, as listed and discussed below. A fundamental requirement of any works or operations undertaken should be that actions fulfil as many of the objectives as possible and not focus on achieving individual aspects of the objectives in isolation.

4.1 Site management and supervision

Directing, specifying works, organisation and implementation of the plan will be carried out by the Trust's Operations Team assisted by the use of consultants as required.

The expertise of staff will be developed with the provision of any required or appropriate training, while developing their experience of woodland management and all it encompasses.

4.2 Organisation of works

All works within the plan area will be carried out in accordance with The Trust's 'Operational Practices and Procedures' document (under revision in 2014).

- Routine works
All works and short term cyclic work such as mowing, hay cropping, litter collection, pruning adjacent to footpaths etc. will be undertaken as part of large performance-based term contracts.
- Long cycle and non-routine works
This category of work includes items such as coppicing and canopy thinning work, which is undertaken on an approximate 15 year cycle, as well as footpath resurfacing, pond excavation or re-profiling. These will be specified and competitively tendered (where and when appropriate) and carried out by skilled contractors or directly employed staff.

4.3 Woodland trees and the implementation of thinning, felling and coppicing operations.

The management of the woodland trees should continue to use the traditional system of coppice with standards, incorporating an irregular shelter wood with mixed aged/sized classes that includes non-invention belts and areas. In essence, work will be undertaken on an approximate 15 year cycle and in each worked compartment appropriate sections of understorey will be coppiced, while leaving selected areas as non-invention belts (scrub/habitat value). Upper and middle canopy trees will be removed as required, allowing:

- The development of retained trees along with lower and middle storeys.
- Allowing various intensities of light to be available to the ground layers.
- Ecological factors (e.g. mixed aged trees and varied habitat layers) to develop.
- Health and safety considerations to be applied.

The implementation of thinning, felling and coppicing operations requires licence approval by the Forestry Commission (FC) under the terms of Section 10 of the Forestry Act 1967. The inclusion of the woodland within the FC English Woodland Grant Scheme (EWGS) exempts the Trust from applying

for a separate licence as long as the proposed felling works are included in a FC approved 'Plan of Operations'. EWGS contracts are for a five year period and the current scheme for Linford and Stanton Wood was approved in November 2009. In accordance with standard practice, Linford Wood is divided up into working compartments (*see Plan 3*). The EWGS approved thinning and coppicing compartments for the five years up to 2014 were 15 (Stanton Wood), 8, 9 and 6.

All ride-side and woodland edge coppicing and thinning works are also approved under the terms of the current EWGS contract.



Picture 10; Rideside coppicing creating a transition area between the path and the high wood, while allowing path users good forward vision. Note; within the compartment, although coppicing action has just taken place an irregular shelterwood (mixed age and size classes represented) is starting to develop.

4.4 Veteran, declining and dead and dying trees

To improve ecological factors and apply HAP 01 (Habitat Action Plan) of the Trust's Biodiversity Action Plan (BAP) larger-diameter dead and dying trees (e.g. standing deadwood or crown die-back) shall, where possible and appropriate to the location, be left in situ (still rooted), e.g. In areas with limited public access, thus ensuring the environment is relatively safe for use by the public. Large



amounts of fallen and cut deadwood, particularly material of large diameter, will be left on the woodland floor and allowed to decay naturally. At least 50% of felled timber from the middle or upper canopy should be left as deadwood habitat. As much as possible of this deadwood should be left in contact with the ground. The amount to be left in a particular compartment should relate to the extent to which it is deficient in deadwood resource.

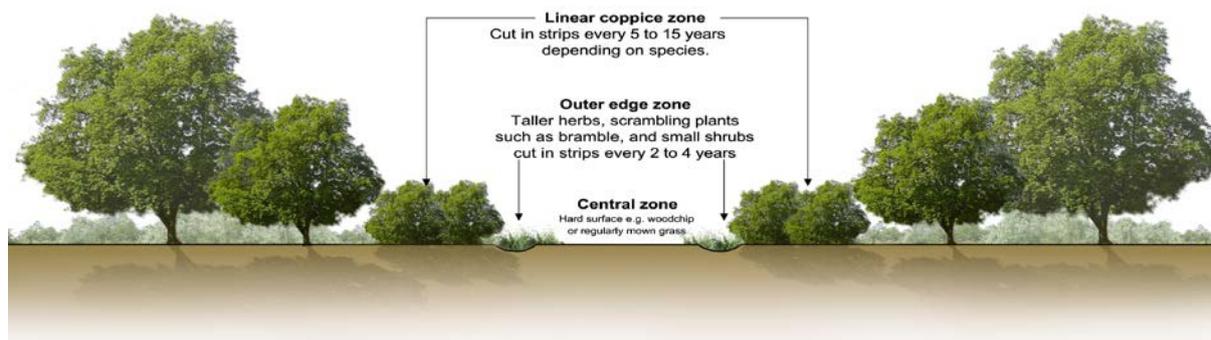
Picture 6; Creating standing deadwood by 'ring barking' a Cherry tree (part of the ill-conceived non-native planting). This is in compartment 9 (worked on in January 2014) and is an area of secondary woodland. The flowering Bluebells extenuates the old ridge and furrow (from a time before the area became wooded); Note how the vegetation thrives best on the ridges, where it is a bit drier.

4.5 Management of individual trees and public access

Individual trees found along paths, rides and other areas of public access shall be managed in accordance with general principles of woodland management, along with the health and safety considerations of users. Under the terms of The Parks Trust's Tree Inspection Policy (July 2013) these trees will be monitored and formal inspections recorded as they are undertaken (normally every three years in such woodland situations) while ensuring any consequential work is recorded.

4.6 Rides and tracks

To increase habitat value, while creating forward and side views for the wood users, the edges of rides and glades should be regularly cut (usually every two or three years) and coppiced to create and maintain a gradation from the field layer to low shrub and sub-shrub growth through to the woodland canopy (see diagram below). The edges will be cut following a scalloped style, usually ranging from a depth of 2 metres to 5 metres from path or ditch edges. Further opportunities will be sought to create greater depth to edge transition in some areas of the woodland. To offer more light availability to paths and rides and associated transition edges (particularly those running on a west to east axis) a higher density of stems from the upper and middle canopies shall be removed, while looking for further edge scalloping/scalloping opportunities.



Picture 7; A diagram showing the gradation from paths/rides (central zone of the diagram), to the field layer, then onto the low shrub and sub-shrub growth, then through to the woodland canopy

4.7 Meadow and grass management

The grassland sward and grassy/shrubby areas adjacent to the rides and woodland edge should generally be managed as long grass with areas being cut once a year or less (as shown in the illustration above).

The largest area of open grass (approximately 0.9ha) is to the south of the woodland adjacent and parallel to the H4 (Danstead Way). This was seeded with a wildflower mix in 2004 and is annually hay-cropped.

Floristically rich, sheltered but sunlit areas of long grass provide habitat for a wide range of species and species groups. Accordingly it is intended to continue with the current approach to grassland maintenance and to seek opportunities to extend and enrich areas of long grass in and around the woodland. *Plan 7* shows current term contract treatment areas (2013 -2018).

4.8 Ponds

Most of the Wood's ponds are in relatively good condition due to the management work (silt and debris removal etc.) undertaken from 1975 onwards. This work will continue as appropriate to each pond and should include vegetation cutting on the pond side, thus keeping the ponds open. Other works required include:

- The dense natural regeneration of Ash along the ditch/watercourse associated with the H4 pond (Danstead Pond) and meadow needs to be thinned out and the ditch re-profiled
- The headwater pond of Springhill Brook will need to be re-excavated, with the outfall from the pond identified, excavated/profiled and re-joined to the woodland drainage system

4.9 Ditches and watercourses

During December to early February of each year, and as part of a rolling two year programme of works, the lengths of path/ride side ditches or watercourses shall be maintained. All grass, herbaceous matter and natural woody regeneration shall be cut to a height of between 100 - 150mm.

The area of cutting shall be along both edges of the ditch and across the surface of the ditch itself. The cut area shall vary between 2.5m and 5.0m in depth forming a wavy or scalloped edge on the woodland side of the ditch. All the arisings from the works shall be roughly raked off and thinly scattered into the wood beyond the area of cutting. The ditch shall then be 'bottomed' to allow the free passage of water. This shall entail the removal of fallen leaves and other accumulated debris. The organic arisings shall be thinly spread on the cut area on the woodland side of the ditch. Plan 7 shows current term contract treatments (2010 -1215).



Picture 8; Ditch line in the spring having been cut the previous winter with Bluebell, Wood Anemone and Lesser Celandine all on show.

4.10 Re-stocking and use of appropriate species

With the exception of compartment 8, there will be no planting of species non-indigenous to Linford Wood.

Re-stocking of the Wood shall take place through:

- The encouragement of natural regeneration or the use of layering (e.g. of Hazel)
- As Oak acorns have difficulty in propagating naturally in woodlands (lack of pigs rooting around and accidentally burying the acorns) there is a need to develop a population of young Oak in the wood. This will be done through gathering acorns from selected Oak trees in the wood, propagating them, growing them on and then planting back in the wood in appropriate locations

As each compartment is worked, previously planted species which are inappropriate (introduced to the wood by planting, such as Southern Beech *Nothofagus spp.* in compartment 13) will be removed; this should be completed by 2020. However, considering the worrying spread of tree diseases (e.g. Ash Dieback, Sudden and Chronic Oak dieback) that are relatively new to the UK, not all planted Alder and Hornbeam will be removed within current time periods. Full removal of these species will only take place once we have a better understanding of how these spreading diseases will affect Linford Wood. This particular strategy needs analysis at each review of the management plan.

When considering developing/using alternative tree species to Pedunculate Oak and Ash, it must be remembered that although some ground flora AWI indicator plants tolerate shade, many are situated in more open conditions along paths and rides and flower early in Spring, when they benefit from the late-leaving characteristics of the main canopy species, particularly Pedunculate Oak and Ash. If disease were to substantially affect the viability either of these tree species in these woodlands, very careful consideration would need to be given to the compatibility of alternative species with the light needs and other habitat requirements of AWI field layer flowering plants.

4.11 Working around the woodland's flora and fauna

Generally, tree, shrub and compartment work will take in place in November and December when impact on the woodland environment is at its lowest. Working at this time of year gives consideration towards the woods' fauna and ground flora by:

- Minimising ground compaction (before the water table or surface area gets saturated from the winter's rain)
- Ensuring emerging bulbs do not get trampled
- Undertaking general works at this time of year should also not conflict with bird nesting (see Parks Trusts document 'Bird Nesting – Working Code of Practice')
- Minimising disturbance to amphibians associated with the ponds /watercourses and associated wetlands (e.g. Great Crested Newts)
- Because of the potential disturbance to bat roosts occurring in the wood, individual trees (usually those in the upper canopy that are beyond 'pole stage') will be appropriately inspected by qualified staff before work takes place.

4.12 Control of pests and diseases

Control of Grey Squirrels should continue. This may prove problematic if the use of Warfarin for this purpose is banned, as is under consideration by the European Community. Alternative control methods would need to be investigated, including other poisons, 'dray poking' using 'disturbing trays', or licensed shooting and trapping.

The spread of Ash dieback *Chalara fraxinea* across mainland Europe and now into the UK, makes it likely that the disease will sometime soon arrive at Linford and Stanton Woods. Although there is no plan to remove our established woodland Ash trees (which account for 60% of the upper canopy and a significant proportion of the understorey and coppiced areas) we will need to encourage other species appropriate to this type of semi-natural ancient woodland to maintain the right kinds of biodiversity. This will be achieved by favouring other tree species when undertaking thinning or felling operations, to increase the percentage of other appropriate species in the upper canopy. Appropriate species are: Pedunculate Oak and Field Maple; but also to a lesser extent Goat Willow *Salix caprea* (previously known as Great Sallow), Grey Willow *Salix cinerea* (previously known as Common Sallow) and Aspen *Populus tremula*, all of which are present in these woodlands in small numbers. In time, more planting of Pedunculate Oak and some other species may have to be undertaken. For Oaks, this would be from acorns sourced from Linford Wood. As Ash gets infected by *Chalara fraxinea* there will be a need to assess individual trees to evaluate the best actions, which may be to: fell, manage the decline or do nothing, depending on how far they are from paths and any other constraints.

With changing climate, other pests and diseases may move into the area so there will be a need to keep aware of such events to meet these challenges.

4.13 The Parks Trust's Biodiversity Action Plan

Woodland managers need to be aware and act in accordance with The Parks Trust's Biodiversity Action Plan (BAP) and act upon proposed and desirable projects as laid out in the BAP including:

Proposed Activities

- Continuation of on-going conservation management activities (coppicing, thinning, and ride/glade management).
- Continue to retain standing and fallen deadwood to increase the deadwood resource.
- Maintain records of known bat tree roosts and retain their local environment.
- Continue to maintain and monitor the established bat box scheme.

Desirable Activities

- Commission professional ecological surveys of woodland vegetation every 10 to 15 years; evaluate against previous surveys to identify change and any long-term trends.
- Locate, record, map and assess the condition of all veteran trees and coppice stools.

- Create refuge habitat/sites for hibernating reptiles and amphibians.
- Collect and collate all previous survey data and compile a comprehensive ecological analysis of the woodlands covering the past 30 years (approximately).

There are several wildlife conservation measures that will continue to be undertaken. These include the installation and maintenance of tawny owl boxes and bat boxes as well as the construction of amphibian hibernacula and grass snake basking and breeding areas.

4.14 Ecological monitoring and investigation

It is intended to continue with other ecological studies of Linford Wood to advise on the appropriateness of management actions being undertaken and to inform future plans. In particular, the last study of the vegetation and ground flora was in 1993 and a review of the effects of management over this period on the flora of the woodland would enable an evaluation of how well the special ancient woodland and other species are doing. There have never been studies of Diptera (true flies, including hoverflies) or Hymenoptera (bees, wasps & ants) in these woodlands. These orders contain important pollinators of ancient woodland plants as well as species specific to ancient trees and deadwood.

4.15 Compartment 8

Dominated by mature Norway Spruce *Picea abies* and Ash, the plantation in Compartment 8 was planted in the late 1940's on ridge and furrow. The field layer in compartment 8 contains about 40 vascular plant species in comparison to 184 in the ancient and long-established secondary areas, and is more capable of taking public pressure than the rest of the woodland. The under-planting consists of a mix of different species which are often not indigenous to this wood (including Wild Service-tree *Sorbus torminalis*, Douglas Fir *Pseudotsuga menziesii* and Hornbeam *Carpinus betulus*) but have been selected for their visual appeal and interest. Much of this plant material is now well established and the area is now suitable for greater public use than other sections of the woodland. The establishment of this compartment as a woodland garden should continue and will include the following actions:

- Removal of the residual invasive scrub such as Elder *Sambucus nigra*
- Continued thinning of the over-storey trees to promote the growth of the new layers of planting and create an open arboretum feel
- Better definition of routes into and around the area and an increase in sitting and strolling areas
- Provision of natural and naturalised play features and items



Picture 9; Compartment 8, a section of woodland, mainly planted with Ash and Norway Spruce after the 2nd World War (on old ridge and furrow), that is now used as a recreational and more open area, that has since been under planted with species such as Wild Service Trees and Douglas Fir.

4.16 Compartment 14

The area of Compartment 14 has been deliberately left for monitoring and habitat purposes and it is intended that the area should continue to be kept as non-intervention. The little work that does take place will be on the edge of the compartment through management of ground flora, and health and safety management of trees along the compartment edge.

4.17 Public access and use

Our woodland management will ensure the wood is fit for public access; this includes:

- Paths (hard and soft surfaces) and benches are appropriately maintained.
- Trees in the vicinity of paths are maintained in a safe condition.
- Compartment 8 continues to be managed with public access being a prime objective for this area.
- The Wood is regularly visited and patrolled by Parks Trust staff and volunteers.
- Anti-social issues are tackled (e.g. illegal camping, vandalism).
- Litter is effectively managed.

4.18 Signage and interpretation

As part of the Trust's revised signage and interpretation strategy (2008) high quality signs were installed in 2013 and 2014. These included: 'badging' signs, notice boards, posts with route markers and site interpretation boards. To ensure recreational use of the wood is not impeded there is a need to ensure signage is well maintained and remains appropriate to the woodland users.

4.19 Productivity

While not a listed objective, productivity of woodland materials from Linford Wood should be a viable consideration. Produce that can be and is sourced from the wood include:

- Timber for firewood or other markets e.g. larger roundwood (in combination with leaving cut wood on the wood floor for habitat value).
- Hazel stakes or binders for hedge laying purposes.
- Wild flower seed e.g. gathering of Bluebell seed.

4.20 Development works (2015 -2020)

It is intended that the following development works will be undertaken as part of the 2015 - 2020 five-year plan:

- Compartment 8 – Further development of the woodland park, creating improved public access and usage.
- Further investigation of the hydrology of the wood and with the use of clay dams, influence the effectiveness of the path/ride associated ditches, which as highlighted in the vegetation study of 1993 might be over efficient and be causing the wood to become a more drier environment that it traditionally has been.
- The headwater pond of Springhill Brook re-excavated. The outfall from the pond identified, excavated, re-profiled and re-joined to the woodland drainage system.
- The dense natural regeneration of Ash along the ditches and watercourses associated with the H4 pond and meadow to be thinned out; the ditch to be re-profiled; temporary wet/dry ponds or holding areas excavated; and amphibian hibernacula created.
- In the five year period re-stocking of the Wood shall take place in appropriate locations through the encouragement of natural regeneration or; the use of layering (e.g. Hazel) and encouraging a population of young Oak in the wood using acorns gathered from Oak trees found in the wood. The re-generation of Field Maple will also need to be monitored over this period.
- Further understand how the wood is being used and the amount of footfall being experienced in the woodland.

Works to the pond adjacent to the development site to the north-west of Linford Wood (Wood Close) will be undertaken in due course and a SUDS (Sustainable Urban Drainage System) constructed on it will be transferred to The Trust. The development of the site owned by Milton Keynes Council will be pursued by the Milton Keynes Development Partnership (MKDP). This land (see *Plan 2*) currently functions as Great Crested Newt terrestrial habitat. In order to undertake development, mitigation works to the surrounding habitat will be required. Discussions were advancing in 2008 (with HCA, the sites' former owners) but the global financial crisis curtailed any movement towards development. It is envisaged that the site will be developed and that mitigation works on Parks Trust land will still be required in the next few years. Any plans will need the approval of The Trust and all works will be undertaken at the expense of MKDP.

4.21 Education and Training

It is intended that the area should be available as a resource for informal use and that there should be a repository of information that can be used for the purposes of education (e.g. contained within signage and online). It is intended that the form of educational use will be generally passive in nature (guided nature walks, general walks, volunteer working groups etc.). When considering areas in the wood that are suitable for educational activities, the grassy rides and glades, paths with chipped surfaces and the Forest School site within Stanton Wood all have potential.

Linford, Shenley and How Park Wood should be seen as a good learning opportunity for staff, who will have the opportunity to learn about the intricacies of working in and managing semi-natural ancient woodlands. Such practical experience will be supported by staff attending seminars or training days covering topics associated with the woodland. This will include RSPB courses in respect to wildlife and birds encountered in woodland environments and undertaking training (formal or informal) regarding improving knowledge of ancient woodland plants.

Section 5: Work Programme Winter 2014 to Winter 2019

5.1 Responsibilities

Directing and specifying works, and implementation of the plan will be primarily carried out by the Trust's Operations Team that will include: Head of Operations, Area Landscape Manager, Arboriculture and Biodiversity Officers, along with the Community Rangers. The Operations team's work will be supported by the Trust's Education, Communications, Event and Community teams and will be assisted by volunteers and the use of consultants as required. The Trust's Chief Executive and Trustees will oversee the strategic implementation of the Management Plan to ensure that aims and objectives are being achieved.

5.2 Compartment work

Compartment work includes general coppicing and thinning works associated with the Wood's sub-compartments that are carried out on a targeted 15 year cycle. Generally, tree, shrub and compartment work will take place from October to December when impact on the woodland environment is at its lowest (minimising ground compaction and conflict with bird nesting, newts and other amphibians, while ensuring emerging bulbs do not get disrupted). All work will take into consideration potential disturbance to bat roosts. Inspections of individual trees should be carried out, especially of trees that are above 'pole stage' size.

As each compartment is worked, previously planted species which are inappropriate (introduced to the wood by planting, such as Southern Beech *Nothofagus spp.* in compartment 13) will be removed; this should be completed by 2020. As a general rule all trees and vascular plants not native to the wood should be removed from the woods (The exception may include the retention of some Hornbeam and Alder – see 3.10).

5.2.1 September 2014. Compartment 9:

Complete the upper and middle canopy thinning of compartment 9, which due to exceptionally wet ground conditions in January 2014 was not completed at that time. The upper canopy will be thinned to a maximum intensity of 20%. The denser middle canopy will be thinned to a maximum intensity of 50%, favouring Pedunculate Oak for retention, in a diversity of species. Elements of standing dead wood will be left or created (i.e. via ring barking), while trees with good habitat opportunities (e.g. holes in the stem) will be left as appropriate. Approximately 50% of cut wood will be left to rot as lying or standing dead wood.

5.2.2 Year 1 (of the new EWGS 5 year programme): 2015/16. Compartment 11: Thinning around planted Oaks

In Compartment 11, thin around the Pedunculate Oak *Quercus robur* (planted in coupes in 1985) and remove the Hornbeam *Carpinus betulus* planted at the same time, while ensuring the remaining pole stage Oak have room to develop.

5.2.3 Year 1: 2015/16. Compartment 2

In Compartment 2, the understorey (predominately Hazel *Corylus avellana* and Ash *Fraxinus excelsior*) is being lost due to over shading.

The upper canopy will be thinned to a maximum intensity of 20%. Elements of standing dead wood will be left or created (i.e. via ring barking), while trees with good habitat opportunities (e.g. holes in the stem) will be left as appropriate. Approximately 50% of cut wood will be left to rot as lying dead wood.

The dense mid-canopy will be thinned to a maximum intensity of 50%, favouring Pedunculate Oak (planted 1976) over Field Maple *Acer campestre* for retention.

The understorey will be coppiced in sections, while not exceeding 50% of the compartmental area (excluding ride-side work). Non-intervention belts (dictated by thicker scrub and areas such as

Blackthorn *Prunus spinosa*) will be left, as will selected tree species to grow on and form the next canopy layer.

As this compartment is thinned there will be an opportunity to open up the headwater pond of Springhill Brook and carry out some re-excavation work, including linking ditches.

5.2.4 Year 2: 2016/17. Compartment 5

In Compartment 5 the understorey (predominately Hazel and Ash with Hawthorn *Crataegus spp.* and Blackthorn *Prunus spinosa*) is being lost due to overshadowing.

The upper canopy will be thinned to a maximum intensity of 20%. Elements of standing deadwood will be left or created (i.e. via ring barking), while trees with good habitat opportunities (e.g. holes in the stem) will also left as appropriate. Approximately 50% of cut wood will be left to rot as lying dead wood.

The dense middle canopy will be thinned to a maximum intensity of 50%, favouring Oak and Field Maple (planted 1982) for retention. Within this operation an objective will be to remove 80% of the non-native Hornbeam *Carpinus Betulus*, and Alder *Alnus glutinosa* (planted 1982), while coppicing their cut stumps.

The understorey will be coppiced in sections, while not exceeding 50% of the compartmental area (excluding ride-side work). Non-intervention belts (dictated by thicker scrub and areas such as of Blackthorn) will be left, as will selected tree species to grow on and form the next canopy layer.

5.2.5 Year 3: 2017/18. Southern section of Compartment 13

In the southern section of Compartment 13 the understorey is being suppressed and lost in large sections of the compartment due to over shading by middle storey non-native Hornbeam (planted late 1970's).

The upper canopy will be lightly thinned, with only up to 10% of the trees removed. Elements of standing deadwood will be left or created (i.e. via ring barking), while trees with good habitat opportunities (e.g. holes in the stem) will be left as appropriate. Approximately 50% of cut wood will be left to rot as lying dead wood.

Regarding the middle canopy, fell 80% of the Hornbeam (coppicing the cut stumps). Fell all other non-native species (i.e. Southern Beech *Nothofagus spp.*) while retaining native species, Ash, Field Maple etc. This work equates to about 30% of the compartment area.

Concentrating mainly on the north east section of Compartment 13, the understorey will be coppiced in sections, while not exceeding 50% of the worked areas (not including ride-side work). Non-intervention belts (dictated by thicker scrub and areas such as Blackthorn *Prunus spinosa*) will be left, as will selected tree species to grow on and form the next canopy layer.

5.2.6 Year 3: 2017/18. Western section of Compartment 7

In the western section of Compartment 7 the middle canopy trees (planted 1979 -1984 with Oak, Hornbeam, Field Maple and Alder) are quite dense and now need to be thinned, with up to 40% of the trees to be removed during thinning.

The upper canopy will be lightly thinned, with only up to 10% of the trees removed as required. Elements of standing deadwood will be left or created (i.e. via ring barking), while trees with good habitat opportunities (e.g. holes in the stem) will be left as appropriate. Approximately 50% of cut wood will be left to rot as lying dead wood.

The understorey will be coppiced in sections, while not exceeding 50% of the compartmental area (not including ride-side work). Non-intervention belts (dictated by thicker scrub and areas such as Blackthorn) will be left, as will selected tree species to grow on and form the next canopy layer.

5.2.7 Year 4: 2018/19. Western section of Compartment 7

In Compartment 12 the understorey (predominately Hazel, Ash, Hawthorn and Blackthorn) is very dense, having not been worked upon for some time.

The upper canopy will be thinned to a maximum intensity of 20%. Elements of standing dead wood will be left or created (i.e. via ring barking), while trees with good habitat opportunities (e.g. holes in the stem) will be left as appropriate. Approximately 50% of cut wood will be left to rot as lying dead wood.

The middle canopy will be thinned to a maximum intensity of 30%, favouring Oak and Field Maple (planted in coups in 1985) for retention, while removing any non-native species found.

The understorey will be coppiced in sections, while not exceeding 50% of the compartmental area (not including ride-side work). Non-intervention belts (dictated by thicker scrub and areas such as Blackthorn) will be left, as will selected tree species to grow on and form the next canopy layer.

5.2.8 Year 5: 2019/20. Southern section of Compartment 3

In the southern section of Compartment 3, the understorey is being dominated by large numbers of regenerating Ash.

The upper canopy will be thinned to a maximum intensity of 20%. Elements (e.g. holes in the stem) will also be left as appropriate. Approximately 50% of cut wood will be left to rot as lying dead wood. The mid-canopy will be thinned to a maximum intensity of 30%, favouring Oak and Field Maple for retention, while removing non-native Alder and Hornbeam (all planted in 1981). Aspen *Populus tremula* found within the compartment will also be generally retained.

The understorey will be coppiced in sections, while not exceeding 50% of the compartmental area (not including ride-side work). Non-intervention belts (dictated by thicker scrub and areas such as Blackthorn) will be left, as will selected tree species to grow on and form the next canopy layer.

5.3 Declining, dead and dying trees and the management of dead wood

As stated in each compartmental working action - larger-diameter dead and dying trees e.g. standing deadwood (which could be artificially created) or those with crown die-back shall, where possible and appropriate to the location, be left in situ. Approximately 50% of felled timber from the upper canopy should be left as lying deadwood habitat. The amount to be left in each compartment should relate to the extent to which it is deficient in deadwood resource (see 4.4).

A substantial proportion (usually around 50%) of the felled or fallen roundwood should be left (particularly larger diameter pieces), with only some being cut to lengths. Where logs are cut, they can be placed as log-piles.

5.4 Management of individual trees and public access

Individual trees found alongside paths, rides and other areas of public access shall be the subject of formal and recorded inspections (see 4.5) under the terms of The Parks Trust's Tree Inspection Policy (July 2013 or later editions). These inspections will take place every three years. An inspection of Linford and Stanton Woods is being completed in 2014, with the next one due in 2017. All consequential required work will be undertaken and recorded.

5.5 Re-stocking of the Wood

In the period 2014 - 19 re-stocking of the Wood shall take place in appropriate places through the encouragement of natural regeneration or the use of layering (e.g. of Hazel).

With the seemingly inevitable arrival of Ash Dieback, there is a need to continue to develop a population of young Oak in the wood. Acorns will be gathered from selected Oak trees in the wood, propagated, grown on and then planted back in the wood in appropriate locations. This will be completed over the five years, with the involvement of local schools. Monitor the re-generation of Field Maple over the five year period.

5.6 Maintenance of paths and rides

All paths and rides will continue to be maintained to enable pedestrian access through the wood; re-surfacing of leisure routes will be carried out as required. Woodchip paths, bridleways and green paths will be topped up with woodchips as required, to ensure they remain good and viable paths. All woodchip and hoggin surfaced horse trails shall be maintained as an intermediate grass specification (max height obtained 200mm), to a width of approx. 2.5m, for the duration of the contract.

Grass rides will be monitored for wetness. At the time of this management plan (2014) both grass rides running west and east of the central north to south paths are lying wet. Over the five year period there is a need to sensitively build up a level of woodchip, in layers, on top of the 2.5 metre wide green rides, to allow them to be lifted above the wet lying areas, while not being detrimental to the ground flora flanking these paths. Woodchip should preferably not be imported from other parts of Milton Keynes, but should be from within these woodlands.

A rolling five year programme of cutting back and coppicing vegetation and scrub found along paths, rides and woodland edges shall be undertaken (to a depth of up to 15 metres in places) in order to create a graduated transition from the field layer through to scrubby regeneration and then on to the woodland canopy. This work will be undertaken to achieve two primary objectives, to:

- a) Allow the development of a greater diversity of habitats and plant and invertebrate species along the ride-side
- b) Enable the public using the rides to do so with confidence while not feeling the vegetation is overbearing or blocking views, as well as enjoying the sight of flowers, butterflies and other wildlife

5.7 Herb layer management

All herbaceous growth overhanging the leisure routes, horse riding trails, grass and woodchip paths throughout Linford Wood shall be managed in accordance with the principles shown on the stylised diagram inset to the term contract specifications (*TC370; Linford Wood and Sheet 11* titled 'Herb Layer Management) and will be cut during mid to late July of each year. The operation shall be carried out using hand tools such as reap hooks, with the objective of cutting back the vegetation overhanging the footpath.

5.8 Formalised grass-cutting (measured)

Continue to manage and maintain the woodlands associated areas of long grass (see *Plan 7*) and The Parks Trust's '*NNE Parks Contract TC370 Section*', '*Linford Wood and sheet 11*' along with '*H4 TC353*' pages 16, 17 and 18'.

The long grass and wildflower areas shall generally be cut in the later part of the season and as described in The Parks Trust document '*Landscape Maintenance by Term Contract*', 2013 Edition (*LM 2013*), Section 3. As appropriate, the arisings will be gathered and removed from site with the objective to improve the sward quality in terms of wildflower content by preventing nutrient enrichment from arisings rotting down in situ. Such an area is the open grass (approximately 0.9ha) found between the Dansteed pond and the H4 (Dansteed Way).

5.9 Grass-cutting (unmeasured)

The grass, herbaceous material and natural woody regrowth that is adjacent to leisure routes and woodchip paths, where there is no 'measured' grass cutting regime specified on the contract drawings ('*NNE Parks contract TC370*'), shall be managed in the following manner:

- a) **Woodchip paths:** In circumstances where grass and other material has colonised and is growing through the woodchip paths the vegetation shall be cut to an intermediate grass specification (max height obtained 200mm) maintaining a width of 1.5-2.0 metres.
- b) **Ditch present:** In circumstances where there is a ditch immediately adjacent, the Contractor shall cut the grass, herbaceous material and natural woody vegetation on both sides of the leisure route, grass and woodchip path as long grass, to the edge of the ditch. The said grass

is to be cut in October and the arisings raked up and disposed of by thinly scattering them into the wood beyond the area of cutting.

- c) **No ditch present:** In circumstances where no ditch is present the Contractor shall cut the grass, herbaceous material and natural woody regrowth as long grass on both sides of the leisure route, grass and woodchip path to a distance of 1.5m and 5.0 m from the path, forming a wavy or scalloped edge with occasional deep indentations away from the leisure route, grass or woodchip path. The said grass is to be cut in October and the arisings raked up and disposed of by thinly scattering them into the wood beyond the area of cutting.
- d) **Green ride fringe management:** During the period from December to early February each year, all grass, herbaceous matter and natural woody regeneration found adjacent to the green rides shall be cut to a height of 100- 150mm. The area of cutting shall be along both edges of the rides. The cut area shall vary between 2.0m and 5.0m, forming a wavy or scalloped edged on the woodland side (fringe) of the green ride.

5.10 Ditch and watercourse maintenance

Ditches will be maintained as part of a two year rolling rotation, during the period December to early February of each year. The lengths of ditch or watercourse as indicated in the contract Drawings (Plan 7) ('NNE Parks contract TC370', section 'Linford Wood and sheet 11') shall be managed in the manner specified below:

- a) All grass, herbaceous matter and natural woody regeneration shall be cut to a height of 100-150mm. The area of cutting shall be along both edges of the ditch and across the surface of the ditch itself. The cut area shall vary between 2.0m and 5.0m, forming a wavy or scalloped edge on the woodland side of the ditch. All the arisings from the works shall be roughly raked off and thinly scattered into the wood beyond the area of cutting.
- b) The ditch shall then be 'bottomed' to allow the free passage of water. This shall entail the removal of fallen leaves and other accumulated debris. The arisings shall be thinly spread on the cut area on the woodland side of the ditch with the exception of any lumps of wood, old stakes, litter or any other inorganic material which shall be gathered up and taken off site to tip.

Further investigation of the hydrology of the wood needs to be carried out and perhaps with the use of clay dams, try to hold water back in the path/ride associated ditches that were created in the 1970's, which could be having an influence in the wood becoming a more drier environment that it traditionally has been.

5.11 Ponds

For pond management, vegetation-cutting on the pond sides, removal of excessive vegetation found within the pond and re-excavating of ponds; works shall be carried out as required with the overall objective of keeping the ponds open to light and available as good habitat.

In addition to the above general work, the following works will be undertaken at individual ponds:

- a) The dense natural regeneration of Ash found along the ditch/watercourse associated with the H4 pond (Dansteed Pond) and meadow needs to be thinned out in 2014/15 and the ditch re-profiled.
- b) As compartment 2 is worked on in 2015/16, the headwater pond of Springhill Brook will be re-excavated, with the outfall from the pond identified, excavated/profiled and re-joined to the woodland drainage system.

5.12 Control of pests and diseases

Control of Grey Squirrels should continue (via our specialist contractors) using best and most effective and humane control measure available, which is currently control by Warfarin.

The spread of Ash dieback *Chalara fraxinea* across the UK is a real concern (see 4.10). Although there is no plan to remove our established woodland Ash trees (which account for 60% of the upper canopy) we will need to encourage other species appropriate to this type of semi-natural ancient

woodland by favouring other tree species – apart from Ash – that are native (e.g. Pedunculate Oak, Field Maple, Aspen, Goat Willow or Grey Willow) to the woodland for retention when undertaking thinning or felling operations.

5.13 Compartment 8

For Compartment 8 we will continue to manage and develop public access, with actions to include:

- a) The creation of more rides through the dense ground vegetation
- b) Removal of the residual invasive scrub such as Elder *Sambucus nigra*.
- c) Further thinning of the over-storey trees to promote the growth of the new layers of planting and create an open arboretum feel.

5.14 Specific wildlife conservation measures

Several wildlife conservation measures will continue to be undertaken. These include the installation and maintenance of tawny owl boxes and bat boxes as well as the construction of amphibian hibernacula and grass snake basking and breeding areas.

5.15 Bench, seat and sign maintenance

Vegetation adjacent to all benches and seats shall be cut as necessary using hand tools such as reap hooks to maintain free and comfortable access to the facilities and to prevent vegetation growing over and through the installations. The benches will be appropriately maintained, which will include cleaning, painting and replacement of failing or damaged timber. Over the five-year period (2014-2019) and beyond we will ensure signage is well maintained and remains appropriate to the woodland users.

5.16 Education and events

The Parks Trust will continue to support the 'Forest School Project' running from within Stanton Wood. It is intended that the educational use of the wood will be generally passive in nature (guided nature walks, general walks, volunteer working groups etc.). Events such as 'Woodland Play' (lead by the MK Play Association) held in compartment 8 will also be supported and encouraged to continue.

5.17 Managing anti-social problems

The Wood is regularly visited and patrolled by Parks Trust Operations staff and Community Rangers, along with regular work visits conducted by employed contractors. Dropped litter is picked up on weekly and monthly cycles (within the term contract) and will be supplemented by reactive and volunteer litter-picking.

Although generally small scale issues occur, such as: illicit camping, vandalism to benches & signs, small scale fires, etc., such problems will be dealt with accordingly and promptly.

5.18 Productivity

Continue to produce woodland products from Linford Wood to include:

- Timber for firewood or other markets e.g. larger roundwood (in combination with leaving cut wood on the wood floor for habitat value)
- Hazel stakes or binders for hedge laying purposes
- Gathering of Wild flower seed e.g. gathering of Bluebell seed

5.19 Jack Stephenson art trail



Continue to support Jack Stephenson and his wood-carved sculptures by leaving timber or tree stumps in situ that are suitable for Jack to carve. We will further support the art trail (sensitive pruning, grass cutting and effective management of the grass ride) to ensure it remains part of the Wood's attraction.

Picture 11; April 2014 - Jack Stephenson giving Rupert a fresh coat of paint

5.20 Monitoring and surveys

Budgets and resource allowing (i.e. the appropriately qualified people/companies available at the right times) the plan is to undertake the following surveys and monitoring work at Linford Wood in the stated years.

- | | |
|-----------|---|
| 2014 | Ground Flora Survey
We are currently in discussion with Moulton College.
The Survey will go ahead either 2014 or 2015. |
| 2015 | Pollinating Insects
(Dr Hilary Erenler, Northampton University) |
| 2016 | Common Bird Census
(Milton Keynes Natural History Society or Middlemarch Ecology) |
| 2016 - 17 | Moths
(Milton Keynes Natural History Society) |
| 2018 | Fungi
(Justin Long/Derek Schafer) |

In addition to the above, North Bucks Bat Group will be monitoring the bat boxes within Linford Wood, three times a year from May 2014 onwards.

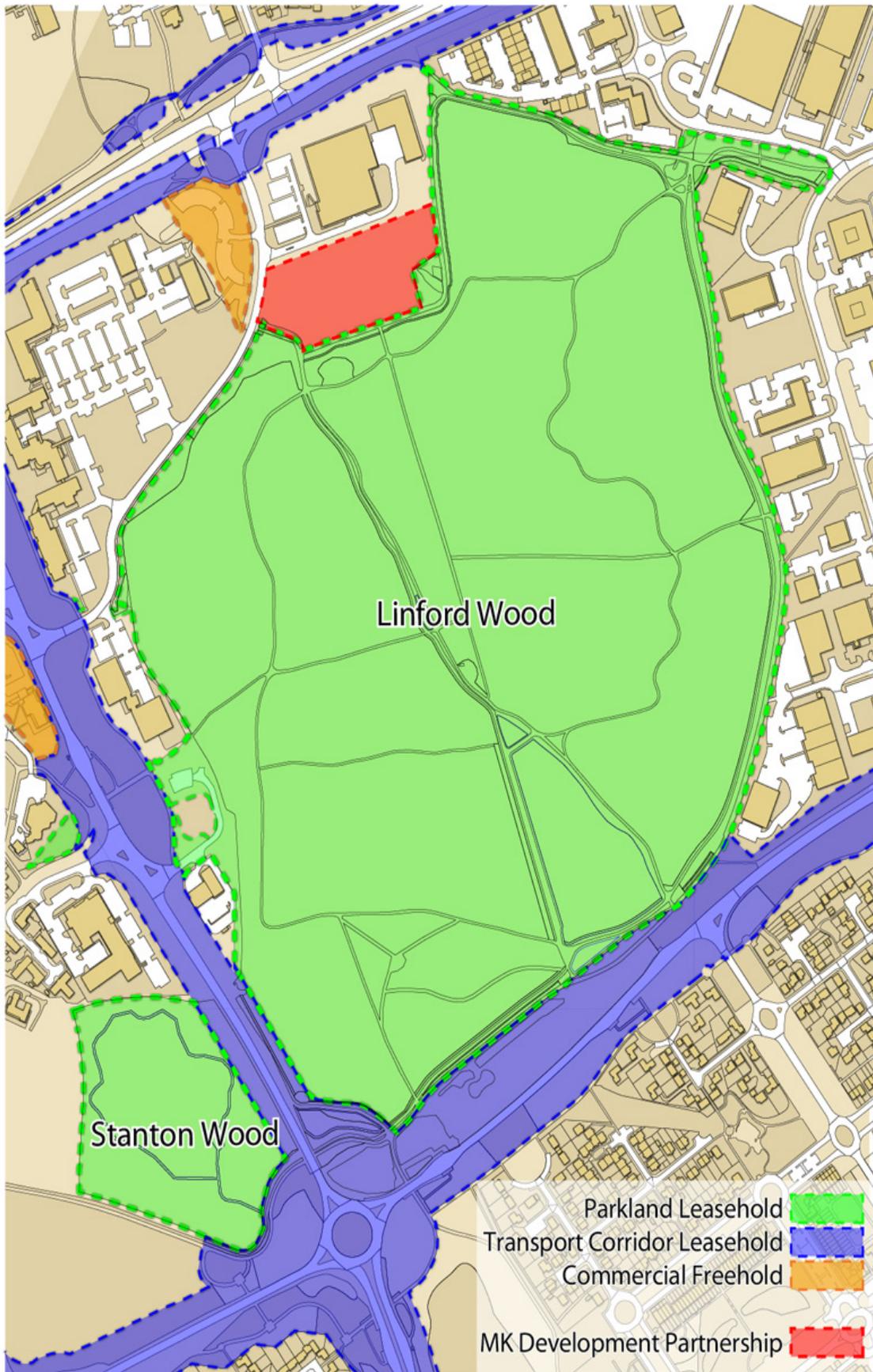
We need to carry out further studies as to numbers of people using the wood and what attracts them to the wood (e.g. dog walkers, enjoying the woodland environment or used as a through path) and we will look to do this in 2015.

Records of species found in Linford and Stanton Wood are held by the Buckinghamshire & Milton Keynes Environmental Records Centre (BMERC). These include all records from the 'Ecological Studies in Milton Keynes' reports, but also records provided by individual ecologists and naturalists. As new studies are carried out, new records will be submitted to BMERC. Checklists are in preparation (2014) for use within The Parks Trust and by those interested in these woodlands, to provide instant access to knowledge of what species have been recorded in these woodlands. This will also enable ecologists and naturalists to be aware of what to look for and to add records of species not yet recorded in these woods. 'Species Lists of Biodiversity in Linford Wood' will cover vascular plants, birds, mammals, reptiles and amphibians, invertebrates and other groups.

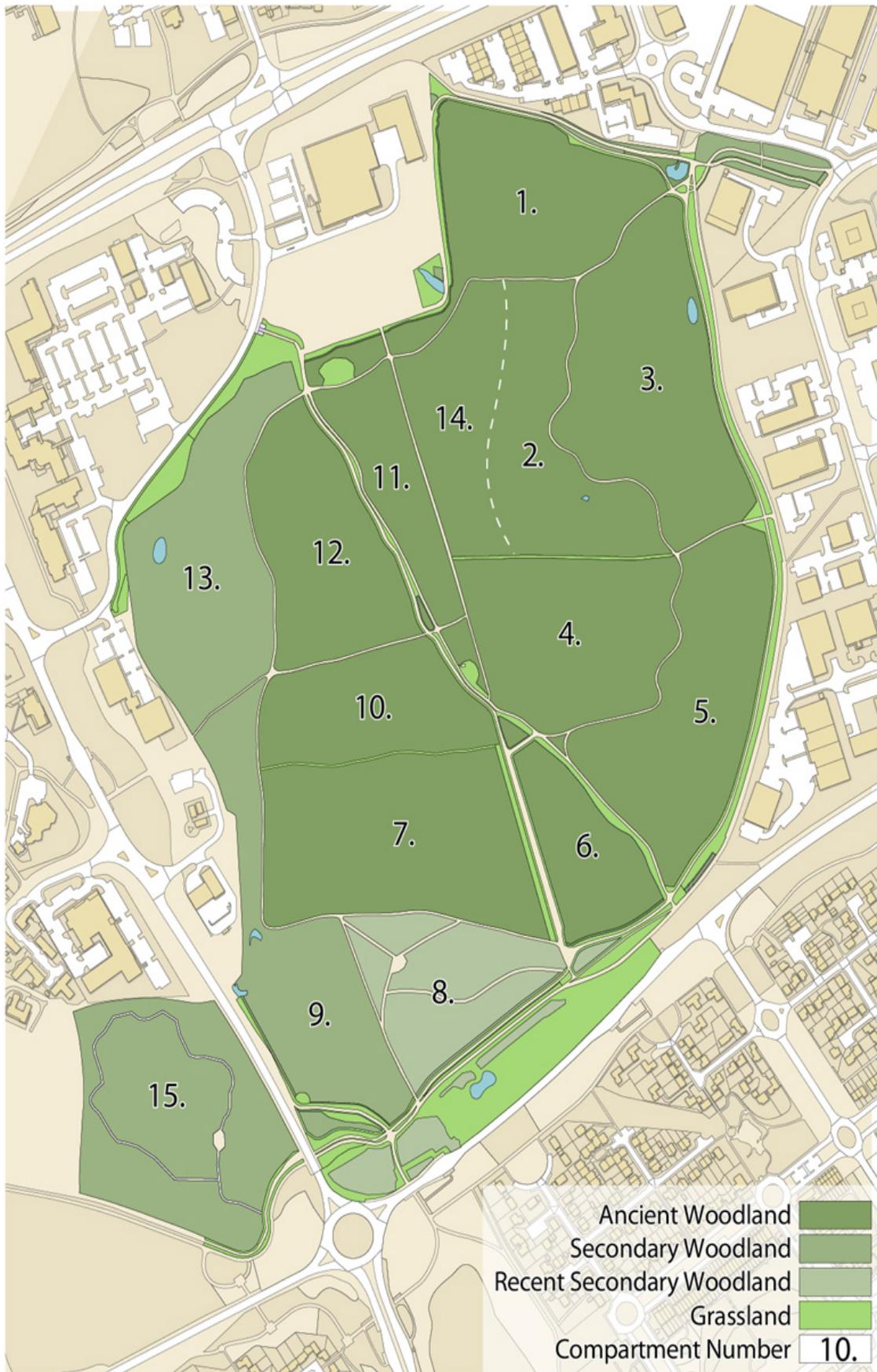
Plan 1: Linford Wood and Stanton Wood Boundaries



Plan 2: Ownership



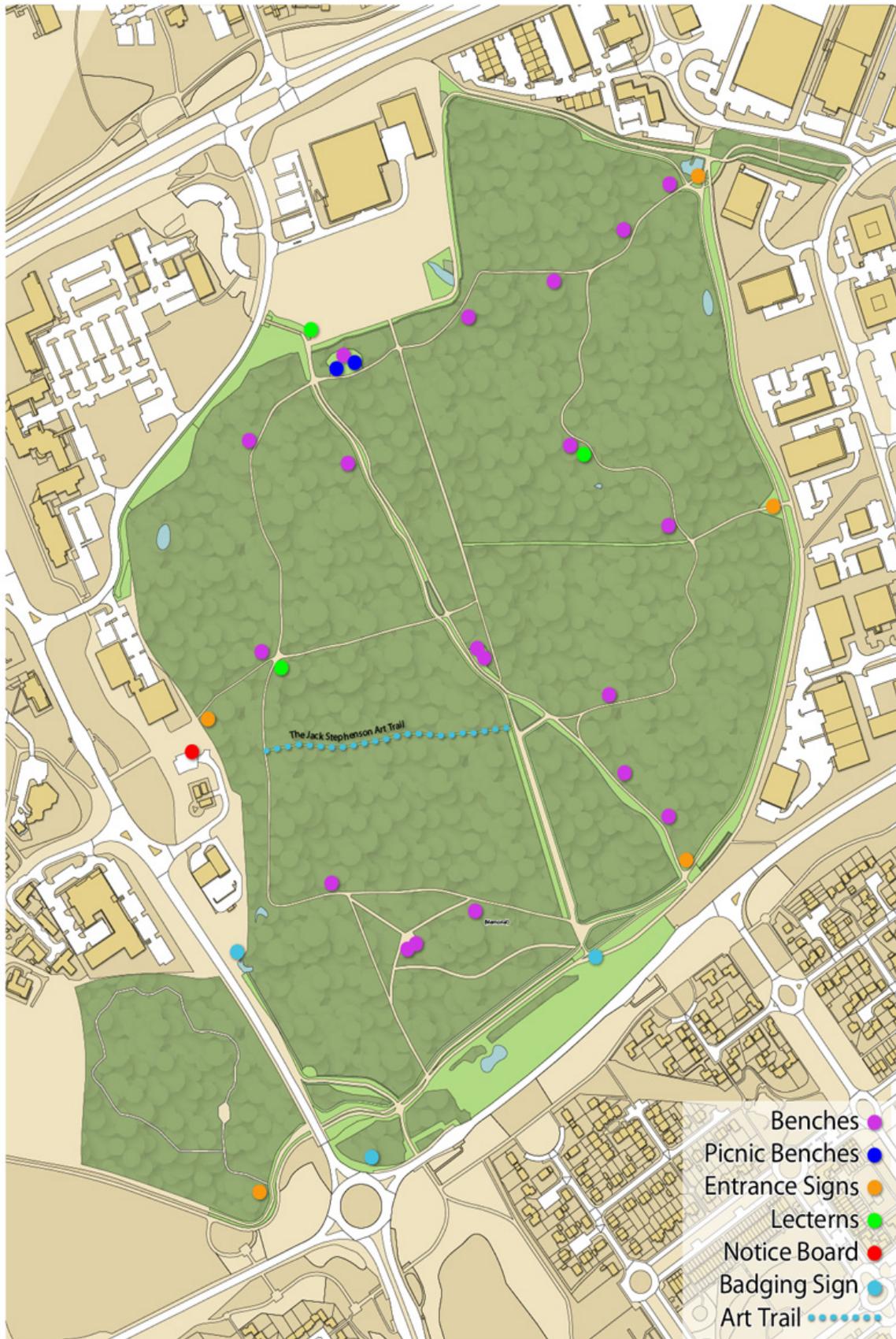
Plan 3: Compartments and vegetation zones



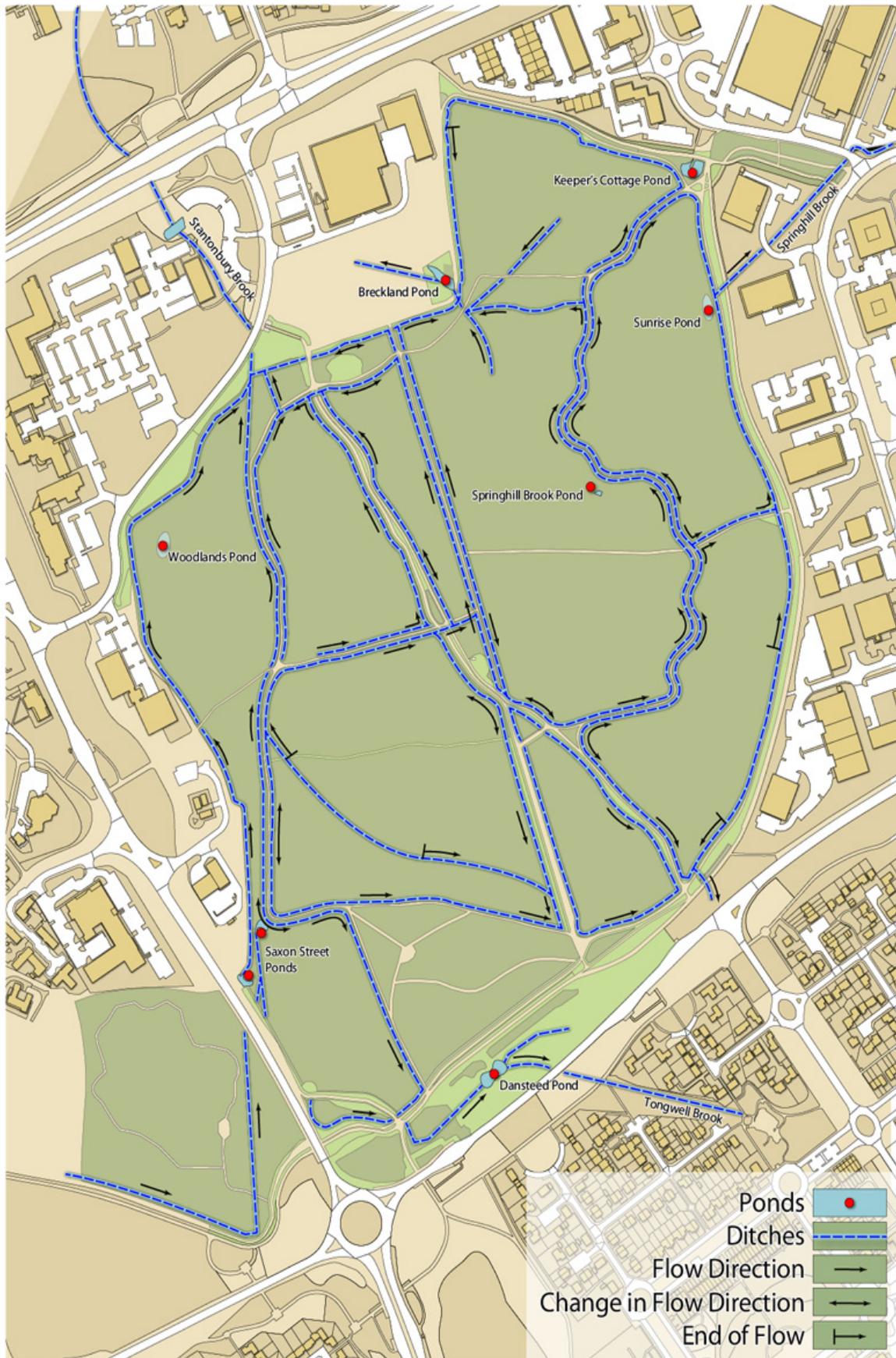
Plan 4: Footpaths, rides and car park



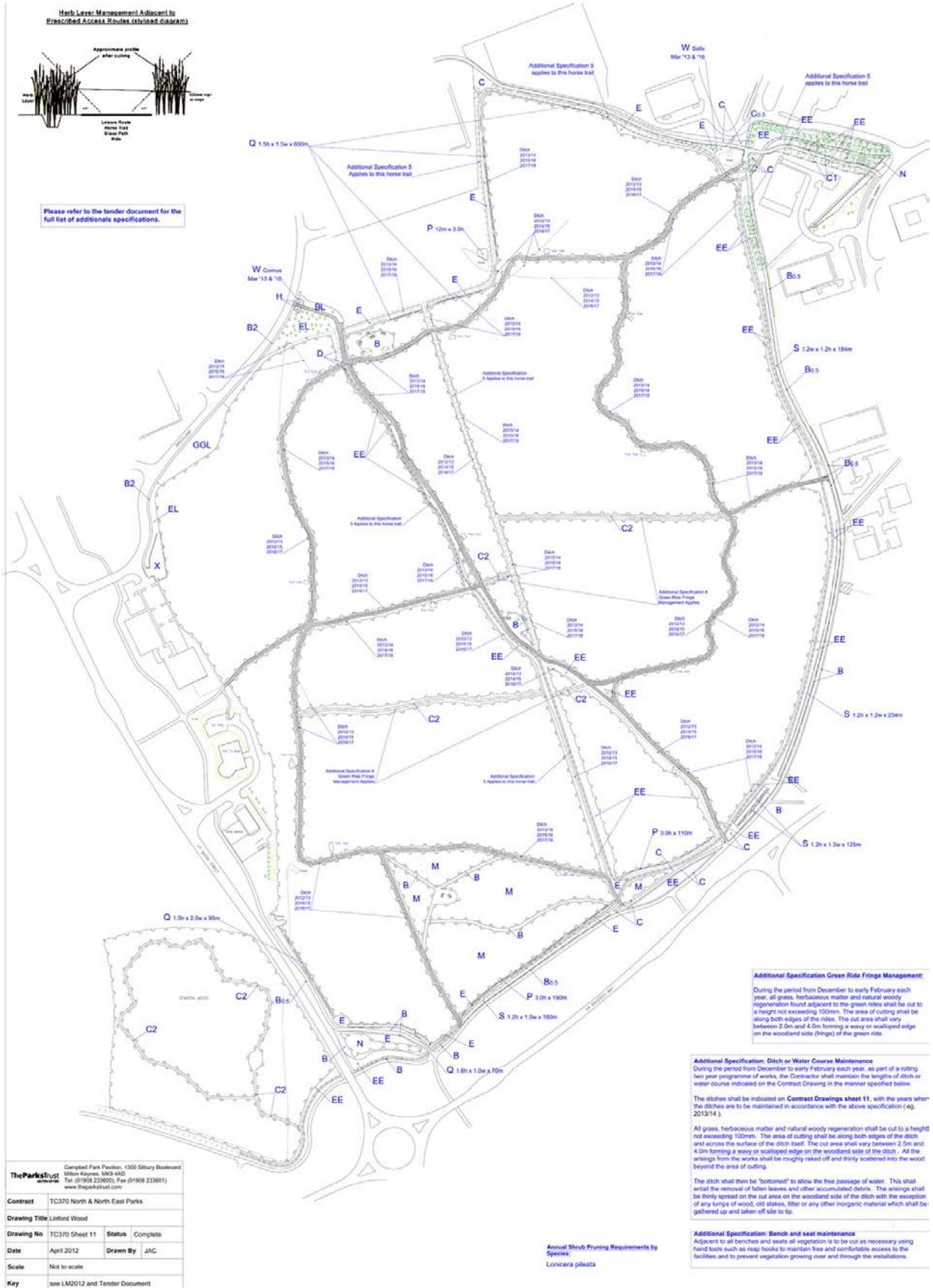
Plan 5: Benches, signage & art trail



Plan 6: Ponds & watercourses



Plan 7: Grounds maintenance contract specification (Reduced from original A0)



TheParksTrust 1300 Silbury Boulevard Milton Keynes, MK9 4AD Tel: 01908 233600, Fax: 01908 233601 www.theparkstrust.com	
Contract	TC370 North & North East Parks
Drawing Title	Linford Wood
Drawing No	TC370 Sheet 11
Date	April 2012
Scale	Not to scale
Key	see LM2012 and Tender Document

Annual Shrub Pruning Requirements by Species:
Lonicera pileata

Additional Specification Green Ride Fringe Management:
 During the period from December to early February each year, all grass, herbaceous matter and natural woody regeneration found adjacent to the green rides shall be cut to a height not exceeding 100mm. The area of cutting shall be along both edges of the rides. The cut area shall vary between 2.0m and 4.0m forming a wavy or scalloped edge on the woodland side (fringe) of the green ride.

Additional Specification: Ditch or Water Course Maintenance
 During the period from December to early February each year, as part of a rolling two year programme of works, the Contractor shall maintain the lengths of ditch or water course indicated on the Contract Drawing in the manner specified below.

The ditches are to be indicated on **Contract Drawings sheet 11**, with the years when the ditches are to be maintained in accordance with the above specification (eg. 2013/14).

All grass, herbaceous matter and natural woody regeneration shall be cut to a height not exceeding 100mm. The area of cutting shall be along both edges of the ditch and across the surface of the ditch itself. The cut area shall vary between 2.0m and 4.0m forming a wavy or scalloped edge on the woodland side of the ditch. All the workings from the works shall be roughly raked off and thinly scattered into the wood beyond the area of cutting.

The ditch shall then be "bottomed" to allow the free passage of water. This shall entail the removal of fallen leaves and other accumulated debris. The arisings shall be thinly spread on the out area on the woodland side of the ditch with the exception of any lumps of wood, old stakes, stier or any other inorganic material which shall be gathered up and taken off site to tip.

Additional Specification: Bench and seat maintenance
 Adjacent to all benches and seats all vegetation is to be cut as necessary using hand tools such as secateurs to maintain free and comfortable access to the facilities and to prevent vegetation growing over and through the installations.

Plan 8: Thinning & coppicing operations



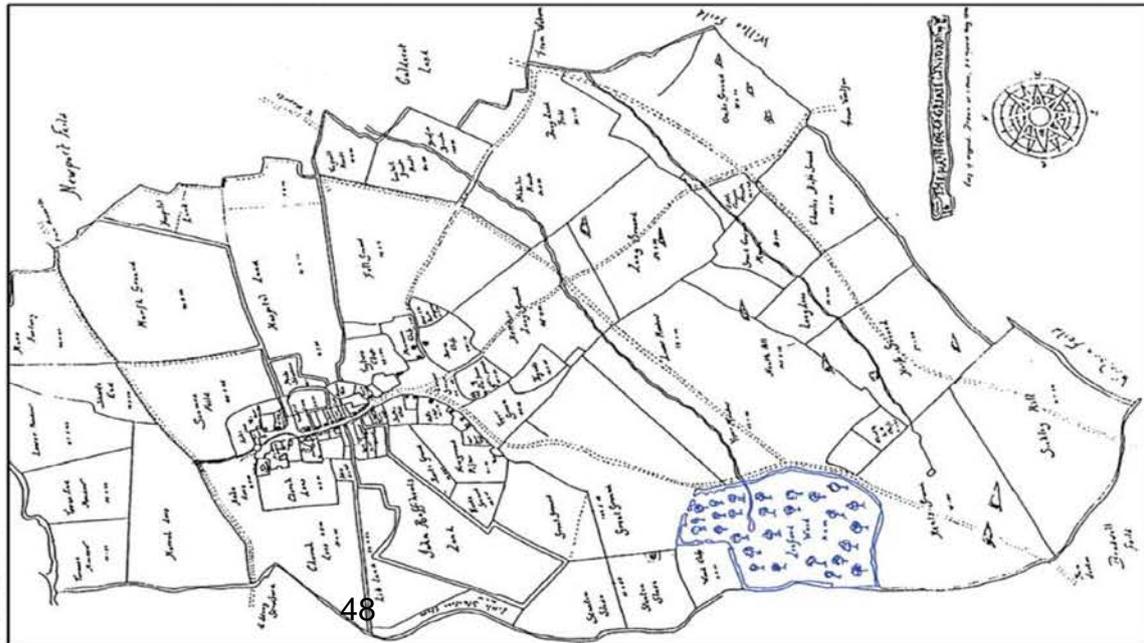
Plan 9: Superseded compartment numbers & historic underplanting works



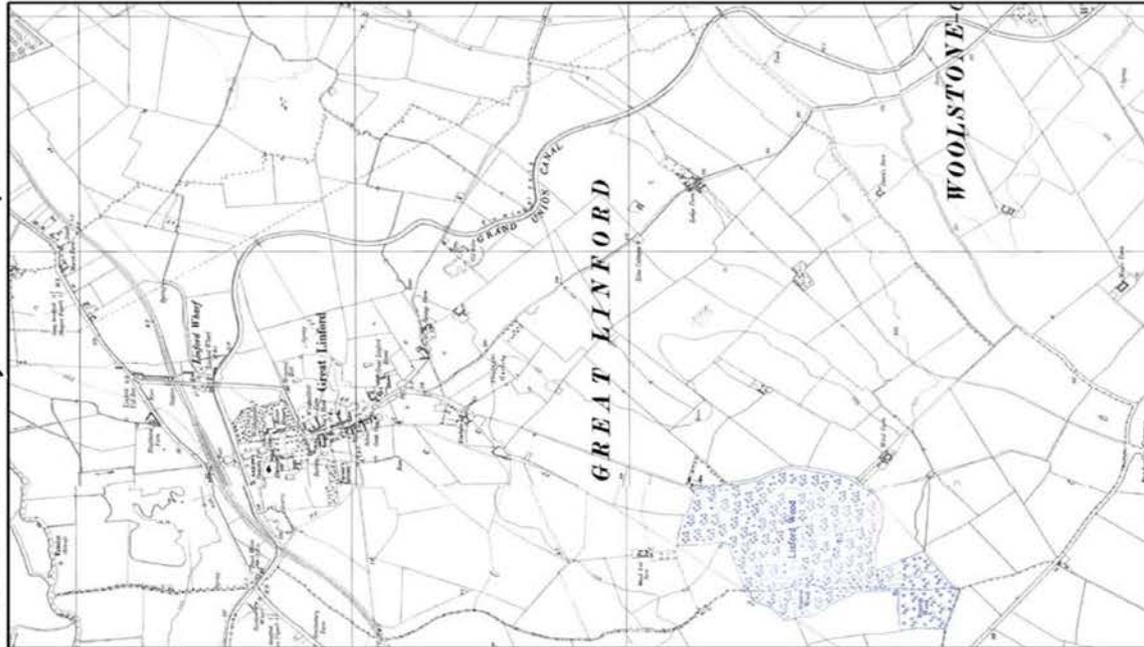
Plan 10: Historic maps comparison

Three maps demonstrating the same area. Linford Wood is highlighted in blue.

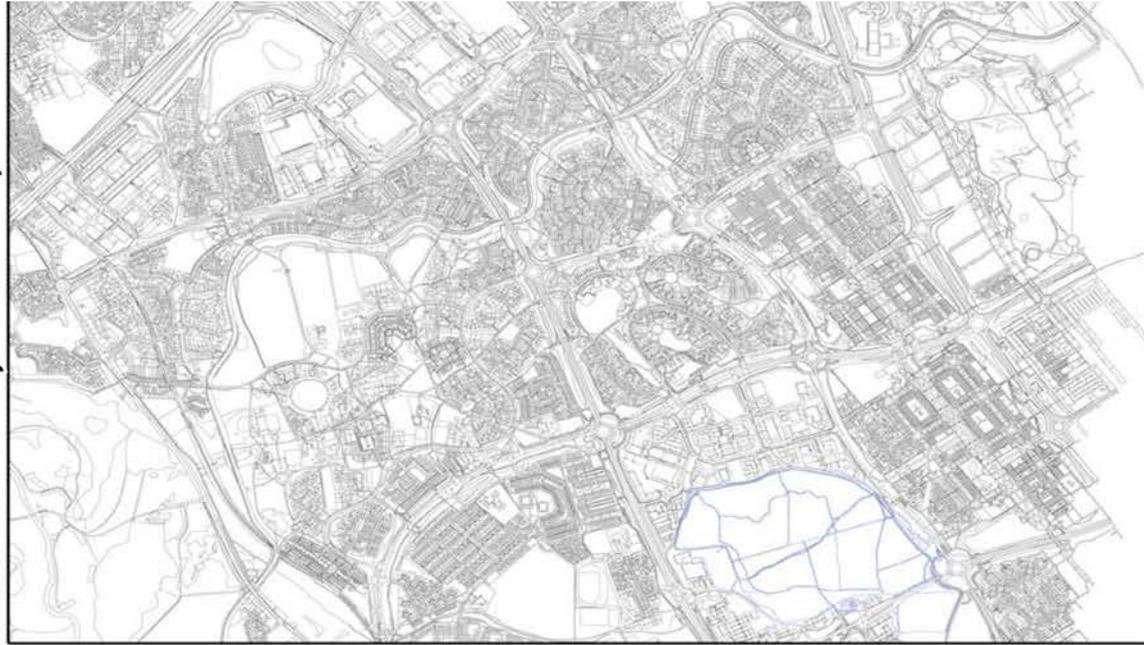
Parish of Great Linford - 1678



Ordnance Survey - 1940s epoch



Ordnance Survey Mastermap - 2014



Appendices

APPENDIX 1:

20th Century Woodland Management of Linford & Stanton Woods

This Appendix describes the sequence of different management regimes applied to Linford and Stanton Woods throughout the 20th century and supplements other sections of the management plan.

1 Woodland condition and change in the first half of the 20th century

Well before the 1970s, probably before 1914, Linford Wood was in derelict condition. It is thought that most of any remaining high canopy Oaks were removed during the First World War, though active management had probably ceased well before this.

Compartment 8 was outside the original Linford Wood and was planted after the second world war, under a Forestry Commission dedication scheme, with Ash and Oak and a nurse of Norway Spruce *Picea abies* and Larch *Larix spp.*. The Milton Keynes Development Corporation purchased the woodland in 1971, but briefly continued to lease it to the Forestry Commission until 1974.

A fundamental change to these woodlands was a consequence of the way in which the New Town was developed around them (see *Plan 10*). The most active elements of woodland for much wildlife are at its edges and along its rides, where there is a graduated transition from woodland to scrub to tall herbs. These areas provide for feeding, predation and basking, and provide transitional habitats of considerable value. Unfortunately some planners view the edge of the high canopy trees as the edge of a woodland. A consequence in Milton Keynes has been that much woodland has been shorn of its ecologically effective edges. Roads and development were placed too close to the woodland edge as were hard-surfaced paths and close-mown grasses. Linford Wood and the remnant of Stanton Wood were also severed from each other.

2 Woodland restoration by the Development Corporation

The Development Corporation embarked on a 15-year rejuvenation scheme in 1974 to open up most of the relatively dark woodland for public use. One of the first operations undertaken was a network of surfaced and unsurfaced paths and horse-riding trails were installed in the wood. New ditches were constructed which was imposed over the existing drainage pattern, which is likely to have an influence on the hydrology and wetness of the wood.

At that time the Wood's 15 compartments were divided into 30 sub-compartments (see *Plan 9*) of which two in Linford Wood and all of Stanton Wood were to be left as non-intervention areas. Each year two sub-compartments were to be cleared of scrub or coppiced and some new tree and shrub planting was to be carried out. Ponds were cleared. New glades and grassed areas were created and benches, picnic tables and signage were put in place.

3 The 1984 review and the 'Linford Wood Management Plan 1985-1989'

An independent report in December 1984 concluded that the mid 20th century planting of Ash *Fraxinus excelsior* and Oak *Quercus robur* had been inadequately thinned and that under-managed coppiced areas had led to intense scrub regeneration which had suppressed regeneration of timber trees. With the benefit of hindsight many of the initial actions and activities can now be viewed as inappropriate. At that time very little was known about semi-natural ancient woodlands so these actions were typical of their period. Since then there has been an increase in knowledge of the importance of such habitats, so the approach to management was changed considerably from the mid 1980s.

The independent report was 'Linford Wood Management Plan 1985-1989' (No. 98 in the 'Ecological Studies in Milton Keynes' series) prepared for Milton Keynes Development Corporation by Cobham Resource Consultants Ltd. It included a detailed and quantitative assessment of all sub-compartments in both woods and set a short-term plan for 1985-89 in the context of a long-term plan.

The 'Linford Wood Management Plan 1985-1989' reviewed the Development Corporation's progress after the first ten years of the rejuvenation scheme. It concluded that: a) the work has been necessary but had not always been done in the right places, with planting spread throughout the woodland rather than in scrubby areas that most needed it; b) exotic tree and shrub species had been unnecessarily introduced; c) the success of planting had been very variable, with some successes and many failures; d) sudden increases in light conditions had accelerated growth of weed species such as Bramble *Rubus fruticosus* and weeding had not kept pace with this; e) scrub had suppressed tree regeneration in larger clearings; and f) natural regeneration of timber species was generally poor. Since that time no planting of exotic species has been undertaken. Except for compartment 8 – which was retained as an area of non-native species – a gradual removal of inappropriate species has been part of management, with the aim of completing this by 2020.

The 'Linford Wood Management Plan 1985-1989' proposed application of four woodland management systems, to be applied to specified sub-compartments:

- a) 'Irregular Shelterwood' for most sub-compartments.
- b) 'Coppice with Standards' for a few sub-compartments.
- c) 'Single-storied High Forest' in other sub-compartments.
- d) Some 'Non-intervention' areas to provide scrub of habitat value.

Within the woodland there are also areas of amenity grassland to be managed as 'Recreation Vegetation Management' and areas of wildflower-seeded grassland.

The 'Shelterwood' system was intended to create intimate mixed-species woodland approximating to 'Ancient Woodland' by a gradual restoration process in which older trees provide protection for younger ones, often in groups rather than singly. It was to be of two types: a) enrichment planting; and b) natural regeneration. The 'Irregular Shelterwood' version of the process can take over 20 years, sometimes more than 50 years, and involves:

- 1) *Preparatory felling*: late thinning to encourage development of crowns of future seed bearers;
- 2) *Seeding felling*: once it is clear that there is going to be a good seed crop, a third to a half of the stems are removed. The understorey and any regeneration already present are also removed. Cultivation may be carried out to assist seedling establishment;
- 3) *Secondary fellings*: usually 2–4 fellings at 3–5 year intervals, with timing and intensity carefully regulated to allow seedlings to grow, but also to prevent rank weed growth;
- 4) *Final felling*: the last secondary felling in which the remaining overstorey is removed.

'Coppice' management was to be applied to limited areas only, where stool potential was high, with coppicing and thinning works to be undertaken on an approximate 15 year cycle. 'High Forest Single Storey' was to be applied to larger areas, using conventional replanting and management, where there were less than 10 mature trees per hectare retained as overstorey. 'Non-intervention' areas were to be reviewed every ten years. 'Rotational Scrub Cutting' was also to be applied wherever this was needed, to encourage particular species or eliminate others, or to create glades or ride-side widening (scalping), for ecological purposes, or to improve the appearance of the woodland for users.

A mix of these techniques has been applied as appropriate to each area of the wood, with the aim of gradually bringing the Wood back to a long-cycle of predominantly coppice with standards, but with all age and size classes of trees represented (irregular shelter wood)', up to high canopy, while retaining some long-term non-intervention areas. From the mid-1980s to the 2000s, work in each compartment has involved a combination of 'irregular shelterwood' and coppice with standards, with the exception of selected non-intervention areas.

4 Woodland management by The Parks Trust

Since The Parks Trust was formed in 1992, the general management approach has been to build on the improvements made through the regime applied since the 'Linford Wood Management Plan 1985-1989' by: management of coupes, encouraging natural regeneration, with thinning and coppicing, to gradually achieve coppice with standards with an irregular shelterwood beneath the high canopy and to restore the woodland by way of a more even handed form of management, where there is a diversity of light levels and age/size groups found across the wood.

Features such as out-grown coppice, individual over-mature and declining trees and unworked areas have been retained in the interests of biodiversity. This has led to a variable woodland environment within which a wide range of age classes are represented. Some deadwood has been retained. To provide more of this ecological niche, large diameter dead and dying trees and trees with substantial crown die-back are being left standing in situ whenever consistent with providing a safe environment for the public. In addition, fallen and cut deadwood, particularly material of large diameter, is being left on the woodland floor and allowed to decay naturally.

The approach is now to work in 5-year programmes submitted for approval by the Forestry Commission (FC) under its English Woodland Grant Scheme. The overall aim is to achieve an ongoing 15-year cycle of management of all compartments of the Wood (but continuing to leave some non-intervention areas). Over the period to 2014 the FC-approved 'Linford Wood 5-year Plan of Operations: 2010-2014' has shaped how and where management has taken place. Several sub compartments have been worked on through: light thinning of the upper canopy, selective removals from the under canopy, coppicing of the understory and clearance of excess scrub. Alongside this there has been path-side coppicing and clearance, and grassland management. The next 5-year programme is due to start in 2014/15.

5 Distinctive woodland features

There are several other important arboricultural features, or ecological attributes of the woodland, which have also required special attention and appropriate management. These are:

- Stanton Wood has an area of approximately 0.5ha dominated by an unusual clone of Smooth-leaf Elm *Ulmus minor* ssp. *minor*. These Elms extend from the main block outside the woodland boundary into old hedgerows either side of V7 (Saxon Street). They demonstrate good resistance to Dutch Elm Disease and this is the single largest block of Elm existing in Milton Keynes
- Several old, large domestic Apple *Malus domestica* trees exist in a row outside the edge of the east side of the wood in the area known as Keepers Cottage. To avoid total collapse these trees were significantly crown reduced in the early 2000s. This process of rejuvenation requires ongoing monitoring as further works will be required to conserve this aged feature
- Clonal groups of Aspen *Populus tremuloides* exist in small quantity in a few locations within the wood. A survey of moths in 2000 specifically noted the paucity of this habitat within Linford Wood and it is a species that needs favouring when operations are undertaken
- Compartment 8 (the Ash, Spruce, Oak plantation) contains the largest and healthiest Norway Spruce *Picea abies* trees in Milton Keynes, creating features and a vegetation type now worth retaining
- The 1678 estate plan (see *Plan 10*) shows a pond within the woodland which is the headwater for Springhill Brook which still exists and flows through part of Neath Hill. This pond will be restored by careful excavation and attempts will continue to re-discover the watercourse which emanated from the pond and flowed through the wood. When found, it will be re-excavated, re-profiled and reconnected to the pond
- Floristically rich, sheltered areas of long grass provide habitat for a wide range of species. So grassland sward and grassy, shrubby areas adjacent to the rides and woodland edge have been generally managed as transitional areas with long grass cut once a year or less. Throughout the grasslands associated with these woods, long-grass-cutting specifications are generally used. Opportunities to extend and enrich areas of long grass in and around the woodland, to form a graded woodland edge – ranging from short to long grass, to scrub and woodland edge – are being taken

6 Management plans

It is not known what site management plans were prepared in the periods before the Development Corporation purchased the wood, but their initial work was shaped by a management plan dated 1971. This was followed by the 1984 Plan which proposed a sharp change of approach based on a thorough analysis of the woodland and its potential. A new management plan was drafted in 2010 by the then Parks Trust Head of Operations, but was not completed. This 2014 plan draws on the 2010 plan and earlier plans.

7 Management for landscape and visual value

The Wood's principal more obvious visual attributes include mature Pedunculate Oak *Quercus robur* and Ash *Fraxinus excelsior* standard trees and occasional Field Maple *Acer campestre*, impressive multi-stemmed Ash trees arising from large historically coppiced Ash stools, and in spring, wild flowers.

The opening up of the woodland to public access in the 1970s and 1980s by construction of a network of paths, enabled people to enjoy varying woodland views as they walk or ride through these woods. A broad horse-riding trail runs from north to south through the heart of the woodland and provides a long and impressive vista the entire length of the woodland. These paths enable users to view and experience the mature woodland along with the swathes of Bluebells *Hyacinthoides non-scripta*, Wood Anemones *Anemone nemorosa* (experienced in spring) and other wildflower. Most paths for pedestrians meander in ways that enable constantly varying, but closer views of the woodland and ground flora while maintaining good forward views, while retaining a sense of distance from nearby urban development. At various points, where paths intersect, longer views into the woodland are achieved. At some points, views focus on trees of unusual form or substantial trees remarkable for their size and obvious age. Over some lengths of path good visual access is provided to spring wildflower areas. Some scalloping either side of paths enables more ground flora to be seen at certain locations. Orchids grow alongside a couple of the unsurfaced paths, providing visual interest of a different landscape character from the surfaced path. Some ponds are found close to paths and provide a focal point of landscape interest. The dominant tree canopy species vary across the woodland, as does the presence of older trees and these, as well as variations in the shrub layer, bring different visual characteristics to each compartment.

In addition to the natural features there are numerous wooden sculptures within the woodland (see Plan 5). These have been created since 1990, and continue to be created, by local amateur artist Jack Stephenson. Jack has had a close association with the woodland for eight decades. He was born and brought up within a few hundred metres of the woodland and has continued to live within walking distance. His sculptures are a visual display and celebration of his life and affinity with his environment.

APPENDIX 2:

REPORTS AND ECOLOGICAL STUDIES

1 Reports by The Parks Trust

- a) 'Landscape Maintenance by Term Contract (LM 2013)' – 2013 Edition
- b) 'Landscape Maintenance by Term Contract: North & North-East Parks Contract - TC370 (2013-19)' – *Specific sections: 'Linford Wood' and 'Sheet 11'*
- c) Landscape Maintenance by Term Contract: H4 'TC353' (*specifically pages 16, 17 and 18*) - 2013–19 – The Parks Trust:)
- d) 'Tree Inspection Policy' – The Parks Trust: July 2013 (*amended version*)
- e) 'Code of Practice for Pre-work Inspections: and works associated with tree/shrub removals during the bird nesting season' – The Parks Trust: July 2012
- f) 'The Trust's Operational Practices and Procedures' – 2003 (due for revision)
- g) 'Linford Wood 5-year Plan of Operations: 2010-2015' (approved by Forestry Authority and included in an English Woodland Grant Scheme)
- h) 'Linford Wood 5-year Plan of Operations: 2015-2020' (In preparation in 2014, for presentation to the Forestry Authority to be included in an English Woodland Grant Scheme)
- i) 'Operational Practices, Policies & Strategies' February 2003 (under revision 2014)
- j) 'Code of Practice for Bat Habitats' February 2012
- k) 'Our Commitment to Biodiversity: The Parks Trust' 2010 (reviewed 2014)
- l) 'The Parks Trust Biodiversity Action Plan' 2011
- m) 'Species Lists of Biodiversity in Linford Wood' (in preparation 2014)

2 Ecological Studies in Milton Keynes Reports

From the mid-1970s Milton Keynes Development Corporation commissioned many ecological reports which were published as 'Ecological Studies in Milton Keynes'. The Parks Trust has continued the series. Seventeen of the Ecological Studies are primarily about Linford Wood or contain substantial content about it (*these are indicated with an asterisk*). A further nine Studies have content which includes Linford Wood. The full list of studies relevant to Linford & Stanton Wood up to 2007 is:

- 13. 'Bryophytes of Selected Habitats' – Mead, R (1975)
- *29. 'A Study of the Vegetation of Linford & Stanton Woods' – Orwin, DA (1978)
- 42. 'Terrestrial Invertebrates Part 1: Survey of Coleoptera' – Jackson, M (1979)
- *43. 'Terrestrial Invertebrates Part 2: Survey of Linford & Howe Park Woods' – Smith, AG & McCann, AG (1979)
- *47. 'Common Bird Census of Linford and Wood 1975-1984' – British Trust for Ornithology (1984)
- 61. 'Butterflies' – Brown, D & Tasker, A (1981)
- 62. 'Moths' – Brown, D & Tasker, A (1981)
- *66. 'A Survey of the terrestrial invertebrate fauna of Linford (+Stanton) and Howe Park Woods' – Smith, AG & McCann, AG (1980)
- *68. 'Butterfly Census of Linford Wood' – Lackey, P (1979)
- *70. 'The Effects of Coppicing on the Vegetation of Linford Wood' – Casey, D (1982)
- *72. 'A Survey of the terrestrial invertebrate fauna of Linford Wood and its implications for management' – Smith, AG & McCann, AG (1980)
- 73. 'Survey of the butterflies in Milton Keynes' – Brown, D & Tasker, A (1982)
- 82. 'A Survey of the Larger Fungi of Milton Keynes' – Osley, NJ (1983)
- 87. 'Ponds Survey 1984 & 1985' – Ridge, I (1985)
- *88. 'Vegetation Survey of Linford Wood' – McNab, C (1984)
- *89. 'Linford Wood Management Plan 1985-1989' – McNab, C (1985)
- *104. 'Common Bird Census of Howe Park, Linford and Shenley Woods' – Tasker, A (1987)
- *121. 'Common Bird Census of Howe Park, Linford and Shenley Woods 1993' – Phillips, J (1993)

- 122. 'A Survey of the distribution of bats in parkland of Milton Keynes' – North Bucks Bat Group (1993)
- *123. 'Linford Wood' Vegetation Survey 1993' – Francis, Dr JL (1993)
- 130. 'A Survey of Dragonflies in Milton Keynes' – Phillips, NJ (1995)
- *133b. 'A Survey of the saproxylic Coleoptera of Howe Park, Linford and Shenley Woods' – Plant, CW (1996)
- *141. 'A Survey of Moths at selected sites in Milton Keynes in 1999' – Townsend, M (2000)

- *144. 'A Survey of Butterflies at six selected sites in Milton Keynes 2002-2003' – Townsend, M (2004)
- *150. 'Common Bird Census of Howe Park, Linford and Shenley Woods' – Middlemarch Environmental (2007)
- *514. 'Bat Survey Linford Wood' – Bernwood ECS (2007)

APPENDIX 3:

Conclusions of selected 'Ecological Studies in Milton Keynes' reports and their implications for site management

This section summarises the 'Ecological Studies in Milton Keynes' reports of most significance for an understanding of Linford Wood and Stanton Wood and covers management recommendations made within these. Some sections of these are included in the main report above. The recommendations of individual studies had to be weighed with recommendations from other studies and against the overall objectives for the Wood. Many were implemented in subsequent management.

70. 'The Effects of Coppicing on the Vegetation of Linford Wood' – Casey, D (1982)

This study aimed to investigate the effects of the management regime on the composition of the tree, shrub and field layers of Linford Wood, to provide a basis for conservation management recommendations relating to its vegetation. Surveys were carried out from April to September of 1980, 1981 & 1982 but the report did not cover Stanton Wood west of Saxon Street, V7.

The report gives a brief outline of the history of the wood which includes evidence that coppicing was being carried out at least by 1531 and that at that time a widespread convention was for coppice with standards to involve felling of standards after about 100 years, or in some cases at between 25 and 70 years old. It describes a typical structure of three-storey coppice with standards which may have applied at Linford, with tall standard trees, large coppice of Ash *Fraxinus excelsior* and Field Maple *Acer campestre*, and small coppice (underwood) of Hazel *Corylus avellana* and Hawthorn *Crataegus* spp.. A few Ash stools over 6' in diameter had been found in Linford Wood and these were considered likely to be over 400 years old, i.e. from before 1600.

The study refers to management during the 1970s having been based on the Milton Keynes Development Corporation 1971 Management Plan for the Wood. The management objective of this was "... to create an amenity woodland. It should be inviting to the public, but must be capable of resisting the pressure placed on it by the public". The 1971 Management Plan also noted the importance of the Wood for wildlife. The 1982 report on 'The Effects of Coppicing on the Vegetation of Linford Wood' explained that, on the basis of the 1971 Plan, compartment management including coppicing had generally been carried out to one compartment each year since 1974. Paths and associated drainage ditches had been constructed and some drainage ditches cleared once or twice a year.

The study method for the 1982 report was identification of flowering plants and their density in four quadrats of 1m² randomly-sited in each of 22 sub-compartments, i.e. 88 small quadrats. Data was related to coppice age and other factors. In addition a survey was carried out of the flora of selected lengths of ditch.

A small number of species were noted as either indicative of Ancient Woodlands or for their local interest or rarity. These were:

- Wood pea *Lathyrus sylvestris* [now known as Narrow-leaved Everlasting-pea]
- Broad-leaved Helleborine *Epipactis helleborine*
- Greater Butterfly orchid *Platanthera chlorantha*
- Herb Paris *Paris quadrifolia*
- Twayblade orchid *Listera ovata*

The 'Wood pea' was a single plant at a single location (now known as Compartment 6) found in 1980 and 1981, but not in 1982. Its location was alongside one of the older woodland rides. It is a plant characteristic of rides and wood margins.

Ancient Woodland Indicator (AWI) plant species recorded in Linford Wood that had been associated with Ancient Woodland in Eastern England by Rackham in 1980 were:

- Wood anemone *Anemone nemorosa*
- Remote Sedge *Carex remota*
- Hawthorn *Crataegus monogyna*
- Bluebell *Endymion non-scriptus* [now *Hyacinthoides non-scripta*]
- Broad-leaved Helleborine *Epipactis helleborine*
- Yellow Archangel *Galeobdolon luteum* [now *Lamiastrum galeobdolon*]
- Hairy St John's-wort *Hypericum hirsutum*
- Dog's Mercury *Mercurialis perennis*
- Three-nerved Sandwort *Moehringia trinervia*
- Wood Forget-me-not *Myosotis sylvatica*
- Bird's-nest Orchid *Neottia nidus-avis*
- Early-purple orchid *Orchis mascula*
- Herb Paris *Paris quadrifolia*
- Greater Butterfly orchid *Platanthera chlorantha*

Additional Ancient Woodland Indicator (AWI) plant species recorded in Linford Wood that were associated with Ancient Woodland in Southern England (by Buchanan in 1979) were:

- Wood small-reed *Calamagrostis epigejos*
- Midland Hawthorn *Crataegus monogyna*
- Narrow-leaved Everlasting-pea *Lathyrus sylvestris*
- Aspen *Populus tremula*

The assessment of the effects of coppicing concluded that the maximum development of ground flora took place in the 'open light stage' of the first seven years, though with little development in the year after coppicing and dramatic increases in the second and third years followed by slower development. To some extent this depended on conditions at the critical two-year point in the cycle when plants had to respond quickly before the beginning of a darker phase. In a wet spring, rushes *Juncus spp.* and Wavy hair-grass *Deschampsia flexuosa* may dominate, forming habitat typical of a fen. Newly coppiced areas are invaded by annuals and biennials such as: Hawkweeds *Hieracium spp.*, Lesser Burdock *Arctium minus*, and Herb-Robert *Geranium robertianum*. Most shade-tolerant perennials persist through the coppicing cycle. Open-habitat perennials increase in the first few years after coppicing but reduce in number after about 4-5 years. Dog's Mercury *Mercurialis perennis* does not survive coppicing well, but it can form large stands in drier, neglected areas. It tends to flourish where there is no coppicing and is significant in shading out other flora, reducing species diversity.

A general conclusion of the study was that "... a rich and diverse flora has been restored as a result of coppicing after 80 or more years of neglect." and "... a breeding bird census carried out in 1979 determined that there had been an increase of territory-holding species following management in a number of sub-compartments". It therefore recommended that a coppicing-with-standards system should be continued. On the basis of the evidence of the study, more specific management proposals were made for different aspects of the Wood. These were:

1 Planting

The density of standards should be around 8-12 per acre, but coppice regrowth had been poor in some sub-compartments. Where restocking with standards is required, native species of tree appropriate to this woodland type should be planted.

2 Tree canopy

As Ash *Fraxinus excelsior* trees were regenerating well, no more ash should be planted, but the other main species appropriate to this woodland type should be favoured, i.e.: Pedunculate Oak *Quercus robur* and Field maple *Acer campestre*.

3 Shrub layer

In some areas the shrub layer was lacking, so recommendations were made for planting of specific species:

- Hazel *Corylus avellana*
 - Guelder-rose *Viburnum opulus*
 - Crab Apple *Malus sylvestris*
 - Spindle *Euonymus europaeus*
 - Holly *Ilex aquifolium*
- ... and in wetter areas:
- Goat Willow *Salix caprea*
 - Grey Willow *Salix cinerea*

4 Perimeter of mature vegetation at coppice edges

A recommendation was made relating particularly to conservation of birds. This was for a vegetation 'edge' of shrubs and some trees to be left around newly-coppiced areas. These should usually be a few metres wide, but wider near to well-used paths. This would provide an undisturbed line of vegetation as habitat for breeding birds. In other locations, 'islands' of denser shrubs and trees should be left within newly-coppiced areas for the same purpose.

5 Field layer

Where Ancient Woodland Indicator (AWI) plant species are found, 'islands' of mature vegetation should be left to assist these shade species. Seeds of these plants are not generally found in the dormant seed store in the soil and these species are poor at spreading and colonising. Where groups of these plants are found, small 'islands' of trees and dead and dying timber should be left to continue to provide them with shade.

6 Careful control of some vegetation

Areas of dense scrub, such as Blackthorn *Prunus spinosa* and Bramble *Rubus fruticosus* were providing valuable nesting sites for birds such as warblers, and habitat for many insects. In some compartments, scrub was dominating to the detriment of tree regeneration and the ground flora. In these areas, scrub, particularly around the base of trees should be controlled. A Sycamore *Acer pseudoplatanus* was seeding profusely. It was recommended that all Sycamore should be removed.

7 Control of herbaceous growth around trees

In some sub-compartments Tufted Hair-grass *Deschampsia cespitosa* was the dominant ground layer species. In most compartments, coppice regrowth seemed unaffected by this, but in compartments with only a few standards and poor coppice regrowth it was likely to affect their growth. In these cases hand-cutting of such species around the base of trees should be used to control such aggressive growth of *Deschampsia cespitosa*.

8 Fires

Fires should be limited to as few sites as possible as it either prevented regrowth of coppice stools, where too close to these, or led to colonisation of sites by aggressive species such as: Rosebay Willowherb *Chamaenerion angustifolium* [now *Chamerion angustifolium*] and Creeping Thistle *Cirsium arvense* which seed and can quickly colonise other areas.

9 Rides

Some of the rides provided examples of unimproved grassland with flowering plants such as Greater Bird's-foot Trefoil *Lotus uliginosus* and Purple Loosestrife *Lythrum salicaria* both of which are attractive to insects. Some *Epipactis helleborine* Broad-leaved Helleborine, which is an unusual woodland plant, were also found. A single cut of the grass in these locations in September would promote these plants.

10 Ditches

The ditches supported a wide diversity of flowering plants. These would be sustained by ditch clearing of only the base and lower slopes, with the material piled on the woodland side of the ditch, and ditch clearing after two years, not annually.

72. 'A Survey of the terrestrial invertebrate fauna of Linford Wood and its implications for management' – Smith, AG & McCann, AG (1980)

Four compartments at different stages of the coppicing management cycle were sampled for invertebrates, and 100 species were found which included: 63 Insect (six-legged), 25 Arachnid (eight-legged, spiders, etc), 8 Myriapod (millipedes and centipedes), 3 Gastropod (snails & slugs), and 1 Isopod (woodlice, etc) species.

The tentative conclusions were that the effects of rotational coppicing had been to:

- reduce some of the plant-eating insect and spider species where coppicing had reduced available foliage and habitat for invertebrates living in the ground layer, because there is initially less leaf litter and the ground layer becomes drier
- initially increase the abundance of leaf beetle, fly and plant-bug species where herbaceous vegetation grew back, as well as the diversity of carnivorous insects such as ground-beetles, rove-beetles, soldier-beetles, robber-flies and parasitic wasps; but this trend began to reverse 5 ½ years after coppicing, though some of the increase may persist much longer

In other words, coppicing initially reduces number and diversity of invertebrate species and numbers, then leads to a significant increase which tails off over time.

The main recommendations for management were that:

1. "... the management regime is of high conservation value so long as the system of rotational coppicing is maintained ..."
2. It was "important also to ensure that there are areas of woodland which remain unmanaged indefinitely to protect species which are susceptible to disturbance" and that such 'wilderness zones' should occupy a greater total area than just compartment 16."
3. "The wildlife conservation value of the present management system would be greatly increased if at least some quantities of timber and brash resulting from fellings or natural death of trees be retained within the woodland and allowed to decompose." "...to provide essential habitats for the larger number of species ... which depend directly or indirectly on decaying wood ... and which constitute an important component of lowland woodland fauna."
4. As the initial trends of increased invertebrate species following coppicing appear to slow after the initial five years, there was uncertainty about longer-term effects. "It will thus be important to continue the careful monitoring of the post-management compartments ... particularly bearing in mind that the reservoir of fauna in the unmanaged compartments must necessarily decrease in quantity as more compartments are progressively brought within rotational management"

82. 'A Survey of the Larger Fungi of Milton Keynes' – Osley, NJ (1983)

Selected sites of potential interest for fungi were surveyed throughout Milton Keynes in autumn 1982 and spring 1983. 212 fungi species were identified, of which 142 were mushrooms or toadstools; the other 70 were smaller forms of fungi. The richest site for fungi was Linford Wood. It had over half (114) of the different species found at all sites surveyed in Milton Keynes; and 46 of these were recorded nowhere else in the survey of other Milton Keynes sites. Many of the species found at Linford Wood are commonly found on deadwood in deciduous woodland. Some species were found only where leaf litter had accumulated. Other species were found on bare soil beside paths, as these sites and the immediate margins of woodland are good sites for fungi. The hard-surfaced paths and deep ditches may reduce this potential. Where clearings become occupied by coarse grass and Bramble *Rubus fruticosus* there are fewer of the larger fungi. Stanton Wood has a much smaller list of fungi: only 26 species and only two of these were not found in Linford Wood.

89. 'Linford Wood Management Plan 1985-1989' – McNab, C (1985)

The 'Linford Wood Management Plan 1985-1989' reviewed the Development Corporation's progress with the Wood after the first ten years of the rejuvenation scheme. It concluded that: a) the work has been necessary but had not always been done in the right places, with planting spread throughout the woodland rather than in scrubby areas that most needed it; b) exotic species had been unnecessarily introduced; c) the success of planting had been very variable, with some successes and many failures; d) sudden increases in light conditions had accelerated growth of weed species such as Bramble *Rubus fruticosus*, and weeding had not kept pace with this; e) scrub had suppressed tree regeneration in larger clearings; and f) natural regeneration of timber species was generally poor. Since that time no planting of exotic species has been undertaken. Except for compartment 8 – which was retained as an area of non-native species – a gradual removal of inappropriate species has been part of management, with the aim of completing this by 2020.

The Management Plan proposed application of four woodland management systems, to be applied to specified sub-compartments: a) 'Irregular Shelterwood' for most sub-compartments, b) coppice with standards for a few sub-compartments, c) single-storied high forest in other sub-compartments, and d) some non-intervention areas to provide scrub of habitat value. Within the woodland there are also areas of amenity grassland to be managed as 'Recreation Vegetation Management' and areas of wildflower-seeded grassland.

The 'Shelterwood' system was intended to create intimate mixed-species woodland approximating to 'ancient woodland' by a gradual restoration process in which older trees provide protection for younger ones, often in groups rather than singly. It was to be of two types: a) enrichment planting; and b) natural regeneration.

[The 'Irregular Shelterwood' version of the process can take over 20 years, sometimes more than 50 years, and involves:

- 1) *Preparatory felling*: late thinning to encourage development of crowns of future seed bearers;
- 2) *Seeding felling*: once it is clear that there is going to be a good seed crop, a third to a half of the stems are removed. The understorey and any regeneration already present are also removed. Cultivation may be carried out to assist seedling establishment;
- 3) *Secondary fellings*: usually 2–4 fellings at 3–5 year intervals, with timing and intensity carefully regulated to allow seedlings to grow, but also to prevent rank weed growth;
- 4) *Final felling*: the last secondary felling in which the remaining overstorey is removed.]

'Coppice' management was to be applied to limited areas only, where stool potential was high, with coppicing and thinning works to be undertaken on an approximate 15 year cycle.

'High Forest Single Storey' was to be applied to larger areas, using conventional replanting and management, where there were less than 10 mature trees per hectare retained as overstorey.

'Non-intervention' areas were to be reviewed every ten years.

'Rotational Scrub Cutting' was also to be applied wherever this was needed, to encourage particular species or eliminate others, or to create glades or ride-side widening (scalloping), for ecological purposes, or to improve the appearance of the woodland for users.

Some sub-compartments were to have more than one management regime). The proposed distribution of management types by sub-compartment was:

- 'Irregular Shelterwood': 1, 1a, 2, 3, 3a, 4, 4a, 5, 5a, 6, 7, 7a, 8, 9, 10, 10a, 11a, 12a, 13, 13a.
- 'High Forest Single Storey': 2a, 6a, 9a.
- 'Coppice' (in sub-compartments also managed as 'Irregular Shelterwood'): 3, 4, 5, 5a.
- 'Rotational Scrub Cutting' (in sub-compartments also managed as 'Irregular Shelterwood'): 2, 4, 5.
- 'Non-intervention': 11, 14a, 15a, 16, 16a.
- 'Recreation Vegetation Management': 4a, 9a, 12, rides, entrances and car-parks.

The 'Shelterwood' system was intended to create intimate mixed-species woodland approximating to 'ancient woodland' by a gradual restoration process in which older trees provide protection for younger ones, often in groups rather than singly. It was to be of two types: a) enrichment planting; and b) natural regeneration.

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'Rotational Scrub Cutting' was also to be applied wherever this was needed, to encourage particular species or eliminate others, or to create glades or ride-side widening (scalloping), for ecological purposes, or to improve the appearance of the woodland for users.

123. 'Linford Wood' Vegetation Survey 1993' – Francis, Dr JL (1993)

A comprehensive study of the vegetation of Linford Wood was carried out in 1993 by Dr Joanna Francis, using standard NVC (National Vegetation Classification) survey techniques. Monitoring was carried out of: canopy, understorey and field layer species and other features such as soils and hydrology. Ride, track, ditch and pond flora were recorded separately. Stanton Wood was not included.

She did this by carrying out a comprehensive survey of 10m x 10m quadrats in almost every 50m x 50m plot throughout the woodland. These covered 115 of the 125 plots, omitting only those plots that were not fully in the wood and those not intersected by a path or ride (as rides, tracks and ditches were surveyed separately). The methodology requires assessment of the abundance of each species, total vegetation cover, vegetation height and other factors.

A total of 118 field layer species were recorded of a total of 184 species in the field layer, understorey and canopy. 130 of these species were found along the rides and ditches. Some comparisons were made with a previous vegetation survey carried out in 1984 and with lists from plant surveys in the 1970s and 1980s. Plant lists from the 1970s included 210 species; those from 1980-1984 included 179.

The main canopy species were:

- Ash *Fraxinus excelsior* (in 93% of the quadrats).
 - Field Maple *Acer campestre* (in 55% of the quadrats).
 - Pedunculate Oak *Quercus robur* (in 49% of the quadrats).
- Canopy cover was 81-100% in the majority of sample quadrats, but many had less than 60% understorey cover. Blackthorn *Prunus spinosa* was sometimes dominant in the shrub layer.

The species most widespread in the field layer and found in over 70% of quadrats were:

- Bramble *Rubus fruticosus*.
- Dog's Mercury *Mercurialis perennis*.
- Bluebell *Hyacinthoides non-scripta*.
- Enchanter's-nightshade *Circaea lutetiana*.
- Ground-ivy *Glechoma hederacea*.

Other widely-dispersed field layer species were:

- Wood Anemone *Anemone nemorosa*.
- Hairy-brome *Bromopsis ramosa*.
- Wood-sedge *Carex sylvatica*.
- Giant Fescue *Festuca gigantea*.
-

All of these field layer species are characteristic of NVC type W8 woodlands.

Some of the field layer species are associated with dryer areas:

- Bluebell *Hyacinthoides non-scripta*
- Yellow Archangel *Lamiastrum galeobdolon*
- Dog's Mercury *Mercurialis perennis*
- False Brome *Brachypodium sylvaticum*

Species present that thrive in wet areas were:

- Tufted Hair-grass *Deschampsia cespitosa*
- Meadowsweet *Filipendula ulmaria*
- Marsh Thistle *Cirsium palustre*
- Soft Rush *Juncus effusus*

The distribution of these species of dryer and wetter areas is uneven across the Wood because some areas hold water more than others.

Another influence on the distribution of field layer species is the amount of light they receive, so some are concentrated along rides and paths [particularly those that are east-west and those without hard surfaces and ditches] others are hidden within the more shaded areas.

Five rarer plants are present or locally abundant in Linford Wood. These are:

- Wood Small-reed *Calamagrostis epigejos*
- Broad-leaved Helleborine *Epipactis helleborine*
- Herb Paris *Paris quadrifolia*
- Greater Butterfly Orchid *Platanthera chlorantha*
- Early-purple Orchid *Orchis mascula*
- Sanicle *Sanicula europea*.

29 of the species recorded in 1993 are southern Ancient Woodland Indicators (AWI); 7 were trees & shrubs, the other 22 were field-layer species.

The AWI trees and shrubs were:

- Field Maple *Acer campestre*
- Crab Apple *Malus sylvestris*
- Aspen *Populus tremula*
- Wild Cherry *Prunus avium*
- Red Currant *Ribes rubrum*
- Field Rose *Rosa arvensis*
- Guelder-rose *Viburnum opulus*.

The AWI field layer species were:

- Common Couch *Agropyron caninum*
- Wood Anemone *Anemone nemorosa*
- Hairy-brome *Bromopsis ramosa*
- Wood small-reed *Calamagrostis epigejos*
- Remote Sedge *Carex remota*
- Wood-sedge *Carex sylvatica*
- Pignut *Conopodium majus*
- Broad-leaved Helleborine *Epipactis helleborine*
- Giant Fescue *Festuca gigantea*
- Bluebell *Hyacinthoides non-scripta*
- Yellow Archangel *Lamiastrum galeobdolon*
- Great Wood-rush *Luzula sylvatica*
- Wood Millet *Milium effusum*
- Early-purple Orchid *Orchis mascula*
- Herb Paris *Paris quadrifolia*
- Butterfly Orchid *Plantathera chlorantha*
- Wood Meadow-grass *Poa nemoralis*
- Barren Strawberry *Potentilla sterilis*
- Primrose *Primula vulgaris*
- Sanicle *Sanicula europea*

- Betony *Stachys officinalis*
- Black Bryony *Tamus communis*

Six of the 29 AWI species are uncommon in woodlands of this particular type (NVC W8) but may become locally abundant in such areas in suitable conditions. These are:

- Wood Small-reed *Calamagrostis epigejos*
- Broad-leaved Helleborine *Epipactis helleborine*
- Early-purple Orchid *Orchis mascula*
- Herb Paris *Paris quadrifolia*
- Butterfly Orchid *Plantathera chlorantha*
- Sanicle *Sanicula europea*

However, Sanicle is very rare in Linford Wood, as are the non-AWI species: Pignut *Conopodium majus* and Goldilocks buttercup *Ranunculus auricomus* which were also found in small numbers.

Analysis of the data indicated that Linford Wood is remnant ancient woodland of the 'W8: Ash-Maple-Mercury' stand type ('W8: *Fraxinus excelsior-Acer campestre-Mercurialis perennis* Woodland'). Within the 31 management compartments studied there were also areas of the sub-community types: W8a, W8b, W8c and W22 'Blackthorn-Bramble' scrub community, as well as another 13 stand types.

General conclusions were that:

- "Species diversity throughout the wood is high, although varying with management."
- "It has good structural and species diversity, considering its very urban nature and heavy public use"

Eight specific management recommendations were made. They were that:

1. **Coppice areas** should be larger than they had been and a few entire areas of about 1ha should be managed in that way. The purpose of this was to increase local homogeneity of plants, i.e. to spread plants characteristic of NVC W8 ancient woodland more widely.
2. **Soil moisture levels** should be maintained. Dr Francis thought that "... current drainage is possibly too severe ... allowing areas of standing water to dry up in summer ..." and "Damp and wet areas are a distinct feature of this woodland type, and diversity should be maintained by reducing water loss". She thought that the construction of drainage ditches had reduced moisture levels. An indicator of the woodland becoming dryer had been the wider spread of Dog's Mercury *Mercurialis perennis*, which is characteristic of dryer aerobic soils. Although this is an ancient woodland indicator (AWI) other AWI species in the woodland require wetter conditions.
3. **Bramble** *Rubus fruticosus* **should be controlled from becoming too dominant.** Although Bramble is an important constituent of the W8 woodland type it can reduce field layer plant diversity. As it is shade tolerant it does not die back as other species do, when shade increases; "... its dominance should be reduced by regular cutting in certain target areas ... This would allow the proliferation of other, more attractive field layer species. Bramble is also valuable to many birds and invertebrates so control must be measured, leaving islands of mature scrub vegetation to benefit shade-tolerant Ancient Woodland Indicator plants and nesting birds.
4. Of the 184 plant species found in Linford Wood, 130 were recorded **along rides and ditches** where there is more light. Mowing and clearing regimes sensitive to these species should be sustained to preserve species diversity in these locations.
5. In contrast, many of the **rarer field layer species** exist vegetatively in shady, undisturbed areas, but can proliferate for a while in recently-cleared areas before competition from other plants builds up. Some are maintained by the coppicing cycle but cannot spread; these include Early-purple Orchid *Orchis mascula*, Herb Paris *Paris quadrifolia*, Greater Butterfly Orchid *Platanthera chlorantha*. Where certain areas are found good for these rarer species, they can be enhanced by reducing competition from other plants through keeping these competitors down by an early and late cut. These rarer plants can then seed and spread. Broad-leaved Helleborine *Epipactis helleborine* is found mainly along the paths and rides and should benefit from management of competitors in this vegetation. Sanicle *Sanicula europea* is characteristic of the field layer of W8, but is very scarce in Linford Wood. It is slow-growing with weak seedlings, but should be encouraged by careful clearing or coppicing. Surprisingly some of the Sanicle was found in the

new plantation in 8a, but may need surrounding grasses to be controlled, possibly by selective graminicides.

6. Some **new tree planting** had been needed to rejuvenate and enhance the genetic stock, but there should be no more planting of exotic species or indigenous species not previously found in this woodland. Examples of those species of which no more should be planted were Hornbeam *Carpinus*, and Lime *Tilia* species. Where Hornbeam had already been planted, it was suggested that these should be coppiced as this would also benefit the field layer in these areas.
7. **Elms** can spread aggressively through suckering and they were present in the west of Linford Wood. Where they spread, they rapidly gain height and overtop other trees. They also increase the level of calcium in the soil which contributes to rapid nutrient turnover, so species such as Elder *Sambucus nigra* and Nettle *Urtica dioica* then become prominent in the underwood near them, which is not desirable. The spread of Elms should be checked.
8. **Deadwood** was poorly represented in Linford Wood. It is an important part of the ecosystem of ancient woodland. Specialist invertebrates depend on deadwood so measures should be taken to increase deadwood to retain these invertebrates and to encourage gradual recolonisation by such species.

133b. 'A Survey of the Saproxyllic Coleoptera of Howe Park, Linford and Shenley Woods' – Plant, CW (1996)

The aim of the survey was to collect data on the deadwood beetle fauna of three woodlands, to provide an adequate database to enable The Parks Trust to monitor future management works. The list of 241 beetles is of all types of beetle and only seven of these were associated with "saproxyllic habitats in ancient pasture woodland" and none of these were in Linford Wood. But there are other species which are not strictly associated with ancient pasture woodland and may occur in woodland or at other sites with deadwood; of the 20 of these species found in the three woodlands, 9 were found at Linford Wood. Of the 241 beetle species recorded for the three woods, 143 were found in Linford Wood, which was fewer than for Howe Park Wood (166 species) or Shenley Wood (182 species) although Linford Wood is considerably larger than the other two woods.

One conclusion was that the past felling of trees and the associated clearance of dead timber had left the three woods with a relatively small deadwood resource, and that deadwood left on the ground was generally too recent to be of particular value to deadwood species of beetle. As the deadwood resource ages and is increased, by management which leaves standing deadwood and fallen deadwood, "the saproxyllic beetle fauna will not, sadly, suddenly undergo a dramatic increase in diversity. It will increase, but this rise will be slow and gradual over a great many years." "Saproxyllic species are extremely sedentary, often restricting themselves to a single tree or log in the case of some species."

A further conclusion was that although saproxyllic beetles are indicators of the deadwood habitat, "a great many other invertebrate groups are also dependent upon this ecological niche" and that improvement of this habitat is likely to be of benefit to most of these other groups. It was therefore suggested that future monitoring should test this by recording other, easily-recorded species such as some of the hoverflies and craneflies which breed in rot-holes, as well as beetles.

Another conclusion was that "...the present management regime appears to be working, and some suggestions for further management into the future are proposed." These were:

1. Though any deadwood can be of value, "... timber of a large diameter – both standing and fallen – is especially important". It was suggested that selected species of a variety of species, including Oak *Quercus robur*, should be felled and left to decay.
2. "The simplest rule about dead wood is that it should be left where it is to undergo natural decay ... Cutting up and removing, or burning dead and fallen trunks or major branches is a reprehensible act which can never be justified in conservation terms."
3. "If it is necessary to move fallen timber it should be moved into partial shade ... the richest fauna tends to be supported by material in partial shade". "Large trunks should be dragged to their new position without being cut into convenient smaller sections."
4. "Timber which is truly in excess of requirements should be stacked to form loose log-piles whilst finer materials can be used to make litter piles. A few large piles are to be preferred over several smaller ones."

5. "The position of any very old trees and any trees with sap runs or rot holes, splits ... and those regularly producing bracket fungi should be carefully noted and the trees preserved throughout any management programme. It is not good conservation practice to attempt to increase the fallen dead wood resource by selecting for felling trees which are already dead or diseased ... When management calls for a reduction in the number of trees the younger and healthier ones should be selected for felling."
6. "Cut stumps should not be killed or chemically treated but left to regenerate or decay as nature dictates. Dead stumps, and particularly decaying rootstocks, have a distinctive and important saproxylic fauna, which includes some of our rarest hoverflies."
7. "A potential problem ... is that of maintaining the continuity of suitable timber. Modern day small and isolated woodland units tend to be dominated by trees which are all, very broadly, of equal age and this has serious implications for the future maintenance of the stock of dead timber. The thinning programme ... has been carefully designed with this problem in mind and is an excellent start ... an management programme should be regarded as an ongoing programme. ... Provision needs to be made now for assessment of the overall timber resource at regular intervals of, perhaps, in the order of fifteen years and a flexible but long-term management plan for this resource (for the next hundred years or more) should be committed to paper."

141. 'A Survey of Moths at selected sites in Milton Keynes in 1999' – Townsend, M (2000)

Moths were studied, between April and November 1999 by direct searching and light-traps, at six sites in Milton Keynes including the three ancient woodlands. The overall species total for Milton Keynes was found to be between 350 and 400 species, not untypical for southern England. Three measures of biodiversity were applied: 'Species Richness' (number of species present), 'Diversity' (Alpha diversity index), 'Species Quality Index' (SQI related to the rarity of species). The report makes the point that: "1999 was generally considered to be a poor year both for weather and insect numbers, which are in any case known to vary considerably from year to year, even for the same species. For this reason, it is likely that a small number of species, particularly the scarcer ones, may have been missed from some or all of the sites during the survey."

Of the ancient woodlands, Shenley Wood was of the highest value. Linford Wood came next on one score, but Howe Park was ranked higher because of the higher number of rarer or more local species. It was suggested that what distinguished Shenley Wood might be that "earlier and more drastic management" had taken place here than in the other two ancient woodlands.

The summary of Linford Wood is this: "The situation in Linford is somewhat different. Many of the rides, although fairly wide, are still mostly rather shaded, and the vegetation in them is rather unvaryingly rank as a result. In the 1993 botanical survey, the rides were described as the best element of the woodland in terms of plant species richness. It is recognised that this must also make a positive contribution to insect diversity, but the rides in Linford perhaps do not present as great a range of microclimate as in the other woods, which is often as important as the presence of the food-plant to specialised insects. In contrast, much of the main ride, although very wide and open (and hence sometimes rather windswept) is subject to much human disturbance, horse-riding etc. or is otherwise managed as amenity. This situation could have a detrimental effect on the wood, because it reduces the availability of woodland edge habitat, and consequently limits the ability of the associated fauna (see also section 5.3.2) to become established. However, it is difficult to see how this could be avoided and the relatively high 'Alpha' for Linford suggests that as in Shenley and Howe Park, management is likely to have had a positive effect overall." But the: "Low number of moths trapped at Linford Wood is of concern".

The report says: "In Linford Wood, everything possible should be done to encourage regeneration and spread of the small area of Aspen *Populus tremula* present. It is unlikely that Light Orange Underwing [*Archiearis notha*] is present, but a number of other species would benefit, such as the nationally local Poplar Lutestring [*Tethea or or*]."

The report also says: "One aspect of the management of all the woods that could be improved is that of the woodland edges. In many places, the grass is mown right up to the edge of the wood. This is particularly noticeably at Shenley and Linford, but also occurs on at least one side of Howe Park. An

uncut margin of up to 5 metres would allow a woodland edge to develop, with uncut grassland and emergent scrub, along with a further zone that is only cut in late summer. This would be highly beneficial, and would also be more aesthetically pleasing.”

It also says: “The larvae of the Mere Wainscot [*Chortodes fluxa*], a woodland specialist which is present in all three woods, only feeds in the stems of Wood Small-reed [*Calamagrostis epigejos*], which grows in the rank vegetation of damp rides and clearings. Therefore, the maintenance of this habitat is essential for the survival of this moth. The eggs are laid in a leaf-sheath in July and August and the larvae feed until the following day, when they leave their habitation and pupate on the ground (Heath and Emmet, 1983). Therefore, any removal of large stands of the food-plant e.g. by weeding or ride edge management operations, should be avoided if at all possible. The larvae of the White-marked [*Cerastis leucographa*] have never been found in the wild, although they are not difficult to rear in captivity (Porter, 1997). Therefore, it is difficult to make management recommendations on their behalf, other than those that apply generally.”

More specifically, the report says: “Invertebrates are susceptible to sudden changes in a well-established habitat, and the pressure on the woodland community will have increased, albeit temporarily, by the disturbance caused by the extensive management that was implemented in all the woods ... However, there is no evidence from this survey that management has been detrimental to the moths in the Milton Keynes woods. Indeed ...it is most likely to have been helpful in preventing decline.”

Another point made in the report is: “The detrimental effects of isolation of good quality habitat within an urban setting is an interesting and highly relevant conservation topic. It is well-worth examination in such a survey as this, not least because little hard data has been gathered. Milton Keynes is atypical in terms of layout, having far more open spaces, wider verges, etc. than older towns. Some of this has been managed sensitively (e.g. the R. Ouzel corridor and the ancient woodlands) and the existence of the six survey sites is testimony to that. However, much consists of a highly landscaped mixture of mown grass, plantations with exotic trees and ornamental shrubberies, which have little entomological interest, so the isolation effect is still in operation for the majority of species.” “Moreover, several woodland species were recorded *only* in Linford, including Pale Oak Beauty (*Serraca punctinalis* Scopoli), Dark Marbled Carpet (*Chloroclysta citrata* Linnaeus) and Ingrailed Clay (*Diarsia mendica* Fabricius). Therefore, the results of the 1999 survey do not provide any firm evidence for any detrimental urbanisation effects on the characteristic woodland moth fauna in Linford Wood.”

144. ‘A Survey of Butterflies at six selected sites in Milton Keynes 2002-2003’ – Townsend, M (2004)

Butterfly species were surveyed in 2002 and 2003 at six sites in Milton Keynes including the three ancient woodlands, using transects as the main method. The overall total for these six sites was 26 species. The largest numbers were generally at sites with large expanses of open grassland, or a mix of open and damper, more shaded habitats. Seven of the species were those classified as Nationally Local.

In Linford Wood there were 21 UK resident species and two migrant species. The most common was the Ringlet *Aphantopus hyperantus*, with more than twice the number found than Large Skipper *Ochlodes venata* and Speckled Wood *Pararge aegeria*. The least abundant species found here were: Marbled White *Melanargia galathea*, Small Tortoiseshell *Aglae urticae*, Holly Blue *Celastrina argiolus* and Painted Lady *Vanessa cardui*. One of the conclusions was that “The appearance of a greater variety of species than in the wood, in one relatively small isolated flowery bank outside Linford shows that there is much potential.”

Another conclusion of the study was “that the sites were being managed favourably for butterflies, but their quality could be further enhanced by less intensive and less extensive management of the woodland rides, woodland edges and open grasslands. Here, mowing could be rotational and reduced in selected areas so that more vegetation is left uncut in any given year, in order to increase the size of suitable breeding areas for certain species ...”.

The report discussed the “apparent loss of Wood White *Leptidea sinapis*, Black Hairstreak *Satyrrium pruni* and White-letter Hairstreak *Satyrrium w-album* from the area, and the scarcity of White Admiral

Limenitis camilla...” and said “It is concluded that although some habitat is suitable for these species, it is too isolated and may not be large enough for sustainable populations. It appears increasingly unlikely that Black Hairstreak is still present, but it is noted that management is ongoing at Howe Park to encourage it.” Within ten years after the study the Black Hairstreak was found at Howe Park Wood.

The report went on to say: “White Admiral, a more mobile species, could return to the woodland sites, and measures to improve conditions for it are recommended, including a survey for the foodplant to target areas for management.”. The foodplant for the White Admiral is Honeysuckle *Lonicera periclymenum* growing in semi-shaded conditions.

The report also said: “It is very unlikely that Wood White is still present, but it is possible that White-letter Hairstreak remains in small numbers, either on sites covered by this survey, or on others in Milton Keynes.”

150. ‘Common Bird Census of Howe Park, Linford and Shenley Woods’ – Middlesbrough Environmental (2007)

The 2007 Common Bird Census of the three ancient woodlands in Milton Keynes provided an update of the two previous ones in 1987 and 1993 and enabled comparisons between them. The method is that of the BTO (British Trust for Ornithology) and uses territory mapping to estimate numbers of each species.

The surveys found less of interest than might be expected for these sizes of semi-ancient woodland. In 1987 the number of bird species breeding in Linford Wood was 27, compared with 36 in Howe Park Wood and 35 in Shenley Wood, but a later survey in 1993 showed some recovery in Linford Wood with more species and additional breeding territories. Further comparisons were made by the Common Bird Census carried out in 2007. In 2007 Linford Wood held 28 breeding species, the same number as Howe Park Wood and Shenley Wood, and these included:

- two National Biodiversity Action Plan species – Bullfinch *Pyrrhula pyrrhula* and Song Thrush *Turdus philomelos*
- three Red List Species of Conservation Concern – Marsh Tit *Poecile palustris* as well as Bullfinch and Song Thrush
- four Amber List Species of Conservation Concern – Dunnock *Prunella modularis*, Goldcrest *Regulus regulus*, Woodpecker *Picus viridis* and Stock Dove *Columba oenas*

The 27 species of breeding bird in Linford Wood held 327 territories in 2007, fewer than in 1993 when there were 364 territories. Notable declines over the 14 intervening years were: Blackcap *Sylvia atricapilla* (a migrant species that nests at low level in dense bramble and other scrub); Chiffchaff *Phylloscopus collybita*, Bullfinch *Pyrrhula pyrrhula*, Coal Tit *Periparus ater*, Marsh Tit; Rook *Corvus frugilegus*; Starling *Sturnus vulgaris*; and *Certhia familiaris*. Birds that had significantly increased territories were: *Turdus merula*; Great-spotted Woodpecker *Dendrocopos major*; Green Woodpecker *Picus viridis*; and Wood Pigeon *Columba palumbus*. Over the 20th century, in line with national trends, other breeding species have been lost from the three main woodlands in Milton Keynes, The 2007 report noted that “there has been a noticeable decline in the number of breeding species within each of the surveyed woodlands with a loss of the following breeding species” Cuckoo *Cuculus canorus*, Mistle Thrush *Turdus viscivorus*, Spotted Flycatcher *Muscicapa striata*, and Willow Tit *Poecile montanus* (a species that has declined nationally and increasingly shrunk its distribution northwards, though at least one was hanging on in the nearby Hanson Centre woodlands in 2014) “The loss of all of these species, with the exception of Mistle Thrush, reflects the national picture”

The 2007 Common Bird Census (CBC) report concluded with eight recommendations:

1. Conduct annual CBC breeding bird surveys to provide information on population trends and relative value of habitats for birds
2. Continue with the woodland management practices then in place: coppicing, ride enhancement and grassland mowing regimes used at that time
3. Create more structural diversity by undertaking thinning and coppicing if some of the woodland
4. Create a ‘graded edge’ around each woodland area, where possible

5. Consider planting one or two areas with a wildbird seed mix to provide winter food for finches, and potentially for buntings which were species with the potential to be attracted to stay and breed. This was recommended for Shenley Wood where there appeared to be the potential on grassland areas outside the Wood
6. Maintain standing and lying deadwood to provide nesting sites and invertebrate prey for birds
7. Install a selection of bird boxes (including new owl boxes) if these can be monitored and maintained
8. Update information boards for the public to say which bird species are present

514. 'Linford Wood Milton Keynes: Bat Survey & Assessment 2009' – Bernwood Environmental Conservation Services (2010)

The aim of the 2009 Bat Survey was to establish what species of bat were present in Linford Wood. Historical data from 1994 was reviewed and transect surveys were carried out in 2008 and 2009 along paths and rides. Bat boxes were erected in 2008 and these were monitored in 2009. Comparisons were made with transect surveys over the same years in Shenley and Howe Park Woods.

The Linford Wood Bat Survey found three species positively confirmed and a further three species unconfirmed. Activity levels were broadly similar in the three woods, though Pipistrelle *Pipistrellus spp.* activity in Linford Wood was generally higher. Levels of *Myotis* species and Brown Long-eared Bats *Plecotus auritus* were very low in all three woods compared with typical woodlands in the wider area, which may be because these species are less tolerant of lighting and fragmented habitats. The exception was the possible presence of the Serotine Bat *Eptesicus serotinus* in Linford Wood.

The Common Pipistrelle *Pipistrellus pipistrellus* was found on almost all rides and transects and the Soprano Pipistrelle *Pipistrellus pygmaeus* was encountered less frequently. *Myotis* species (probably Natterer's *Myotis nattereri*) were registered on all survey visits. Noctules *Nyctalus noctula* were detected in circumstances which indicated that they were roosting in or close to Linford Wood. Serotines *Eptesicus serotinus* were recorded on a few occasions, which is remarkable as they have not been recorded in Milton Keynes before and are rare in Buckinghamshire.

The most bat activity was detected within the north-western side of the Wood, the central ride and the southern area (Compartment 8 where the Common Pipistrelle was found among conifers).

A map in Appendix 4 of the report shows linear corridors connecting Linford Wood to the wider area and potentially used by bats. One is across V7 to Stanton Wood and Common Lane through Heelands. Three more follow the three brooks leading out of Linford Wood: through Stantonbury towards Linford lakes; across to Neath Hill (Springhill Brook) towards Tongwell Lake and the River Ouzel); and to Conniburrow, the brook that joins Springhill Brook at Tongwell.

Conclusions and recommendations included:

- Many of the areas where bat foraging was recorded had been cleared recently. This provided an additional opportunity for bats to forage
- Woodland bat species (Brown Long-eared and *Myotis* species) prefer partially shaded, cluttered areas. The report said that "In areas of known bat roosts, including bat boxes, the management principles should aim at maintaining the mosaic woodland structure favouring dense shrubs and minimising coppice work to rotational management of small compartments." But it did recognise that "a more complete evaluation should be based on the follow up monitoring, balanced with the other ecological features known to be present (i.e. floristic, invertebrate and bird interest etc.) together with forestry management objectives and public access"
- There was insufficient information on how linear corridors are used by bats, but these would be affected by the availability of foraging habitats and roost features, such as mature trees with cavities, deadwood and loose bark. Noctules tend to use such corridors after emergence, and water features tend to support Daubenton's Bat *Myotis daubentonii*. Potentially, grid-roads may provide important movement corridors when trees are sufficiently mature.

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