



Figure 48: View of the ephemeral perennial habitat located on site.

4.2.16 Tall Ruderal

This habitat was confined to the earthen bund that formed the southern and western confines of the parking provision of Field Parcel 1. Species recorded included cock's foot, black bindweed *Fallopia convolvulus*, sheep's fescue, creeping thistle *Cirsium arvense*, bramble, common nettle, bristly ox-tongue *Helminthotheca echinoides*, spear thistle *Cirsium vulgare*, cow parsley *Anthriscus sylvestris* and common hogweed *Heracleum sphondylium*.

4.2.17 Other Habitats

The Site supported a series of stock fences, an area utilised for parking constructed using compacted gravel, areas of bare ground and a single area of concrete hardstanding that forms the top of an underground storage tank located close to the northern edge of Field Parcel D.

4.3 Fauna

The data search results have been referenced throughout this report within the relevant sections; the full dataset is available in Appendix 3.

4.3.1 Amphibians

Thirty-four records for amphibian species were returned by Sussex Biodiversity Records Centre (SBRC) within 1 km of the Site, for 5 amphibian species common toad *Bufo bufo*, common frog *Rana temporaria*, great crested newt *Triturus cristatus*, smooth newt *Lissotriton vulgaris* and palmate newt *Lissotriton helveticus*. Only one record for this species was returned from the data search, but they are known to be present locally and quite widespread within the landscape.

Terrestrial habitats on site presented foraging, sheltering and breeding opportunities for common and widespread amphibian species as well as the rare great crested newt.

Standing water is present on Site with six ponds being recorded (see 3.11.7 above & Appendix 1). Two of these ponds, located in the south-western corner of the site are currently utilised for coarse fishing are therefore deemed unsuitable for supporting amphibian species due to the presence of the predatory common carp *Cyprinus carpio*. The other four ponds, two located within Field Parcel E and the other two within the woodland compartments are considered suitable for breeding great crested newts and other common and widespread amphibian species. Common amphibians, including the S41 species common toad and newt species within their terrestrial phases are likely to be present in suitable habitats, particularly in the damper areas and at hedgerow bases, tree bases. The Site is considered to be of **Local importance** for both great crested newt and common and widespread amphibian species.

4.3.2 Badger

No records of badger were returned by SBRC within 1 km of the Site. Sussex Biological Records Centre (SBRC) state that they do not release their records on this species. However, badger are known to be both widespread, common and living at relatively high densities for this species within the local landscape.

An active (at the time of survey) main badger sett comprising five holes was recorded within the semi-natural woodland located on Site (TN1 – Appendix 1). A further three-entrance, disused badger sett was located to the south of the Site (TN2 – Appendix 1). Field signs of badger travelling through the Site (pathways and snuffle holes) indicate that the Site is of **site importance** to at least one badger social group/ clan.

4.3.3 Bats

Foraging/ Commuting Bats

Numerous records for commuting or foraging bats were returned from the data search from SBRC from within 1 km of the site.

This included records for brown long-eared bat *Plecotus auritus*, unidentified long-eared species *Plecotus* sp., soprano pipistrelle *Pipistrellus pygmaeus*, common pipistrelle *Pipistrellus pipistrellus*, unidentified pipistrelle *Pipistrellus* species, Nathusius's pipistrelle *Pipistrellus nathusii*, Noctule *Nyctalus noctula*, Whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandtii*, unidentified *Myotis* sp., serotine *Eptesicus serotinus* and unidentified bat *Chiroptera* species.

On consulting aerial photographs, it is most likely that bats using the local area utilise the flanking woodlands within the Site to travel from east to west and from north to south along these strong linear features supporting the commuting of bat species and allowing the access of further foraging grounds/ habitats within the surrounding landscape through the use of other commuting features such as hedgerows, hedgerow trees and woodlands. The veteran (and ancient) sweet chestnut trees within the site are likely to be of interest due to the rich habitats (and therefore likely diverse and abundant invertebrate prey) they provide.

Due to its location, habitat connectivity to large areas of semi-natural woodland and the diverse semi-natural habitats present, the Site is considered to be of **County importance** for commuting bat species.

As the main body of the Site contains foraging habitat for bats and the Site is considered to be of importance for foraging bat species, including noctule, particularly during May - July, when cockchafer beetles *Melolontha* sp. are on the wing. However, there is an abundance of high quality foraging habitat in the local area comprising woodlands, woodland edge habitats with smaller areas of good-quality semi-improved grassland and river corridors and as such, the importance of the site for foraging bat species is not considered important above the **Local** level.

Roosting Bats

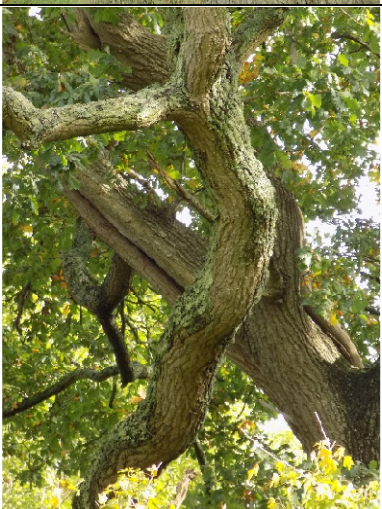
Numerous roost records were returned by SBRC including a single maternity roosts for brown long-eared *Plecotus auratus* and records for general summer roosting for brown long-eared bat *Plecotus auritus*, unidentified long-eared species *Plecotus* sp., soprano pipistrelle *Pipistrellus pygmaeus*, common pipistrelle *Pipistrellus pipistrellus*, unidentified pipistrelle *Pipistrellus* species, Noctule *Nyctalus noctula*, natterer's bat *Myotis nattereri*, unidentified *Myotis* sp., serotine *Eptesicus serotinus* and unidentified bat *Chiroptera* species within 2 km of the Site.

Trees

No bat roosts were found within trees on Site although a number of trees on site presented potential roosting features (PRFs) that had a moderate to high bat roosting potential. These are discussed in more detail in **Table 5** below:

Table 5: PRFs within Site trees (refer to Target Notes (TN), Appendix 1.

Picture	Description	Potential Roosting Feature category
	Bark flake – TN3, Appendix 1	Low
	Woodpecker hole (WPH) – TN4, Appendix 1	Low-moderate

Picture	Description	Potential Roosting Feature category
	Woodpecker hole – TN5, Appendix 1	High
	Rams horns feature – TN6, Appendix 1	Low-moderate
	Multiple features present on veteran ancient sweet chestnut trees – TN7, Appendix 1	High

Picture	Description	Potential Roosting Feature category
	Impact shatter and rot features – TN8, Appendix 1	Moderate - high
	Woodpecker hole – TN9, Appendix 1	High
	Woodpecker hole – TN10, Appendix 1	High

Building

The only building located on site supported a large number of features that have the potential to support roosting bats. Gaps under ridge and roof tiles were recorded along with access gaps into the two (locked) rooms within the building providing access into dark areas including access to the ridge beam. As stated earlier, access into the two rooms of the building were not possible so a full assessment could not be undertaken.

A single degraded bat dropping was recorded lying on the edge of the southern facing open area within the building (see Figure 49 below).



Figure 49: View of the same tree with human for scale showing a multitude of veteran and faunal features.

It is considered highly likely that the building supports unknown numbers of roosting crevice dwelling bat species including both day and night roosting. The presence of 'breathable membrane' under the ceramic tiles of this building is cause of significant concern as this has been shown to actively entrap and kill bats that come into contact with it.

Within the context of the local area and bearing in mind the presence of numerous roosts for the species recorded from SBRC, the Site is considered to be of no more than **Parish Importance** for roosting bats.

4.3.4 Birds

The Site was found to provide good nesting and foraging habitat for a range of bird species, in particular within hedgerows and semi-natural ancient woodland component of the Site and the plantation woodland canopies.

Notably, the rare NERC 41 birds red kite *Milvus milvus*, lapwing *Vanellus vanellus*, curlew *Numenius arquata*, turtle dove *Streptopelia turtur*, cuckoo *Cuculus canorus*, skylark *Alauda arvensis*, woodlark *Lullula arborea*, yellowhammer *Emberiza citrinella*, linnet *Linaria cannabina*, hawfinch *Coccothraustes coccothraustes*, lesser redpoll *Acanthis cabaret*, bullfinch *Pyrrhula pyrrhula*, tree pipit *Anthus trivialis*, spotted flycatcher *Muscicapa striata*, marsh tit *Poecile palustris*, house sparrow *Passer domesticus*, starling *Sturnus vulgaris*, song thrush *Turdus philomelos*, barn owl *Tyto alba* and common kingfisher *Alcedo atthis* were also returned from the data search from SBRC.

An owl box was recorded within the building located on site (see Figure 43), although no evidence of use was recorded.

The Site is considered to be of **Local Importance** for breeding birds.

4.3.5 Dormouse

Thirteen records were returned by SBRC within 1 km of the Site within connecting habitat (nearest location approximately 200 m east of the Site). Owing to the number of records, the good connectivity of the habitat within the local landscape in the form of large areas of semi-natural ancient woodland, plantation woodland,

secondary woodland and native hedgerows, their presence on site is presumed. The Site is considered to be of **Local Importance** for dormouse.

4.3.6 Invertebrates

A wide range of invertebrate species were returned from the data search from SBRC from within 1 km of the Site. Species recorded included the S41 (species of principle importance) butterfly species purple emperor *Apatura iris*, small heath *Coenonympha pamphilus*, white admiral *Limenitis camilla*, large tortoiseshell *Nymphalis polychloros* and brown hairstreak *Thecla betulae*.

The dragonfly/damselfly species downy emerald *Cordulia aenea* and common darter *Sympetrum striolatum* were also returned from the data search.

Roesel's bush cricket *Roeseliana roeselii*, was also returned from the data search.

The rare beetle, the stag beetle *Lucanus cervus*, has also been recorded within 1 km of the Site.

A large number of moth species was also recorded from within 1 km of the Site boundary. This included the S41 and Bap priority moth species knot grass *Acronicta rumicis*, ear moth *Amphipoea oculatea*, minor shoulder knot *Brachylomia viminalis*, false mocha *Cyclophora porata*, small square spot *Diarsia rubi*, figure of eight *Diloba caeruleocephala*, small phoenix *Ecliptopera silaceata*, small emerald *Hemistola chrysoprasaria*, ghost moth *Hepialus humuli*, shoulder striped wainscot *Leucania comma*, rosy minor *Litologia literosa*, brindled beauty *Lycia hirtaria*, dot moth *Melanchra persicariae*, white ermine *Spilosoma lubricipeda*, buff ermine *Spilosoma lutea*, blood vein *Timandra comae*, cinnabar *Tyria jacobaeae* and oak hook tip *Watsonalla binaria*.

Other invertebrate species include records for the S41 species of true fly northern yellow splinter *Lipsothrix errans* and river-shore crane fly *Rhabdomastix japonica*.

Common and widespread invertebrates are assumed on Site owing to the variety of semi-natural habitats present and the large number of records for S41 priority species, in particular butterfly and moth species returned by SBRC. Dead wood is present within oak, sweet chestnut, beech and ash canopies of the semi-natural ancient woodland, parkland trees and secondary woodland. As such, the Site is considered to be of **Local Importance** for invertebrate species.

4.3.7 Reptiles

Thirty-two records of reptile species were returned from the data search from SBRC comprising; slow worm *Anguis fragilis*, barred grass snake *Natrix Helvetica*, adder *Vipera berus* and common lizard *Zootoca vivipara*. Habitats on site were considered suitable for slow worm and grass snake.

Due to the habitats present on Site, the Site is considered to be of **Site Importance** for these reptile species.

4.3.8 Otter

No records for otter *Lutra lutra* were returned as part of the desk study. However, it is stated within the data search material that records for otter are not included within the records publicly released. Otter are now again present in every river catchment within England and their presence within the local landscape is therefore assumed.

Suitable habitat on site comprised the stream that runs along the majority of the southern part of the Site as well as the ponds located on Site. The stream is likely to offer foraging, commuting habitat and possibly breeding habitat, although the watercourse is rather shallow.

4.3.9 Hedgehog

Sixteen records for hedgehog *Erinaceus europaeus* were returned from the data search from SBRC. The hedgerow bases, woodland edge and scrub habitats are suitable for S41 Species of Principal Importance European hedgehog *Erinaceus europaeus* and their presence on site is therefore assumed. The Site is likely to be of **Local Importance** for this species.

4.3.10 European Rabbit

Fifteen records for European rabbit *Oryctolagus cuniculus* were returned from the data search from SBRC. Although not normally considered within an ecology based report, this species has undergone a rapid nationwide decline over the previous few years due to the emergence of Rabbit Haemorrhagic Disease 2, or RHD 2, is a particularly severe disease with a mortality rate of 90%+. This disease entered the UK from the pet trade from China in 2019.

No evidence of this species was recorded on site and the grasslands are considered sub-optimal due to their length and species composition. However, it is considered likely that a low-density population is present on Site.

4.4 Flora

The results have been referenced throughout this report within the relevant sections; the full dataset is available in Appendix 3.

4.4.1 Invasive Plant Species

The data search returned 80 records for invasive species located within 1 km of the Site. This included records for species listed on Schedule 9 of the Wildlife & Countryside Act 1981. This included records for three-cornered leek *Allium triquetrum*, monbretia *Crocosmia × crocosmiiflora*, Japanese knotweed *Fallopia japonica*, winter heliotrope *Petasites fragrans*, false acacia *Robinia pseudoacacia*, *Rhododendron ponticum*, holm oak *Quercus ilex*, cherry laurel *Prunus laurocerasus*, parrot's feather *Myriophyllum aquaticum*, least duckweed *Lemna minuta*, Spanish bluebell *Fallopia japonica*, Nuttall's waterweed *Elodea nuttallii*, Newzealand pygmyweed *Crassula helmsii*, Himalayan cotoneaster *Cotoneaster simonsi*, wall cotoneaster *Cotoneaster horizontalis*, red valerian *Centranthus ruber* and variegated yellow archangel *Lamium galeobdolon* subsp. *argenteum*.

The site itself supported two invasive non-native species, including species listed on Schedule 9 of the Wildlife & Countryside Act 1981 (as amended). This included winter heliotrope (see TN11 – Appendix 1) and *Rhododendron ponticum* (see TN12 – Appendix 1).

4.4.2 Notable Plant Species

The 1 km data search returned records for a wide range of notable plant species comprised of 140 records. Species returned included bluebell *Hyacinthoides non-scripta*, Aggregate-headed Hawkweed *Hieracium aggregatum*, Dyer's greenweed *Genista tinctoria*, box *Buxus sempervirens*, quaking grass *Briza media*, wood sorrel *Oxalis acetosella*, lesser spearwort *Ranunculus flammula*, sanicle *Sanicula europaea*, Devil's-bit scabious *Succisa pratensis*, autumn lady's-tresses *Spiranthes spiralis* and the liverwort fringed heartwort *Ricciocarpus natans*.

Of these, wood sorrel and sanicle were recorded on site. Possibly due to the time of year, no other of these species were recorded on site during the survey.

4.4.3 Lichens

A single record for lichen species were returned from the data search from SBRC. This comprised *Verrucaria polysticta*, listed as Nationally Scarce (NS).

4.4.4 Fungi

Four records for lichen species were returned from the data search from SBRC. This comprised bay polypore *Polyporus badius*, tiered tooth *Hericium cirrhatum*, Devil's fingers *Clathrus archeri* and *Pholiota adiposa*, all listed as Sussex Rare.

5 CONSERVATION MANAGEMENT PLAN 2023 - 2047

5.1 Introduction

The Site is made up of large areas of improved and semi-improved grassland and a series of woodland habitats (semi-natural ancient woodland, broadleaved plantation woodland and secondary woodland). Other habitats include small areas of arable, a series of ponds, a watercourse, small areas of dense scrub, dense bracken, ephemeral perennial, tall ruderal and a series of parkland trees including veteran and ancient trees. The site measures approximately 109.3 ha in size.

This plan forms part of the Beechy Bottom Park Conservation Management Plan 2023-2048 and aims to set out the management and rationale for the management on the site to ensure that the site meets its targets for habitat and animal species restoration.

5.2 History and Past Management of the Site

The Site has not previously been managed by any land-based scheme such as Entry Level Stewardship Scheme (ELS) or Higher-Level Stewardship (HLS) schemes. The Site may have been subject to an historical English Woodland Grant Scheme or Woodland Grant Scheme, although these records are not available online due to the age of the presumed agreement, it is assumed that the broadleaved plantation woodland located to the west of the Site are as a result of this.

The broadleaved plantation woodland located to the west of the Site (and in smaller parcels located towards the centre and east of the site) are believed to have been planted on former pasture fields and parts of the historic parkland at some point in the late 1980s to mid-1990s. Since its planting the only apparent management that has taken place has been the removal of the majority of the tree guards, a very few were in evidence during the Site visit. Since then, these woodlands have essentially been left as non-intervention woodlands with little active management bar the maintenance of the rides.

The other woodlands, including the semi-natural ancient woodland, secondary woodland, broadleaved Turkey oak plantation woodlands and the parkland trees (including the veteran and ancient sweet chestnut trees) do not currently receive any management bar from the occasional cyclical cutting of the *Rhododendron ponticum* located within the semi-natural ancient woodland component of the site. The public rights of way (PROW) that run through these woodlands are also maintained to provide pedestrian access through the Site.

The grassland component of the Site is currently managed in a number of ways with Field Parcel A being managed as amenity grassland to provide local sports facilities. Field Parcel B is likely subject to bi-annual mechanical topping. Field Parcels C has been historically managed by occasional re-seeding and taking a series of silage cuts throughout the growing season while Field Parcels D & E have been managed by a combination of re-seeding, mechanical cutting and bailing (see Figure 51) and cattle grazing. Field parcels F & G have been fenced off recently and have not received any active management as yet but are likely to be historically part of an arable rotation with field margins.

The majority of the grassland formed part of the historic parkland associated with Cuckfield Park, located to the east of the Site and was likely managed through extensive grazing of cattle on permanent pasture with a large number of parkland trees forming wood-pasture. This can be seen on Figure 50 below, which details a view of the OS 25 inch 1892-1914 map of Cuckfield Park. This figure is of particular interest as it shows the direct relationship between the site and Cuckfield House and also shows not only the veteran and ancient sweet chestnut groves located to the south of the Site but also the large number of parkland trees that have been lost from the Site as a whole.

Historically, through looking at Figure 50 below, it is possible to see that a large number of parkland trees have been lost from the areas of the Cuckfield Park to the extent that it is possible to see that the historic parkland was previously managed as wood pasture in a parkland setting. Wood pasture and parkland is land that has been managed traditionally through grazing of permanent grassland. This parkland, as discussed earlier, started as a medieval hunting forest but was de-parked in 1618 and has since then formed part of the landscaped grounds of the adjacent Cuckfield Park.

The ponds located on Site can be split into three different categories. The two woodland ponds appear to be been former quarry locations which receive no active management. The two coarse fishing ponds are managed by a local angling club for the coarse fishing purposes. The two ponds located within Field Parcel currently fenced off and are currently not managed in any way.



Figure 50: View of the OS 25 inch 1892-1914 map of Cuckfield Park showing the number of parkland trees that formerly covered the Site.

5.3 Future Vision

A minimal-input, more-natural and soft-touch grazing regime means removing internal man-made barriers to permit herbivores (stock and wild animals) to roam freely. Vegetation will develop and change without interference except where necessary and then at minimum levels needed.

The proposal is to enclose the park with a secure deer and cattle-proof fencing and then to remove the limited internal barriers to allow free access throughout the site for stock and wild animals. This is envisaged to include herds of cattle and pigs and wild animal species such as hare, red and roe deer would graze across the whole of the park. The vegetation will then be subject to a more naturalistic management process which can be built up over time allowing habitats to develop, through succession, into more semi-natural states.

This naturalistic grazing project has been inspired in part by the work undertaken at the nearby Knepp Estate and therefore by the theories of the Dutch ecologist Frans Vera. Frans Vera theorised that a true wilderness in this part of Europe would have been driven by disturbance from wild herbivores and would have looked more like wood pasture than dense, closed canopy forest. This may have been the case of the continent where large-scale seasonal migration by large numbers of herbivores was both feasible and possible, but this was unlikely to have taken place in mainland Britain since the end of the last ice age approximately 11,700 years ago due to the lack of a winter migratory refuge and low numbers of large herbivores when compared with a continental wide natural system.

To look at what can be created at Beechy Bottom, we have to look to a more recent past when a combination of fallow and 'waste' areas and areas of traditional farming practices created habitat that supported large numbers of individual animals and a wide range of wildlife species. Prior to the Second World War, the UK supported very large areas of semi-natural habitat which in turn supported large wildlife populations (albeit in the absence of predators such as sparrow hawk and pine martens), in particular of farmland bird species. This was in part due to the large-scale imports of food products from the Empire, which from the 1880s led to a 60-year farming depression and a general lack of progression of farming methods and techniques.

During the war, an area measuring approximately 4 million acres was ploughed up and put into agricultural production. To give a comparison, this is similar in scale to the combined area of the whole of Cornwall, Devon, Somerset and Dorset. Post-war, this trend continued and large areas of scrub, woodland, wetland and permanent grassland went into intensive agricultural production.

Post-war government subsidies were heavily targeted towards increasing agricultural production. This led to changes in farming practices, which included the loss of mixed farming systems (creating arable and intensive pasture monocultures), the move from spring to autumn sowing of cereal crops (which actively kills farmland bird young), and increased use of a new diverse range of pesticides, all of which have been demonstrated to have had adverse impacts on farmland birds such as skylark *Alauda arvensis* and grey partridge *Perdix perdix*.

Five farmland specialists (corn bunting *Emberiza calandra*, grey partridge, starling *Sturnus vulgaris*, turtle dove *Streptopelia turtur* and tree sparrow *Passer montanus*) have experienced severe declines in excess of 80% since 1970. The grey partridge in particular has seen severe declines of 93% between 1967 to 2018.

However, the work at the Knepp Estate has seen a large-scale restoration of bird, reptile, botanical, mammal, amphibian populations. This includes large rises in all of the above species as well as rare migrants such as nightingale rufous nightingale. With the UK summer population estimates to be just 5500-6000 birds, Knepp Estate can now boast of 40 territories (approx. 80 birds can be inferred) being defended, when in 2001, Knepp estate supported none.

It should be the aim of the proposed park to try and restore these lost animal species and restore degraded habitats. A particular focus will be on farmland bird species, but also reptile, amphibian, mammal and invertebrate populations as well as botanical diversity. By introducing more naturalistic processes such as 'soft touch' extensive management systems and allowing the development of woody scrub areas, forb rich and structured grassland as well as allowing natural regeneration within the woodlands should, over time, create species-rich and evocative wildlife rich habitats. As an aside, this will also result in carbon sequestration into the soils through the abandonment of more intensive agricultural techniques.

Once this management has been set up, Beechy Bottom Country Park will then be left to 'go wild', with minimal management, but with close welfare and ecological monitoring to evaluate habitat and animal population change while providing a refuge for bats and birds that are currently lacking within the habitats on Site at present.

The overall vision is of a park where natural processes predominate, and long-term financial stability is achieved outside a conventional agricultural framework. So far as is possible, management of the park will deliver environmental and landscape enhancement through these management techniques.



Figure 51: Proposed vision of the grassland component of the site showing grazing herbivores living within a species-rich grassland setting with areas of successional scrub providing rich bird and mammal foraging and nesting opportunities.

5.4 Biodiversity Restoration Detail - Habitats

Field parcels A will continue to form part of the sports pitch provision locally in order to continue to provide a local sporting facility for the local community.

Field Parcels B and C, due to the high level of permissive public use for dog-walking and other public recreational walking will be retained as this going forward in order to provide this facility locally. Cut paths within Grassland Compartments B & C and cut the remainder of the grassland twice a year, once in March and once in September (remove arisings).

Field Parcels D – G, along with the majority of the woodland component of the Site, veteran trees and Site ponds are envisioned to be subject to part of a project to restore semi-natural habitats with the aim of restoring animal and plant populations that have been lost from the local area and wider countryside.

5.4.1 Arable

The arable component of the site is small, measuring approximately 0.34 ha. As this already ploughed land, this habitat should be sown with a species-rich native meadow mixture. This will allow this area to act as a source of wind and animal dispersed seed for the surrounding species-poor grassland habitats, as well as providing an immediate habitat provision for a wide range of invertebrate, bird, amphibian, mammal and reptile species.

It is recommended that Emorsgate Seeds EM3 – Special General Purpose Meadow Mixture (containing 32 forb and grass species) is sown to create a species-rich sward which will allow the spread of species diversity throughout the retained grassland sward on Site.

Preparation

To establish this habitat, the existing habitat should be removed through the use of glyphosate or repeat cultivation. Chemical use is recommended here due to the difficulty in using machinery within these relatively confined areas to help create a well prepared and good quality seed bed before sowing.

To prepare a seed bed, first remove weeds using repeated cultivation or a herbicide. Then plough or dig to bury the surface vegetation, harrow or rake to produce a medium tilth, and roll, or tread, to produce a firm surface. Sowing seed is best sown in the autumn or spring but can be sown at other times of the year if there is sufficient warmth and moisture. The seed must be surface sown and can be applied by machine or broadcast by hand. To get an even distribution and avoid running out divide the seed into two or more parts and sow in overlapping sections. Do not incorporate or cover the seed, but firm in with a roll, or by treading, to give good soil/seed contact.

First year management

Most sown meadow wildflower and grass species are perennial; they will be slow to germinate and grow and will not usually flower in their first growing season. There will often be a flush of annual weeds from the soil in the first growing season which may grow up and obscure the meadow seedlings beneath. This annual weed growth is easily controlled by topping or mowing.

Mow newly sown meadows regularly throughout the first year of establishment, to a height of 40-60mm, removing cuttings if dense. This will control annual weeds and help maintain balance between faster growing grasses and slower developing wildflowers.

Avoid cutting in the spring and early summer as the mixture contains yellow rattle *Rhinanthus minor* which parasitizes the grass species allowing for the development of more forb species within the sward. These sown annuals should be allowed to flower, then in mid-summer cut back and the cut vegetation removed.

Carefully dig out or spot treat any residual perennial weeds such as docks.

In the second and subsequent years EM3 sowings can be managed in a number of ways. The best results are usually obtained by traditional meadow management based around a main summer hay cut in combination with autumn and possibly spring mowing.



Figure 52: View of a typical EM3-sown meadow.

5.4.2 Grassland

This habitat within the Site, with the correct management and over time has the potential to support a wide range of bird, mammal, invertebrate, reptile and amphibian populations as well as re-creating habitats that have been lost and allowing other habitats to become more varied, structured and species-rich.

The Site has the potential to allow the improved grassland to transition to a more species rich and structured sward that has the ability to support a wide range of invertebrate and mammal species which will in turn support wide food web increasing number of reptile and amphibian species including common lizard, grass snake, slow worm, smooth, palmate and great crested newt. This will in turn lead to the development of areas of dense woody scrub will be allowed to develop around the edges of the grassland parcels which will intern support a wide range of bird species, including farmland bird species which have been lost from the landscape.

Over time, it is hoped that the grassland will develop into a much more diverse and species-rich natural grassland interspersed with scrub and woodland edge habitats.

5.4.3 Ponds

The ponds currently located within grassland component of the Site are to be opened up through the felling of a small number of trees and removal of the scrub that currently surrounds the ponds. This will allow light onto the ponds and enable the ponds to be utilised as a natural source of water for stock and wild animals.

The two ponds currently utilised as coarse fishing ponds are to be subject to electrofishing to humanely remove the fish currently present. These can be transported offsite and used to stock offsite ponds. The ponds will then be allowed to settle out to improve the water quality, thereby preventing the pollution of the River Adur, located to the south of the Site. It is expected that these ponds will then be utilised by wildlife including amphibian, invertebrate reptile and botanical species.

The two ponds located within the semi-natural woodland on site will be left as non-intervention ponds in terms of active human management. Stock will however be allowed to access these ponds and it is expected that some management impacts will be encountered over the period of this management plan. These will be monitored by park staff.

5.4.4 Woodlands

The semi-natural ancient woodland component of the Site is currently subject to relatively high fallow deer pressure. As such, there is little in the way of natural regeneration. The plantation woodlands generally lacked an understorey due to the planting of tree species with no understorey species, as opposed to woodland shrub species. A clear browse line is present within the woodlands. The development of some limited scrub and thick forb vegetation within the plantation woodlands is limited to the rides where light is allowed to impact the woodland floor.

Within the semi-mature plantation woodland, it is proposed to create a number of glades and to veteranise (see section 5.4.11 below) all of the poplar and a proportion of the Turkey Oak and ash component of the plantation woodlands. This combined with a sharp reduction of the local fallow population and allowing the low numbers of stock (red deer, cattle and pigs) full access to the woodland habitats generally. It is hoped that a more naturalistic woodland structure with open glades and areas of natural underwood regeneration will develop.

This measure will benefit a wide range of mammal, bird, invertebrate and amphibian species.

5.4.5 Parkland Trees

The site supports a range of parkland trees. The majority of these originate from the post-war era and can be classed as semi-mature to mature trees. These are of some value to wildlife at present, offering limited foraging and nesting resources, but are not of the age that has allowed the development of features that have the potential to support roosting bats, bird nesting features associated with deadwood or saproxylic invertebrate species, such as stag beetle species. Over time, as these trees age and suffer the impacts associated with aging, they will offer more in the way of habitats suitable for a wide range of wildlife.

It is proposed that a wide program of re-planting is undertaken with at least 60 trees being planted in order to re-create the wood-pasture landscape that previously existed on Site. These trees should be planted mimicking the locations as shown on the OS 25 inch 1892-1914 map (see Figure 50). These have been set out in order to provide sight and wildlife commuting lines through the landscape. Beech *Fagus sylvatica* should not be planted as this species is vulnerable to the impacts of drought, and therefore, climate change. It is recommended that pedunculate oak *Quercus robur* and sweet chestnut *Castanea sativa* should make up the tree species utilised. Both these trees are more drought resistant and have the ability (in the case of pedunculate oak) to support a wide range of invertebrate species and mimic the species composition of the surviving mature and veteran parkland trees.

5.4.6 Veteran Trees

A small number of veteran (and ancient) trees exist within the Site. These historic and, in the case of the sweet chestnut component, are nationally important trees. A number of these trees have fallen and some are standing deadwood. These trees contain a large number of features that have the potential to support roosting bats, nesting birds and likely to support a wide range of saproxylic invertebrates.

These trees are significant natural reservoirs in their own right and need to be preserved as far as possible as they provide habitats found nowhere else on the estate. These trees must be retained, monitored, studied and protected going forward. The fallen deadwood accumulations should be left in-situ in order to preserve the saproxylic invertebrates that likely already exist here.

5.4.7 Native Hedgerows

A small number of native hedgerows exist towards the north of the Site. Hedgerows are an important habitat in the countryside as they mimic woodland edge habitat and as such are important for nesting birds, dormice, and amphibian species during their terrestrial phase.

A number of the existing hedgerows on site are unmanaged and are now developing into lines of trees, while the hedgerows of more recent origin have not been cut for a number of years. It is recommended that all of the hedgerows are allowed to grow tall and bushy, with the hedgerows of more recent origin allowed to develop to be 3 m tall x 3 m wide.

5.4.8 Watercourse

Watercourses are of significant wildlife interest in terms of providing foraging, nesting and commuting habitat for a wide range of species. The River Adur, running through part of the southern extent of the Site is currently suffering heavily from the polluted outflow from the existing coarse fishing ponds. The water is both turbid and likely high in nutrients as a by-product of keeping large numbers of fish within confined waterbodies. These fish likely receive supplementary feeding which will further impact the nutrient levels and therefore the outflow into the river. This, of course, impacts a wide range of wildlife both on site and further downstream.

In order to support wildlife generally, the water quality of the river needs to be significantly improved. It is proposed to close the coarse fishing ponds and electro-fish the water-bodies. This can be a non-lethal, with the fish humanely removed and relocated to a less impacting location off-site.

5.4.9 Dense Scrub

The dense scrub habitat present on site is confined to very small areas of the Site within Grassland Compartment E and surrounding the ponds located within this compartment. This habitat is considered to be of considerable value to wildlife, in particular nesting bird and invertebrate species, including rare and scarce species such as brown hairstreak *Thecla betulae*, which depends of the presence of blackthorn *Prunus spinosa* as its foodplant. Blackthorn and hawthorn scrub also provide a 'nursery' for tree species, in particular immature oak species, providing protection from browsing and grazing animals such as cattle, ponies and deer.

It is envisaged that pockets of scrub be allowed to develop across the grassland component of the site and woodland edges prior to the introduction of stock animals (red deer, cattle etc) on site. This will provide a very substantial boost for bird species in particular.

The development of this habitat within the grassland and woodland edge habitats has the potential to provide a huge boost to wildlife species, including rare and scarce species such as nightingale and brown hairstreak.

5.4.10 Dense Bracken

This habitat is present within very restricted areas of Grassland Compartment D alongside woodland compartments and along natural geological folds in the landscape. In some cases, this clonal plant can be very aggressive and therefore damaging to the environment. However, bracken can be beneficial to wildlife, particularly in a mix with other habitats by providing nesting locations and cover for a range of bird species.

Bracken edge habitat is also beneficial for reptile species, especially when emerging from hibernation during spring by providing shelter, foraging and dispersal routes. Small mammal species also benefit from bracken by providing foraging and shelter opportunities. Eleven invertebrate species are found only on bracken, and many others use it as part of their diet, for example several species of fritillary butterflies use bracken areas with their caterpillars feeding on violets and then pupating under dead plant material. Often woodland plants such as bluebell, primrose and wood anemone grow under bracken providing valuable pollen and nectar for

insects in the spring. To provide the greatest benefits for wildlife, bracken should be managed as part of the grassland, heathland or woodland habitat in which it grows. At Beechy Bottom Country Park, it is envisaged that this habitat will spread within the grassland component of the site and form a matrix with scrub, grassland and woodland thereby providing a variety of habitats suitable for a wide range of wildlife species.

5.4.11 Building

The only building on Site, a 19th century barn located on the edge of Grassland Compartment E is to be partially converted for the use by the proposed ranger. It is envisaged that the building will be utilised as an office and as a store and will also act as a hub for visitors with a sheltered area for people to eat. As mentioned earlier, the building also supports a disused owl box and has signs of roosting bats. As such the appropriate ecology works will be to be completed prior to conversion. The existing Tyvek membrane must be removed as it can entrap bats.

5.4.12 Veteranisation

This is the process of targeting low-value / undesirable trees that require removal or, in the case of ash, are dying of disease anyway in order to create instant habitat of high value to a wide variety of mammal, bird, fungi and saproxylic invertebrate species through the creation of standing deadwood with a series of specially designed features carving into them specifically designed for a range of bat species (different bat species prefer different roosting positions) and bird species such as bark flakes for species such as treecreeper, nest boxes for general bird species and woodpecker holes. Features low down on tree trunks can also be created specifically to support dormouse and other small mammal species. Branches removed from the tree canopies in order to create a more stable trunk will be deposited on the woodland floor to create deadwood accumulations of significant interest (along with the retained standing deadwood to saproxylic invertebrate species and fungi).

5.4.13 Ash Dieback Disease

Ash dieback disease *Hymenoscyphus fraxineus* is a serious fungal pathogen that attacks ash trees and was first confirmed in Britain in 2012. The disease is native to eastern Asia and causes significant leaf loss, stem and branch lesions, crown dieback, and is usually fatal, particularly with younger specimens or coppiced trees.

It is reported that older mature trees can sometimes live with the disease but often become weakened or stressed and are therefore more susceptible to secondary fungal infections from honey fungus *Armillaria mellea*. Once a tree is infected there is no cure or treatment and the crown can die very quickly and, in some cases, modifying the structural condition of the wood in one season.

Ash trees with advanced ash dieback can be particularly brittle and dangerous to work on. As mentioned above, some trees can be significantly affected by the disease in a single season, this could result in the tree being a high risk and a danger to the public in some circumstances. Therefore, dead standing trees in high or moderate target areas, close to footpaths, need to be quickly assessed in order to determine the appropriate management, i.e. felling, pollarding or monolithing. In many cases individual ash trees have shown resilience to ash dieback, it is important that these trees are identified, retained and monitored. For this reason, pre-emptive felling of diseased ash trees should be discouraged, unless the tree poses a significant risk to people or property.

The ash trees observed at Beechy Bottom County Park are in reasonable condition with moderate signs of ash dieback disease at present. The worst affected ash are located within the plantation woodland located to the west of the Site. The remainder of the ash trees growing on the estate are along hedgerow boundaries and in woodlands which are categorized as very low risk to people or property. Management of these trees will be dependent on the overall impacts of the disease over the coming years.

5.4.14 Climate Change

Climate change is predicted to change global temperatures and weather patterns are to become more extreme. The Met Office (2008 data) predict hotter, drier summers with average temperatures of 31°C and warmer, wetter winters for the Southwest of England. This has large implications on woodlands and other associated flora and fauna.

Wildlife and lower plant life communities also make up a large part of the woodland ecosystem and therefore it is likely that woodland habitats will also be affected by climatic change. For this reason, it is of utmost importance where possible to help create habitats throughout woodland ecosystems, in order to support and, is possible, enhance biodiversity.

5.5 Biodiversity Restoration Detail – Species

5.5.1 Mammals

Hard provisions, such as the provision of the bat maternity, dormouse and tree veteranisation will allow an immediate benefit to mammal wildlife populations through providing shelter, roosting and nesting opportunities that are currently lacking from within the Site. This is due to the lack of woodland understorey and the presence of a general even-age structure within the plantation woodlands (of recent origin and Turkey oak dominated areas) that lack a more natural age range and as such, the features associated with older trees that can be utilised for both nesting/roosting that develop with age.

In terms of bat boxes, it is recommended that [Schwegler 1FS large colony boxes](#) are utilised. The Schwegler 1FS Large Colony Box provides bats with a very large internal space. This allows high numbers of bats to congregate together and makes it very popular for accommodating large colonies in summer. It is particularly attractive to noctule *Nyctalus noctula*, Nathusius' pipistrelle *Pipistrellus nathusii* and brown long-eared bat *Plecotus auritus* as well as nurseries, with roosts containing between 70-100 bats have been recorded. The large internal space and variety of hanging places makes it ideal for bats to use as a nursing area. The 1FS is suitable for both summer and winter roosting/hibernation. This will instantly provide a resource that is currently lacking from the site for the reasons already stated. A total of six boxes should be installed across the site, focussed on the southern edge of the semi-natural ancient woodland and on some of the mature and veteran chestnut trees located within the site.

5.5.2 Birds

Hard provisions, such as the provision of the tree veteranisation/bird boxes will allow an immediate benefit to bird wildlife populations through providing shelter, roosting and nesting opportunities that are currently lacking from within the site. This is due to the lack of woodland understorey and the presence of a general even-age structure within the plantation woodlands (of recent origin and Turkey oak dominated areas) that lack a more natural age range and as such, the features associated with older trees that can be utilised for both nesting/roosting that develop with age.

The proposed new management of the grassland component of the site, allowing the spread and development of scrub habitat following by the introduction of cattle, brown hare and red deer will enhance the site for a wide variety of common and widespread bird species. In particular, certain rare, declining and scarce species should be targeted as indicators of habitat restoration success. These are:

-  **Nightingale** - The development of patches of scrub on former arable land at Knepp Castle has led to a surge in numbers of very rare and scarce species such the nightingale *Luscinia megarhynchos*. This once common species has all but disappeared from the landscape of England, declining a staggering 92% between 1970 – 2018 (British Trust of Ornithology BTO)

figures). In 1999, a national nightingale survey at Knepp by the BTO recorded only seven nightingale territories at Knepp. But in 2012 (post-rewilding) a survey conducted by a student at Imperial College London identified 34 territories, 79% of which were thought to be paired birds that were potentially breeding. Since 2012 that figure has increased even further to 40 territories as of 2021.

The Imperial College study showed that the habitat nightingales were focussing their nesting within overgrown hedges between 8-14 metres deep, made up of mixed shrub species with a preponderance of blackthorn. The interior of these thorny shrubs provide the adults and their fledgling chicks with a safe place to forage for insects in the leaf-litter. Nightingale territories are usually found in habitats associated with woodland and woodland edge habitats.

🍁 **Barn owl** - The barn owl *Tyto alba* is widely distributed across Britain. But at an estimated c.4,000 breeding pairs (Barn Owl Project 1997), can be considered at a low density. This population is partially migratory during the winter period and is somewhat limited (being at the edge of its northern range) during the winter months. The barn owl was once a familiar owl of lowland English farmland – both pastoral and arable – with peak densities occurring in East Anglia, Lincolnshire and Yorkshire. Historically, numbers have recovered since an all-time low of 1,400 breeding pairs in 1988-91 from a high of the first national barn owl survey of 12,000 breeding pairs in 1932.

Favoured habitats contain areas of rough grassland and woodland edge, within which populations of field vole *Microtus agrestis* (the favoured prey) are sufficiently abundant. The availability of small mammal prey shapes breeding behaviour; breeding may be delayed or not take place at all in those years when small mammal populations are at a low. Populations have recovered somewhat from an earlier period of decline and have benefited from the erection of nest boxes and appropriate habitat management. Barn Owl is listed on Schedule One of the Wildlife & Countryside Act and so receives additional legal protection, making it illegal to disturb its nesting sites. All five species of British owl, including barn owl are now regularly recorded at Knepp.

The creation of large-scale tussocky grassland and woodland edge habitat interspersed with pockets of successional scrub will create ideal habitat to support a large population of small mammals, including field vole. It is unknown if barn owl currently nest or frequent the site, but the existing habitats – improved and heavily managed grassland – are considered to be unsuitable for supporting a breeding population of this species. This can be supported by the installation of two barn owl boxes located on suitable trees within the parkland/woodland edge habitats.

🍁 **Turtle dove** - The turtle dove *Streptopelia turtur*, a summer migratory visitor to the UK, is the fastest-declining bird in the UK. The species, as recently of the early 1970s was both common and widespread across southern Britain. The range extended into southwest England and eastern Wales, northwest into Lancashire and northwards up the eastern coast of England to Scotland. The population was estimated at 125,000 breeding pairs in 1970. The population has fallen a staggering 98% as of 2021 and is continuing to steadily halve in number every four years. This has sadly been mirrored across their European range with an 80% decline since 1980. As such, it is now classified as globally Vulnerable, and now has a European Action Plan identifying steps to address the key issues such as habitat loss, insufficient food availability, and excessive over hunting (in the Mediterranean region). The current national estimate is of 1,00 breeding pairs, with many counties being able to support single breeding pairs only. Sussex is one of the national strongholds of this species, with 80 breeding territories being recorded in 2019, 25% of these were recorded at Knepp.

Favoured habitats include tall, thick hedgerows, a high level of 'weed' seed from seasonal native herbaceous plants and areas of scrub and successional woodland edge habitat to provide nesting habitat.

The creation of large-scale tussocky and herb rich grassland and woodland edge habitat (over 4 m tall) interspersed with pockets of successional scrub will create ideal habitat to support a small, possibly single breeding pair of this species within the Site.

- 🌿 *Cuckoo* - Cuckoos are also migratory summer visitors and are well-known brood parasites. Instead of building their own nest, the females lay their eggs in other birds' nests, especially meadow pipits, dunnocks and reed warblers. The Breeding Bird Survey organised by the British Trust for Ornithology has documented a 70% decline since 1995, whilst the Scottish population has increased by 30%. The reasons for this are not entirely clear, but currently cuckoos are faring much better in areas of heathland, especially in the uplands, than in the farmed lowlands.

The decline of cuckoo is not fully understood, but is probably related to the decline in semi-natural habitats in the lowlands due to agricultural intensification. This had led to a loss of the invertebrate prey such as the 'wooly bear' caterpillars (garden tiger *Arctia caja* larvae), which are a key item for adult cuckoos.

Cuckoo has now being recorded at Knepp (an estate that was formerly 3,500 ha of arable), with four cuckoos being ringed in 2018, so habitat restoration can help this species recover. The restoration and diversification of the grassland habitats will help support this species by providing the foodplants that this species require. The larvae of garden tiger are generalists, meaning they eat a large variety of plants without much specialisation. However, most larvae of this species obtain their characteristic toxic compounds from their diet, which can vary from foxglove, members of the daisy family and species of plantain.

5.5.3 *Reptiles*

The creation of a series of hibernacula from excess cut wood (from the veteranisation process) should be utilised to create hibernacula in suitable locations. These could be in close proximity to the ponds on site both on the woodland edge and within the grassland component of the site. These features offer a combination of shelter, foraging and hibernation opportunities to a range of reptile (and amphibian species).

The development of the grassland component of the Site into tussocky grassland with short basking areas grazed by a variety of herbivores will also provide a large area of suitable habitat for these species, in particular common lizard, slow-worm and grass snake. The introduction stock that are not subject to ivermectin worm control will also provide dung that will in turn support a wide range of invertebrate species that will provide a large abundance of prey items for the reptile species, such as slow-worm and common lizard.

5.5.4 *Amphibians*

The creation of the reptile hibernacula (as set out in section 5.5.3 above) also be of considerable benefit for amphibian species such as common frog, common toad, palmate, smooth and great crested newt by providing shelter, foraging and hibernation opportunities. The creation of fallen deadwood habitats will also provide similar hibernation, shelter and foraging opportunities.

The development of the grassland component of the site into tussocky grassland with areas of successional scrub and woodland edge habitats will provide suitable foraging (during their terrestrial phases) and commuting / connective habitat for these species. The introduction stock (that are not subject to ivermectin worm control) will also provide dung that will in turn support a wide range of invertebrate species that will provide a large abundance of prey items for the amphibian species mentioned above.

The opening up of the ponds located within the grassland and the restoration and electro-fishing of the existing coarse fishing ponds will also provide a number of new suitable breeding locations for these species.

5.5.5 Invertebrates

The veteranisation process will create instant habitat of high value to a wide variety of saproxylic invertebrate species through the creation of standing and fallen deadwood accumulations which will be of significant interest to these saproxylic invertebrate species.

The creation of a species-rich native grassland within the area formerly occupied by the arable will also provide a new species-diversity to the grassland component on site providing foraging opportunities and foodplants for a wide range of invertebrate species, in particular butterfly, beetle and moth species. The creation of rough tussocky grassland that is allowed, through carefully controlled grazing patterns to develop into a more species-rich sward over time will provide a large area of suitable habitat for invertebrate species, thereby providing a food source for a wide range of animal species.

The development of scrub patches throughout the grassland component of the site and along the woodland edges will provide areas of blackthorn scrub which will in turn provide habitat for the rare brown hairstreak butterfly.

5.5.6 Invasive Species

The Site supports a number of non-native invasive species, both animal and plant. To summarise:

- ✿ The semi-natural ancient woodlands support quite large stands of common rhododendron. This species is listed on Schedule 9 of the Wildlife & Countryside Act 1981 making it illegal to allow this plant to spread in the wild and onto neighbouring properties. This plant reproduces readily from seed and has since spread rapidly across the UK, being most invasive in western and upland areas. It's dense, evergreen foliage and rapid growth crowd out almost all other species and phenols from its leaves suppress the germination of any other plants;
- ✿ A large patch of the invasive non-native winter heliotrope, located to the south of the site. This species aggressively spreads in woodland, woodland edge and grassland habitats. It is spread by rhizomes and root fragments;
- ✿ A population of grey squirrel *Sciurus carolinensis* within all of the woodlands located on Site. The invasive greys, are responsible for the disappearance of the native red throughout much of England and Wales, due to the squirrel pox virus they transmit and the fact that they compete for food and habitat with their smaller relatives;
- ✿ Fallow deer *Dama dama*, now naturalised in the country, inhabit the Site. This species love a moderately high densities in the woodland on Site and as such have a negative impact on the woodland ground flora and understorey; and,
- ✿ Turkey oak *Quercus cerris* has been planted as a single species plantation woodland within the Site. This species, especially in an area with reduced grazing pressure can spread rapidly and has many invasive properties being able to aggressively spread and outcompete native species including English oak.

The following management recommendations are proposed:

Rhododendron

It is essential that this species is aggressively controlled, and over-time eradicated within the Site boundary. Control of *R. ponticum* invasion in the woodland is often taken as the first operation in the restoration of native habitats. The choice of control/eradication method can influence the recovery of the Site, and this should be considered when planning any operations. Control options that include the complete or partial removal of *R. ponticum* shoots before herbicide control will allow faster re-invasion of plants, especially if coupled with ground disturbance. The speed of recovery is also dependent on a local source of viable propagules.

A stem injection control method has been successfully trialled in Western Scotland and Wales. The removal of the largest plants has always posed the greatest challenge and expense to managers, their continued presence in the environment the greatest threat to the species' long-term eradication, as mature bushes can produce up to a million seeds a season, continually re-invading surrounding habitats.

The following methods are recommended:

- ✿ Injecting herbicide directly into the stems of large rhododendron results in their death within six months. Not only is the dead material then easier to remove, but the application of the herbicide is more precise than in traditional methods, uses less product producing overall cost savings.
- ✿ Cut during the winter (September to March), focussing on older, seedbearing bushes first, and follow up with stump treatment immediately. Seed dispersal tends to be very low, generally within a few metres of the individual bush, and research shows that destroying the oldest/core plant is more effective than starting at the edge of the infested area and dealing with younger plants and seedlings;
- ✿ Pull up any seedlings if they come out easily and dig out any plants manually where feasible (don't leave any roots behind);
- ✿ Treat young bushes, any regrowth from stumps and any remaining seedlings with a foliar spray mixed with an adjuvant (this breaks down the waxy layer on the surface of the leaf) between May to October. Research seems to show that these sprays are most effective on younger bushes that are less than 1.3 m tall;
- ✿ Treat mature bushes with a stem injection treatment, if available. If not, then apply a foliar spray as for other younger bushes; and,
- ✿ Burn the cuttings but make sure you limit the number of fire sites since any bare ground created will result in more sites being available for the seeds to take hold.

Winter Heliotrope

Winter heliotrope is a non-native invasive species that was introduced to the UK from abroad. Winter heliotrope was brought over from the Americas and North Africa (mostly) to be planted in gardens during the 1800s as it provides good ground coverage and had a pleasant aroma.

Managing the plant is best achieved via herbicide treatment and/or regular mechanical cutting of plants, which will over time weaken and destroy the plant by not allowing photosynthesis. This should be carried out once a month throughout the UK growing season until the plant no longer returns. Treatment can take a number of years to achieve full eradication.

Grey Squirrel

The grey squirrel was introduced to the UK from North America in 1876. The UK population has grown rapidly since then to the detriment to our native red squirrel through direct competition and the spread of squirrel pox. The native red squirrel has been lost over much of their range, including in Sussex and the whole of southern England.

Grey squirrels also cause extensive damage to our woodlands by stripping bark from trees' main trunks (both from the base and up into the canopy) and branches. They can over time strip a complete ring of bark around the tree, killing the tree. The costs of damage are estimated at between £6 and £10million per annum in Great Britain.

There are encouraging methods being trialled at present in order to deal with this species, this includes a project studying fertility control and the possible future spread/re-introduction of the pine marten. But these possibilities of control are likely many years away yet.

It is recommended that the grey squirrel is heavily managed across the Site. There is a need for a variety of control methods to be available and these should be supported by good practice guidance. Any new control methods should meet legal and welfare criteria as well as being cost effective. There are currently two methods available to achieve this, trapping and shooting.

Trapping

For trapping guidance use: [Grey squirrel traps](#). The use of live-capture traps is recommended to avoid any by-catch fatalities. It is envisaged that the ranger will undertake the proposed grey squirrel trapping.

Shooting

It is envisaged that the ranger will undertake the proposed grey squirrel shooting. In order to legally, safely and humanely control grey squirrel through shooting, the shooter must:

- 🍂 Have permission from the owner of the sporting rights;
- 🍂 Access to a suitable gun/licence and compliance with the law concerning its ownership and use; in gardens an airgun may be the only suitable option;
- 🍂 Plan carefully safe shooting angles with a backstop within the area you have permission to shoot;
- 🍂 Check you have sufficient third party insurance (recommend £10 million);
- 🍂 Consider the squirrels' welfare; you must be a competent shooter so they are killed humanely
- 🍂 Consider a good use for the culled squirrels. Does a local project want them for research? They are perfectly edible by humans or pets such as ferrets; and,
- 🍂 Record what you see and shoot and be ready to provide that information to local projects.

Fallow Deer

Evidence of the negative effects caused by the fallow population within the woodlands include:

- 🍂 Putting browsing pressure (the consumption of tree shoots, shrubs and woody/bark vegetation) on existing trees and ground flora;
- 🍂 Inhibiting the natural regeneration of the native woodlands making them vulnerable to disease, long term survival and climate change; and,
- 🍂 Hampering the use of natural succession to establish new areas of scrub and juvenile woodland.

Once the Site is fenced, the fallow and muntjac *Muntiacus reevesi* deer if present) should be eradicated in order to allow native deer species to predominate within the Site, with introduced red deer and any roe deer that may be present being encouraged and managed as required.

Turkey Oak

The Turkey oak has been widely cultivated in the UK since the 18th century. However, it wasn't until 1905 that it was first recorded in the wild. Since then, it has aggressively colonised areas of the British countryside and displaced native plants. The species has an overall low value to UK wildlife, offering little in the way of habitat for UK invertebrate species.

It has now become naturalised and is spreading into wildlife-rich habitats such as calcareous grassland and heathland, threatening native species. It is also the host of the knopper gall wasp, an insect which damages the acorns of the native oak so affecting its ability to reproduce.

In order to manage this species within the Site:

- ✿ Selectively remove/thin a proportion (2% per year) of the mature Turkey oak trees each year by ring barking, ensuring that these trees are not within falling distance of the footpaths on Site;
- ✿ Veteranisation of an additional 2% of the Turkey oak within the site each year, leaving standing and fallen deadwood piles, ensuring that these trees are not within falling distance of the footpaths on Site; and,
- ✿ Manage and remove the juvenile Turkey oak spreading within the grassland component of the Site.

5.5.7 Injurious Weeds, Land Management and Nuisance Issues.

The park will be bound by The Weeds Act 1959. This legislation requires occupiers of land where specified weeds are growing to take action to prevent them spreading. The five injurious weeds are spear thistle *Cirsium vulgare*, creeping thistle *Cirsium arvense*, curled dock *Rumex crispus*, broadleaved dock *Rumex obtusifolius* and ragwort *Jacobaea vulgaris*.

Given the size of the park it will be the case that there will be no requirement to control weeds where there is no perceived risk of spread to other farmland or land beyond the boundary fence. However, there is likely to be a need to continue current practice of controlling primarily through mowing the vegetation near to the boundary so as to prevent the spread of seeds and the consequent spread of weeds to other land. As such the park will need to monitor the spread of invasives such as rhododendron. The ranger will need to consider whether localised management and control is required.

5.6 Stock Overview

The choice of herbivore has been made after careful research. The animals will recreate, so far as possible, the type of grazing pressure likely to have existed historically that will lead to the development of restored species-rich and diverse habitats.

The proposals involve:

- ✿ Fencing the outer perimeter of the country park with deer and stock fencing followed by the removal of most internal fencing and barriers;
- ✿ The provision of safe crossing points over the footpaths that cross the estate;
- ✿ Provision of vantage points to allow visitors to view the Site without entering the park itself; and,
- ✿ Minimally-managed herds of cattle, red deer and pigs with the introduction of brown hare to complement the introduced species composition.

The exact breed mix for the future is not known. However, the following recommendations are suggested:

- ✿ Fallow deer are recommended to be removed due to their non-native (but naturalised) status, impact on woodlands, high numbers and to simplify ease of future population management.
- ✿ Tamworth pigs are the closest we have to the Old English forest pig but are far more easier to manage than the hybrid 'Iron-age pig' and are not subject to the Dangerous Wild Animals Act as are wild boar *Sus scrofa*.
- ✿ The final cattle breeds are still under consideration, but it must be a UK native rare breed that is suitable and adapted to lowland England. Sussex cattle, an ancient breed first described just after the Norman invasion and therefore a Saxon breed is however recommended, as this breed is under threat in the UK and of local origin. Horned blood lines should be selected and animals that conformed to the older breed type with powerful forequarters (see Figure 54 & 55 below) rather than the later bred animals that have been bred to produce more beef.



Figure 54: Horned Sussex cow– once described as “the sweetest beef in England”.



Figure 55: Horned Sussex Cattle, showing the powerful forequarters, horns and white tail.

Obviously, there is no record of the stocking density of historic wildernesses in lowland Europe or England. Nor do we know what types, breeds and numbers of animals may have grazed such areas. In many ways, however, the actual animal is less interesting than the effect of their selective grazing on the vegetative cover and the resultant habitat change / creation.

The park ranger will be in charge of monitoring the effects of the proposed grazing as the project progresses. If the ranger decides that there is an imbalance or excess of animals, numbers must be adjusted. Working on a range of grazing pressure from 0.3 – 0.7 Livestock Units per ha (LSU/ha)(5), the populations of different animals and species could range quite widely. Exact numbers are not known, nor will they be assessable for many years.

Table 6 below, however, gives a current "best guess" at likely numbers, based on grazing density towards the lower end.

Table 6: Possible Stocking Ratio Animal Numbers

Stock	Animal numbers
Cattle (probably Sussex)	10 cows, 2 heifers, 1 bull
Red deer	3 stags, 10 hinds
Pigs	1 boar, 2 sows
Brown hare	10 Jills, 5 Jacks

5.7 Cattle

Cattle *Bos taurus* are ideal for removing long, coarse grass growth. The tongue is used to pull tufts of vegetation into the mouth, which at low/medium intensity leaves a tussocky appearance.

Cattle are less selective grazers than either equines or sheep, and are likely to graze a vegetation stand or community to a fairly average height, producing a more homogeneous end result. They do not selectively eat flower heads of herbs, unlike sheep. This can be beneficial for the creation of a botanically diverse grassland over time. but may support less variety of invertebrates than a more structured end result.

As ruminants, cattle may spend up to 16 hours a day resting to allow ingested food to be digested by the rumen micro-fauna. They can be quite selective about their resting places and favoured spots can soon show signs of dung accumulation or damage to the turf, but this is generally less noticeable than with sheep or equines. On very large areas, this impact is likely to be significant.

Hoof marks can be very valuable on sites where bare ground is desirable. Heavier animals can cause damage to vegetation and soils around supplementary feeding sites, especially in wet weather or on soft ground. Cattle have a considerable impact on the vegetation with respect to the trampling of bracken and low scrub, breaking up mats of dead litter and creating pathways through tall, dense vegetation.

5.7.1 Foraging Preferences

Cattle have a generalised feeding behaviour and broad mouths, making it impossible for them to ingest individual components of the sward by choice. Selection is therefore made on the basis of patches of sward rather than of individual plants. This generalised feeding behaviour is a valuable asset, within extensive systems, for maintaining species diversity of herb-rich swards.

Cattle usually take sedges, along with other herbage, particularly as the grazing season progresses. Rushes are generally avoided. Control of rush within an area through cattle grazing involves high stocking densities for short periods of time; careful consideration of possible impacts on other aspects of sites importance, such as breeding birds and invertebrates, should also be taken into account if this occurs.

5.7.2 *Impact on Trees and Shrubs*

Cattle can have a significant impact on shrubs and small trees, as they tend to remove leaves and twigs by a tearing action rather than a nipping with their teeth; this can be highly damaging and cause the affected tree/shrub to die. A broad range of woody species is consumed, with ash, sycamore and oak being amongst the most preferred, whilst birch, hazel and hawthorn are less favoured. Horned cattle may cause significant physical damage to scrub, by rubbing against trees and bushes and pushing through them.

5.7.3 *Social Behaviour and its Effect on Foraging*

In general, cattle are social grazers and on large sites will almost always be found in close proximity to each other when feeding. Favoured parts of the site will thus begin to show signs of grazing very quickly, whilst areas where the pasture is less palatable will take longer to show any impact. However, some breeds of cattle, for example highlands, appear to form territories with cyclical use of large areas and may travel miles in one day, with individuals quite widely dispersed.

5.7.4 *Impact of Age on Foraging Ability*

Cattle have resilient teeth and seldom lose them with age. Additionally, grazing ability tends to improve with age and animals cope better with a poorer quality diet once the rumen is fully developed at around 18 months. This improved foraging ability must be balanced against their ability to get about, particularly on arduous terrain.

5.7.5 *Dunging Behaviour*

As an adaptation to reducing parasites burdens, cattle avoid grazing within 10-20 cm from the edge of each pat of dung; thus, even in tightly grazed situations the sward develops a mosaic pattern of short turf strewn with randomly scattered tufts of tussock where pats have been deposited.

5.7.6 *Pigs*

Tamworth pigs tend to be hardier and more suitable for foraging on a wide range of food for themselves and are less prone to sun burn than some other breeds. They are also able to tolerate outwintering provided they are well fed and can find shelter from the wind within the woodlands. They willingly graze, browse and consume berries and fungi, and have been known to take invertebrates which helps to create and maintain a mosaic of bare ground, herb rich pasture and shrub layer. The impact of pigs must be assessed and reduced as required if the impact becomes too great.

Depending on the outcome of these assessments, appropriate stocking density and timing will vary as we only require a low number of pigs over a larger area. At low densities, pigs will dig some areas and forsake others, leading to habitat variability. If plenty of varied food is available there may be no need for supplementary winter feeding.

The beneficial effects of pigs in conservation grazing and land management are many and include acting as a natural predator for invasive species, reducing ground layer density, increasing dead wood percentage, breaking up soil, generating nesting materials and clearing or thinning vegetation.

5.7.7 *Deer*

Red deer are not only an evocative species in lowland Britain but they are a post-glacial native and considered a suitable grazing animal for open habitat conservation. Only two species of deer are considered UK native, the red deer and the roe deer *Capreolus capreolus*. They have largely been lost from lowland Britain with sizeable populations only existing on Exmoor and the southwest peninsular, Norfolk, the Lake District and Scotland. Although it should be noted that none of the mainland deer in Scotland are 100% pure genetically,

as they are all hybrids with the non-native sika deer *Cervus nippon*. Due to their current distribution, is commonly assumed that the red deer is a beast of the open moor, but in fact they are creatures of dense forest, riverine and bog habitats. They have been pushed into these open upland areas by human activities. This is reflected in the fact that a red deer stag in Scotland weighs up to 350 lbs, while in England they can weigh up to 600 lbs due to the higher quality forage available and better shelter availability.

Like fallow deer, red deer graze as well as browse but, because of their size, they can impact dense vegetation better than smaller species. Red deer graze in the growing season and browse and de-bark in the winter months when the grass gets tougher and lose its nutrients. They can also de-bark poisonous elder by neutralising the cyanide in their stomachs – something cattle are unable to achieve.

Research at Knepp has shown that red deer are a generalist herbivore and the only species to favour plantations as habitat, something that Beechy Bottom Park has plenty of. They also show a preference for grassland where bramble, one of their favourite food plants, is prevalent.

The stags rut from late-September to mid-October. Their territorial displays often involve the pawing up the ground and turving up the sward with their antlers. This adds another disturbance factor to the land, creating opportunities for other species as well as an autumn spectacle for visitors walking through the park.

5.7.8 Brown Hare

Brown hares were introduced in Iron Age times from either Scandinavia or northern Europe. They are widespread in the lowlands throughout England, Wales and Scotland. Brown hares are replaced by the native mountain hare *Lepus timidus* in upland areas of Scotland and central England.

Brown hares *Lepus europaeus* live in very exposed habitats, and they rely on acute senses and running at speeds of up to 70 kph (45mph) to evade predators. Hares do not use burrows, but make a small depression in the ground among long grass, known as a form. They spend most of the day on or near the form, moving out to feed in the open at night. Though generally solitary, hares sometimes band into loose groups when feeding.

Breeding takes place between February and September and a female can rear three or four litters a year, each of two to four young. The young, known as leverets, are born fully furred with their eyes open and are left by the female in forms a few metres from their birth location. Once a day for the first four weeks of their lives, the leverets gather at sunset to be fed by the female, but otherwise they receive no parental care. This avoids attracting predators to the young at a stage when they are most vulnerable. Foxes are important predators of young hares and where foxes are common there are likely to be few hares.

Brown hares have little legal protection as they are game animals managed by farmers and landowners. Numbers declined substantially since the beginning of this century, though they are still common animals in many parts of the country. Today's modern farms, including the parkland at Beechy Bottom, are intensive in nature and has little habitat for the hares to hide in. As such, they are currently considered absent from the Site.

This is aggravated by the rise in fox numbers from 1950 to now, when the fox numbers have risen several hundred percent overall due to the presence of more farmed animals and small shooting concerns within the landscape.

The introduction of this evocative species to the park is hoped to help restore this species to the locality.

5.7.9 *Animal Welfare and Management.*

There are obligations on landowners who have control over animals, and further legislation may be brought through Parliament in the future. The animals within the park need to be observed sufficiently frequently to avoid suffering, to meet obligations under the Welfare of Farmed Animals (England) Regulations 2000, as advised in the Welfare Codes for cattle, pigs and deer. This may be daily during calving and when there are young calves. In the event of illness or injury (causing pain or discomfort), assistance should be administered. This, of course, goes somewhat against the concept of animals being kept free from human interference. Whilst suffering is natural it is not acceptable under the Welfare Regulations, and good management practices will need to be followed. There should be no animal welfare reasons to prevent the proposals being carried out.

5.7.10 *Ear Tagging and Passports.*

Farmed animals must be recorded as follows:

- 🍁 All cattle must have a cattle passport, and all cattle must be ear tagged within 30 days of birth. There is no way around this issue. Accordingly, calves will need to be caught and tagged;
- 🍁 All pigs must be earmarked by a single tag or tattooed, again necessitating capture and handling, before slaughter;
- 🍁 Deer do not require to be tagged;

It may be possible to record some by observation without capture. These obligations will significantly affect the way the livestock are managed, because they impose management obligations and necessitate handling of livestock more frequently than might otherwise have been needed. It will mean that there will have to be location(s) into which the animals can be herded for handling, as such a mobile corral/s will be required.

5.8 **Site Access**

The Site supports a section of the High Weald Landscape Trail, a Public Right of Way (PROW) that runs east-west through the centre of the site. In addition, another PROW and Public Bridleway (PB) runs east-west within the site close to the southern site boundary. A third PROW runs broadly south-east to the north-west along the north field boundary of Grassland Compartment B (see Appendix 1).

By law, footpaths and bridleway must be kept open, and their maintenance is an obligation of the SPS. The proposed park operator will have liabilities to ensure public safety and may be held liable if an animal causes injury that could have been expected. Liability does not extend to injuries wholly the fault of the person injured.

Advice from various sources is to ensure that stiles are safe and that paths are clearly marked. It will be necessary to clear vegetation along the routes of the rights of way so that they remain passable at all times. This will have a management-time implication, but will not prejudice the integrity of the proposals.

It may be required for the cows to only be allowed within one compartment for covering by the bulls for a one month period per breeding season, before removing the bull offsite in order to restrict the amount of time a bull is present on Site. This management mostly overcomes any potential conflicts with footpath usage. A lot will depend on the temperament of the bull.

The park operator will therefore need to:

- 🍁 Supply equipment for the ranger to manage the rights of way and thereby comply with legal obligations;
- 🍁 Put up signs showing that a bull is in residence during the month period the bull is envisaged to be on Site;
- 🍁 Monitor livestock births. As necessary, offspring may need to be castrated;

- ✦ Monitor animal behaviour, and if necessary, contain/remove certain animals at times of the year. This may require a temporary fenced area within one of the grassland compartments on site, which obviously goes against the overall objective but may become an essential management requirement.

5.9 Potential Issues

Any proposal usually ends in some form of compromise, and the proposal set out in this document is no different. The following "showstoppers" are considered to be:

- ✦ Animal welfare, management and identification obligations necessitate some livestock husbandry and prevent some wild animals from being kept;
- ✦ The risk to users of highways and bridleways means domesticated variants of wild animals must be utilised.

5.10 Feasibility Assessment

It is considered that the proposed project is feasible. The concept is to:

- ✦ Create an area of animal grazing where there would be no interference from man, except in emergency;
- ✦ The wildlife and the vegetation would be allowed to develop through natural succession;
- ✦ There should generally be completely free access across the proposed park both of the grassland compartments and the woodland compartments;
- ✦ A degree of human management is unavoidable;
- ✦ There is a need for considerable expenditure in terms of fencing the boundary. Stock handling facilities capable of holding rarely-handled animals will be needed. A visitor centre could be very expensive and yet produce little income;
- ✦ There will be ongoing management obligations in terms of public rights of way, animal welfare, control of weeds (to prevent spread out of the estate);
- ✦ It is proposed that once habitats have developed, the park should apply for management funding under the Higher Level Scheme and any successor such as Environmental Land Management Scheme (ELMS);
- ✦ It will take years for the populations of wild and stock animals to reach a stable size in balance with the developing habitats;
- ✦ Taxation. For the land to continue to benefit from agricultural property relief, it must continue to qualify as land occupied for the purposes of agriculture. The keeping of livestock for meat or other products would qualify. Commercial activity with a view to the realisation of profits is needed to retain the opportunity to offset periodic losses for income tax purposes;
- ✦ Overall, there are no insurmountable legal, physical, liability or practical limitations;
- ✦ Wild animals. The Estate is crossed by footpaths/bridleways. The introduction of non-contained animals such as wild boar, which currently feature on the Dangerous Wild Animals Act list, is not feasible. It is advised that the use of domestic derivatives will not diminish the value of the project;
- ✦ Project lifespan. As will be outlined in this report, ecological theories driving this project suggest that a natural 400-500 year cycle would have evolved in the wild. Clearly no landowner can commit to such a timescale. A 25-year timeframe is envisaged, initially, for the project. The proposals as set out in this report are, therefore, a variation from the original concept. They are to some extent a compromise.

5.11 Staffing

The proposed ranger/s should have the following responsibilities and skills:

- ✦ Monitoring and maintenance of boundary fencing;

- ✦ Monitoring, handling, husbandry and animal welfare checks of animals;
- ✦ Some management of land in a few key areas (e.g. noxious weed control near to the periphery) therefore will need a pesticide ticket;
- ✦ Management/maintenance of public rights of way – will require brush cutter and chainsaw (up to large felling) tickets;
- ✦ The ranger should have a full Fire-arms Certificate (FAC) including humane dispatch to control problem fox population if threatening ground nesting birds and a HAD ticket to cover the euthanasiation of injured stock / wild animals;
- ✦ Undertake some limited observational monitoring of wild bird species;
- ✦ Have some botanical skills; and,
- ✦ Public and visiting student management.

Staffing levels for the first three items are estimated at one person with casual assistance. The Health and Safety of staff will be paramount. No staff should be asked or expected to handle animals where there is a significant risk of injury. A full risk assessment is recommended, to be carried out at an appropriate stage as the project progresses.

5.12 Monitoring

Given the number of variables that can affect the outcomes of this grazing management plan, site monitoring is essential to ensure the aims of the plan are being achieved. If the aims are not being achieved, then changes to the management regime will be required. On a site like this, monitoring should focus on vegetation structure and flowering forb species cover and diversity as well as invertebrate, reptile, amphibian, bat and bird monitoring.

6 REFERENCES

- Backmeroff, C. E. and Peterken, G.F (1989) Long-term changes in the woodlands of Clairinsh Transactions of the Botanical Society of Edinburgh
- Bibby C.J., Burgess N.D., Hill D.A. and Mustoe S.H. (2000) *Bird Census Techniques, 2nd Edition*. Academic Press, London.
- Bright P.W., Morris P.A. and Mitchell-Jones A. (2006) *Dormouse Conservation Handbook, 2nd Edition*. English Nature, Peterborough.
- Broadmeadow, M. (2004) The potential effects of climate change for trees and woodland in the South West [www.forestresearch.gov.uk/pdf/cchg_SW_climate_change.pdf/\\$FILE/cchg_SW_climate_change.pdf](http://www.forestresearch.gov.uk/pdf/cchg_SW_climate_change.pdf/$FILE/cchg_SW_climate_change.pdf)
Date information obtained: 10th April 2010.
- Broadmeadow, M. and Ray, D. (2005) Climate Change and British Woodland Forestry Commission: Forest Research Information Note
- Burrows, R. (1971) *The Naturalist in Devon and Cornwall* David and Charles: Newton Abbot.
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
- Cresswell P., Harris S. & Jefferies D.J. (1990) *The history, distribution, status and habitat requirements of the badger in Britain*. Nature Conservancy Council, Peterborough.
- Eaton M., Aebischer N., Brown A., Hearn R., Lock L., Musgrove A., Noble D., Stroud D. and Gregory R. (2015) *Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man*. British Birds 108: 708-746.
- Ferris-Khan, R. and Patterson, G.S. (1992) Monitoring Vegetation Changes in Conservation Management of Forests Forestry Bulletin 108, HMSO.
- Fuller, R. J. (1995) *Bird life of woodland and forest* Cambridge: Cambridge University Press.
- Gill, R. (2000) The impact of deer on woodland biodiversity Forestry Commission. Forest Research, Edinburgh.
- Goldberg, E., Kirby, K., Hall, J., Latham, J. (2007) The ancient woodland concept as a practical conservation tool in Great Britain Journal for Nature Conservation Vol. 15
- Green, T. (2005) Comment: Is there a case for the Celtic Maple or the Scots Plane? British Wildlife 16 (3)
- Gurnell, J. and Pepper, H. (1998) Grey Squirrel damage to broadleaf woodland in the New Forest: A study on the effects of control Q. J. Forestry
- Harding, P. T. and Rose, F. (1996) *Pasture-woodlands in lowland Britain* Abbots Ripton: Institute of Terrestrial Ecology.
- Harris, E. (1987) The case for sycamore. Quarterly Journal of Forestry 81, 32-36.
- Harris S., Cresswell P. and Jefferies D. (1991) *Surveying Badgers*. Mammal Society, London.

- Heath, M. J. and Oakes, H. (1990) Woodland surveys in Southwest England Using the National Vegetation Classification CSD Report 1239. Peterborough: NCC.
- Hein, S., Collett, C., Ammer, C., Goff, N. L., Skovsgaard, J. P. and Savill, P. (2008) A review of growth and stand dynamics of *Acer pseudoplatanus* L. in Europe: implications for silviculture COST.
- Hester, A. J., Mitchell, F. J. G. and Kirby, K. J. (1996) Effects of season and intensity of sheep grazing on tree regeneration in a British upland oakwood Forest Ecology and Management
- Joint Nature Conservation Committee (2010) *Handbook for Phase 1 Habitat Survey - a Technique for Environmental Audit*. Reprinted by JNCC, Peterborough.
- Kirby, K. (1988) A woodland survey handbook Joint Nature Conservation Committee, Research and survey in nature conservation series, Report No. 11.
- Kirby, K. J., Thomas, R. C., Key, R. S., McLean, I. F. G., Hodgetts, N. (1995) Pasture-woodland and its conservation in Britain Biological Journal of the Linnean Society, Vol. 56, Issue s1
- Kirby, K. J., Reid, C. M., Thomas, R. C. and Goldsmith, F. B. (1998) Preliminary estimates of fallen dead wood and standing dead trees in managed and unmanaged forests in Britain Journal of Applied Ecology Vol.35
- Lonsdale D. (1999) Principles of Tree Hazard Assessment and Management TSO
- Marchant J.H. (1983) *BTO Common Bird Census Instructions*, BTO Tring.
- Mattheck C. and Breloer H. 1994 The Body Language of Trees: A handbook for failure analysis TSO
- Matteck C and Bethge K 1998 The Structural Optimization of Trees Springer-Verlag, Naturwissenschaften
- Mc Evoy, P. M., Flexen, M., and McAdam, J. H. (2006) The effects of livestock grazing on ground flora in broadleaf woodlands in Northern Ireland Forest Ecology and Management
- Met Office (2010) Date information obtained: 15th April 2020
<http://www.metoffice.gov.uk/climatechange/guide/ukcp/map/>
- Mitchell A (1974) Collins field Guide, Trees of Britain and Northern Europe Harper Collins Publishers
- Mitchell, F. G. J. and Kirby, K. J. (1990) The impact of large herbivores on the conservation of Semi-natural woods in the British uplands Forestry.
- Mitchell-Jones A.J. (2004) *Bat Mitigation Guidelines*. English Nature, Peterborough.
- Natural England (2010) *South Hams SAC – Greater Horseshoe Bat Consultation Zone Planning Guidance*.
- Peterken, G. F. (1999) Applying natural forestry concepts in an intensively managed landscape Global Ecology and Biogeography 8
- Peterken, G. F. (1983) Woodland Conservation in Britain. In Goldberg E., Kirby K., Hall J.,
- Latham J. 2007 The ancient woodland concept as a practical conservation tool in Great Britain Journal for Nature Conservation Vol. 15

Peterken, G. F. (1996) *Natural Woodland: Ecology and Conservation in Northern Temperate Regions* Cambridge: Cambridge University Press.

Peterken, G. F. (2001) Ecological effects of introduced tree species in Britain *Forest Ecology and Management*, 141, 31-42.

Rackham, O. (1986) *The History of the Countryside: The classic history of Britain's landscape, flora and fauna* Dent.

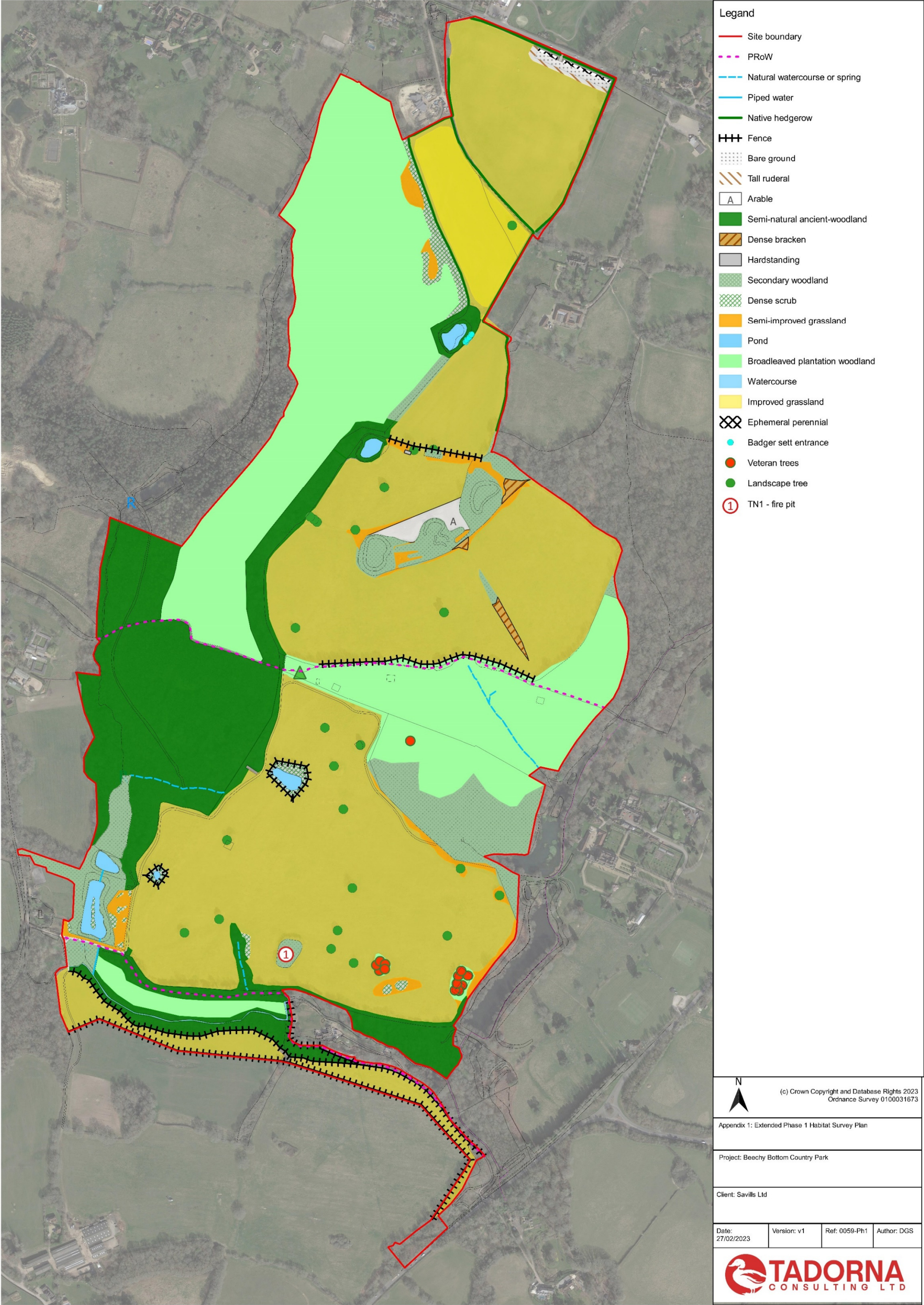
Rackham, O. (1980) *Ancient Woodland: its history, vegetation and uses in England* Edward Arnold, London.

Rose F. and Harding, P.T. (1978) Pasture and woodlands in Lowland Britain and their importance for the conservation of the epiphytes and invertebrates associated with old trees. Nature Conservancy Council & The Institute of Terrestrial Ecology.

Southwood, T.R.E. (1961) The numbers of species of insect associated with various trees. *J. Animal Ecology* 30: 1-8.

Stace, C. (2019) *New Flora of the British Isles* (4th Edition). C&M Floristics, Middlewood Green.

Wray S. Wells D., Long E. & Mitchell-Jones T (2010) *Valuing Bats in Ecological Impact Assessment*, In Practice **70**: 23-25.



- Legend
- Site boundary
 - PRoW
 - Natural watercourse or spring
 - Piped water
 - Native hedgerow
 - Fence
 - Bare ground
 - Tall ruderal
 - A Arable
 - Semi-natural ancient-woodland
 - Dense bracken
 - Hardstanding
 - Secondary woodland
 - Dense scrub
 - Semi-improved grassland
 - Pond
 - Broadleaved plantation woodland
 - Watercourse
 - Improved grassland
 - Ephemeral perennial
 - Badger sett entrance
 - Veteran trees
 - Landscape tree
 - ① TN1 - fire pit

N

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Ordnance Survey 0100031673

Appendix 1: Extended Phase 1 Habitat Survey Plan

Project: Beechy Bottom Country Park

Client: Savills Ltd

Date: 27/02/2023	Version: v1	Ref: 0059-PH1	Author: DGS
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