European Site Conservation Objectives: Supplementary advice on conserving and restoring site features

Wormley Hoddesdonpark Woods Special Area of Conservation (SAC)
Site Code: UK0013696

Wormley Hoddesdonpark Woods (S. Kaupe Natural England, 2016)

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Wormley Hoddesdonpark Woods SAC.

This advice should therefore be read together with the SAC Conservation Objectives available here.

You should use the Conservation Objectives, this Supplementary Advice and any case-specific advice given by Natural England, when developing, proposing or assessing an activity, plan or project that may affect this site.

This Supplementary Advice to the Conservation Objectives presents attributes which are ecological characteristics of the designated species and habitats within a site. The listed attributes are considered to be those that best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. Each attribute has a target which is either quantified or qualitative depending on the available evidence. The target identifies as far as possible the desired state to be achieved for the attribute.

The tables provided below bring together the findings of the best available scientific evidence relating to the site's qualifying features, which may be updated or supplemented in further publications from Natural England and other sources. The local evidence used in preparing this supplementary advice has been cited. The references to the national evidence used are available on request. Where evidence and references have not been indicated, Natural England has applied ecological knowledge and expert judgement. You may decide to use other additional sources of information.

In many cases, the attribute targets shown in the tables indicate whether the current objective is to 'maintain' or 'restore' the attribute. This is based on the best available information, including that gathered during monitoring of the feature's current condition. As new information on feature condition becomes available, this will be added so that the advice remains up to date.

The targets given for each attribute do not represent thresholds to assess the significance of any given impact in Habitats Regulations Assessments. You will need to assess this on a case-by-case basis using the most current information available.

Some, but not all, of these attributes can also be used for regular monitoring of the actual condition of the designated features. The attributes selected for monitoring the features, and the standards used to assess their condition, are listed in separate monitoring documents, which will be available from Natural England.

These tables do not give advice about SSSI features or other legally protected species which may also be present within the European Site.

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email HDIRConservationObjectivesNE@naturalengland.org.uk

About this site

European Site information

Name of European Site	Wormley Hoddesdonpark Woods Special Area of Conservation (SAC)
Location	Hertfordshire
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1 April 2005
Qualifying Features	See section below
Designation Area	335.53ha
Designation Changes	None
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	Wormley-Hoddesdonpark Wood South SSSI Wormley-Hoddesdonpark Wood North SSSI
Relationship with other European or International Site designations	None

Site background and geography

This site covers a series of woods lying mainly on London clay, with some gravel deposits and areas of chalky boulder clay. Most woodlands are ancient with associated areas of secondary woodland which have grown up on old fields and glades. The varied geology combines with the former land uses to produce a mosaic of vegetation. The largest part of the site is oak-bracken-bramble woodland, dominated by sessile oak *Quercus petraea* and hornbeam *Carpinus betulus*, with areas of pedunculate oak *Quercus robur* and hornbeam. Further there are large stands of almost pure hornbeam (former coppice). There are also marshy areas with alder *Alnus glutinosa*, pendulous sedge *Carex pendula* and yellow pimpernel *Lysimachia nemorum* as well as areas with higher proportions of ash *Fraxinus excelsior*, Dogs Mercury *Mercurialis perennis* and Yellow Archangel *Lamium galeobdolon* on the chalky boulder clay. Areas dominated by bluebell *Hyacinthoides non-scripta* do occur, but elsewhere there are stands of great wood-rush *Luzula sylvatica* with carpets of the mosses *Dicranum majus* and *Leucobryum glaucum*. Locally, a bryophyte community more typical of continental Europe occurs, including the mosses *Dicranum montanum*, *D. flagellare* and *D. tauricum*. Nationally the woods are regarded as the best remaining example of the south eastern sessile oak hornbeam woods.

This SAC is part of the Wormley Wood - Hoddesdonpark Wood Nature Conservation Review site (Grade 1), part of the Wormley - Hoddesdonpark Wood possible Special Area for Conservation and part of the proposed National Nature Reserve.

Wormley Hoddesdonpark Woods is part of the Northern Thames Basin National Character Area (NCA Profile 111)

About the qualifying features of the SAC

The following section gives you additional, site-specific information about this SAC's qualifying features. These are the natural habitats and/or species for which this SAC has been designated.

Qualifying habitats:

- **H9160 Sub-Atlantic and medio-European oak or oak-hornbeam forests**

In south-east England there are woodland stands of oak *Quercus* spp. with some hornbeam *Carpinus betulus* that are considered closer to this central European habitat type than its Atlantic counterpart (mainly mixed Atlantic bluebell-oak forests). Bluebell *Hyacinthoides non-scripta*, which is most abundant in Atlantic parts of Europe including the UK, is unusually rare in this Annex I type. Typical species include great wood-rush *Luzula sylvatica*, hairy wood-rush *L. pilosa* and, locally, southern wood-rush *L. forsteri*, with greater stitchwort *Stellaria holostea*, ivy *Hedera helix* and honeysuckle *Lonicera periclymenum*. Stands fall within NVC type W10 *Quercus robur – Pteridium aquilinum – Rubus fruticosus* community.

Wormley Hoddesdonpark Woods has large stands of almost pure hornbeam *Carpinus betulus* (former coppice), with sessile oak *Quercus petraea* standards. Areas dominated by bluebell *Hyacinthoides non-scripta* do occur, but elsewhere there are stands of great wood-rush *Luzula sylvatica* with carpets of the mosses *Dicranum majus* and *Leucobryum glaucum*. Locally, a bryophyte community more typical of continental Europe occurs, including the mosses *Dicranum montanum*, *D. flagellare* and *D. tauricum*.

Table 1: Supplementary Advice for Qualifying Features: H9160. Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Maintain the total extent of the feature to 335.53 hectares	There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. For this feature tree roots (particularly of veteran trees) can extend a considerable distance beyond the boundary of the site - they can be impacted by soil compaction (such as caused by vehicles or construction works); agricultural operations or other soil disturbance (like trenches); and agro chemicals or other chemicals which get into the soil. Any loss of woodland/wood-pasture area - whether at the edge or in the middle of a site will reduce the core area where wood-pasture conditions are found - these support significant assemblages of species dependent on woodland conditions (e.g lichens and bryophytes - being one example). Loss of any woodland area which fragments a site into different parts will clearly disturb the movement of species between the remaining parts of the woodland.	Natural England (2013) Definition of Favourable Condition – Wormley-Hoddesdonpark Woods North SSSI Natural England (2013) Definition of Favourable Condition – Wormley-Hoddesdonpark Woods South SSSI
Extent and	**Spatial**	Maintain the distribution and	A contraction in the range, or geographic spread, of the feature	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
distribution of the feature	**distribution of the feature within the site**	configuration of the feature, including where applicable its component vegetation types, across the site	(and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature.	
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification type • W10 *Quercus robur – Pteridium aquilinum – Rubus fruticosus* Woodland	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. The site holds several NVC Communities as mapped by Jonathan Cox Associates in 1998. Only W10 is a notified feature and covered just over 75% of the site in 1998, though rarely in a pure form (generally associated with other NVC types). According to the 1998 survey, the other most common NVC types present are: W16 *Quercus spp - Betula spp - Deschampsia flexuosa* Woodland and W8 Fraxinus excelsior - Acer campestre – Mercurialis perennis Woodland (all other NVC types accounted for under 10% of the site).	Jonathan Cox Associates, 1998, Wormley and Hoddesdonpark Woods NVC survey. A report to English Nature. (Available from Natural England on request) POWELL M., 1990, Wormley/Hoddesdon Park Woods, Hertfordshire, South of White Stubbs Lane (available from Natural England on request) POWELL M., 1990, Wormley/Hoddesdon Park Woods, Hertfordshire, North of White Stubbs Lane (available from Natural England on request)
Structure and	**Vegetation**	Maintain at least 3 age classes	A distribution of size and age classes of the major site-native	This attribute will be periodically

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
function (including its typical species)	**structure - age class distribution**	(pole stage/ medium/ mature) spread across the average life expectancy of the commonest trees.	tree and shrub species that indicate the woodland will continue in perpetuity, and will provide a variety of the woodland habitats and niches expected for this type of woodland at the site in +question.	monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure - age class distribution (for woodland pasture sites with many old trees)**	Maintain at least 3 age classes (pole stage/ medium/ mature) spread across the average life expectancy of the commonest trees; an ancient or veteran class should always be present	A distribution of size and age classes of the major site-native tree and shrub species that indicate the woodland will continue in perpetuity, and will provide a variety of the woodland habitats and niches expected for this type of woodland at the site in question. The woodland pastures on this site have a varied history and veteran trees are not present in all areas and in these areas at least one age class is missing. Ermine Street has the best example of veteran Hornbeam pollards, with a new generation of pollards present.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure - canopy cover**	Maintain an appropriate tree canopy cover across the feature, which will typically be between 40-90% of the site	Canopy cover is the overall proportion of vegetative cover consisting of any woody layer ranging from established regeneration to mature and veteran stages. Woodland canopy density and structure is important because it affects ecosystem function and in particular microclimate, litter-fall, soil moisture, nutrient turnover and shading; this in turn influences the composition of plants and animals in lower vegetation layers and soil. Open canopies with just scattered trees will have less of a woodland character and reduced diversity of woodland-dependent species (although they may still be important as a form of woodland-pasture). Completely closed canopies across the whole woodland are not ideal either however, as they cast heavier shade and support fewer species associated with edges, glades and open grown trees, and have little space where tree regeneration could occur. In general, the woodland canopy of this feature should provide a core of woodland interior conditions with some open and edge habitat as well.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and	**Vegetation**	Restore a tree canopy cover	Canopy cover is the overall proportion of vegetative cover	This attribute will be periodically

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
function (including its typical species)	**structure - canopy cover (for woodland-pasture sites with many old trees)**	across 10-30% of the woodland feature, including a high proportion of mature or over mature trees with open grown, free crowns.	consisting of any woody layer ranging from established regeneration to mature and veteran stages. Woodland canopy density and structure is important because it affects ecosystem function and in particular microclimate, litter-fall, soil moisture, nutrient turnover and shading; this in turn influences the composition of plants and animals in lower vegetation layers and soil. Open canopies with just scattered trees will have less of a woodland character and reduced diversity of woodland-dependent species (although they may be still be important as a form of woodland-pasture). Completely closed canopies across the whole woodland are not ideal either however, as they cast heavier shade and support fewer species associated with edges, glades and open grown trees, and have little space where tree regeneration could occur. In general, the woodland canopy of this feature should provide a core of woodland interior conditions with some open and edge habitat as well. A restore target has been set as canopy cover exceeds desired limits in the wood-pasture areas of the site.	monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure - open space**	Maintain areas of permanent/temporary open space within the woodland feature, typically to cover between 10-30% of area	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. Having some open, sunlit and largely tree-less areas as part of the woodland community is often important to facilitate natural tree and shrub regeneration and also to provide supporting habitat for specialist woodland invertebrates, birds, vascular and lower plants. Such open space can be permanent or temporary and may consist of managed grazed areas, linear	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			rides and glades, or naturally-produced gaps caused by disturbance events such as windthrow/fire/tree falling over/snow damage.	
Structure and function (including its typical species)	**Vegetation structure - open space (for woodland pasture with old trees)**	Restore areas of permanent/ temporary open space within the woodland feature, typically to cover between 60-80% of area	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. Having some open, sunlit and largely tree-less areas as part of the woodland community is often important to facilitate natural tree and shrub regeneration and also to provide supporting habitat for specialist woodland invertebrates, birds, vascular and lower plants. Such open space can be permanent or temporary and may consist of managed grazed areas, linear rides and glades, or naturally-produced gaps caused by disturbance events such as windthrow/fire/tree falling over/snow damage. A restore target has been set has the areas of open space within the wood-pasture areas is insufficient to meet the desired target.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure - old growth**	Maintain the extent and continuity of undisturbed, mature/old growth stands (typically comprising at least 20% of the feature at any one time) and the assemblages of veteran and ancient trees (typically >10 trees per hectare).	Good woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. For this habitat type, old or over-mature elements of the woodland are particularly characteristic and important features, and their continuity should be a priority.	
Structure and	**Vegetation**	Maintain the extent and	Woodland structure includes variations in age, tree form,	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
function (including its typical species)	**structure - old growth (for woodland pasture sites with many old trees)**	continuity of undisturbed, mature/old growth stands (typically comprising at least 20% of the feature at any one time) and the assemblages of veteran and ancient trees (typically >10 trees per hectare).	layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. For this habitat type, old or over-mature elements of the woodland are particularly characteristic and important features, and their continuity should be a priority. This may require active management by 'recruiting' veterans (e.g. through tree ageing techniques where necessary) from the mature and younger trees, and ensuring sufficient regeneration - at a rate necessary to keep pace with the rate of veteran tree death at a particular site.	
Structure and function (including its typical species)	**Vegetation structure - dead wood**	Maintain the continuity and abundance of standing or fallen dead and decaying wood, typically between 30 - 50 m3 per hectare of standing or fallen timber or 3-5 fallen trees >30cm per hectare, and >10 standing dead trees per hectare	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. For this habitat type, old or over-mature elements of the woodland are particularly characteristic and important features, and their continuity should be a priority.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure - dead wood (for woodland pasture sites with many old trees)**	Maintain the continuity and abundance of standing or fallen dead and decaying wood, typically between 30 - 50 m3 per hectare of standing or fallen timber or 3-5 fallen trees >30cm per hectare, and >10 standing dead trees per hectare	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. For this habitat type, old or over-mature elements of the	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			woodland are particularly characteristic and important features, and their continuity should be a priority.	
Structure and function (including its typical species)	**Vegetation structure - age class distribution**	Maintain at least 3 age classes (pole stage/ medium/ mature) spread across the average life expectancy of the commonest trees.	A distribution of size and age classes of the major site-native tree and shrub species that indicate the woodland will continue in perpetuity, and will provide a variety of the woodland habitats and niches expected for this type of woodland at the site in question.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure - shrub layer**	Maintain an understorey of site native shrubs including hazel, elder, hawthorn, and dogwood typically between 10-40% of the stand. Understorey species may also include sweet chestnut, ash, field maple	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. Hornbeam woodland has many similarities with beech dominated woodland, sharing its very heavy shade leading to strong dominance of canopy layer and low vegetation diversity.	Jonathan Cox Associates, 1998, Wormley and Hoddesdonpark Woods NVC survey. A report to English Nature. (Available from Natural England on request) This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure - shrub layer(for woodland pasture sites with many old trees)**	Maintain an understorey of shrubs and trees covering 10 - 20% of the site (this will vary with light levels, grazing and site objectives). Understorey species may include: hawthorn, blackthorn, crab apple, field maple, hazel, willow	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. The targets set within this attribute should reflect the most appropriate structure for the woodland feature on a particular site, taking account of its known interest, history, past management and the landscape context. There is more opportunity for growth of scrub or young tree growth in wood-pasture sites because of higher light levels.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its	**Vegetation structure - Woodland**	Maintain a graduated woodland edge into adjacent semi-natural open habitats, other	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)	**edge**	woodland/wood-pasture types or scrub.	functioning. Woodland edge is defined as being the transitional zone between the forest feature and adjacent but different habitat types - the best woodland edges will have a varied structure in terms of height and cover. Many typical forest species make regular use of the edge habitats for feeding due to higher herb layer productivity and larger invertebrate populations.	
Structure and function (including its typical species)	**Adaptation and resilience**	Maintain the resilience of the feature by ensuring a diversity of site-native trees (e.g. hornbeam, oak, ash, birch, aspen, sycamore, wild service) are present across the site.	This recognises the increasing likelihood of natural habitat features needing to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being moderate, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that this site is considered to be vulnerable overall but moderately so. This means that some adaptation action for specific issues may be required, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability.	NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England (Available at http://publications.naturalengland.org.uk/publication/4954594591375360) Jonathan Cox Associates, 1998, Wormley and Hoddesdonpark Woods NVC survey. A report to English Nature. (Available from Natural England on request) POWELL M., 1990, Wormley/Hoddesdon Park Woods, Hertfordshire, South of White Stubbs Lane (available from Natural England on request) POWELL M., 1990, Wormley/Hoddesdon Park Woods, Hertfordshire, North of White Stubbs Lane (available from Natural England on request) This attribute will be periodically monitored as part of Natural

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				England's site condition assessments.
Structure and function (including its typical species)	**Browsing and grazing by herbivores**	Maintain browsing at a (low) level that allows well developed understorey with no obvious browse line, & lush ground vegetation with some grazing sensitive species evident (bramble, ivy etc), and tree seedlings and sapling common in gaps.	Herbivores, especially deer, are an integral part of woodland ecosystems. They are important in influencing woodland regeneration, composition and structure and therefore in shaping woodland wildlife communities. In general, both light grazing and browsing is desirable to promote both a diverse woodland structure and continuous seedling establishment. Short periods with no grazing at all can allow fresh natural regeneration of trees, but a long-term absence of herbivores can result in excessively dense thickets of young trees which shade out ground flora and lower plant species. However, heavy grazing by deer or sheep prevents woodland regeneration, and can cause excessive trampling and/or poaching damage, canopy fragmentation, heavy browsing, bark-stripping and a heavily grazed sward. The presence and impact of deer on the SAC has been highlighted in the Site Improvement Plan as being of concern, deteriorating the lower canopy and ground flora. The introduction of deer exclosures have been put in place to mitigate against the effects of deer led by the Forestry Commission. At present the level of browsing across the SAC is within desired limits but requires continued monitoring.	Natural England (2015) Site Improvement Plan – Wormley Hoddesdonpark Woods (SAC) This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Regeneration potential**	Restore the potential for sufficient natural regeneration of desirable trees and shrubs; typically tree seedlings of desirable species (measured by seedlings and <1.3m saplings - above grazing and browsing height) should be visible in sufficient numbers in gaps, at the wood edge and/or as regrowth as appropriate ;	The regeneration potential of the woodland feature must be maintained if the wood is to be sustained and survive, both in terms of quantity of regeneration and in terms of appropriate species. This will Include regeneration of the trees and shrubs from saplings or suckers, regrowth from coppice stools or pollards, and where appropriate planting. Browsing and grazing levels must permit regeneration at least in intervals of 5 years every 20. The density of regeneration considered sufficient is less in parkland sites than in high forest. Regeneration from pollarding of veteran trees should be included where this is happening.	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Regeneration across the site is patchy; factors influencing this may include deer browsing and heavy shade.	
Structure and function (including its typical species)	**Tree and shrub species composition**	Maintain a canopy and under-storey of which 95% is composed of site native trees and shrubs: *Quercus robur, Quercus petraea, Carpinus betulus, Betula spp, Fraxinus excelsior, Corylus avellana, Populus tremula, Crataegus monogyna, Rubus spp, Pteridium aquilinum, Milium effusum, Lonicera periclymenum*	Native trees and shrubs in general support a greater diversity of associated species than non-native species, especially amongst groups of invertebrates which depend directly on trees for food and shelter. There are many plants and animals which use or co-exist with non-native trees, but many rare and threatened woodland species are specialists adapted to one or a few native trees or shrub species (birches, willows and oaks, are examples of trees that host many specialist insect species). The SAC is dominated by site native tree species with the exception small areas of conifers, especially in the north-east of the site, which were planted in the 1960's. These are gradually being replaced by site-native trees.	Jonathan Cox Associates, 1998, Wormley and Hoddesdonpark Woods NVC survey. A report to English Nature. (Available from Natural England on request)
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Maintain the abundance of the species listed below to enable each of them to be a viable component of the H9160 habitat The constant and preferential plants of the W10 woodland NVC community types which forms a key component of the H9160 feature	Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; • **Structural** species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • **Influential** species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • **Site-distinctive** species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them	Natural England (2013) Definition of Favourable Condition – Wormley-Hoddesdonpark Woods North SSSI Natural England (2013) Definition of Favourable Condition – Wormley-Hoddesdonpark Woods South SSSI DAVEY S., 1998, Wormley-Hoddesdonpark Woods, A lower plant survey of Woodland SACs (available from Natural England on request)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available.	
Structure and function (including its typical species)	**Invasive, non-native and/or introduced species**	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the feature	Invasive or introduced non-native species are a serious potential threat to the biodiversity of native and ancient woods, because they are able to exclude, damage or suppress the growth of native tree, shrub and ground species (and their associated typical species), reduce structural diversity and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum pesticides). Such species can include Rhododendrons, snowberry, Japanese knotweed, giant hogweed and Himalayan balsam, for example. Similarly, this would include pheasants, rabbits and non-native invertebrate 'pest' species.	Natural England (2015) Site Improvement Plan – Wormley Hoddesdonpark Woods (SAC)
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	
Structure and function (including its typical species)	**Root zones of ancient trees**	Maintain the soil structure within and around the root zones of the mature and ancient tree cohort in an un-compacted condition	The management of land within and around forest habitats which are characterised by ancient trees can be crucial to their individual welfare and long-term continuity, and the landscape they are part of can be just as or even more important. The condition of the soil surrounding such trees will affect their roots, associated mycorrhizal fungi and growth. Plants have difficulty in compacted soil because the mineral grains are	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			pressed together, leaving little space for air and water which are essential for root growth. Unless carefully managed, activities such as construction, forestry management and trampling by grazing livestock and human feet during recreational activity may all contribute to excessive soil compaction around ancient trees.	
Supporting processes (on which the feature relies)	**Functional connectivity with wider landscape**	Maintain the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis.	
Supporting processes (on which the feature relies)	**Air quality**	Restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). Natural England (2015) Site Improvement Plan – Wormley Hoddesdonpark Woods (SAC)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.	
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. This is included as disruption/ damage to hydrological processes could be caused by activities at some distance from the site boundary, e.g. through extraction of ground or surface waters; diverting or damming river channels; pollution of water source; channel alignment that disrupts natural geomorphological processes; tunnelling etc.	
Supporting processes (on which the feature relies)	**Illumination**	Ensure artificial light is maintained to a level which is unlikely to affect natural phenological cycles and processes to the detriment of the feature and its typical species at this site.	Woodland biodiversity has naturally evolved with natural patterns of light and darkness, so disturbance or modification of those patterns can influence numerous aspects of plant and animal behaviour. For example, light pollution (from direct glare, chronically increased illumination and/or temporary, unexpected fluctuations in lighting) can affect animal navigation, competitive interactions, predator-prey relations, and animal physiology. Flowering and development of trees and plants can	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			also be modified by un-natural illumination which can disrupt natural seasonal responses.	
Version Control Advice last updated: N/A				
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