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

Helbeck and Swindale Woods Special Area of Conservation (SAC)
Site Code: UK0030167

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Helbeck and Swindale Woods SAC. This advice should therefore be read together with the SAC Conservation Objectives available here.

Where this site overlaps with other European Sites, you should also refer to the separate European Site Conservation Objectives and Supplementary Advice (where available) provided for those sites.

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	Helbeck and Swindale Woods Special Area of Conservation (SAC)
Location	Cumbria
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1 April 2005
Qualifying Features	See below
Designation Area	136.38 ha
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)	Helbeck Wood SSSI Swindale Wood SSSI
Relationship with other European or International Site designations	The boundary of this SAC coincides with Moor House – Upper Teesdale SAC. The Conservation Objectives for this site can be found here

Site background and geography

The site comprises two ash woods, Helbeck and Swindale, separated by open fell that lie on the Eden valley scarp slope of the north Pennines above the village of Brough 7 miles south east of Appleby-in-Westmorland in Cumbria and within the North Pennines National Character Area (NCA Profile 10). The woodlands lie between 210 and 350 m above sea level and the climate is generally cool and wet. Helbeck Wood lies on the SW frontal slope of the scarp which rises in ridges and tiers of the underlying Carboniferous limestone bedrock towards Little Fell whilst Swindale occupies the nearby deep and cliff-lined valley of Swindale Beck and Wellhead Sike.

The two woods are characterised by an irregular topography of limestone cliffs, steep slopes, block and fine screes but include areas that are overlain by more acidic glacial drift soils. The woodland composition varies accordingly with stands of pure ash, some wych elm, scattered oak and areas of birch and with varying amounts of aspen, gean, hazel, rowan, holly and bird cherry. The field layer is very rich on the limestone soils and typified by ramsons and dog's mercury and with a diverse range of other herbs and there are glades and open areas that support blue-moor grass and fescue grasslands and in places base-rich calcareous flushes.

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:

- **H9180 Tilio-Acerion forests of slopes, screes and ravines**

The *Tilio-Acerion* ravine forests of Helbeck and Swindale is the Annex 1 habitat that is the primary reason for selection of this site. The woods have developed on Carboniferous limestone bedrocks and are largely dominated by ash *Fraxinus excelsior* with some wych elm *Ulmus glabra* associated with coarse scree, cliffs, steep rocky slopes and ravines, where inaccessibility has reduced human impact. The feature often occurs as a series of scattered patches grading into other types of woodland or as narrow strips along stream-sides but at Helbeck and Swindale it is more extensive reflecting the amount of exposed limestone.

The lightly grazed woodlands support a rich and varied ground flora including stands of ramsons and dog's mercury, a range of other herbs including lily-of-the-valley (*Convallaria majalis*) and there is a good diversity of lichens and bryophytes on trees and boulders. There are also transitions into more acidic substrates with birch and hawthorn or areas of sessile oak and hazel where glacial drift covers the bedrock. Locally distinctive transitions to calcareous flushes and grassland are also present in glades and openings.

The woodland feature correspond to the following NVC types: W8 *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland and W9 *Fraxinus excelsior - Sorbus aucuparia - Mercurialis perennis* woodland.

Qualifying Species:

Not applicable

Table 1: Supplementary Advice for Qualifying Features: H9180. Tilio-Acerion forests of slopes, screes and ravines; Mixed woodland on base-rich soils associated with rocky slopes *

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 94.3 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 area - whether at the edge or in the middle of a site will reduce the core woodland area where woodland 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. The target area comprises the combined area of the feature as set out in the Definitions of Favourable Condition for the	English Nature. 2006. Definition of Favourable Condition – Swindale Wood SSSI (Available from Natural England on request) Natural England. 2008. Definition of Favourable Condition – Helbeck Wood SSSI (Available from Natural England on request) Natural England. 2008. Digitised Phase 2 Habitat maps of Helbeck Wood 2008 and Swindale Wood 2005. Phase 2 Habitat maps from English Nature 1984. Available from Natural England.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			component SSSIs. These areas are derived from the digitised Phase 2 habitat maps (both sites 1984) combined with aerial photographs (Helbeck Wood 2008, Swindale Wood 2005).	
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Maintain the distribution and configuration of the H9180 feature, including where applicable its component vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (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.	As for Extent target set out above.
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the H9180 feature are referable to and characterised by the following National Vegetation Classification types: W8 *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland W9 *Fraxinus excelsior - Sorbus aucuparia - Mercurialis perennis*	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.	As for Extent target set out above.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		woodland		
Structure and function (including its typical species)	**Vegetation structure - canopy cover**	Maintain an appropriate tree canopy cover across the H9180 feature, which will typically be 30-90% canopy cover within Swindale Wood and 50-60% in Helbeck Wood within the woodland stands.	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, litterfall, 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. Target derived from Definitions of Favourable Condition for Helbeck Wood SSSI and Swindale Wood SSSIs. The Helbeck target in turn derives from the JNCC Common Standards Monitoring Guidance for bryophytes and lichens: http://jncc.defra.gov.uk/pdf/CSM_bryosLichens.pdf The higher canopy cover target for Helbeck Wood reflects the need for a balance of light and humidity for the suite of lichens that occur within the site.	As for Extent target set out above.
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 approximately 20%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.	As for Extent target set out above.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. Open ground within and along the edges of the H9180 feature supporting calcareous grassland and base-rich flushes is a characteristic element of the feature on this site. The higher target reflects the current extent of open ground which is considered satisfactory for the site.	
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 function (including its typical	**Vegetation structure - dead wood**	Maintain the continuity and abundance of standing or fallen dead and decaying wood, typically between 30 - 50 m3 per	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.	As for Extent target set out above.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species)		hectare of standing or fallen timber or 4-5 fallen trees >30cm per hectare, and >10 standing dead trees per hectare	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.	
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.	As for Extent target set out above.
Structure and function (including its typical species)	**Vegetation structure - shrub layer**	Maintain an understorey of shrubs cover 20 - 40% of the stand 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.	As for Extent target set out above.
Structure and function (including its typical species)	**Vegetation structure - woodland edge**	Maintain a graduated woodland edge into adjacent semi-natural open habitats, other woodland/wood-pasture types or scrub.	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. Grasslands / arable fields managed with high doses of agro-chemicals could potentially not allow this gradation of woodland edge and could have other impacts on the integrity of the site (pollution/ nutrient enrichment etc). The site supports other woodland, grassland and flush communities and the transitions between these and the H9180 feature should be maintained. The Site Improvement Plan for	As for Extent target set out above. Natural England. 2014. Site Improvement Plan for Helbeck and Swindale Woods SAC: http://publications.naturalengland.org.uk/publication/5914271330336768

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			this SAC identifies the need to maintain open areas and glades through appropriate woodland management. The key communities comprise: W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland. W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland CG9 *Sesleria albicans-Galium sterneri* grassland M10 *Carex dioica-Pinguicula vulgaris* mire	
Structure and function (including its typical species)	**Adaptation and resilience**	Maintain the resilience of the H9180 feature by ensuring a diversity of site-native trees (at least 9 site native tree species) e.g. ash/ wych elm/ aspen/ alder/ sycamore/ rowan/ bird cherry/ downy birch/ gean) 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. 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. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being low, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that this site is considered to be vulnerable overall but are a lower priority for	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. Natural England/Forestry Commission (2015 as amended), What can we do about “Chalara” ash dieback (*Hymenoscyphus fraxineus*) on woodland SSSIs? https://www.forestry.gov.uk/pdf/ChalaraSSSINEFCE.pdf/$FILE/ChalaraSSSINEFCE.pdf Natural England. 2014. Site Improvement Plan for Helbeck and Swindale Woods SAC: http://publications.naturalengland.org.uk/publication/591427133033

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			further assessment and action. Individual species may be more or less vulnerable than their supporting habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable. Ash dieback disease ('Chalara') caused by the fungus *Hymenoscyphus fraxineus* is now present in the site and is a threat to the H9180 feature and this is recognised in the Site Improvement Plan. The feature can be made more resilient to the disease by ensuring the maintenance of a diversity of other trees and shrubs, particularly those that have similar ecological characteristics to ash. These latter species might also be encouraged to increase their frequency across the site as part of a programme of mitigation measures that might be developed for the site.	6768
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, and lush ground vegetation with some grazing sensitive species evident 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.	
Structure and function (including its typical species)	**Regeneration potential**	Maintain the potential for sufficient natural regeneration of desirable trees and shrubs; typically tree seedlings of desirable species (measured by	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.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		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	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.	
Structure and function (including its typical species)	**Key structural, influential and site-distinctive species**	Maintain the diversity and abundance of the species groups listed below to enable each of them to be a viable component of the H9180 habitat; The constant and preferential plants of the W8 and W9 woodland NVC community types which forms a key component of the H9180 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 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,	Natural England. 2014. Site Improvement Plan for Helbeck and Swindale Woods SAC: http://publications.naturalengland.org.uk/publication/5914271330336768 Natural England/Forestry Commission (2015 as amended), What can we do about "Chalara" ash dieback (*Hymenoscyphus fraxineus*) on woodland SSSIs? https://www.forestry.gov.uk/pdf/ChalaraSSSINEFCE.pdf/$FILE/ChalaraSSSINEFCE.pdf

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			and species may be added or deleted, as new information about this site becomes available. Sycamore *Acer pseudoplatanus* is identified in the Site Improvement Plan for this SAC as being present at undesirable levels in some parts of the wood. However, the species is also seen as one that could contribute to the mitigation of ash dieback disease and so is included in the list of desirable trees.	
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 H9180 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. Sycamore *Acer pseudoplatanus* is a non-native species that is present on the site and is considered a negative feature – its control is identified as an action in the Site Improvement Plan for the SAC. However, recent research in relation to ash die-back disease has shown that sycamore has similarities to ash in some respects, in terms of the species it supports (nearly half of those associated with ash can also use sycamore) and some of its other ecological functions (nutrient cycling) and qualities (such as its similar bark pH – important for some lichens). In European ash forests sycamore is a native component, and it has now naturalised itself into many UK woodlands. It is likely that where sycamore *Acer pseudoplatanus* is present with ash,	English Nature. 2006. Definition of Favourable Condition – Swindale Wood SSSI (Available from Natural England on request) Natural England. 2008. Definition of Favourable Condition – Helbeck Wood SSSI (Available from Natural England on request) Natural England. 2014. Site Improvement Plan for Helbeck and Swindale Woods SAC: http://publications.naturalengland.org.uk/publication/5914271330336768 Natural England/Forestry Commission (2015 as amended), What can we do about “Chalara” ash dieback (*Hymenoscyphus fraxineus*) on woodland SSSIs? https://www.forestry.gov.uk/pdf/ChalaraSSSINEFCE.pdf/$FILE/ChalaraSSSINEFCE.pdf

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			and the ash *Fraxinus excelsior* dies, that sycamore *Acer pseudoplatanus* will fill the gaps if left undeterred. Woodland management should maintain ash where it shows resistance to the disease and encourage a range of native tree species (e.g. aspen *Populus tremuloides* and gean *Prunus avium*) that are already present on the site to fill the gaps. Sycamore *Acer pseudoplatanus* could also be part of this mix and where it is present and the impact of sycamore on ground flora is a concern manipulating stand structure to allow more light to reach the forest floor is recommended, and maintaining the total amount of sycamore in the canopy at a low proportion, ideally below 15%.	
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 H9180 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.	
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.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. Woodland of this type is very restricted in extent in the North Pennines so opportunities should be sought wherever possible to extend the woodland beyond its current boundaries and make linkages with other woodlands across the landscape. Opportunities should also be sought to create more natural transitions to other semi-natural habitats that occur adjacent to the site including base-rich flushes and limestone grasslands.	
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 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. The Site Improvement Plan for Helbeck & Swindale Woods (Natural England 2014) identified that N deposition currently	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. 2014. Site Improvement Plan for Helbeck and Swindale Woods SAC: http://publications.naturalengland.org.uk/publication/5914271330336768

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			exceeded the relevant critical level for the SAC interest feature and that this should be addressed. 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 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. Swindale Beck forms part of the headwaters of the River Eden SAC. The site supports alkali fens in the form of base-rich springs and flushes and transitions with these and the woodland are important features of the site.	
Supporting processes (on which the feature relies)	**Illumination**	Ensure artificial light is maintained at 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,	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			and animal physiology. Flowering and development of trees and plants can also be modified by un-natural illumination which can disrupt natural seasonal responses.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				