



European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features

Castle Eden Dene Special Area of Conservation (SAC) Site code: UK0012768



Yew woodland at Castle Eden Dene © Natural England 2009

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Castle Eden Dene SAC. This advice should therefore be read together with the SAC Conservation Objectives available <u>here</u>.

This advice updates and replaces a previous draft version dated 28 September 2016.

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 <u>HDIRConservationObjectivesNE@naturalengland.org.uk</u>

About this site

European Site information

Name of European Site	Castle Eden Dene Special Area of Conservation (SAC)
Location	County Durham
Site Maps	The designated boundary of this site can be viewed <u>here</u> on the MAGIC website
Designation Date	1 April 2005
Qualifying Features	H91J0 Taxus baccata woods
Designation Area	194.57 hectares
Designation Changes	Not applicable
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's <u>Designated Sites System</u>
Names of component Sites of Special Scientific Interest (SSSIs)	Castle Eden Dene SSSI
Relationship with other European or International Site designations	Durham Coast SAC lies approximately 200 metres to the east of this site.
Other information	Natura 2000 Standard Data Form for Castle Eden Dene SAC

Site background and geography

Castle Eden Dene covers an area of approximately 195 hectares in north-east England and represents the most extensive northerly native occurrence of yew *Taxus baccata* woods in the UK. Situated near the coast on the edge of Durham's urban fringe, near Peterlee New Town, Castle Eden Dene is the largest and biologically the richest of a series of steep-sided wooded denes. The SAC forms part of the <u>Castle Eden Dene National Nature Reserve</u>.

The underlying geology of this site is Magnesian Limestone which was deposited by the Germano-British Sea which extended over much of northern Britain in Permian times, some 200 million years ago. The limestone, which dips gently to the east, lies on top of the coal measures. On top of the limestone lie a series of boulder clays which were laid down during the ice ages. As the ice melted, water flowing to the sea cut deep ravines (or 'denes') into the limestone.

Castle Eden Dene is 5.6km long and is the largest of a series of valleys which run down to the coast between Sunderland and Hartlepool, reaching the sea at Denemouth. Often there is no water at the bottom of the gorge, as Castle Eden Burn is seasonal and disappears into the limestone rock during the summer.

Public access to the site has been improved over the years with the construction of suitable drainage around newly installed footpaths and bridges over the Dene. There are several entrance points into the Dene, from Peterlee and Horden to the north, Castle Eden, Blackhall and Heselden to the south, and

from the A19 and A1086 roads. This has led to the site being a popular destination for walkers. However, storms in 2009 and 2012 have left some areas of the site relatively inaccessible due to the instability of the boulder clay slopes. These slopes have become colonised by a wide range of ruderal and wetland plants in which giant horsetail *Equisetum telmateia* is often abundant, whilst in time willow *Salix* spp. scrub may become established.

Castle Eden Dene shows extensive and typical woodland zonation. The majority of the lower sections of the woodland is developed on base-rich soils with ash *Fraxinus excelsior* and wych elm *Ulmus glabra* as the main canopy species, although sycamore *Acer pseudoplatanus* is well established and yew *Taxus baccata* common. Hazel *Corylus avellana* is the most abundant shrub species, but guelder rose *Viburnum opulus*, spindle *Euonymus europaeus*, privet *Ligustrum vulgare*, dogwood *Cornus sanguinea* and spurge laurel *Daphne laureola* are also significant components of the shrub flora. The species-rich ground flora is dominated by wild garlic *Allium ursinum* with wood anemone *Anemone nemorosa*, dog's mercury *Mercurialis perennis* and sanicle *Sanicula europaea*, whilst in the humid valley-bottom there are locally extensive stands of hart's-tongue fern *Phyllitis scolopendrium*.

In the upper parts of the Dene pedunculate oak *Quercus robur* and, to a lesser extent, birch *Betla pubescens* dominate the canopy, with an understorey of hazel, holly *llex aquifolium* and rowan *Sorbus aucuparia*, and a ground flora containing tufted hair-grass *Deschampsia cespitosa*, or bracken *Pteridium aquilinum*.

At the western end of the dene is a small stand of unimproved grassland, containing blue moor-grass *Sesleria albicans*, rock rose *Helianthemum nummularium*, quaking grass *Briza media* and fragrant orchid *Gymnadenia conopsea*.

Rare and local species in the Dene include lily-of-the-valley *Convallaria majalis*, herb paris *Paris quadrifolia* and round-leaved wintergreen *Pyrola rotundifolia*, along with juniper *Juniperus communis* and the small-leaved lime *Tilia cordata*.

The invertebrate fauna of the site is exceptional and of national importance, one of only four sites so accredited in the whole of Northumberland and Durham. The insect fauna includes regionally rare species, such as the elm feeding moth and Blomer's rivulet *Discoloxia blomeri*.

Castle Eden Dene SAC is part of the <u>Durham Magnesian Limestone Plateau National Character Area</u> (NE435).

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:

• H91J0 Taxus baccata woods of the British Isles ('yew-dominated woodland')

Yew *Taxus baccata* woodland typically occurs on shallow, dry soils usually on chalk or limestone slopes, but in a few areas stands on more mesotrophic soils are found. Although there is variation, yew tends to be overwhelmingly dominant and is usually associated with a very sparse shrub and tree layer. Only a few species, such as dog's mercury *Mercurialis perennis*, can survive beneath the dense shade cast by the canopy of mature yew trees.

This SAC represents the most extensive northerly native occurrence of yew *Taxus baccata* woods in the UK. Extensive yew groves are found in association with ash-elm *Fraxinus-Ulmus* woodland and it is the only site selected for yew woodland on Magnesian Limestone in north-east England.

The principal underpinning NVC habitat for this SAC is the yew woodland community (*W13b Taxus baccata - Mercurialis perennis sub-community*). This habitat is in located in patches throughout the site with the largest areas in the central region of the SAC. In addition to this mixed broadleaf woodland there are sections of other woodland types containing a scattering of yew trees. These include alder woodland (*W7a Alnus glutinosa – Fraxinus excelsior – Lysimachia nemorum; Urtica dioica sub-community and W7c Alnus glutinosa – Fraxinus excelsior – Lysimachia nemorum; Deschampsia cespitosa sub-community); ash woodland (<i>W8 Fraxinus excelsior – Acer campestre – Mercurialis perennis*) and oak woodland (*W10e Quercus robur – Pteridium aquilinium – Rubus fruticosus; Acer pseudoplatanus – Oxalis acetosella sub-community*).

This area supports a rich invertebrate assemblage which includes species strongly associated with wood-decay habitats, slow flowing water and seepage habitats.

Qualifying Species:

There are no qualifying species for this SAC.

References:

RODWELL, J.S. (ed.) 1991. *British Plant Communities. Volume 1. Woodlands and scrub.* Cambridge University Press.

Table 1: Supplementary Advice for Qualifying Features: H91J0. *Taxus baccata* woods of the British Isles; Yew-dominated woodland *

	butes	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 H91J0 feature (including its transitions to other habitats) at 194.40 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. A notable feature of this SAC is considered to be the vegetation zonation across the woodland habitat. To reflect this attribute, it is therefore considered important to also retain the full extent and range of the other native woodland types present (W7, W8, W10) which neighbour and transition into the component woodland type of the H91J0 feature. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. In this SAC stand loss due to natural processes such as slope erosion and landslides due to heavy rain may be acceptable as long as it is either <0.5 ha or 0.5% of the total stand area. Tree roots (particularly of veteran trees) may extend a considerable distance beyond the boundary of the site. A reduction 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 the woodland conditions (e.g. lichens and bryophytes). Loss of any woodland area which fragments a site into different parts may interrupt the movement of species between the remaining parts of the woodland, especially those with limited powers of dispersal. This SAC contains 194.40 ha of broadleaved mixed and yew woodland. The specific ar	Aerial Photograph 2011 (held by Natural England. This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u> <u>assessments</u> .

	outes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
Extent and distribution of the feature	Spatial distribution of the feature within the site	Maintain the distribution and configuration of the H91J0 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.	NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16. Held by Natural England
			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.	
			Small areas of W13, yew woodland exist predominately along the central southern area and a strip of woodland along the northern corridor towards Peterlee. However, the majority of the W13 woodland is connected by W10 oak and W6/7 alder woodlands.	
			Woodland biodiversity is being enhanced on this site through increasing the structure of this feature through encouraging natural regeneration, removing plantation (conifer) areas and through leaving some open areas. These open areas, including those along the edge of the Dene (within the buffer area) are being restored to meadow and rough grassland.	
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the H91J0 feature are referable to and characterised by the following National Vegetation Classification type,	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).	NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16.
		Yew woodland W13b <i>Taxus baccata; Mercurialis perennis</i> sub-community	Maintaining these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural	NATURAL ENGLAND Technical Information Note TIN053

butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
		fluctuations). Conditions that promote natural regeneration of this habitat type will be encouraged. These include scarification/soil surface disturbance at felling sites, scarification/subsoiling of 'buffer zone' and after care weeding e.g. bramble control. Due to the threat from ash die back, sycamore will be acceptable as a viable alternative on site. Beech is further well established on site with several veteran trees, these will be maintained and natural regeneration encouraged. The only tree species currently planted is oak, which is been sourced from locally collected acorns for educational purposes. All planted saplings will have appropriate rabbit guards / deer protection.	<u>Guidance on</u> <u>dealing with the</u> <u>changing</u> <u>distribution of tree</u> <u>species</u>
Canopy cover	Maintain an appropriate tree canopy cover across the H91J0 feature, which will typically be >75% of the canopy on 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, 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. Yew trees in this SAC account for over 60% of the canopy cover within the W13b <i>Taxus baccata; Mercurialis perennis</i> sub-community NVC vegetation type. Stands of conifers and non-native tree species which are shading out yew	This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u> <u>assessments</u> .
		Canopy cover Maintain an appropriate tree canopy cover across the H91J0 feature, which will typically be	Canopy cover Maintain an appropriate tree canopy cover across the H9100 feature, which will typically be >75% of the canopy on site Conditions that promote natural regeneration of this habitat type will be encouraged. These include scarification/soil surface disturbance at felling sites, scarification/subsoling of 'buffer zone' and after care weeding e.g. bramble control. Due to the threat from ash die back, sycamore will be acceptable as a viable alternative on site. Beech is further well established on site with several veteran trees, these will be maintained and natural regeneration encouraged. Canopy cover Maintain an appropriate tree canopy cover across the H9100 feature, which will typically be >75% of the canopy on 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 microelimate, 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 weedened species (although they may be still be important as a form of woodland character rate reduced and over any densities pace where tree regeneration courses across the whole woodland are not ideal either hower, as they cost heavier shade and support fewer species associated with edges, glades and open grown trees, and have little space where tree regeneration cours. In general, the woodland canopy of this feature should provide a core of woodland interior conditions with some open and edge habitat as well.

Attri	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			are currently being identified and will be thinned or completely removed to promote regeneration of yew. This includes all conifers except a large stand of mainly Sitka Spruce, <i>Picea sitchensis</i> towards the western end of the site which may be retained for bird and insect species.	
Structure and function (including its typical species)	Open space	Maintain areas of permanent/temporary open space within the H91J0 woodland feature, typically to cover approximately 10% 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. 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. The woodland on this SAC has been previously thinned out and large areas (>1ha) of conifer blocks removed. Further trees along the northern edge of the site have largely been removed, opening up the canopy. 	This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u> <u>assessments</u> .
	Old growth	Maintain the extent and continuity of undisturbed, mature/old growth stands (typically comprising at least 50% of the H91J0 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. 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. Veteran yew trees are scattered throughout the woodlands and where possible should be maintained. In addition other deciduous tree species are also maintained where possible. Older trees especially provide nest holes for birds, roost sites for bats and sap runs.	This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u> <u>assessments</u> .
	Decaying and 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	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. Dead and actively decaying wood, either as part of a standing tree or as a fallen tree on the woodland floor, is an important component of woodland	This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u>

Attri	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
Structure and function (including its typical species)	Tree age class distribution	per hectare Maintain at least 2 age classes (e.g. pole stage, mature, veteran) spread across the average life expectancy of the trees - which can be hundreds of years.	 ecosystems, and supports a range of specialist invertebrates, fungi, lichens and bryophytes, and associated hole-nesting birds and roosting bats, all of which may be very typical of the feature. On this SAC a proportion (e.g. up to 25%) of cut sycamore and beech butts, which have been made safe and are lying flat to the ground are maintained to rot and decay. Further, diseased elm is treated or felled for safety reasons in similar fashion but all butts are left unless this presents a hazard or they are required for other purposes. The overall quantity of deadwood across the site is considered 'good' where at least 1 large (>50cm diameter at breast height) fallen tree or trunk is visible and plenty of 5 – 50cm pieces are visible per hectare. This deadwood is especially important for the rich invertebrate assemblage on site. However, due to the close proximity with urban areas, there are problems on this site with the unconsented removal of deadwood for firewood and the excessive collection of fungal fruiting bodies. 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. In order to diversify the age structure, where possible the edges of rides should be managed to establish a field and shrub layer. Rotation coppicing on edges should be encouraged and the use of herbicide should not be necessary unless trying to achieve a level of standing deadwood. However, work is often necessary including tree or limb removal to make safe dangerous trees in areas of high public access. 	Assessments.
	Shrub layer	Maintain a typically sparse understorey under the yew canopy, with occasionally present shrubs (e.g. holly, hawthorn, elder)	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. Due to the natural low light level under yew canopies, the shrub layer and understory is sparse but dose vary in species composition within the site. The young scrub layer typically includes occasional saplings of hazel <i>Corylus</i> , oak <i>Quercus</i> , ash <i>Fraxinus excelsior</i> , alder <i>Alnus glutinosa</i>	This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u> <u>assessments</u>

Attri	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			hawthorn <i>Crataegus spp.</i> , wild cherry <i>Prunus avium</i> and rowan <i>Sorbus aucuparia</i> . However, on this site yews are commonly found growing on shallower slopes. As landslips on this site are frequent disturbance to or removal of sections of the shrub layer is not uncommon.	
Structure and function (including its typical species)	Woodland edge (graduated edge; buffered; mosaics with other habitats)	Maintain a graduated woodland edge into adjacent semi-natural open habitats, other woodland/wood-pasture types or scrub.	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. 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.	NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16.
			In order to diversify the age structure, where possible the edges of rides should be managed to establish a field and shrub layer. Rotation coppicing on edges should be encouraged and the use of herbicide should not be necessary unless trying to achieve a level of standing deadwood.	
			Areas of Ash, Oak and Hazel will need minimal intervention although selective felling and thinning will be undertaken to create open areas that will catch sunlight and encourage reestablishment of a more diverse ground flora. In the edge of maturing woodland close to properties, these mature trees may need to be felled to prevent damage to people and property. Where this is the case, regeneration will be managed to encourage lower growing native shrubs and rowan to form a natural shrub layer.	
	Adaptation and resilience	Maintain the resilience of the H91J0 feature by ensuring a diversity of site-native tree species; although yew dominates, this can be provided by a scattering of one or more of whitebeam, ash, beech, sycamore and oak.	The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) 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 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.	NATURAL ENGLAND, 2015a. Climate Change Theme Plan and supporting NBCCV Assessments for SACs and SPAs [both available at
			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	http://publications.n aturalengland.org.u k/publication/49545 94591375360].

Attri	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			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 as being <i>low</i> , taking into account the sensitivity, fragmentation, topography and management of its habitats. These sites are considered to be vulnerable overall but are a lower priority for 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 required. 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.	
Structure and function (including its typical species)	Regeneration potential	Maintain the H91J0 feature's 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 every 5 years out of every 20 years. 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. There is currently a good level of natural regeneration of all tree species including yew. However, browsing from deer is a problem on site. Young trees are currently being protected against browsing through tree guards as initiated under the Deer Initiative. Future work will work closely with partners on the site boundaries to collaborate to address problems of deer on site. There is still however, some planting proposed - oak <i>Quercus sp.</i>, spindle 	NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16.

Attrik	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			<i>Euonymus europaeus</i> and crab apple <i>Malus sylvestris</i> are being planted with seed sourced from within the Dene. Juniper <i>Juniperus communis</i> is also being planted from seed from nearby coastal populations.	
	Tree and shrub species composition	Maintain a canopy and under- storey of which 95% is composed of site native trees and shrubs. These include yew <i>Taxus</i> <i>baccata</i> , hazel <i>Corylus</i> , <i>oak</i> <i>Quercus</i> , ash <i>Fraxinus</i> , alder <i>Alnus glutinosa</i> hawthorn <i>Crataegus spp.</i> , wild cherry <i>Prunus avium</i> and rowan <i>Sorbus</i> <i>aucuparia</i> .	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). Rapid removal of all exotics would mean a loss of woodland structure over much of the site and be both damaging to the ecology of the site. However, some non-invasive non-natives are retained as they pose no threat and add to diversity of the site and are frequently veteran trees e.g. horse chestnut. Due to the threat of ash die back, sycamore is to be maintained on site. Only in certain areas of dense sycamore regeneration and when this is encroaching on the interest feature will saplings be thinned if resources allow.	NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16.
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 H91J0 habitat; Yew <i>Taxus baccata</i> Spindle <i>Euonymus europaea</i> Elm <i>Ulmus glabra</i> Dog's mercury <i>Mercurialis</i> <i>perennis</i> Assemblage of woodland invertebrates	 Some plant or animal species (or related groups of such species) make a particularly important contribution to the 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 habitat's structure or help to define an Annex I habitat on a site (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 site. 	This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u> <u>assessments</u>
			There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall	

Attri	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. Pressures from natural landslips due to the instability of the steep slopes and close proximity to urban areas resulting in fly tipping and erosion may in time influence the distribution and abundance of the 'typical flora and fauna' on site.	
	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 H91J0 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.	This attribute will be periodically monitored as part of Natural England's <u>site</u> <u>condition</u> <u>assessments</u> NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16.
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 H91J0 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. Due to the steepness of slopes and high rainfall, landslips are common on this SAC.	
Supporting processes (on which the feature relies)	Functional connectivity with wider landscape	Restore the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the SAC.	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 but which may be important for the migration, dispersal and genetic exchange of those typical species closely associated with the qualifying Annex I habitat	NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16. Arial photograph of

Attri	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			feature 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. Castle Eden Dene is the largest of the thirteen valleys of Durham's coastal plateau. Only three others have substantial woodlands, of which Hawthorn Dene some 11km, North of Castle Eden Dene, is the most important. Urban environment or arable land separates most of these denes. There is limited connectivity between these sites with scattered trees along field lines and some species poor hedgerows being the main method of connectivity. Following the Castle Eden Dene down towards the coastline, there is a higher level of connectivity along the coast due to the area being designated Durham Coast SAC. Working groups such as the Coastal Streams Partnership help to promote connectivity between these sites.	the SAC, 2011, held by Natural England.
Supporting processes (on which the feature relies)	Air quality	Restore as necessary the concentrations and deposition of air pollutants to below the site- relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (<u>APIS</u>).	This habitat type is considered sensitive to changes in air quality. Exceedance of critical values for air pollutants may modify the chemical status of the habitat's substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical values for atmospheric nitrogen and acidity are currently being exceeded at this SAC. 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	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 (<u>APIS</u>).

Attri	butes	Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			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. Due to this site's close proximity to urban areas it is important to control, reduce and ameliorate atmospheric nitrogen impacts. Nitrogen and acidity critical loads have already been exceeded for this site so action will be required to restore concentrations to below the thresholds. However, a site nitrogen action plan has not yet been implemented.	
Supporting processes (on which the feature relies)	Hydrology	At a site level maintain natural hydrological processes to provide the conditions necessary to sustain the H91J0 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. Castle Eden Burn flows through a large culvert under the A19 to the west of the site and it is important to ensure that this is always kept clear to prevent high volumes of water collecting on farmland west of the A19. However, due to the steep sided gorge of the Dene, flooding is not a considerable problem. Whereas landslips are common and are a concern for the SAC. Run-off from the A19 can also be source of pollution and there are several water pipes and a sewer that runs through the Dene. Natural England is working with the Highways Authority and Northumbrian Water to reduce the risks of pollution.	Arial photograph of the SAC, 2011 (held by Natural England).
	Illumination	Ensure artificial light is maintained to a level which is unlikely to affect natural phenological cycles and processes to the detriment of the H91J0 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 also be modified by un-natural illumination which can disrupt natural seasonal responses.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site- based evidence (where available)
			habitat feature. Therefore, there has not currently been any investigation on light levels on this site.	
Supporting processes on which the eature relies)	Conservation measures	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the H91J0 feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	NATURAL ENGLAND, 2014. Site Improvement Plan: Castle Eden Dene SAC (SIP038) NATURAL ENGLAND, 2011. Castle Eden Dene NNR Management Plan 2011-16. ENGLISH NATURE, 2005. Views about the management of Castle Eden Dene SSSI. Available at http://www.sssi.nat uralengland.org.uk/ Special/sssi/vam/V AM%201000738.pd f

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