



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

**Arnecliff and Park Hole Woods Special Area of Conservation (SAC)  
UK0030142**



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## **About this document**

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Arnecliff and Park Hole Woods SAC.

This advice should therefore be read together with the SAC Conservation Objectives available [here](#).

**This advice replaces a draft version dated 24 January 2019 following the receipt of comments from the site's stakeholders.**

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](mailto:HDIRConservationObjectivesNE@naturalengland.org.uk)**

## About this site

### European Site information

<b>Name of European Site</b>	Arnecliff and Park Hole Woods Special Area of Conservation (SAC)
<b>Location</b>	North Yorkshire
<b>Site Map</b>	The designated boundary of this site can be viewed <a href="#">here</a> on the MAGIC website
<b>Designation Date</b>	1 April 2005
<b>Qualifying Features</b>	See section below
<b>Designation Area</b>	52.39ha
<b>Designation Changes</b>	N/A
<b>Feature Condition Status</b>	Details of the feature condition assessments made at this site can be found using Natural England's <a href="#">Designated Sites System</a>
<b>Names of component Sites of Special Scientific Interest (SSSIs)</b>	Arnecliff and Park Hole Woods SSSI
<b>Relationship with other European or International Site designations</b>	The boundary of this SAC coincides with: <a href="#">North York Moors SPA</a> and <a href="#">SAC</a>

### Site background and geography

The site consists of East Arnecliff Wood, part of Park Hole Wood (both ancient semi-natural woodlands) and part of West Arnecliff wood (ancient semi-natural/ancient replanted woodland).

East Arnecliff Wood rises on the southern bank of the River Esk within the North York Moors and Cleveland Hills National Character Area ([NCA Profile 25](#)). Pedunculate oak, rowan and birch are widespread and abundant. Wych elm is locally frequent and there is a widespread shrub layer of hazel, some holly and occasional hawthorn. The upper acidic parts have widespread wavy-hair grass, with greater woodrush, hairy woodrush, bilberry, scattered heather, hard fern and mosses. West Arnecliff Wood is contiguous with East Arnecliff Wood. The wood rises up from Glaisdale beck and is west facing.

Park Hole Wood is a mixed deciduous wood occupying a south facing valley. There is a mixture of mature and sub-mature oak and birch. Alder is scattered near the beck. Hazel is widespread in the shrub layer with scattered or locally frequent holly, hawthorn and blackthorn. The herb layer is moderately diverse and includes hard shield fern, tufted hair grass, and sedges.

Several springs are present among the rocky areas which provide damp, sheltered and shaded conditions in which a rich fern and moss flora thrives. This includes the locally rare species Tunbridge filmy fern and hay scented buckler fern. The regionally rare wood fescue grass is also present on this site. East Arnecliff wood also contains a few shallow pools.

## **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:**

- **H91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles; Western acidic oak woodland**

This SAC supports a range of woodland types dominated by mixtures of oak (*Quercus robur* and/or *Q. petraea*) and birch (*Betula pendula* and/or *B. pubescens*). It is characteristic of base-poor soils in areas of at least moderately high rainfall in northern and western parts of the UK

### **Qualifying Species:**

- **S1421 *Trichomanes speciosum*; Killarney fern**

Killarney fern *Trichomanes speciosum* is a medium-sized, long-lived fern with delicate, translucent fronds arising from a creeping rhizome. In Great Britain it grows on constantly shaded and permanently humid rock faces, often in deep recesses, in wooded ravines and on cliffs. The species is frost-sensitive, so that nearly all British localities for sporophyte plants are in mild oceanic districts in the far west and at low altitudes. Most sporophyte populations are very small. However, the gametophyte generation has been recorded from numerous localities (Rumsey et al. 1998), persisting in a state of indefinitely suspended development under present conditions; their occurrence does not alter views on the conservation needs of the sporophytes. The scattered colonies of the mature sporophyte may represent fragmented relics of a wider distribution during warmer post-glacial conditions now surviving under a sub-optimal climate.

**Table 1: Supplementary Advice for Qualifying Features: H91A0. Old sessile oak woods with Ilex and Blechnum in the British Isles; Western acidic oak woodland**

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
<b>Extent and distribution of the feature</b>	<b>Extent of the feature within the site</b>	<p>Maintain the total extent of the H91A0 feature to 52.49 hectares.</p> <p>Development of semi-natural woodland stands where non-native conifers have been felled (unit 1).</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p> <p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p>
<b>Extent and distribution</b>	<b>Spatial distribution of</b>	Maintain the distribution and configuration of the H91A0	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional	



Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
of the feature	the feature within the site	feature, including where applicable its component vegetation types, across the site.	<p>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.</p> <p>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.</p>	
Structure and function (including its typical species)	Vegetation community composition	<p>Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types</p> <p><b>W4</b> <i>Betula pubescens</i> – <i>Molina caerulea</i> woodland</p> <p><b>W10e</b> <i>Quercus robur</i> – <i>Pteridium aquilinum</i> – <i>Rubus fruticosus</i> woodland, <i>Acer pseudoplatanus</i> – <i>Oxalis acetosella</i> sub-community</p>	<p>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.</p> <p>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. 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 fluctuations).</p> <p>The woodland has not had a National Vegetation Classification Survey undertaken to confirm the NVC type(s) occurring within the woodland. In the process of writing the favourable condition tables, all available scientific information was analysed along with local knowledge of the site and the listed NVC types appear to be the closest fit and are what the condition of the site is currently measured against. These may be updated or refined should further data become available in future.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p> <p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p>
Structure and function (including its	Vegetation structure - canopy cover	Maintain an appropriate tree canopy cover across the feature, which will typically be between	Canopy cover is the overall proportion of vegetative cover consisting of any woody layer ranging from established regeneration to mature and veteran stages.	This attribute will be periodically monitored as part of Natural England's site

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)		60-90% in mature strands.	<p>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.</p> <p>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.</p> <p>In general, the woodland canopy of this feature should provide a core of woodland interior conditions with some open and edge habitat as well.</p>	<p>condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a>.</p> <p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p>
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 10% of the wood to be comprised of permanent and temporary open space at any one time.	<p>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.</p> <p>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.</p> <p>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.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a>.</p> <p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p>
Structure and function (including its typical species)	Vegetation structure - old growth	<p>Maintain the extent and continuity of undisturbed, mature/old growth stands.</p> <p>A minimum of 10% of the woodland (5-10 trees per ha to</p>	<p>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.</p> <p>For this habitat type, old or over-mature elements of the woodland are particularly characteristic and important features, and their</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a>.</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		be allowed to grow to over-maturity/death on site.	continuity should be a priority.	<a href="#">System</a>  Natural England (2016) Definition of Favourable Condition – Arnecliff & Park Hole Woods SSSI (Available from Natural England on request)
<b>Structure and function (including its typical species)</b>	<b>Vegetation structure - dead wood</b>	Maintain the continuity and abundance of standing or fallen dead and decaying wood, typically  A minimum of 3 fallen lying trees, >20 cm diameter per ha, and 4 trees per hectare allowed to die standing.	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 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.	This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a>  Natural England (2016) Definition of Favourable Condition – Arnecliff & Park Hole Woods SSSI (Available from Natural England on request)
<b>Structure and function (including its typical species)</b>	<b>Vegetation structure - age class distribution</b>	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 and recorded on <a href="#">Natural England's Designated Sites System</a>  Natural England (2016) Definition of Favourable Condition – Arnecliff & Park Hole Woods SSSI (Available from Natural England on request)



Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
<b>Structure and function (including its typical species)</b>	<b>Vegetation structure - shrub layer</b>	Maintain an Understorey (2-5m) shrubs covering at least 20% of the total 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.	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p> <p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p>
<b>Structure and function (including its typical species)</b>	<b>Vegetation structure - woodland edge</b>	Maintain a graduated woodland edge into adjacent semi-natural open habitats, other woodland/wood-pasture types or scrub.	<p>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.</p> <p>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).</p>	<p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p>
<b>Structure and function (including its typical species)</b>	<b>Adaptation and resilience</b>	Maintain the resilience of the H91A0 feature by ensuring a diversity at least 3 species of site-native trees e.g birch, rowan, holly predominate across the site, with occasional older oak, beech, sycamore and ash species.	<p>This recognises the increasing likelihood of natural habitat features needing to absorb or adapt to wider environmental changes.</p> <p>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.</p> <p>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</p>	<p>NATURAL ENGLAND, 2015. Climate change Theme Plan available <a href="#">here</a></p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>feature's long-term viability.</p> <p>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/supporting 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.</p>	
<b>Structure and function (including its typical species)</b>	<b>Browsing and grazing by herbivores</b>	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.	<p>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.</p> <p>In general, both light grazing and browsing is desirable to promote both a diverse woodland structure and continuous seedling establishment.</p> <p>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, barkstripping and a heavily grazed sward.</p>	This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a>
<b>Structure and function (including its typical species)</b>	<b>Regeneration potential</b>	Maintain the potential for sufficient natural regeneration of desirable trees and shrubs; signs of seedlings growing through to saplings and to young trees at sufficient density to maintain canopy over a 10 yr period (or equivalent regrowth from coppice stumps).	<p>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.</p> <p>This will Include regeneration of the trees and shrubs from saplings or suckers, regrowth from coppice stools or pollards, and where appropriate planting.</p> <p>Browsing and grazing levels must permit regeneration at least in</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p> <p>Natural England (2016)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		No more than 20% of areas regenerated by planting. All planting material of locally native stock. No planting in sites where it has not occurred in the last 15 years.	<p>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.</p> <p>The regeneration of Oak and native broadleaves is important for the integrity of the Oak woodland feature (H91AO) and to also maintain a suitable microclimate for the Killarney fern feature (S1421). There is the potential that that natural regenerative of Oak/native broadleaves may be insufficient to ensure favourable status of the woodland feature and the Killarney fern. Monitor to determine whether additional planting is required to ensure sufficient regeneration of oak.</p>	<p>Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p> <p>Natural England (2014) <a href="#">Site Improvement Plan for Arnecliff and Park Holes Woods SAC</a></p>
<b>Structure and function (including its typical species)</b>	<b>Tree and shrub species composition</b>	<p>Maintain a canopy and under-storey of which 95% is composed of site native trees and shrubs – Birch, Rowan and Holly with occasional older oak, beech, sycamore and ash species.</p> <p>Death, destruction or replacement of native woodland species through effects of introduced fauna or other external unnatural factors not more than 10% by number of area in a five year period.</p>	<p>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.</p> <p>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).</p> <p>Sycamore and Beech present at the time of designation and regeneration has been noted. This is acceptable as long-term the balance of regeneration favours the native species.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p> <p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p> <p>Forestry Commission. Woodland Management Plan: Arnecliff and Park Hole Woods 2026.</p>
<b>Structure and function (including its typical species)</b>	<b>Key structural, influential and/or distinctive species</b>	<p>Maintain the abundance of the typical species listed below to enable each of them to be a viable component of the H91AO habitat:</p> <ul style="list-style-type: none"> <li>Constant and preferential plant species of W4 and</li> </ul>	<p>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;</p> <ul style="list-style-type: none"> <li><b>Structural</b> 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').</li> </ul>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		W10e woodland NVC vegetation types which comprise the H91A0 feature within this SAC	<ul style="list-style-type: none"> <li>• <b>Influential</b> 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)</li> <li>• <b>Site-distinctive</b> species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC.</li> </ul> <p>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.</p> <p>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</p>	Natural England (2016) Definition of Favourable Condition – Arnecliff & Park Hole Woods SSSI (Available from Natural England on request)
<b>Structure and function (including its typical species)</b>	<b>Invasive, non-native and/or introduced species</b>	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the H91A0 feature	<p>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.</p> <p>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.</p> <p>Western Hemlock <i>Tsuga heterophylla</i> was felled from the site in 2012 to encourage natural regeneration of native broadleaves, however, regeneration from the remaining seedbank remains an issue. If the regeneration is not pulled, the Oak woodland feature (H91A0) could be threatened as the Western Hemlock may dominate.</p>	Natural England (2014) <a href="#">Site Improvement Plan for Arnecliff and Park Holes Woods SAC</a>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
<b>Structure and function (including its typical species)</b>	<b>Soils, substrate and nutrient cycling</b>	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.	
<b>Structure and function (including its typical species)</b>	<b>Root zones of ancient trees</b>	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 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.	
<b>Supporting processes (on which the feature relies)</b>	<b>Air quality</b>	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 ( <a href="http://www.apis.ac.uk">www.apis.ac.uk</a> ).	<p>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.</p> <p>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.</p> <p>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.</p>	<p>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 (<a href="http://www.apis.ac.uk">www.apis.ac.uk</a>).</p> <p>Natural England (2014) <a href="#">Site Improvement Plan for Arnecliff and Park Holes Woods SAC</a></p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>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.</p> <p>The critical load for nitrogen deposition is currently in exceedance. Critical load = 10-15 Kg/N/ha/yr. Current average nitrogen deposition = 30 Kg/N/ha/yr.</p>	
<b>Supporting processes (on which the feature relies)</b>	<b>Hydrology</b>	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the H91A0 feature within the site	<p>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.</p> <p>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.</p> <p>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.</p>	
<b>Supporting processes (on which the feature relies)</b>	<b>Illumination</b>	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.	<p>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.</p> <p>Flowering and development of trees and plants can also be modified by un-natural illumination which can disrupt natural seasonal responses.</p>	
<b>Version Control:</b> Advice last updated: <b>21<sup>st</sup> February 2019</b> following stakeholder feedback, additional reference source added to sources of site based evidence to <b>Tree and shrub species composition</b> attribute				
<b>Variations from national feature-framework of integrity-guidance:</b> N/A				



**Table 2: Supplementary Advice for Qualifying Features: S1421. *Trichomanes speciosum*; Killarney fern**

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
<b>Population</b>	<b>Population abundance</b>	Maintain the abundance of the population at a level which is above 100 sporophytes, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	<p>This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve. This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period (generally at least 10 years). The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature.</p> <p>Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment.</p> <p>Unless otherwise stated, the population size or presence will be that measured using standard methods, such as peak mean counts or breeding surveys. This value is also provided recognising there will be inherent variability as a result of natural fluctuations and margins of error during data collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise that the figures stated are the best available.</p>	This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Populations of seedless plants such as ferns which reproduce by spores can be very slow to develop in the UK and will probably be knocked back by long cold winters or hot dry summers from time to time. Such fluctuations are essentially natural and probably cannot be totally avoided. However, if site humidity and stability are maintained the population should remain at least constant and ideally (in the absence of unusual climatic events) would be expected to slowly increase.	
<b>Population</b>	<b>Population structure</b>	Maintain a healthy structure to the population to include a mat of gametophytes within which sporophytes retain old non-fertile fronds in good condition for several seasons and some fertile fronds are produced annually. Frond size should be maintained or increased.	Declining frond size or frond number and particularly loss of sporophytes which cannot be related to obvious adverse weather patterns are immediate causes for concern. Ideally censuses of Trichomanes sporophyte colonies should include long-term monitoring of individual plants as frond size, longevity and fertility are useful indicators of condition, and it is difficult to relate such attributes to performance without meticulous recording.	
<b>Supporting habitat: extent and distribution</b>	<b>Distribution of supporting habitat</b>	Maintain the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	<p>A contraction in the range, or geographic spread, of the feature (and its component vegetation) 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. Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site.</p> <p>Such fragmentation may 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 this feature and this may affect its viability.</p>	
<b>Supporting habitat: extent and distribution</b>	<b>Extent of supporting habitat</b>	Maintain the total extent of the habitat which support the feature at 15 hectares.	<p>In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC.</p> <p>15 ha inferred from habitat data within the Killarney Fern surveys undertaken by Ken Tewren between 1995 and 2010.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p> <p>Tewren, K. (1995 - 2010) Killarney Fern surveys in Arnecliff &amp; Parkhole Woods. Unpublished</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				reports for Natural England.
<b>Supporting habitat: structure/ function</b>	<b>Grazing</b>	Avoid all stock grazing	Stock grazing could result in disturbance of boulders/rocks at any time of year and would open up the summer vegetation if carried out during this season - both impacts could have serious deleterious impacts on the Trichomanes and all stock grazing should be avoided.	
<b>Supporting habitat: structure/ function</b>	<b>Habitat structure: including regeneration/ colonisation niches</b>	Maintain the natural rocky substrates in an undisturbed state - such locations have characteristically almost unvarying high humidity and extreme shelter - all unoccupied niches within the designated area should also be maintained in an undisturbed state and, where appropriate, under a continuous canopy to afford opportunities for local colonisation	Suitable habitats include rocky substrates which are deeply fissured, within deep gullies/ravines and/or on north-facing cliffs/banks and which are fully protected from direct insolation, where high humidity is maintained by nearby water and/or a woodland canopy and where protection from prolonged severe frost is afforded by geographical location and/or a combination of the aforementioned features. Whilst the species appears to be frost hardy it is believed to require a very long growing season.	
<b>Supporting habitat: structure/ function</b>	<b>Humidity</b>	Maintain appropriate levels of humidity within the site	High levels of humidity is critical for this species and whatever features contribute towards this on site (tree canopy, nearby surface water etc.) they must be maintained at least at the levels present at the time of designation and, where practicable, enhanced and their benefits extended to other suitable niches nearby.	
<b>Supporting habitat: structure/ function</b>	<b>Site disturbance</b>	Minimise access and disturbance to supporting boulder/rock substrates, including detachment of rhizomes from the substrate and exposure of crevices to sunlight by trampling of surrounding vegetation	This species has a long history of collection and is one of the few taxa in the UK where over-collection appears to have been in part responsible for its current conservation status. Site confidentiality to minimise potential disturbance coupled with an active minimal access policy remains desirable for this species.	
<b>Supporting habitat: structure/ function</b>	<b>Substrate</b>	Maintain a naturally-occurring, undisturbed substrate of rock fissures and crevices between boulders in natural situations.	The substrates vary to some degree although they are usually hard, acid rocks including gritstones and sandstones. The species appears generally unable to colonise new or artificial sites (such as quarries or walls) in the UK at present even when the substrate and habitat requirements are fully met.	
<b>Supporting</b>	<b>Vegetation</b>	Maintain a natural woodland	The composition of the vegetation is not critical for this	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
habitat: structure/ function	structure and composition	structure with continuous high canopy and natural shrub/ regeneration and ground layers over the rocky/boulder-strewn/fissured substrates favoured by sporophyte populations of this species.	<p>particular feature although the canopy should primarily consist of native deciduous taxa. The vegetational composition is probably less important than its structure - <i>Trichomanes</i> requires high levels of humidity (provided by a woodland canopy and/or extremely sheltered geographical location), complete protection from direct sunlight (partly down to aspect and presence of deep crevices and also by the locally exuberant surrounding ground flora present during the summer months (nettles, brambles etc) and protection from prolonged winter cold (primarily down to the geographical location and the deep crevices within and between large rocks/boulders) - this must not be significantly compromised (e.g. by disturbance of boulders felling of canopy clearance of ground vegetation).</p> <p>Ash die-back and its impact upon the canopy structure should be monitored with a view to maintaining a relatively dense canopy. Species such as sycamore will be accepted as naturalised species in order to maintain the woodland structure to support this feature.</p> <p>Crevices can be at risk of becoming shallower where leaf and other vegetative litter can build up within them. Shallowing of crevices may force <i>Trichomanes</i> plants into a more exposed position.</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Maintain the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	<p>This recognises the increasing likelihood of supporting habitat features 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.</p> <p>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</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>feature's long-term viability.</p> <p>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 and supporting habitats. This means that this site is considered to be vulnerable overall but moderately so.</p> <p>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.</p>	
<b>Supporting processes (on which the feature and/or its supporting habitat relies)</b>	<b>Air quality</b>	Maintain or, where necessary, restore 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 ( <a href="http://www.apis.ac.uk">www.apis.ac.uk</a> ).	<p>The supporting habitat of this feature 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 (including food-plants) and reducing supporting habitat quality and population viability of this feature. 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.</p> <p>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.</p> <p>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. 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</p>	<p>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 (<a href="http://www.apis.ac.uk">www.apis.ac.uk</a>).</p> <p>Natural England (2014) <a href="#">Site Improvement Plan for Arnecliff and Park Holes Woods SAC</a></p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>timescales.</p> <p>The critical load for nitrogen deposition is currently in exceedance. Critical load = 10-20 Kg/N/ha/yr. Current average nitrogen deposition = 30 Kg/N/ha/yr.</p>	
<b>Supporting processes (on which the feature and/or its supporting habitat relies)</b>	<b>Conservation measures</b>	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to maintain the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	<p>Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site.</p> <p>Further details about the necessary conservation measures for this site can be provided by contacting Natural England.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments and recorded on <a href="#">Natural England's Designated Sites System</a></p> <p>Natural England (2014) <a href="#">Site Improvement Plan for Arnecliff and Park Holes Woods SAC</a></p> <p>Natural England (2016) Definition of Favourable Condition – Arnecliff &amp; Park Hole Woods SSSI (Available from Natural England on request)</p> <p><a href="#">Arnecliff &amp; Park Holes Woods SSSI Views about Management Statement.</a></p>
<b>Supporting processes (on which the feature and/or its supporting habitat relies)</b>	<b>Water quantity/ quality</b>	Where the feature or its supporting habitat is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature	<p>For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type.</p> <p>Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.</p>	



Attributes	Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
<b>Version Control</b> Advice last updated: <b>20 February 2019</b> following stakeholder feedback, Addition to explanatory notes for <b>Vegetation structure and composition</b> to highlight the risk to Killarney Fern from shallowing of crevices by leaf litter build up.			
<b>Variations from national feature-framework of integrity-guidance:</b> Attribute for <b>Supporting Habitat - Soils, substrate and nutrient cycling</b> has been deleted as not relevant. Killarney Fern grows on boulders not soil.			