



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

**Naddle Forest Special Area of Conservation (SAC)
Site code: UK0030335**



Photo: Mirkside, Naddle Forest (Simon Webb/ Natural England)

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Naddle Forest SAC. This advice should therefore be read together with the SAC Conservation Objectives available [here](#).

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

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

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

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

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

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

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

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email

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About this site

European Site information

Name of European Site	Naddle Forest Special Area of Conservation (SAC)
Location	Cumbria
Site Maps	The designated boundary of this site can be viewed here on the MAGiC website
Designation Date	1 April 2005
Qualifying Features	H91A0. Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles; Western acidic oak woodland H4030. European dry heaths H4010. Northern Atlantic wet heaths with <i>Erica tetralix</i> ; Wet heathland with cross-leaved heath
Designation Area	362.67 hectares
Designation Changes	None
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	Naddle Forest SSSI
Relationship with other European or International Site designations	None
Other information	Natura 2000 Standard Data Form for Naddle Forest

Site background and geography

Naddle Forest covers two valleys above the shores of Haweswater reservoir in the Eastern Lake District within the parish of Shap. The SAC occurs at between 200-440m above sea level and in a wet climate with annual precipitation circa 2000mm (Averis, 1992). It is regarded as being one of the most important examples of ancient woodland in the Lake District (Pearsall, 1950, Halliday, 1997).

The woodland is effectively an isolated block separated from any other woodland by open sheep-grazed fells. It is characterised by steep and rocky slopes with a NW-E facing aspect. These steeper slopes are cloaked by broadleaved woodland which are rich in bryophytes, fern beds and herb species. These woodlands are varied, reflecting the underlying geology with stands of acidic oak dominated woodland, transitions to areas of wet woodland, and where the soils are richer, base-rich ash dominated stands.

Above the main woodlands, the habitats are dominated by open heathland, wet heath and small valley mire systems.

The SAC forms part of the [Haweswater Nature Reserve](#) managed by the RSPB.

References

HALLIDAY, G. 1997. *A flora of Cumbria*. University of Lancaster.
PEARSALL, W.H. 1950. *Mountains and Moorland*. Collins. New Naturalist.
AVERIS, A.G.B. 1992. Bryophyte monitoring at Naddle Low Forest, Cumbria. *English Nature Research Reports No. 17*. EN, Peterborough.

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 habitat type generally comprises 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 typically characteristic of base-poor soils in areas of at least moderately high rainfall in northern and western parts of the UK.

A key feature of this habitat type is the rich Atlantic communities of bryophytes (mosses, hornworts and liverworts) associated with it.

The Atlantic oak woods at Naddle Forest are the Annex I habitats that are the primary reason for selection of this site. The woodlands lie in two distinct stands; one along the southern shore of the Reservoir and the other along the sides of the Naddle Beck.

The geology here is the Borrowdale Volcanic series, which is highly variable and the soils vary from acidic to basic brown earths. The woodland reflects this with oak and birch dominated stands developed in the poor soils and stands of ash-hazel woodland on the richer soils. Locally impeded drainage and springs produce wet woodland dominated by alder.

The lightly grazed woodland ground flora is well developed with a profusion of bryophytes, rich fern stands, corticolous (bark-growing) lichens and bulky woodland herbs. The woodlands show local transitions to basin mire and fen communities with rich stands of tall herbs.

The woodlands correspond to the following National Vegetation Classification types: W9 *Fraxinus excelsior* – *Sorbus aucuparia* – *Mercurialis perennis* woodland, W11 *Quercus petraea* - *Betula pubescens* - *Oxalis acetosella* woodland, W17 *Quercus petraea* - *Betula pubescens* - *Dicranum majus* woodland, W4 *Betula pubescens*- *Molinia caerulea* woodland and W7 *Alnus glutinosa* - *Fraxinus excelsior* - *Lysimachia nemorum* woodland

- **H4030. European dry heaths**

European dry heaths typically occur on freely-draining, acidic to circum-neutral soils with generally low nutrient content. Ericaceous dwarf-shrubs dominate the vegetation. The most common is heather *Calluna vulgaris*, which often occurs in combination with gorse *Ulex* spp., bilberry *Vaccinium* spp. or bell heather *Erica cinerea*, though other dwarf-shrubs are important

locally. Nearly all dry heath is semi-natural, being derived from woodland through a long history of grazing and burning

At Naddle Forest SAC, European dry heaths are more restricted than the western oak woodlands in their distribution. Small stands occur on crags and within the woodlands, but the only extensive stands occur on more level ground above the woodlands. These areas are known as Naddle Top and Naddle High Forest. The heathland here occurs on the woodland edge and is representing the transition from woodland to more open habitats. Open grown trees and small stands of scrub are characteristic of the transition.

These heathlands correspond to the following National Vegetation Classification types: H12 *Calluna vulgaris*-*Vaccinium myrtillus* heath and H10 *Calluna vulgaris*- *Erica cinerea* heathland. Wetter stands show transition to wet heath, blanket bog and valley mire communities.

- **H4010. Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath**

Wet heath usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. The vegetation is typically dominated by mixtures of cross-leaved heath *Erica tetralix*, heather *Calluna vulgaris*, grasses, sedges and *Sphagnum* bog-mosses.

At Naddle Forest, the Atlantic wet heaths are not extensive and occur locally on wet mineral ground. They are difficult to distinguish from degraded blanket or valley mire but these two communities occur on deeper peat as opposed to mineral ground which supports wet heath vegetation.

At Naddle the wet heath, which corresponds to the M15 *Tricophorum cespitosum* – *Erica tetralix* wet heath National Vegetation Classification type, is characterized by constancy of *Erica tetralix*.

Qualifying Species:

- Not applicable

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)
Extent and distribution of the feature	Extent of the feature within the site	Restore the total extent of the H91A0 feature to 197.2 hectares.	<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 are vulnerable to soil compaction (such as caused by vehicles or construction works); agricultural operations or other soil disturbance (like trenches) and applications of chemical 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). 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 includes a woodland restoration area of 29 hectares. This covers 24ha at Mirkside (through amalgamation of the three exclosures) and a further 5 hectares at Naddle High Forest. The 5 hectares includes land at Naddle Top where woodland regeneration is being promoted on the upper woodland edge.</p> <p>A restoration target is proposed as the extent of woodland within the SAC is currently</p>	This data is taken from Natural England measurement of aerial photography in 2009 and from the 2013 HLS agreement objectives which defined the area to be restored.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			impacted by historically high livestock grazing levels. Within grazing exclosures the woodland thrives but elsewhere it is degraded or absent. The target is to restore a more natural distribution of the woodland habitat reflecting the soils and ecology of the site rather than its past management. These types of woodland will not regenerate under its own canopy so regeneration will, by definition, be onto adjoining open habitats.	
Extent and distribution of the feature	Spatial distribution of the feature within the site	Restore the distribution and configuration of the H91A0 feature, including where applicable its component vegetation types, across the site	<p>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.</p> <p>This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction.</p> <p>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. In particular the bryophyte assemblage characteristic of the Atlantic Oakwoods is vulnerable to edge effect impacts such as loss of humidity and shade.</p> <p>The spatial distribution of this habitat at Naddle Forest does not reflect its ecology but rather its past management. The objective is to restore a more natural distribution. This means linking fragmented blocks and restoring a more natural transition at the top edge of the existing woodlands. The whole of this site is below the tree-line and a less fragmented woodland is the objective.</p>	As detailed in the extent section above.
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the H91A0 feature are referable to and characterised by the following National	<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</p>	Site NVC surveys available from RSPB.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<p>Vegetation</p> <p>Classification types:</p> <p>W9 <i>Fraxinus excelsior</i> – <i>Sorbus aucuparia</i> – <i>Mercurialis perennis</i> woodland,</p> <p>W11 <i>Quercus petraea</i> - <i>Betula pubescens</i> - <i>Oxalis acetosella</i> woodland,</p> <p>W17 <i>Quercus petraea</i> - <i>Betula pubescens</i> - <i>Dicranum majus</i> woodland,</p> <p>W4 <i>Betula pubescens</i>-<i>Molinia caerulea</i> woodland and</p> <p>W7 <i>Alnus glutinosa</i> - <i>Fraxinus excelsior</i> - <i>Lysimachia nemorum</i> woodland</p> <p>Maintain transitions between these NVC types and open heathland and mire communities</p>	<p>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>Transitions between these broad community types are well represented on site. Of particular importance are transitions to wetland communities characterised by bulky perennial herbs within the ground flora and transitions to dry heath shown by open woodland and regeneration of characteristic tree species.</p>	
	Vegetation structure - canopy cover	Maintain an appropriate tree canopy cover across the H91A0 feature, which will typically be at least 80% canopy cover within the woodland stands	<p>Canopy cover is the overall proportion of vegetative cover consisting of any woody layer ranging from established regeneration to mature and veteran stages.</p> <p>Woodland canopy density and structure is important because it affects ecosystem function and in particular microclimate, litter fall, soil moisture, nutrient turnover and shading; this in turn influences the composition of plants and animals in lower vegetation layers and soil.</p> <p>Open canopies with just scattered trees will have less of a woodland character and reduced</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>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>	
Structure and function (including its typical species)	Vegetation structure - open space	Maintain areas of permanent and temporary open space within the woodland typically to cover approximately 20% of area	<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. The target should be met by natural processes where this is possible.</p> <p>The area known as Naddle High Forest contains a higher proportion of open space and is characterised by some open grown trees and a wood-pasture feel. This area is targeted for some expansion of woodland (see extent targets above) but the higher proportion of open space will be maintained within this area.</p>	The SSSI condition assessments 2001-2016 show that the existing structure and proportion of open space is good.
	Vegetation structure - old growth	Maintain the extent and continuity of undisturbed, mature/old growth stands (typically comprising at least 20% of the H91A0 feature at any one time) and the assemblages of veteran and ancient trees (typically >10 trees per hectare).	<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 continuity should be a priority.</p> <p>Old trees and old growth stands are of particular value for corticolous lichens and bryophytes. These are characteristic of the woodlands at Naddle Forest.</p>	The SSSI condition assessments 2001-2016 show that the existing structure and proportion of veteran trees and old growth stands

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				is good. The 2011 survey of Corticolous lichens (Pentecost, 2011 survey of Corticolous lichens of Naddle Forest, Unpublished report. Available from Natural England on request) makes reference to specific veteran trees and old growth stands.
Structure and function (including its typical species)	Vegetation structure - dead wood	Maintain the continuity and abundance of standing or fallen dead and decaying wood, typically 6 fallen trees >30cm per hectare, and >6 standing dead trees per hectare	<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>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.</p>	The SSSI condition assessments 2001-2016 show that the existing structure and the volume of dead wood is good, other than in young growth stands (recently restored woodland

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	Vegetation structure - age class distribution	Restore at least 3 age classes (pole stage/ medium/ mature) spread across the average life expectancy of the commonest trees.	<p>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.</p> <p>Securing regenerating trees in open glades and on the edges of existing stands would restore the age class structure. Where mature trees are missing (in young growth stands) it will take many decades to improve structure.</p>	<p>areas)</p> <p>The SSSI condition assessments 2001-2016 show that the existing age class structure is good but geographically variable, with sapling or pole stage trees missing for many of the mature stands.</p>
Structure and function (including its typical species)	Vegetation structure - shrub layer	Maintain an understorey (shrub layer of 2-5metres in height) which covers at least 10% of total stand area within the oak and wet woodlands and at least 30% within the ash-hazel stands on deeper soils.	<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>See also grazing and browsing attribute below.</p>	
	Vegetation structure - woodland edge	Restore 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.</p> <p>Many typical forest species make regular use of the edge habitats for feeding due to higher herb layer productivity and larger invertebrate populations.</p>	See section on extent above

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>The 2016 FCTs and 2013 HLS agreement detail areas where the woodland edge will be restored. These areas include Naddle Top, Naddle High Forest and the area on the southern edge of the Mirkwood stands. The target applies to the whole site but these are the poorest woodland edges in most need of restoration.</p> <p>Grasslands 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.</p>	
	Adaptation and resilience	Maintain the resilience of the H91A0 feature by ensuring a diversity (at least 10 species) of site-native trees (eg oak, birch, holly, ash, sycamore, alder rowan, wych elm, cherry, willow) and a diversity (at least 5 species) of site-native shrubs (e.g. hazel, hawthorn, blackthorn, juniper, willow).	<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 feature's long-term viability.</p> <p>The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being <i>moderate</i>, taking into account the sensitivity, fragmentation, topography and management of its habitats. 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 required.</p>	<p>RSPB, 2015. Haweswater Reserve management plan 2015-2020.</p> <p>NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability Assessments (NBCCVAs) for SACs and SPAs in England. Available here.</p>
Structure and function	Browsing and grazing by	Maintain grazing/browsing at a	Herbivores can be an integral part of woodland ecosystems. They are important in influencing woodland regeneration, composition and structure and therefore in shaping	NATURAL ENGLAND

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(including its typical species)	herbivores	low level that allows a well-developed understorey of trees and shrubs	<p>woodland communities.</p> <p>In general, both light grazing and browsing are desirable to promote both a diverse woodland structure and continuous seedling establishment. Indicators of a suitable level of grazing and browsing can include no obvious browse line, locally lush ground vegetation with some grazing sensitive species evident, and tree seedlings and sapling common in gaps.</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, bark-stripping and a heavily grazed sward.</p> <p>Some grazing can benefit the bryophyte assemblage by reducing competition with woodland ground flora. However the bryophytes also need continuity of cover and maintenance of humidity, thus requiring tree regeneration in the medium term.</p> <p>The Site Improvement Plan for Naddle Forest SAC identified high deer numbers as the most pressing issue and the top priority action to address for the site. A deer impact assessment should be undertaken to ascertain the impact of both roe and red deer. Red deer numbers are locally high and are a potential threat to the structure and function of the woodland.</p>	2014. Site Improvement Plan for Naddle Forest SAC (SIP145). Available at http://publications.naturalengland.org.uk/publication/4918763635867648
Structure and function (including its typical species)	Regeneration potential	Restore the potential for sufficient natural regeneration of desirable trees and shrubs as appropriate	<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. 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.</p> <p>Browsing and grazing levels must permit regeneration at least in intervals of 5 years every 20. The density of regeneration considered sufficient is less in parkland sites than in high forest. Regeneration from pollarding of veteran trees should be included where this is</p>	The SSSI condition assessments 2001-2016 show that the regeneration within Naddle Forest is patchy and suppressed by deer and livestock. The new HLS and

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>happening.</p> <p>Securing regeneration on the woodland edges as detailed above is a key objective.</p>	management plan addresses this issue.
	Tree and shrub species composition	Maintain a canopy and under-storey of which 95% is composed of site native trees and shrubs	<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 density is currently low on this site. In view of the likelihood of ash-dieback impacting on the site in the medium term sycamore should be retained as a canopy tree (but not planted). This decision, and the quantity of sycamore regeneration, should be reviewed on a regular basis</p>	
Structure and function (including its typical species)	Key structural, influential and site-distinctive species	<p>Maintain the diversity and abundance of the species and species groups listed below to enable them to be a viable component of the H91A0 habitat;</p> <p>Site-native tree and shrub species (as listed in adaptation and resilience section above)</p> <p>Ground flora representative of relevant NVC community types</p>	<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"> – <i>Structural</i> 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'). – <i>Influential</i> 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). – <i>Site-distinctive</i> species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular site. – <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>AVERIS, B. 2008 Bryophyte Site Dossier for Naddle Forest</p> <p>PENTECOST 2011 Corticolous lichens of Naddle Forest, Cumbria.</p> <p>RSPB point count data (birds)</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<p>(including transitional types) as listed in vegetation community composition section above.</p> <p>Assemblages of lichens, bryophytes, ferns and breeding birds strongly characteristic of western acidic oak woodland</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>	<p>RSPB management plan 2015</p> <p>SSSI citation and NE survey data.</p>
Structure and function (including its typical species)	Invasive, non-native and/or introduced species	<p>Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the H91A0 feature</p>	<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>	
	Soils, substrate and nutrient cycling	<p>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 H91A0 habitat.</p>	<p>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.</p> <p>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.</p>	
	Root zones of ancient trees	<p>Maintain the soil structure within and around the root zones</p>	<p>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.</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		of the mature and ancient tree cohort in an un-compacted condition	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.	
Supporting processes (on which the feature relies)	Air quality	Restore as necessary the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this H91A0 feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>This habitat type is considered sensitive to changes in air quality.</p> <p>Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding.</p> <p>There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) 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>The Site Improvement Plan for Naddle Forest (Natural England 2014) identified that N deposition currently exceeds the relevant critical loads for all three SAC interest features</p> <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>More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).</p> <p>NATURAL ENGLAND, 2014, Site Improvement Plan: Naddle Forest (SIP237).</p>
Supporting processes	Hydrology	At a site, unit and/or catchment level,	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.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(on which the feature relies)		maintain natural hydrological processes to provide the conditions necessary to sustain the H91A0 feature within the site	<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. Eg 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>	
	Illumination	Ensure artificial light is maintained at a level which is unlikely to affect natural phenological cycles and processes to the detriment of the H91A0 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.	
	Conservation measures	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to maintain or restore the structure, functions and supporting processes associated with the H91A0 feature	<p>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.</p> <p>This information will typically be found within 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.</p>	<p>NATURAL ENGLAND, 2014, Site Improvement Plan: Naddle Forest (SIP237).</p> <p>ENGLISH NATURE, 2005. Views about the management of Naddle Forest SSSI.</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				RSPB, 2015. Haweswater Reserve Management Plan 2015-2020
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: The standing and fallen wood targets were adjusted to make them consistent with the 2016 monitoring objectives for the site 6 fallen and 6 standing dead per hectare. Resilience targets changed by separating species into trees and shrubs.				

Table 2: Supplementary Advice for Qualifying Features: H4030. European dry heaths; H4010. Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	Extent of the feature within the site	<p>Maintain the total extent of the H4030 feature at 55 hectares.</p> <p>Maintain the total extent of the H4010 feature at 12.64 hectares.</p>	<p>See supporting notes for this attribute in table 1 above.</p> <p>The SAC targets for woodland, described in the table above, contain sections on restoring more natural woodland edges, more regeneration on open ground and a less fragmented or more natural distribution of woodland habitats. This will entail some woodland regeneration within the dry heathland communities within area known as Naddle Top and Naddle High Forest. This is at the top edge of the extensive woodlands on the southern shore of the reservoir. This regeneration will not lead to a loss in extent of heathland rather it will increase the structural diversity of the heathland community.</p> <p>On the site the wet heath communities occur in a mosaic with wet heath, blanket bog and valley mire intermingled. Past heavy grazing of the communities has led to some degradation of the characteristic communities making separation difficult on the ground. Further work and peat depth probing may be necessary to separate degraded blanket bog and wet heath communities.</p> <p>The monitoring targets to define favourable condition of the heathland habitat are set at a level to encompass increased regeneration in these areas.</p>	This data is taken from Natural England measurement of aerial photography in 2009.
	Spatial distribution of the feature within the site	Maintain the distribution and configuration of the H4030 and H4010 features, including where applicable their component vegetation types, across the site	<p>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.</p> <p>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.</p> <p>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</p>	RSPB Management Plan 2015

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>associated with the Annex I habitat feature.</p> <p>At Naddle Forest the heathland habitat is not severely fragmented forming a continuous block across Naddle Top and into Naddle High Forest. The restoration of quality of the habitat in the High Forest area will reduce fragmentation further.</p> <p>At Naddle Forest the wet heath habitat is degraded by past grazing management. This has fragmented the habitat across the areas of Naddle Top and Naddle High Forest. The restoration of quality of the habitat as detailed within the HLS agreement will reduce fragmentation further.</p>	
Structure and function (including its typical species)	Vegetation community composition	<p>Ensure the component vegetation communities of the H4030 feature are referable to and characterised by the following National Vegetation Classification types: H12 <i>Calluna vulgaris</i>-<i>Vaccinium myrtillis</i> heath and H10 <i>Calluna vulgaris</i>-<i>Erica cinerea</i> heathland</p> <p>Ensure the component vegetation communities of the H4010 feature are referable to and characterised by the following National Vegetation Classification type: M15 <i>Tricophorum cespitosum</i> – <i>Erica tetralix</i> wet heath</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>RSPB Management Plan 2015</p> <p>NVC survey and distribution of habitats shown within the management plan.</p>
	Vegetation community transitions	Restore areas of transition between the features and communities which form other	Transitions/zonations between adjacent but different vegetation communities are usually related to naturally-occurring changes in soil, aspect or slope. Such 'ecotones' retain characteristics of each bordering community and can add value in often containing species not found in the adjacent communities.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		heathland-associated habitats, such as wet heath, mires, fen, scrub and woodland.	<p>Retaining and restoring such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. This is an important attribute as many characteristic heathland species utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle.</p> <p>Transitions between these broad community types are well represented on site. Of particular importance are transitions to wetland communities and transitions to woodland and scrub characterised by regeneration of tree and scrub species. Some of these transitions are degraded by historic heavy grazing levels. These need restoration.</p>	
Structure and function (including its typical species)	Vegetation structure: cover of dwarf shrubs	Restore an overall cover of dwarf shrub species of at least 50% of the H4030 and H4010 features	<p>Variation in the structure of the heathland vegetation (vegetation height, amount of canopy closure, and patch structure) is needed to maintain high niche diversity and hence high species richness of characteristic heathland plants and animals. Many species also utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle.</p> <p>The structural character of the heathland feature is strongly influenced by the growing habits of its dominant species which in most cases will be ericoids (i.e. plants that look like heathers, including members of the Ericaceae and Empetraceae families). The ericaceous species heather (<i>Calluna vulgaris</i>), bell heather (<i>Erica cinerea</i>), cross-leaved heath (<i>Erica tetralix</i>, bilberry (<i>Vaccinium myrtillus</i>) and cowberry (<i>Vaccinium vitis-idaea</i>) are the commonest and most characteristic dwarf-shrubs. <i>Calluna</i> is usually the most abundant. Crowberry <i>Empetrum nigrum</i>, another common species in some coastal and transitional heaths, is not strictly ericaceous but is often treated as an ericoid species.</p> <p>At this SAC cross-leaved heath (<i>Erica tetralix</i>) is the dominant ericoid within the wet heath habitat although heather (<i>Calluna vulgaris</i>) can occur at high frequencies. Other ericoids occur at lower frequencies and may mark transition to dry heath communities.</p>	
	Vegetation composition: bracken cover	Restore a low cover of dense bracken (typically <10%) to the H4030 and H4010 features	The spread of bracken (<i>Pteridium aquilinum</i>) is a problem on many lowland heathlands. The unpalatable nature and density of bracken as a tall-herb fern, and its decomposing litter, can smother and shade out smaller and more characteristic heathland vegetation.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Usually active management of bracken is required to reduce or contain its cover across this habitat feature. Dense bracken beds within heathlands should be targeted for woodland restoration where this is an objective.	
	Vegetation structure: tree cover	Maintain the broadly open character of the H4030 and H4010 features, with a scattered cover of native trees and scrub (<25% cover)	<p>Scrub (mainly trees or tree saplings above 1 m in height) and isolated open grown trees are usually very important in providing structural diversity and therefore warmth, shelter, cover, food plants, perches, territorial markers and sources of prey for typical heathland invertebrates and vertebrates.</p> <p>But overall cover of scrub and trees across this habitat feature should be maintained or restored to a limited level, with a structurally complex edge and with characteristic heathland vegetation as ground cover. If scrub is locally important for any associated species with their own specific conservation objectives, then a higher level of cover will be acceptable.</p> <p>The area of scrub/tree cover should be stable or not increasing as a whole. See sections on woodland edge and transition restoration above.</p>	
	Vegetation structure: heather age structure	Maintain a diverse and natural age structure amongst the ericaceous shrubs typically found on the site.	<p>Each phase of growth associated with the characteristic heathers which dominate this feature also represents different microclimatic conditions and microhabitats which may provide shelter or food to other organisms. Therefore, it is important to maintain a mosaic of heather in different phases of growth. Within this SAC this will not be undertaken by cutting or burning but by allowing the natural cycle to progress over time to naturalise the age-class structure of the heathland.</p> <p>Typically this age structure may consist of between 10-40% cover of (pseudo) pioneer heathers; 20-80% cover of building/mature heathers; <30% cover of degenerate heathers and less than <10% cover of dead heathers. However there will be times when this age structure is skewed by past historic management.</p>	
	Vegetation: undesirable species	Maintain the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread:	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Agricultural weeds, Rhododendron.		
Structure and function (including its typical species)	Key structural, influential and/or site distinctive species	<p>Maintain the abundance of the species or species groups listed below to enable each of them to be a viable component of the H4030 and H4010 habitats;</p> <p>Dwarf shrubs as listed above</p> <p>Petty whin <i>Genista anglica</i>,</p> <p>Juniper <i>Juniperus communis</i></p> <p>Assemblage of lichen and bryophyte species strongly characteristic of the heathland features</p> <p>Assemblage of bird species strongly characteristic of heathland features</p> <p>Cotton-grass <i>Eriophorum angustifolium</i>, deer-grass <i>Trichophorum cespitosum</i>, bog asphodel <i>Narthecium ossifragum</i>, sundew <i>Drosera rotundifolia</i> butterwort <i>Pinguicula</i> spp</p>	See the supporting notes for this attribute in table 1 above	<p>RSPB point count data (birds)</p> <p>RSPB management plan 2015</p> <p>SSSI citation and NE survey data.</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	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 site	<p>This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site.</p> <p>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.</p> <p>The link through to and the management of Mardale Common is known to be of particular importance as this area is functionally connected to the SAC area and supports habitats similar to those seen within the SAC. Optimal management of the common can extend the functional connectivity of the site.</p>	RSPB Management Plan 2015 as referenced above
Structure and function (including its typical species)	Adaptation and resilience	Restore the H4030 and H4010 feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	See the supporting notes for this attribute in table 1 above	
	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 H4030 and H4010 habitats.	See the supporting notes for this attribute in table 1 above	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature 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 H4030 and H4010 features	<p>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.</p> <p>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.</p> <ul style="list-style-type: none"> • Maintain low nutrient levels to maintain high numbers of species through the management activities • Management of succession may become a critical aspect of management for this habitat, by a combination of active processes and grazing/cutting. • A range of invertebrates and plants require bare ground/peat where it is not too frequently disturbed by vehicles or feet. 	See attribute in table1 above
	Air quality	Restore as necessary the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this H4030 and H4010 features of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>See the supporting notes for this attribute in table 1 above.</p> <p>The Site Improvement Plan for Naddle Forest (Natural England 2014) identified that N deposition currently exceeds the relevant critical loads for all three SAC interest features</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 (www.apis.ac.uk).</p> <p>Site Improvement Plan for Naddle Forest SAC (Natural England 2014)</p>
	Water quality	Where the feature is dependent on surface water and/or groundwater, maintain	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.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		water quality and quantity to a standard which provides the necessary conditions to support the H4010 feature.	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. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.	
	Hydrology	At a site, unit and/or catchment level maintain natural hydrological processes to provide the conditions necessary to sustain the H4010 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.</p>	Hydrological survey of blanket bog hydrology undertaken and restoration undertaken (grip blocking: information available from RSPB) pre 2013. No data available with respect to dry or wet heath.
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: The targets for maintenance or restoration of gorse were deleted. There are no significant gorse stands within this habitat nor are there community types with gorse typically found within them. At this altitude Juniper is the more typical scrub component within heathland filling a similar ecological niche. This species is covered by the sections covering tree cover and flora and fauna. Targets within heather age structure modified to reflect the no-burning or cutting policy on the heath.				

