



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

**Morecambe Bay Pavements Special Area of Conservation (SAC)
Site Code: UK0014777**



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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Morecambe Bay Pavements 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 European Site.

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

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

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

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

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

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

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

About this site

European Site information

Name of European Site	Morecambe Bay Pavements Special Area of Conservation (SAC)
Location	Cumbria and Lancashire
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1 April 2005
Qualifying Features	See section below
Designation Area	2,609.69 ha
Designation Changes	n/a
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)	Cringlebarrow and Deepdale SSSI, Farleton Knott SSSI, Gait Barrows SSSI, Hawes Water SSSI, Hutton Roof Crag SSSI, Marble Quarry and Hale Fell SSSI, Middlebarrow SSSI, Scout and Cunswick Scars SSSI, Thrang End and Yealand Hall Allotment SSSI, Thrang Wood SSSI, Underlaid Wood SSSI, Whitbarrow SSSI
Relationship with other European or International Site designations	n/a

Site background and geography

The Morecambe Bay Pavements SAC comprises 12 component sites located in northwest England, to the northeast of Morecambe Bay, within the [Morecambe Bay Limestones National Character Area](#) (NCA). The mild, oceanic climate, coupled with the geology, aspect of the rock exposures and extensive areas of semi-natural habitats mean that diversity is high and some species can exist here at their northern limit in Britain.

The SAC contains marl lakes and fen, calcareous grassland with juniper and heath and ash woodland with yew and oak, along with the richest limestone pavements in the UK. There is one location with narrow-mouthed whorl snail. The component sites within the [Arnside-Silverdale Area of Outstanding Natural Beauty](#) (AONB) have ecological connections with non-designated areas of high-quality grassland, limestone pavement and woodland.

Hawes Water is considered to be the best example of a lowland lake with stoneworts *Chara spp.* (also called a marl lake) in England. The lake is fringed by a belt of mixed fen, including areas of calcareous fen dominated by great fen-sedge *Cladium mariscus*. Great fen-sedge also occurs at Little Hawes Water, which is one of the water sources for Hawes Water. Cunswick Tarn is also a marl lake with fen including great fen-sedge, though it is much smaller and eutrophication means that *Chara* species are currently absent.

This site has both wooded and open lowland limestone pavements. Trees typically include yew *Taxus baccata*, hazel *Corylus avellana*, and ash *Fraxinus excelsior* with shrubs including juniper *Juniperus communis*, buckthorn *Rhamnus catharticus* and spindle *Euonymus europaeus*. Other characteristic species include rigid buckler-fern *Dryopteris submontana*, limestone fern *Gymnocarpium robertianum*,

dark-red helleborine *Epipactis atrorubens*, angular Solomon's-seal *Polygonatum odoratum* and fingered sedge *Carex digitata*. Gait Barrows supports strong populations of the narrow-mouthed whorl snail *Vertigo angustior* on shaded, mossy limestone pavement, an unusual habitat for the species.

Calcareous grasslands dominated by blue moor-grass *Sesleria caerulea* have a range of structural variation associated with intensity of grazing and the presence of cliffs, screes, and limestone pavements. There are important transitions to scrub (including juniper scrub) and woodland. Heather *Calluna vulgaris* is a frequent component of the grassland sward and where the soils are deeper a heathland community can occur in patches and mosaics with the grassland.

The ash-dominated woodland occurs here on rocky substrates including limestone pavements, scree and steep slopes. It contains ancient groves of small-leaved lime *Tilia cordata*, sometimes with elm *Ulmus* spp. The rich woodland flora includes rare or scarce species such as fingered sedge, wood fescue *Festuca altissima* and mezereum *Daphne mezereum*.

Yew occurs both as dense groves on rock and as scattered trees in the understorey of ash or ash-elm woodland. Where the soils are deeper and more acidic, patches or bands of oak woodland occur, often with a heather dominated understory.

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:

H3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. ('Calcium-rich nutrient-poor lakes, lochs and pools')

This habitat type is characterised by water with a high base content, most often calcium but very rarely magnesium, and is usually confined to areas of limestone and other base-rich substrates, from which the dissolved minerals are derived. In addition, such waterbodies are generally characterised by very clear water, low nutrient status and an abundance of stoneworts (*Chara* spp).

Hawes Water is a lowland lake lying on a predominantly Carboniferous limestone foundation and with a substrate of deep lacustrine shell-marl. The water is highly calcareous and the lake is fed by springs within it. This site is considered to be the best example of a lowland hard oligo-mesotrophic lake with *Chara* spp. in England, owing to the clarity, low nutrient status and high calcium content of its water. The rare rugged stonewort *Chara rudis* and scarce species *C. aspera*, *C. hispida* and *C. pedunculata* occur here. Cunswick Tarn is a small marl lake that has had poor water quality in the recent past.

H5130 *Juniperus communis* formations on heaths or calcareous grasslands

Morecambe Bay Pavements represents *Juniperus communis* formations on H8240 Limestone Pavements or H6210 semi-natural dry grassland dominated by blue moor-grass *Sesleria caerulea* at low to intermediate altitude in north-west England. In contrast to most areas in northern England, these are ungrazed or grazed at low intensity and have affinities to southern mixed scrub, owing to the presence of species such as wild privet *Ligustrum vulgare* and burnet rose *Rosa pimpinellifolia*.

H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (important orchid sites)

These grasslands are typically found on thin, well-drained, lime-rich soils associated with chalk and limestone. They occur predominantly at low to moderate altitudes in England and Wales, extending locally into upland areas in northern England, Scotland and Northern Ireland. Most of these calcareous grasslands are maintained by grazing. A large number of rare plants are associated with this habitat.

Extensive CG9 *Sesleria albicans* – *Galium sternerii* grasslands occur at Morecambe Bay Pavements. The grassland has an overall northern character but is also rich in southern lowland species, so providing important regional variation distinct from Craven Limestone Complex and Moor House – Upper Teesdale, also in northern England. There is a wide range of structural variation associated with intensity of grazing and the presence of cliffs, screes, and H8240 Limestone pavements on the margins of the grassland stands. There are important transitions to calcareous scrub and H9180 Tilio-Acerion forests.

H8240 Limestone pavements* (Priority feature)

Limestone pavements are outcrops of rock, typically horizontal or gently inclined. The surface has been dissolved by water over millions of years into 'paving blocks', known as clints, with a complex intersecting pattern of crevices, known as grikes, between them. A range of calcareous rock, heath, grassland, scrub and woodland vegetation can occur on limestone pavement. The vegetation of limestone pavements is unusual because of the combinations of these floristic elements.

This is one of four SACs in northern England representing Limestone Pavements on Carboniferous limestone. This site provides an example of lowland pavements that range from low to moderate altitudes (up to 274 m). Some of the pavements form woodland clearings that are sheltered and warm up quickly in spring. The pavement flora is here at its most diverse and, where grazing is absent, can be seen at its best because plant growth is not confined to the grikes (gaps between limestone blocks). Trees and shrubs growing above the pavement surface include yew *Taxus baccata*, juniper *Juniperus communis*, buckthorn *Rhamnus cathartica*, hazel *Corylus avellana*, small-leaved lime *Tilia cordata* and ash *Fraxinus excelsior*. Other plants occurring on the site include the nationally scarce rigid buckler-fern *Dryopteris submontana*, which is abundant on Hutton Roof Crag, rustyback *Ceterach officinarum*,

limestone fern *Gymnocarpium robertianum*, lily-of-the-valley *Convallaria majalis*, dark-red helleborine *Epipactis atrorubens*, pale St John's-wort *Hypericum montanum*, ploughman's-spikenard *Inula conyzae*, angular Solomon's-seal *Polygonatum odoratum*, wood-sage *Teucrium scorodonia*, lesser meadow-rue *Thalictrum minus* and hairy violet *Viola hirta*. Some pavements lie within pasture but are for the most part lightly grazed or browsed.

H9180 *Tilio-Acerion* forests of slopes, screes and ravines* (Priority feature) ('Mixed woodland on base-rich soils associated with rocky slopes')

These are woods characterised by ash *Fraxinus excelsior*, wych elm *Ulmus glabra* and lime (mainly small-leaved lime *Tilia cordata*). Introduced sycamore *Acer pseudoplatanus* is often present and is a common part of the community in mainland Europe, where it is native. The habitat type typically occurs on nutrient-rich soils that often accumulate in the shady micro-climates towards the bases of slopes and ravines. Therefore it is found on calcareous substrates associated with coarse scree, cliffs, steep rocky slopes and ravines, where inaccessibility has reduced human impact.

Woodland within Morecambe Bay Pavements, along with the nearby Roudsea Wood and Mosses SAC, represents *Tilio-Acerion* forests on Carboniferous limestone in north-west England. Although close to the northern limit of lime distribution, the ash *Fraxinus excelsior*-dominated woodland around Morecambe Bay contains many patches of small-leaved lime *Tilia cordata*, which survive sometimes with elm *Ulmus* spp., often along rock outcrop edges. There is a rich assemblage of rare species, including fingered sedge *Carex digitata*, wood fescue *Festuca altissima* and mezereon *Daphne mezereum*. The habitat type occurs here both on H8240 Limestone pavements and other rocky areas.

H91J0 *Taxus baccata* woods of the British Isles* (Priority feature) ('Yew-dominated woodland')

Yew *Taxus baccata* woodland occurs on shallow, dry soils usually on chalk or limestone slopes, but in a few areas stands on more mesotrophic soils are found. The habitat is classified as NVC type W13 *Taxus baccata* woodland. Within this community yew tends to be overwhelmingly dominant and is usually associated with a very sparse shrub and tree layer. Only a few species, such as dog's mercury *Mercurialis perennis*, can survive beneath the dense shade cast by the canopy of mature yew trees.

Along with Roudsea Wood and Mosses and Yewbarrow Woods SACs, Morecambe Bay Pavements is an example of yew *Taxus baccata* woods in north-west England. These yew woods are on the northern Carboniferous limestone and, as in the Wye Valley, yew occurs both as dense groves and as scattered trees in the understorey of ash or ash-elm *Fraxinus-Ulmus* woodland. Yew woodland here represents the development of long-established stands on unstable scree and rocky slopes.

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.

Heather *Calluna vulgaris*-dominated communities occur in pockets of deeper, acidic soils within H91A0 Old sessile oak woods and H6210 grasslands, and as a mosaic within the grassland.

H7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae (Priority feature) ('Calcium-rich fen dominated by great fen sedge (saw sedge)')**

This Annex I type comprises the more species-rich examples of great fen-sedge *Cladium mariscus* fen, particularly those stands enriched with elements of the *Caricion davallianae* (i.e. small-sedge fen with open, low-growing sedge vegetation).

Within this SAC, calcareous fen is found around the margins of Hawes Water, Little Hawes Water and Cunswick Tarn.

H91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles ('Western acidic oak woodland')

Oak woodland occurs on deeper, acidic soils within the ash woodland. This habitat type 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 characteristic of base-poor soils in areas of at least moderately high rainfall in northern and western parts of the UK.

The habitat shows considerable variation across its range, in terms of the associated ground flora and the richness of bryophyte communities. There is also a continuous spectrum of variation between oak-dominated and birch-dominated stands. Often these local variations reflect factors such as rainfall, slope, aspect, soil depth, and past and present woodland management (e.g. coppicing, planting, grazing). The most distinctive forms of the habitat have a ground flora dominated by bryophytes. Other variants include stands in which the ground flora is characterised by the prominence of dwarf shrubs, such as bilberry *Vaccinium myrtillus*; grasses, such as wavy hair-grass *Deschampsia flexuosa*, common bent *Agrostis capillaris* and sweet vernal-grass *Anthoxanthum odoratum*; and plants indicative of more mesophytic conditions, including bluebell *Hyacinthoides non-scripta*, bramble *Rubus fruticosus* and scaly male-fern *Dryopteris affinis*.

Frequently the oak woodland occurs as part of a mosaic of woodland types that varies with position on the slope, occurrence of streams or other waterbodies, and local soil enrichment. These transitions are important in maintaining the structure and function of the habitat type and differ across the country.

Qualifying Species:

S1014 Narrow-mouthed whorl snail *Vertigo angustior*

The tiny narrow-mouthed whorl snail is found primarily in marshy ground of high, even humidity, with flowing groundwater, but subject neither to deep or prolonged flooding nor to periodic desiccation. It requires unshaded conditions and lives amongst short vegetation composed of grasses, mosses or low herbs that are quickly warmed by the sun.

In the British Isles it has been found in wet base-rich meadows, in coastal marshes, dune slacks and maritime turf, and in depressions within limestone pavement.

Morecambe Bay Pavements represents narrow-mouthed whorl snail *Vertigo angustior* in north-west England near to the northern limit of its range in the UK. Gait Barrows supports strong populations of the species where it is found in close association with limestone pavement.

Table A: Presence of qualifying SAC features within component SSSIs

SSSI	Feature	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara spp</i>	European dry heaths	<i>Juniperus communis</i> formations	Semi-natural dry grasslands and scrubland facies	Calcareous fens with <i>Cladium mariscus</i>	Limestone pavements	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i>	<i>Taxus baccata</i> woods of the British Isles	Tilio-Acerion forests of slopes, screes and ravines	Narrow-mouthed whorl snail <i>Vertigo angustior</i>
	Feature reference	H3140	H4030	H5130	H6210	H7210	H8240	H91A0	H91J0	H9180	S1014
	See Table	1	2	2	2	1	3	4	4	4	5
	County										
Cringlebarrow and Deepdale	Lancashire				*		*	*	*	*	
Farleton Knott	Cumbria			*	*		*			*	
Gait Barrows	Lancashire	*		*	*	*	*		*	*	*
Hawes Water	Lancashire	*			*	*	*		*	*	
Hutton Roof Crag	Cumbria		*	*	*		*	*	*	*	
Marble Quarry and Hale Fell	Cumbria			*	*		*		*	*	
Middlebarrow	Cumbria			*	*		*		*	*	
Scout and Cunswick Scars	Cumbria	*	*	*	*	*			*	*	
Thrang End and Yealand Hall Allotment	Lancashire			*	*		*	*	*	*	
Thrang Wood	Lancashire						*		*	*	
Underlaid Wood	Cumbria			*	*		*		*	*	
Whitbarrow	Cumbria		*	*	*		*	*	*	*	

Table B: Estimated area (hectares) of qualifying SAC features within component SSSIs

P Present, but scattered and/or covering small area
 NK Present, but area not known

SSSI	Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp	European dry heaths	<i>Juniperus communis</i> formations	Semi-natural dry grasslands and scrubland facies	Calcareous fens with <i>Cladium mariscus</i>	Limestone pavements	Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i>	<i>Taxus baccata</i> woods of the British Isles	Tilio-Acerion forests of slopes, screes and ravines	Narrow-mouthed whorl snail <i>Vertigo angustior</i>
Cringlebarrow and Deepdale				0.3		36.5	49.8			
Farleton Knott			Mosaic 110.6			103.2			3.3	
Gait Barrows	NK		NK		NK	11 Juniper P		40.8		P
Hawes Water	6.08			4	0.3	12		1	49.92	
Hutton Roof Crag		2.2 dense juniper 53.6 grassland with heath and juniper				103.8	P	48.3		
Marble Quarry and Hale Fell			0.5			26.9 Juniper P		11.2	24.3	
Middlebarrow			P	1		6		2.3	12	
Scout and Cunswick Scars	1.4	337.2 grassland with heath and juniper			P			31.88		
Thrang End and Yealand Hall Allotment			P	6.1		41.13	40			
Thrang Wood						3		3.1	1.6	
Underlaid Wood			P	0.9		14		8.8	86.8	
Whitbarrow		NK	NK	NK		123.6	603.6			

Table 1: Supplementary Advice for Qualifying Features: H3140. Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.; Calcium-rich nutrient-poor lakes, lochs and pools and H7210. Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge) *

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the features H3140 H7210	Extent of the features within the site	Restore the total extent of the H3140 feature to 8.2 ha Restore the total extent of the H7210 feature.	There should be no measurable net reduction (excluding any trivial loss) in the extent and area of this feature, and at Hawes Water/Gait Barrows SSSIs the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. No area measurement available for the H7210 feature. The <i>Cladium</i> fen occurs around the margins of Hawes Water, Little Hawes Water and Cunswick Tarn. The extent of <i>Cladium</i> at Little Hawes Water may have been reduced by past lowering of the water level.	NATURE CONSERVANCY COUNCIL - CHARTER, E. 1982. Habitat survey of Cunswick Tarn ENGLISH NATURE - NEWBOLD, C. 1999. Habitat survey of Hawes Water
Extent and distribution of the feature H7210	Spatial distribution of the feature within the site	Restore the distribution and configuration of the H7210 feature, including where applicable its component vegetation types, across the site	Distribution includes the spatial pattern or arrangement of this habitat feature, and its component vegetation types, across the site. Changes in distribution may affect the nature and range of the vegetation communities present, the operation of the physical, chemical, and biological processes in the system and the resiliency of the site and its features to changes or impacts. This feature is mainly represented within the SAC at Hawes Water with small areas at Little Hawes Water and Cunswick Tarn.	NATURE CONSERVANCY COUNCIL - CHARTER, E. 1982. Habitat survey of Cunswick Tarn ENGLISH NATURE 2005, 2007 NATURAL ENGLAND. Hawes Water species surveys.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species) H3140	Invasive, non-native and/or introduced species	Ensure non-native species categorised as 'high-impact' in the UK under the Water Framework Directive are either rare or absent but if present are causing minimal damage to the feature	Non-native species constitute a major threat to many open water systems. Impacts may be on the habitat itself (e.g. damage to banks and consequent siltation) or directly on characteristic biota (through predation, competition and disease), or a combination of these. The UK Technical Advisory Group of the Water Framework Directive produces a regularly updated classification of aquatic alien species (plants and animals) according to their level of impact. In general high impact species are of greatest concern but low or unknown impact species may be included in the target on a site-specific basis where there is evidence that they are causing a negative impact (for example high cover values or abundances). Those taxa considered likely to colonise lakes, are indicated by an 'L' in the UKTAG guidance. Examples of such high-impact species may include Water Fern, New Zealand pygmyweed and the zebra mussel.	
Structure and function (including its typical species) H7210	Invasive, non-native and/or introduced species	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the H7210 feature	Invasive or introduced non-native species can be a serious potential threat to the structure and function of these habitats, because they are able to exclude, damage or suppress the growth of their associated typical species, reduce structural diversity of the habitat and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e. g. use of broad spectrum pesticides).	
Structure and function (including its typical species) H3140	Macrophyte community structure	Restore a characteristic zonation of macrophyte vegetation; <i>Chara</i> beds should normally cover a minimum of 50% of the photic zone, although extent will be variable according to site and seasonal changes.	This is a strongly characteristic structural aspect of this habitat feature. In many cases <i>Chara</i> (stoneworts) will be the dominant feature. Management of Cunswick Tarn should aim to restore the zonation of vegetation.	PENTECOST A, 2009. The Marl Lakes of the British Isles - Freshwater Reviews 2 pp167_197
Structure and function (including its typical species) H3140	Macrophyte community structure	Maintain maximum depth of plant colonisation. This is likely to be the maximum depth colonised by <i>Chara</i> spp.	This is a strongly characteristic structural aspect of this habitat feature. It will be a response to water transparency, sediment type and disturbance.	
	Macrophyte community structure	Maintain a characteristic and well defined hydrosere associated with the water	A hydrosere is a naturally-occurring plant succession which occurs in an area of standing fresh water. Over time, an area of open freshwater will naturally dry out, ultimately becoming woodland. During this change, a range of different wetland	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		body (where this is present)	habitat types such as swamp and marsh, will succeed each other. This structure around the margins of the lake creates a buffer zone that can help protect the lake from a limited amount of sediment and nutrient inputs. It also increases habitat heterogeneity providing additional food sources and refugia.	
	Physical structure - lake shoreline	Restore the natural shoreline of the lake at Hawes Water.	Alteration of the shoreline may result in changes in water movements within the lake, which would have effects on patterns of sediment deposition.	
	Physical structure - lake substrate	Maintain the natural and characteristic substrate for the lake.	Marl production is desirable, although this may be low or absent in oligotrophic hard waters. The distribution of sediment particle size and organic content influences the biology of the lake and will affect the suitability of within-lake habitats for invertebrates and macrophytes, and fish spawning grounds. Increases in sediment loading from activities in the catchment area, including those on the lake shore, may result in the smothering of coarse sediments. Increased inputs of leaf litter, as a result of scrub encroachment, may also be cause for concern, as organic-rich sediments may be a poor rooting medium for macrophytes.	PENTECOST A, 2009. The Marl Lakes of the British Isles - - Freshwater Reviews 2 pp167_197 BENNION H, RAWCLIFFE R, BURGESS A, CLARKE G, CLARKE S, DAVIDSON T, ROSE C, ROSE N, SAYER C, TURNER S (2009) Using novel palaeolimnological techniques to define lake conservation Objectives. Final Report to Natural England Environmental Change Research Centre
Structure and function (including its typical species) H7210	Vegetation community composition	Ensure the component vegetation communities of the H7210 feature are referable to and characterised by the following National	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Vegetation Classification type: <i>S2 Cladium mariscus</i> swamp and sedge-beds	to sustaining the overall habitat feature. The <i>Cladium</i> stands occur in mosaics and transitions to other emergent plant communities.	
Structure and function (including its typical species) H3140 H7210	Key structural, influential and/or distinctive species	Restore the abundance of the species listed below to enable each of them to be a viable component of the H3140 feature; Cunswick Tarn (species believed to have been present) <i>Chara aspera</i>, <i>C. curta</i>, <i>C. hispida</i>, <i>C. rudis</i>, <i>Potamogeton praelongus</i> <i>Schoenoplectus lacustris</i> Hawes Water <i>Chara aspera</i>, <i>Potamogeton lucens</i>, <i>P. coloratus</i>, <i>Fontinalis antipyretica</i>, <i>Schoenoplectus lacustris</i>, <i>Hippuris vulgaris</i>, <i>Utricularia</i> spp. Maintain the abundance of saw sedge <i>Cladium mariscus</i> as the main component of the H7210 feature.	Some plant or animal species (or related groups of such species) make a particularly important contribution to the structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; • Structural species which form a key part of the habitat's structure or help to define an Annex I habitat on a site (see also the attribute for 'vegetation community composition'). • Influential species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat). • Site-distinctive species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular site. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available.	BENNION H, RAWCLIFFE R, BURGESS A, CLARKE G, CLARKE S, DAVIDSON T, ROSE C, ROSE N, SAYER C, TURNER S (2009) Using novel palaeolimnological techniques to define lake conservation Objectives. Final Report to Natural England Environmental Change Research Centre PENTECOST A (2013) Report on the current status of Cunswick Tarn, Cumbria. Report to Natural England ENGLISH NATURE 2005, 2007 NATURAL ENGLAND. Hawes Water species surveys.
Structure and function	Presence/cover of	Maintain a low cover of not more than 5% of scrub or	Native trees and shrubs occur naturally on fens but an abundance of scrub and trees is sometimes regarded as detrimental because they are indicators and	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(including its typical species) H7210	woody species	trees within stands of H7210.	perpetrators of drying out and may cause damage to vegetation structure through shading effects. Birch, pine, willow and rhododendron (an invasive non-native species) are the main species of concern.	
Structure and function (including its typical species) H3140	Fisheries	Maintain a total projected estimate for biomass of total fish production at less than 200kg/ha (this should take into account the growth potential of the resident and stocked fish).	Fish communities may exert a strong influence on overall lake ecology and may cause or exacerbate eutrophication symptoms. Where fisheries are present it should be a balanced mixed fishery. There should be a presumption against stocking non-native species, carp and bream.	
Supporting processes (on which the feature relies) H3140	Water quality - phosphate	Restore stable nutrient levels appropriate for lake type. The maximum annual mean concentration of TP is 10 µg P l ⁻¹ for deep (>3m) (Hawes Water) and 15 µg P l ⁻¹ for shallow (<3m) oligo-mesotrophic hard standing waters (Cunswick Tarn <3m).	Increased loadings of P to a water body are likely to lead to higher algal biomass in the water column, which in turn can have significant impacts on the standing water ecosystem through, for example, competition with vascular plants for nutrients and light, changes in pH, oxygen depletion and production of toxins. Decreasing dissolved oxygen and increasing ammonia levels are associated with death and decay of algal blooms, as is a release of toxins from toxin-producing species. If palaeolimnological techniques or hindcast modelling have been employed to reconstruct natural background phosphorus concentrations for a particular lake, these can be used to set targets, although it may be necessary to accept a small deviation from these background conditions. Alternatively, historical water chemistry data may exist for individual lakes.	WIJK, E. 2012. Understanding the ecological response of marl lakes to enrichment: a combined limnological and palaeolimnological approach. Submission for a Doctorate of Philosophy, Department of Geography, UCL 2012 WIJK, E. et al. 2013. Chemical and biological responses of marl lakes to eutrophication Freshwater Reviews 6, pp 35 - 62
	Water quality - nitrogen	Restore a stable nitrogen concentration, which will typically be between 1-2mg/l. (1.5mgL ⁻¹ for Cunswick Tarn)	There is an increasing understanding that some standing waters are sensitive to nitrogen (N) enrichment and eutrophication may be driven by increases in N, but site-specific information is usually required to determine whether N or phosphate (P) is more important. Where P levels are significantly above their target values and there is evidence that the lake is N limited (for example by N levels falling to negligible levels in summer), N targets should be set in addition to P targets.	
	Water quality - acidity	Maintain acidity levels to reflect unimpacted conditions - values of Acid Neutralising Capacity (ANC) should be typically	Changes in pH can alter the entire freshwater community present within a water body affecting all trophic levels. Potential causes of a shift in pH include air pollution and direct application of lime to the water column as an acidification amelioration strategy (this should not be carried out).	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		pH 7.5-9.5 for oligo-mesotrophic hard lakes.	Acidity levels should reflect un-impacted conditions - values of Acid Neutralising Capacity (ANC) considered to avoid significant impact on characteristic biota are laid out in the site's FCT (these are the same numerical values as used to protect high ecological status under the WFD in the UK). As a guide, pH 7.5-9.5 for oligo-mesotrophic hard lakes. Although, pH naturally fluctuates throughout the year, e.g. snow melt may lead to pulses of acid water, and increased plant biomass in summer may result in large fluctuations in pH, including daytime increases in pH values. Therefore pH is not used as a monitoring target, however its importance in affecting many in lake processes means that the pH of a water body should not be artificially altered.	
Supporting processes (on which the feature relies) H3140	Water quality - other pollutants	Restore water quality to 'good' chemical status (i.e. compliance with relevant Environmental Quality Standards).	A wide range of pollutants may impact on habitat integrity depending on local circumstance. Good chemical status includes a list of EQSs for individual pollutants that are designed to protect aquatic biota with high levels of precaution.	
	Water quality - dissolved oxygen	Maintain dissolved oxygen levels at >6mg/l (for cyprinid waters) throughout the year.	As for species in terrestrial environments, dissolved oxygen (DO) is required for respiration by aquatic organisms. Anthropogenic activities leading to phytoplankton blooms and increased loadings of organic matter to lakes can cause decreases in the concentration of dissolved oxygen available to support the species present. Mean dissolved oxygen refers to DO being measured at 0.5m intervals throughout the entire water column where the water column is not stratified and measurements taken at 0.5 m intervals below the thermocline only where stratification occurs.	
	Water transparency	Restore the clarity of water to a depth of at least 3.5 metres	Water transparency is the major determinant of the depth of colonisation by macrophytes, therefore, it should not be reduced. This should allow plant colonisation to at least 3.5m, but if maximum depth of colonisation has previously been recorded at greater water depths this should be maintained. Increased nutrient loads leading to increased algal growth will reduce water transparency, disturbance of the sediment by water sports and bottom feeding fish such as carp and bream also increase turbidity and reduce water transparency. Increased sediment loads to a lake would also have this effect.	
	Water quality - algae	Maintain chlorophyll at concentrations which comply with WFD high ecological status; blooms of blue-green or green algae should not occur.	Chlorophyll is the pigment used for photosynthesis by plants, and the concentration of chlorophyll in the water column during the growing season therefore provides a good measure of the abundance of phytoplankton. Phytoplankton is an important driver of structure and function in lakes and high phytoplankton levels (algal blooms) are usually associated with nutrient enrichment. Characteristic and representative non-charophyte algal cover may be significant,	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			but excessive growths of uncharacteristic, filamentous algae on lake substrate or macrophytes are indicative of nutrient enrichment.	
Structure and function (including its typical species) H7210	Water chemistry	Maintain the low nutrient status of water irrigating the H7210 feature, ensuring it is rich in base ions, particularly calcium.	This feature depends on clean, nutrient-poor water. UKTAG (2012) provides threshold values for nitrate concentration in groundwaters for different wetland types. The threshold values will mainly be used in the characterisation of GWDTE status for the WFD, primarily as a risk screening tool, to assess if sites are 'at risk' or 'not at risk' from groundwater mediated nutrient pressure. Due to the complex cycling of nutrients within many GWDTE, these threshold values are less well suited for application within sites but rather just to groundwater that is directly feeding the site.	UK Technical Advisory Group on the Water Framework Directive Technical report on groundwater dependent terrestrial ecosystem (GWDTE) threshold values. V8; 23 March 2012 https://www.wfduk.org/sites/default/files/Media/Environmental%20standards/GWDTTE%20chemical%20values_Final_230312.pdf
Supporting processes (on which the feature relies) H3140 H7210	Hydrology	At a catchment level restore natural hydrological processes to provide the conditions necessary to sustain the features within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. Hydrology influences lake ecosystem functioning in two ways: determining residence time (flushing) and water level fluctuations. Flushing of lakes is important for dilution and removal of nutrients and phytoplankton, and for reduction in sedimentation. The timing of different flushing rates within the year influences the biology of the lake. For example, reduced flushing in summer would encourage bloom conditions. Modifications of inflows and outlets or changes in hydrology, e.g. from flood control regimes, abstraction and gravel removal can lead to unnatural changes in lake levels. Past drainage has lowered the water level in Little Hawes Water, reducing the	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			extent of possible habitat for <i>Cladium</i> fen, and a ditch takes water from Cunswick Tarn at times of high water levels, which may reduce the range of possible water levels..	
Supporting processes (on which the feature relies) H3140 H7210	Hydrology	Maintain a high piezometric head and permanently high water table (allowing for natural seasonal fluctuations) on groundwater dependent sites.	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Cunswick Tarn, Hawes Water and Little Hawes Water all have connections to groundwater e.g. through springs and might be impacted by reductions in groundwater levels.	
Supporting processes (on which the feature relies) H3140	Sediment load	Maintain the natural sediment load	Increases in the sediment load also increases nutrient loads to a site. Increases in non-calcium carbonate siltation could result from increased lake productivity, changes in catchment land-use and drainage, lake level fluctuations, climatic fluctuations or changes in sewage treatment. Some peat slumping is acceptable, provided this is not induced due to land drainage.	
Supporting processes (on which the feature relies) H3140	Supporting off-site habitat	Restore the extent, quality and spatial configuration of land or habitat surrounding or adjacent to the site which is known to support the features	The structure and function of the qualifying habitat, including its typical species, may rely upon the continued presence of areas which surround and are outside of the designated site boundary. Changes in surrounding land-use may adversely (directly/indirectly) affect the functioning of the feature and its component species. This supporting habitat may be critical to the typical species of the feature to prevent/reduce/absorb damaging impacts from adjacent land uses e.g. pesticide drift, nutrient enrichment. The wider catchments of Hawes Water, Little Hawes Water and Cunswick Tarn have an influence over water supply and nutrient levels in the water bodies. Nutrient inputs within the wider catchment should be at a level to allow recovery of the water bodies from past enrichment.	
Structure and function	Adaptation and resilience	Restore the feature's ability, and that of its supporting	This recognises the increasing likelihood of natural habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability	NATURAL ENGLAND (2015).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(including its typical species) H3140 H7210		processes, to adapt or evolve to wider environmental change, either within or external to the site	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. 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. Resilience of these features would be increased by having a more natural hydrology and reduced nutrient levels.	Climate Change Theme Plan and supporting NBCCV Assessments for SACs and SPAs at http://publications.naturalengland.org.uk/publication/4954594591375360)
Supporting processes (on which the feature relies) H7210	Air quality	Restore the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. This feature is listed as currently exceeding the critical load. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. 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. This feature is sensitive to nitrogen and whilst within the range of values given, the feature is currently exceeding the lower end of the range given for this feature. Website accessed 16/03/2018.	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)
Supporting processes (on which	Functional connectivity/ isolation	Maintain the natural isolation of the water body and its lack of connectivity	The natural isolation of some standing water bodies can provide some protection from threats such as pollution and invasive species. Hydrological isolation can also lead to unique or diverse species assemblages due to genetic isolation or the	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
the feature relies) H3140		to other water bodies	absence of predators. These water bodies should have their isolated state maintained. Many of the oligo-mesotrophic hard waters will be aquifer-fed. Connectivity between lakes and surrounding wetlands are important for resource protection and ecosystem functioning and are particularly at risk from drainage, water level stabilisation and shoreline modifications.	
Supporting processes (on which the feature relies) H7210	Conservation measures	Restore 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 H7210 feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	NATURAL ENGLAND, 2014. Morecambe Bay Pavements Site Improvement Plan (SIP142). Available at http://publications.naturalengland.org.uk/publication/6401957140889600 ENGLISH NATURE, 2005. Views about the Management of the component SSSIs. Available by searching for SSSI here
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: H3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp Supporting processes – air quality. Deleted as no Critical load identified for this feature. Aerial inputs could be included water quality – nitrogen Supporting processes – Hydrology - Piezometric head, Added as appropriate to these groundwater-connected sites Structure and function - Adaptation and resilience . Added as applies to tarns as well as the fen feature				
H7210. Calcareous fens with Cladium mariscus and species of the Caricion davallianae; Calcium-rich fen dominated by great fen sedge (saw sedge) * Structure and function (including its typical species) - Exposed substrate deleted. At this site the Cladium is located at the lake edge as part of the fringing swamp and there is little exposed substrate.				

Table 2: Supplementary Advice for Qualifying Features: H6210. Semi-natural dry grasslands and scrubland facies: on calcareous substrates (Festuco-Brometalia); Dry grasslands and scrublands on chalk or limestone, H4030. European dry heaths, H5130. *Juniperus communis* formations on heaths or calcareous grasslands

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the features H6210 grassland H5130 juniper H4030 heath	Extent of the features within the site	Maintain and Restore as appropriate the total extent of the H6210 grassland feature to 513.7 ha grassland, including mosaics and transitions to heath, juniper scrub and other habitats. Restore the total extent of the H5130 juniper feature to 2.2 ha of dense juniper within 391 ha of juniper/grassland/heath/rock mosaic and presence in some component SSSIs (see Table A) Maintain the total extent of the H4030 heath feature occurring as a mosaic within 391 ha of grassland.	See supporting notes for this attribute in Table 1 above. On this site, calcareous grassland occurs in complex mosaics and transitions with limestone pavement, woodland, scrub, bracken, heath, acidic grassland and juniper stands. There is some true calcareous heath but the majority of heath occurs in pockets of more acidic soil within the calcareous habitats. Patches of heath vary greatly in size and much heath is intermixed with calcareous grassland. Pockets of acidic grassland with no heath species may represent vacant niches for this habitat. Juniper occurs mainly as scattered bushes and small stands. There are few large stands and little regeneration. The fungus-like pathogen <i>Phytophthora austrocedri</i> is present. This site has many different management regimes and the feature condition varies between component SSSI units.	ENGLISH NATURE 1999. NVC Survey of Scout and Cunswick Scars SSSI ENGLISH NATURE (CUMBRIA TEAM) 1999. Morecambe Bay Pavements cSAC - NVC Survey of Gait Barrows, Yealand Hall Allotments and Cringlebarrow & Deepdale Woods. ENGLISH NATURE 1999, 2005. Marble Quarry & Hale Fell surveys. ENGLISH NATURE 1996, 1998. NVC surveys of Hawes Water and Gait Barrows.
Extent and distribution of the features H6210	Spatial distribution of the features within the site	Maintain the distribution and configuration of the H6210 grassland and H4030 heath features, including where applicable their component	Distribution includes the spatial pattern or arrangement of the habitat feature, and its component vegetation types, across the site. Changes in distribution may affect the nature and range of the vegetation communities present, the operation of the physical, chemical, and biological processes in the system and the resiliency of the site and its features to changes or	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
grassland H5130 juniper H4030 heath		vegetation types, across the site Restore the distribution and configuration of the H5130 juniper feature, including where applicable its component vegetation types, across the site	impacts. A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction.	
Structure and function (including its typical species) H5130 juniper	Vegetation structure - age class	Restore a population of Juniper comprising plants at different life stages; this should comprise phases of old growth (>100 years old), building to mature and pioneer/seedling (<5cm girth)	Juniper regeneration can be infrequent and episodic, resulting in populations with few age classes. Populations with full and wider age range tend to be associated with conditions providing regular opportunities for establishment, such as continual exposure of bare soils on steep slopes. These will be more self-sustaining in the longer term. Juniper populations at this site tend to be mature to over-mature though there is some regeneration.	
Structure and function (including its typical species) H4030 heath	Vegetation structure: heather age structure	Restore a diverse heather age structure to the H4030 feature	. Much of the heather is currently mature or over-mature and regeneration is needed to maintain cover of heath in the long term.	
Structure and function (including its typical species) H4030 heath	Vegetation structure: cover of dwarf shrubs	Maintain and restore as appropriate an overall cover of dwarf shrub species which is typically between 25-90%	Variations in the structure of the heathland vegetation (vegetation height, amount of canopy closure, and patch structure) are needed to maintain high niche diversity. Heather <i>Calluna vulgaris</i> is often the only heath species present and may be of uniform age and height. Pockets of acidic grassland may formerly have held heath (e.g. on Scout Scar).	
Structure and function (including its typical species)	Vegetation structure: cover of gorse	Maintain cover of common gorse <i>Ulex europaeus</i> at <5%	Gorse is a very valuable wildlife habitat. Both dense and spiny, it provides good cover for many wildlife species: birds, mammals and reptiles; breeding habitat for rare or declining bird species, and excellent winter roosting. The flowers, borne at a time of year when other sources of pollen or nectar are in short supply, are particularly good for insects and other invertebrate	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
H4030 heath			pollinators. However gorse may cause problems if unchecked by dominating an area, eliminating other habitats. Extensive stands of mature gorse may also be serious fire hazards.	
Structure and function (including its typical species) H4030 heath feature only	Vegetation composition: bracken cover	Restore a cover of dense bracken which is low, typically at <10%	The spread of bracken <i>Pteridium aquilinum</i> is a threat to heath on this site as it occupies the same niche. 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. Usually active management of bracken is required to reduce or contain its cover across this habitat feature. However, this fern has also some nature conservation value for fritillary butterflies, which utilise bracken litter habitat and this should be considered if bracken management is proposed.	
Structure and function (including its typical species) H6210 grassland H4030 heath	Vegetation community composition	Ensure the component vegetation communities of the H6210 grassland and H4030 heath feature are referable to and characterised by the following National Vegetation Classification type (s); Calcareous grassland CG9a, CG9b Heath H9 and mosaics with calcareous grassland types	The habitat features comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. 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).	ENGLISH NATURE, 1999. NVC Survey of Scout and Cunswick Scars SSSI
Structure and function (including its typical species) H6210 grassland	Vegetation: proportion of herbs (including <i>Carex</i> spp)	Restore the proportion of herbaceous species within the H6210 feature to within the range 40%-90%	A high cover of characteristic herbs, including sedges (<i>Carex</i> species) is typical of the structure of this habitat type. Former and current grazing regimes within the site have generally resulted in dominance of blue moor-grass <i>Sesleria caerulea</i> and herb representation in the sward may still be low on some areas.	
Structure and function (including its typical species) H6210	Key structural, influential and/or distinctive species	Restore the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat;	See the supporting notes for this attribute in Table 1 above.	More detail on the species for each component SSSI is given in the relevant 'Definitions of Favourable

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
grassland		<i>Asperula cynanchica</i> , <i>Carlina vulgaris</i> , <i>Campanula rotundifolia</i> , <i>Euphrasia</i> spp., <i>Filipendula vulgaris</i> , <i>Galium sternerii</i> , <i>Gentianella</i> spp., <i>Helianthemum oelandicum</i> , <i>Helianthemum nummularium</i> , <i>Hippocrepis comosa</i> , <i>Leontodon hispidus</i> , <i>Lotus corniculatus</i> , <i>Pilosella officinarum</i> , <i>Sanguisorba minor</i> , <i>Scabiosa columbaria</i> , <i>Sesleria caerulea</i> , <i>Succisa pratensis</i> , <i>Thymus polytrichus</i> .		Condition for designated features of interest', available on request.
Structure and function (including its typical species) H4030 heath	Key structural, influential and/or distinctive species	Maintain the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat; <i>Calluna vulgaris</i>, <i>E. cinerea</i>, <i>Vaccinium myrtillus</i>, <i>Agrostis</i> spp., <i>Carex</i> spp., <i>Danthonia decumbens</i>, <i>Deschampsia flexuosa</i>, <i>Festuca</i> spp., <i>Nardus stricta</i>, <i>Galium saxatile</i>, <i>Hypochaeris radicata</i>, <i>Lotus corniculatus</i>, <i>Plantago lanceolata</i>, <i>Polygala serpyllifolia</i>, <i>Potentilla erecta</i>, <i>Rumex acetosella</i>, <i>Thymus praecox</i>, <i>Viola riviniana</i>, <i>Filipendula vulgaris</i>, <i>Galium verum</i>, <i>Helianthemum nummularium</i>, <i>Sanguisorba minor</i>.		
Structure and function (including its typical	Vegetation: undesirable species	Maintain the frequency/cover of the following undesirable species within acceptable levels and prevent changes in surface	There will be a range of undesirable or uncharacteristic species which, if allowed to colonise and spread, are likely to have an adverse effect on the feature's structure and function, including its more desirable typical species. These may include invasive non-natives such as <i>Cotoneaster</i> spp, or coarse	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species) H6210 grassland H5130 juniper		condition, soils, nutrient levels or hydrology which may encourage their spread; H6210 grassland <i>Cirsium arvense</i>, <i>Cirsium vulgare</i>, <i>Senecio jacobaea</i>, <i>Urtica dioica</i>, <i>Cotoneaster</i> spp, particularly <i>C. horizontalis</i>, <i>Larix</i> spp. H5130 juniper <i>Cotoneaster</i> spp Shading tree species (but note that tree cover can include important species such as yew <i>Taxus baccata</i> or Lancaster whitebeam <i>Sorbus lancastriensis</i>)	and aggressive native species which may uncharacteristically dominate the composition of the feature. Undesirable species may indicate an issue with another aspect of the site's structure and function and may require active management to avert succession to a different state.	
Structure and function (including its typical species)	Vegetation community transitions	Maintain the pattern of natural vegetation zonation/transitions between shallow and deeper soils, to rocky habitats such as scree and between calcareous grassland and acidic grassland, scrub, woodland, heath and juniper.	Transitions/zonation 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. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna.	
Structure and function (including its typical species) H5130 juniper	Physical structure: ground disturbance	Maintain a provision of disturbed and eroding bare ground at a level which is compatible with maintaining or restoring the regeneration potential of the H5130 feature	As a pioneer species, the proximity of bare ground is likely to be the most important factor responsible for juniper seedling establishment. Areas that remain continuously open with plentiful bare ground are much more likely to support seedlings. Episodes of intense bare ground creation need to be followed by long periods of little or no disturbance. Having the ability to provide some areas of exposed bare ground may be required to encourage natural regeneration of juniper plants in order to	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			sustain the feature into the longer-term.	
Structure and function (including its typical species) H6210 grassland H5130 juniper H4030 heath	Soils, substrate and nutrient cycling	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal/bacterial ratio, to within typical values for the habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	
Structure and function (including its typical species) H6210 grassland H5130 juniper H4030 heath	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	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. Some component parts of the SAC lie adjacent to or near similar limestone habitats, especially within Arnsdale-Silverdale AONB but other component sites are more isolated. Restoring or enhancing connectivity would benefit both designated and undesignated areas.	
Structure and function (including its typical species) H6210 grassland H5130 juniper H4030 heath	Adaptation and resilience	Maintain the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	This recognises the increasing likelihood of natural 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. Using best available information, any necessary or likely adaptation or	NATURAL ENGLAND (2015). Climate Change Theme Plan and supporting NBCCV Assessments for SACs and SPAs at http://publications.naturalengland.org.uk/publication/4954594

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being low taking into account the sensitivity, fragmentation, topography and management of its habitats/supporting habitats. This means that this site is considered to be vulnerable overall but is a lower priority for further assessment and action. Individual species may be more or less vulnerable than their supporting habitat itself. In many cases, change will be inevitable so appropriate monitoring would be required.	591375360
Supporting processes (on which the feature relies) H6210 grassland	Air quality	Maintain the concentrations and deposition of air pollutants within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. 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. This feature lies between minimum and maximum values for site-relevant critical loads for nitrogen deposition. Website accessed 15/03/2018.	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).
Supporting processes (on which the feature relies) H5130 juniper H4030 heath	Air quality	Restore 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	See supporting notes for this attribute in row above. These features currently exceed the site-relevant critical load for nitrogen deposition. Website accessed 16/03/2018.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		(www.apis.ac.uk).		
Supporting processes (on which the feature relies) H610 grassland	Conservation measures	Maintain and restore, as appropriate, 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 features	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	NATURAL ENGLAND, 2014. Morecambe Bay Pavements Site Improvement Plan (SIP142). Available at http://publications.naturalengland.org.uk/publication/6401957140889600
Supporting processes (on which the feature relies) H4030 heath	Conservation measures	Restore 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 feature		ENGLISH NATURE, 2005. Views about the Management of the component SSSIs. Available by searching for SSSI here
Version Control				
Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance:				
The targets for some attributes listed above include both ‘maintain’ or ‘restore’ objectives. This is because this SAC is an extensive complex of geographically-separate component sites. Overall, both objectives will be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will be able to provide further advice on request.				
Grassland				
Structure and function (including its typical species) - Supporting off-site habitat; deleted as not applicable				
Juniper				
Structure and function (including its typical species) - Vegetation community composition; reference to NVC community deleted as the juniper in Morecambe Bay Pavements SAC is not referable to an NVC community but is associated with the CG9 grassland.				
Structure and function (including its typical species) - Typical species: flora and fauna; deleted for reason above.				
Structure and function (including its typical species) - Vegetation community transitions; deleted as there are no transitions to other habitats				
Structure and function (including its typical species) – Canopy cover; deleted as there is only a small area of closed canopy stands and this is not limiting regeneration				
Structure and function (including its typical species) - Functional connectivity with wider landscape deleted as there are no critical connections for juniper.				
Structure and function (including its typical species) - Supporting off-site habitat deleted as there is no major occurrence of juniper on land surrounding the site.				
Heath				

Attributes	Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species) - Vegetation structure: cover of gorse. Reference to <i>Ulex gallii</i> deleted as it has no or low presence on the site and is a desirable component of the vegetation. Structure and function (including its typical species) - vegetation structure: tree cover deleted as not appropriate to the scattered distribution of this feature on the site. Structure and function (including its typical species) - Vegetation structure: heather age structure. Recommended percentages for growth phases deleted as heath on this site is a relatively small component and occurs in patches. 'No one growth phase dominant' added to indicate desirability of having a range of ages of heather present. Structure and function (including its typical species) - Vegetation: undesirable species deleted as bracken and gorse are listed in other rows. Supporting processes (on which the feature relies) - Conservation measures. Requirement for bare ground for species deleted as the heath habitat is scattered and bare ground is more appropriately provided within the grassland. Supporting processes (on which the feature relies) - Water quality deleted as the feature is not dependent on surface or ground water.			

Table 3: Supplementary Advice for Qualifying Features: H8240. Limestone pavements *

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	Extent of the feature within the site	Maintain the total extent of the H8240 feature at 517 ha. (This is a minimum area as some pavement may have been mapped as woodland)	There should be no measurable net reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis.	ENGLISH NATURE 1986 - 1994 Limestone Pavement Order project surveys NATURE CONSERVANCY COUNCIL 1985 Cringlebarrow and Deepdale SSSI – map of extent of limestone pavement ENGLISH NATURE 1999 Morecambe Bay Pavements cSAC - NVC Survey of Gait Barrows, Yealand Hall Allotments and Cringlebarrow & Deepdale Woods
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the H8240 feature are referable to and characterised by the following National Vegetation Classification types:- CG9 <i>Sesleria albicans</i> - <i>Galium sternerii</i> grassland CG10 <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Thymus praecox</i> grassland OV38 <i>Gymnocarpium robertianum</i> - <i>Arrhenatherum elatius</i> community OV39 <i>Asplenium trichomanes</i> - <i>A. ruta-muraria</i> community OV40 <i>Asplenium viride</i> - <i>Cystopteris fragilis</i> community	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. 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). A range of calcareous rock, heath, wetland, grassland, scrub and woodland NVC types can occur on limestone pavement. The NVC does not include limestone pavement vegetation per se but a number of NVC types may be present, usually in fragmentary form. Communities include OV38 <i>Gymnocarpium robertianum</i> - <i>Arrhenatherum elatius</i> community, OV39 <i>Asplenium trichomanes</i> - <i>A. ruta-muraria</i> community, OV40 <i>Asplenium viride</i> - <i>Cystopteris fragilis</i> community, CG9 <i>Sesleria albicans</i> - <i>Galium sternerii</i>	ENGLISH NATURE 1990, 1998 Marble Quarry and Hale Fell – Limestone Pavement surveys

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		W8 <i>Fraxinus excelsior</i> - <i>Acer campestre</i> - <i>Mercurialis perennis</i> woodland W9 <i>Fraxinus excelsior</i> - <i>Sorbus aucuparia</i> - <i>Mercurialis perennis</i> woodland W13 <i>Taxus baccata</i> woodland	grassland, CG10 <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Thymus praecox</i> grassland, W8 <i>Fraxinus excelsior</i> - <i>Acer campestre</i> - <i>Mercurialis perennis</i> woodland, W9 <i>Fraxinus excelsior</i> - <i>Sorbus aucuparia</i> - <i>Mercurialis perennis</i> woodland and W13 <i>Taxus baccata</i> woodland (where yew is not considered to be part of W8 or W9). Limestone pavements have two characteristic forms: wooded and open. Where a dense canopy cover results in mosses covering the clint tops the pavement is considered to be wooded. Different targets apply for wooded and open pavements. In most of the constituent sites of the Morecambe Bay Pavements, the pavement feature contains a mosaic of both types.	
Structure and function (including its typical species)	Vegetation community transitions	Maintain the pattern and combination of natural vegetation zonation/transitions between grassland, heath, scrub and woodland	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. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. The vegetation of limestone pavements is unusual because of the combinations of floristic elements, including woodland and woodland edge species, such as hart's-tongue <i>Phyllitis scolopendrium</i> and dog's mercury <i>Mercurialis perennis</i>. On the clint surfaces or the upper walls of the grikes there are plants of rocky habitats, such as wall-rue <i>Asplenium ruta-muraria</i> and maidenhair spleenwort <i>Asplenium trichomanes</i>. The grikes provide a shady, humid environment favouring woodland plants.	
	Invasive, non-native and/or introduced species	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the H8240 feature	Invasive or introduced non-native species can be a serious potential threat to the structure and function of these habitats, because they are able to exclude, damage or suppress the growth of their associated typical species, reduce structural diversity of the habitat and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum pesticides). Non-native species may include exotic pines, larch spp, beech and sycamore. Non-natives appear to be an increasing problem, especially cotoneaster and buddleia.	
	Vegetation: undesirable species	Maintain the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface	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	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		condition, soils, nutrient levels or hydrology which may encourage their spread; <i>Arrhenatherum elatius</i> , <i>Cirsium arvense</i> , <i>Cirsium vulgare</i> , large docks, , <i>Senecio jacobaea</i> , <i>Rubus fruticosus</i> , <i>Urtica dioica</i> .	depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants.	
Structure and function (including its typical species)	Wooded pavement: vegetation structure and distribution.	On wooded pavements, Restore the presence of seedlings, saplings, mature trees and shrubs comprising site-native species in wooded areas, with open space typically present over 10%-30% of the pavement vegetation by area.	Structural variation will often be a result of woodland management but can also be natural as an inherent feature of the structure and the function of the pavement itself. Yew or juniper stands can be (and should be) dense and continuous. Deer can have an adverse effect on tree and shrub regeneration.	
	Open pavement	On open pavements, maintain scrub and woody cover at between 5-25% of the pavement feature	A proportionate amount of scrub and woody cover (including Juniper) increases the structural variety of pavement vegetation, provides more vegetation edge for plant species and results in higher invertebrate interest.	Targets for scrub cover on component SSSIs can be found in the site Favourable Condition Tables
	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 H8240 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.	
	Adaptation and resilience	Maintain the 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 supporting notes for this attribute in table 1.	
	Key structural, influential and site-distinctive species: flora and fauna	Maintain the abundance of the I species listed below to enable each of them to be a viable component of the Annex 1 habitat; <i>Arabis hirsuta</i> , <i>Asplenium viride</i> , <i>Carex digitata</i> , <i>Carex</i>	See supporting notes for this attribute in table 1.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<i>ornithopoda, Ceterach officinarum, Clematis vitalba, Convallaria majalis, Cystopteris fragilis, Dryopteris submontana, Epipactis atrorubens, Eupatorium cannabinum, Geranium sanguineum, Gymnocarpium robertianum, Hypericum montanum, Juniperus communis, Melica nutans, Melica uniflora, Polygonatum odoratum, Rubus saxatilis, Polystichum aculeatum, Thalictrum minus</i>		
Supporting processes (on which the feature relies)	Air quality	Restore the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See supporting notes for this attribute in table 1. This habitat type is considered sensitive to nitrogen deposition. It is however uncertain if this site exceeds the critical load for nitrogen as the model uses alpine and subalpine communities with sensitive lichen and bryophytes. (APIS accessed 30/5/2017). Taking account of the typical species present and the likely sensitivity of the ecosystem to atmospheric nitrogen deposition,	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).
	Conservation measures	Restore the management measures necessary to restore the structure, functions and supporting processes associated with the H8240 feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Although rock-based, limestone pavement is an inherently fragile habitat and susceptible to human activity. Threats to the habitats include heavy grazing, nitrogen deposition, and increase in non-native and undesirable species. Management measures will differ between open, scrubby and wooded pavement.	NATURAL ENGLAND, 2014. Morecambe Bay Pavements Site Improvement Plan (SIP142). Available at http://publications.naturalengland.org.uk/publication/6401957140889600 ENGLISH NATURE, 2005.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Views about the Management of the component SSSIs. Available by searching for SSSI here
Version Control Advice last updated:				
Variations from national feature-framework of integrity-guidance: Extent and distribution of the feature - Spatial distribution of the feature within the site deleted as limestone pavement is rock – not mobile Structure and function (including its typical species) - Vegetation composition: bracken deleted as not applicable to limestone pavement and included in the table for H4030. European dry heaths				

Table 4: Supplementary Advice for Qualifying Features: H91A0. Old sessile oak woods with Ilex and Blechnum in the British Isles; Western acidic oak woodland, H91J0. Taxus baccata woods of the British Isles; Yew-dominated woodland * and H9180. Tilio-Acerion forests of slopes, screes and ravines; Mixed woodland on base-rich soils associated with rocky slopes *

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the features	Extent of the features within the site	Maintain the total extent of the woodland features H91A0 – no area measurement currently available H91J0 - This feature occurs within Tilio-acerion and has not always been measured separately. Areas available are; Hawes Water – 1 ha Marble Quarry and Hale Fell – 11.2 ha Middlebarrow 2.3 ha Thrang Wood 3.1 ha H9180 902 ha, which includes some areas of yew and sessile oak woodland.	There should be no measurable net reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. For this feature, tree roots (particularly of veteran trees) can extend a considerable distance beyond the boundary of the site - they can be impacted by soil compaction (such as caused by vehicles or construction works); agricultural operations or other soil disturbance (like trenches); and agro chemicals or other chemicals which get into the soil. Any loss of woodland area - whether at the edge or in the middle of a site will reduce the core woodland area where woodland conditions are found - these support significant assemblages of species dependent on woodland conditions (e.g. lichens and bryophytes - being one example). Loss of any woodland area which fragments a site into different parts will clearly disturb the movement of species between the remaining parts of the woodland.	ENGLISH NATURE. 1999. NVC Survey of Scout and Cunswick Scars SSSI ENGLISH NATURE 1999 & 2005 Marble Quarry & Hale Fell SSSI aerial photograph surveys. NATURE CONSERVANCY COUNCIL. 1982 Cringlebarrow and Deepdale SSSI - Woodland survey cards (Peterken classification) ENGLISH NATURE. 1999. Morecambe Bay Pavements cSAC - NVC Survey of Gait Barrows, Yealand Hall Allotments and

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Cringlebarrow & Deepdale Woods.
Extent and distribution of the features	Spatial distribution of the features within the site	Maintain the distribution and configuration of the woodland features including where applicable their component vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. On this site, yew groves have the same (though generally more species-poor) ground flora as the surrounding woodland. It is acceptable in principle for groves to change location but note that groves currently contain a significant proportion of the older age class of trees within the woodland as a whole.	
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 Vegetation Classification types; W10e <i>Quercus robur</i>-<i>Pteridium aquilinum</i>-<i>Rubus fruticosus</i> woodland, <i>Acer pseudoplatanus</i>-<i>Oxalis acetosella</i> sub-community, W11 <i>Quercus petraea</i>-	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. 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).	NVC equivalents of these SAC features are defined in Table 1 of JNCC Report No. 288 (1998) The relationship between Biodiversity Action Plan Priority and Broad Habitat Types, and other woodland classifications. J.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<i>Betula pubescens</i>-<i>Oxalis acetosella</i> woodland, W16b <i>Quercus</i> spp.-<i>Betula</i> spp.-<i>Deschampsia flexuosa</i> woodland, <i>Vaccinium myrtillus</i>-<i>Dryopteris dilatata</i> sub-community, W17 <i>Quercus petraea</i>-<i>Betula pubescens</i>-<i>Dicranum majus</i> woodland Ensure the component vegetation communities of the H91J0 feature are referable to and characterised by the following National Vegetation Classification types; W8/9 (yew groves) or W13	Yew groves in northwest England are described in British Plant Communities as a feature of W8 but are considered by some to represent W13. Small groves may not be mapped separately.	E. Hall and K. J. Kirby RODWELL, J S (ed) 1991 British Plant Communities – Woodlands and Scrub. Cambridge University Press
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the H9180 feature are referable to and characterised by the following National Vegetation Classification types; W8/9 (including yew groves that may be mapped as W13)	Yew groves in northwest England are described in British Plant Communities as a feature of W8 but are considered by some to represent W13. Small groves may not be mapped separately.	As above
Structure and function (including its typical species)	Vegetation structure - canopy cover	Maintain an appropriate tree canopy cover across the woodland features, which will typically be between 40-90% of the site	Canopy cover is the overall proportion of vegetative cover consisting of any woody layer ranging from established regeneration to mature and veteran stages. Woodland canopy density and structure is important because it affects ecosystem function and in particular microclimate, litter fall, soil moisture, nutrient turnover and shading; this in turn influences the composition of plants and animals in lower vegetation layers and soil.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Open canopies with just scattered trees will have less of a woodland character and reduced diversity of woodland-dependent species (although they may be still be important as a form of woodland-pasture). Completely closed canopies across the whole woodland are not ideal either however, as they cast heavier shade and support fewer species associated with edges, glades and open grown trees, and have little space where tree regeneration could occur. In general, the woodland canopy of this feature should provide a core of woodland interior conditions with some open and edge habitat as well.	
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 area	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. Having some open, sunlit and largely tree-less areas as part of the woodland community is often important to facilitate natural tree and shrub regeneration and also to provide supporting habitat for specialist woodland invertebrates, birds, vascular and lower plants. Such open space can be permanent or temporary and may consist of managed grazed areas, linear rides and glades, or naturally-produced gaps caused by disturbance events such as windthrow/fire/tree falling over/snow damage. To provide open space, some parts of the SAC have active coppicing rotations as part of management for nature conservation.	
Structure and function (including its typical species)	Vegetation structure - old growth	Restore the extent and continuity of undisturbed, mature/old growth stands (typically comprising at least 20% of the feature at any one time) and the assemblages of veteran and ancient trees (typically >10 trees per hectare).	Good woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. In the H91A0 feature, old or over-mature elements of the woodland are particularly characteristic and important features, and their continuity should be a priority. Yew groves are generally composed of old trees in undisturbed stands. They represent most of the oldest age class within the yew woodland and the Tilio-acerion. In H9180 Tilio-Acerion, past management has removed most of the oldest age classes of trees, with the exception of yew. Over much of the site, management aims to achieve this target.	
Structure and function (including its typical species)	Vegetation structure - dead wood	Restore the continuity and abundance of standing or fallen dead and decaying	See supporting notes for this attribute in Table 7 above. Past management has removed much of the dead wood or older trees that might	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)		wood, typically between 30 - 50 m ³ per hectare of standing or fallen timber or 3-5 fallen trees >30cm per hectare, and >10 standing dead trees per hectare	provide standing or fallen dead wood.	
Structure and function (including its typical species)	Vegetation structure - dead wood	Restore the continuity and abundance of standing or fallen dead and decaying wood, typically between 30 - 50 m ³ per hectare of standing or fallen timber or 3-5 fallen trees >30cm per hectare, and >10 standing dead trees per hectare	Woodland structure includes variations in age, tree form, layering, the distribution and abundance of open space and dead wood. It plays a critical role in woodland ecosystem functioning. 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. Past management has removed much of the dead wood or older trees that might provide future dead wood habitats and this habitat is poorly represented in most woodlands. On some parts of the site, the standing wood target may be reduced as thin soils or exposure mean that dead trees fall over.	
Structure and function (including its typical species)	Vegetation structure - age class distribution	H91A0 and H9180 features - Restore at least 3 age classes spread across the average life expectancy of the commonest trees. H91J0 feature – Restore at least 2 age classes spread across the average life expectancy of the trees - which can be hundreds of years.	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. Previous management has generally removed the oldest trees from the woodlands with the exception of yew stands, which lack the younger age classes. Deer browsing over past decades has prevented recruitment to the sapling stage with the exception of holly, which is often locally dominant in the shrub layer and as young trees.	
Structure and function (including its typical species)	Vegetation structure - shrub layer	H91A0 feature - Restore an Understorey of shrubs covering 20 - 60% of the stand area (this will vary with light levels and site objectives)	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. Deer browsing over past decades has reduced shrub cover. Where present, the denser shrub stands tend to be dominated by holly.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		H91J0 feature - Maintain an understorey of shrubs that is sparse under the yew canopy. H9180 feature – Maintain and restore as appropriate an understorey of shrubs cover 20 - 60% of the stand area.		
Structure and function (including its typical species)	Vegetation structure - woodland edge	Maintain a graduated woodland edge into adjacent semi-natural open habitats, other woodland/wood-pasture types or scrub.	Woodland edge is defined as being the transitional zone between the forest feature and adjacent but different habitat types - the best woodland edges will have a varied structure in terms of height and cover. Many typical forest species make regular use of the edge habitats for feeding due to higher herb layer productivity and larger invertebrate populations. Grasslands / arable fields managed with high doses of agro-chemicals could potentially not allow this gradation of woodland edge and could have other impacts on the integrity of the site (pollution/ nutrient enrichment etc).	
Structure and function (including its typical species)	Adaptation and resilience	H91A0 feature - Restore the resilience of the feature by ensuring a diversity (at least 3 species of site-native trees e.g sessile or pedunculate oak, birches, holly, rowan) across the site. H91J0 feature - Maintain the resilience of the feature by ensuring a diversity of site-native tree species; although yew dominates, this can be provided by a scattering of one or more of whitebeam, ash, birch, sycamore and oak.	See supporting notes for this attribute in Table 1 above. The H91A0 feature is community is currently quite species poor in the canopy layer due to past management that favoured oak. It is the ground flora that marks it out rather than the woody species. The H91J0 feature tends to be concentrated in small groves dominated almost entirely by yew.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		H9180 feature - Maintain the resilience of the feature by ensuring a diversity of site-native tree species (at least 4 species e.g. ash/ small-leaved lime/ aspen/ alder/ sycamore/ rowan/ bird cherry/ birch) is present across the site.		
Structure and function (including its typical species)	Browsing and grazing by herbivores	Restore browsing to a level that allows a well-developed woodland understorey (as indicated by no obvious browse line, lush ground vegetation with some grazing-sensitive species evident (e.g. bramble, ivy), and tree seedlings and sapling common in gaps.	Herbivores, especially deer, are an integral part of woodland ecosystems. They are important in influencing woodland regeneration, composition and structure and therefore in shaping woodland wildlife communities. In general, both light grazing and browsing is desirable to promote both a diverse woodland structure and continuous seedling establishment. Short periods with no grazing at all can allow fresh natural regeneration of trees, but a long-term absence of herbivores can result in excessively dense thickets of young trees which shade out ground flora and lower plant species. However, heavy grazing by deer or sheep prevents woodland regeneration, and can cause excessive trampling and/or poaching damage, canopy fragmentation, heavy browsing, bark-stripping and a heavily grazed sward. Browsing by deer is a current (2018) threat to understory regeneration.	
Structure and function (including its typical species)	Regeneration potential	Restore the potential for sufficient natural regeneration of desirable trees and shrubs; typically tree seedlings of desirable species (measured by seedlings and <1.3m saplings - above grazing and browsing height) should be visible in sufficient numbers in gaps, at the wood edge and/or as	The regeneration potential of the woodland feature must be maintained if the wood is to be sustained and survive, both in terms of quantity of regeneration and in terms of appropriate species. This will include regeneration of the trees and shrubs from saplings or suckers, regrowth from coppice stools or pollards, and where appropriate planting. Browsing and grazing levels must permit regeneration at least in intervals of 5 years every 20. The density of regeneration considered sufficient is less in parkland sites than in high forest. Regeneration from pollarding of veteran trees should be included where this is happening. Yew regeneration is generally very low within existing stands of this species but can	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		regrowth as appropriate.	occur within the Tilio-Acerion. Browsing by deer is a current (2018) threat to tree regeneration.	
Structure and function (including its typical species)	Tree and shrub species composition	H91A0 feature - Maintain a canopy and under-storey of which 95% is composed of site native trees and shrubs e.g. oak, birch, rowan, holly, yew, hazel, blackthorn, hawthorn, honeysuckle, bramble. H91J0 feature - Maintain a canopy and under-storey of which 95% is composed of site native trees and shrubs e.g. yew, ash, hazel	Native trees and shrubs in general support a greater diversity of associated species than non-native species, especially amongst groups of invertebrates which depend directly on trees for food and shelter. There are many plants and animals which use or co-exist with non-native trees, but many rare and threatened woodland species are specialists adapted to one or a few native trees or shrub species (birches, willows and oaks, are examples of trees that host many specialist insect species).	
Structure and function (including its typical species)	Key structural, influential and site distinctive species: flora and fauna	Restore the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat; H91A0 feature Canopy: Oak spp, birch spp, yew Understorey: Rowan, holly, hazel, hawthorn, occasional juniper, bramble Ground flora: heather <i>Calluna vulgaris</i>, bilberry <i>Vaccinium myrtillus</i>; rich assemblage of woodland bryophytes; assemblage of bracken or ferns such as with <i>Blechnum</i>, <i>Dryopteris</i> species; <i>Oxalis acetosella</i>	See supporting notes for this attribute in Table 2 above. The number and species of trees and shrubs present has been altered by previous woodland management whilst the shrubs and ground flora have often been impacted by high levels of browsing by deer.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		and <i>Galium saxatile</i> Assemblage of hole-nesting woodland birds H91J0 feature Canopy – yew Ground flora - Dog's mercury <i>Mercurialis perennis</i> or hart's-tongue <i>Phyllitis scolopendrium</i>. Other species (shared with Tilio-acerion) can include false-brome <i>Brachypodium sylvaticum</i>; pignut <i>Conopodium majus</i>; meadowsweet <i>Filipendula ulmaria</i>; Herb Robert <i>Geranium robertianum</i>; wood avens <i>Geum urbanum</i>; ivy <i>Hedera helix</i>; barren strawberry <i>Potentilla sterilis</i>; bramble <i>Rubus fruticosus</i>; common dog-violet <i>Viola riviniana</i>		
		H9180 feature 1. Species defining the component NVC types of W8 and W9 types which include; ash <i>Fraxinus excelsior</i>; oak <i>Quercus robur</i>; hazel <i>Corylus avellana</i>; yew <i>Taxus baccata</i> false-brome <i>Brachypodium sylvaticum</i>;		

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Herb Robert <i>Geranium robertianum</i>; wood avens <i>Geum urbanum</i>; ivy <i>Hedera helix</i>; dog's mercury <i>Mercurialis perennis</i>; barren strawberry <i>Potentilla sterilis</i>; bramble <i>Rubus fruticosus</i>; common dog-violet <i>Viola riviniana</i> 2. Distinctive flora of this feature; small-leaved lime <i>Tilia cordata</i>; wych elm <i>Ulmus glabra</i>; wild cherry <i>Prunus avium</i>; spindle <i>Euonymus europaeus</i>; fingered sedge <i>Carex digitata</i>; Lancastrian whitebeam <i>Sorbus lanceolatus</i> 3. Distinctive fauna of this feature; Red wood ant <i>Formica rufa</i> (on some component SSSIs)		
Structure and function (including its typical species)	Invasive, non-native and/or introduced species	Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the woodland feature	Invasive or introduced non-native species are a serious potential threat to the biodiversity of native and ancient woods, because they are able to exclude, damage or suppress the growth of native tree, shrub and ground species (and their associated typical species), reduce structural diversity and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum pesticides). Such species can include Rhododendrons, snowberry, Japanese knotweed, giant hogweed and Himalayan balsam, for example. Similarly, this would include pheasants, rabbits and non-native invertebrate 'pest' species.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	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 woodland habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	
Supporting processes (on which the feature relies)	Functional connectivity with wider landscape	Maintain the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site	See supporting notes for this attribute in Table 2 above.	
	Air quality	Maintain the concentrations and deposition of air pollutants within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See supporting notes for this attribute in Table 2 above. H91A0 feature The critical loads for nitrogen and acidity are not currently being exceeded on this site (APIS accessed 31/5/2017) H91J0 and H9180 features These features are considered sensitive to nitrogen deposition which can cause changes in species composition and ground vegetation. They are currently exceeding the critical load for nitrogen (APIS accessed 31/5/2017)	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).
	Hydrology	At a site and catchment level, maintain natural hydrological processes to provide the conditions necessary to sustain the woodland feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. This attribute 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.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	Illumination	Ensure artificial light is maintained at a level which is unlikely to affect natural phenological cycles and processes to the detriment of the woodland 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.	
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: The targets for some attributes listed above include both 'maintain' or 'restore' objectives. This is because this SAC is an extensive complex of geographically-separate component sites. Overall, both objectives will be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will be able to provide further advice on request.				
H91J0. Taxus baccata woods of the British Isles; Yew-dominated woodland * Structure and function - Vegetation structure - open space deleted as considered not applicable. Yew occurs as groves, its total area is small and open space is provided within the Tilio-Acerion. Structure and function - Vegetation structure – dead wood - target amended from 3-5. As the trees in the yew stands are long-lived and even-aged there is little dead wood and few fallen trees.				

Table 4: Supplementary Advice for Qualifying Features: S1014. *Vertigo angustior*; Narrow-mouthed whorl snail

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature and/or its supporting habitat relies)	Conservation measures	Maintain the management measures which are necessary to maintain the structure, functions and supporting processes associated with the Narrow-mouthed whorl snail and/or its supporting habitats.	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	NATURAL ENGLAND, 2014. Morecambe Bay Pavements Site Improvement Plan (SIP142). Available at http://publications.naturalengland.org.uk/publication/6401957140889600 ENGLISH NATURE, 2005. Views about the Management of the component SSSIs. Available by searching for SSSI here
Supporting habitat: extent and distribution	Extent of supporting habitat	Maintain the total extent of the habitat which supports the Narrow-mouthed whorl snail feature. The habitat is moss-covered clints (the limestone blocks in pavement) shaded by hazel and yew.	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. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data.	KILLEEN, I. J. 2010 A condition assessment of <i>Vertigo angustior</i> at Gait Barrows, Cumbria. Report for Natural England.
	Distribution of supporting habitat	Maintain the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types,	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. Such	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		across the site	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.	
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	See notes for this attribute in Table 9 above.	
	Air quality	Restore concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See notes for this attribute in Table 9 above. Limestone Pavements at this site exceed the Critical Load for nitrogen (website accessed 01/09/2016)	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)
Population (of the feature)	Population abundance	Maintain the abundance of the narrow-mouthed whorl snail population as widespread and locally abundant within its supporting habitat.	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. 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. 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	KILLEEN, I.J. 1997. Survey for the terrestrial snail <i>Vertigo angustior</i> at three sites in England (Gait Barrows NNR, Flordon Common and Martlesham Creek). English Nature Research Report. 228. KILLEEN, I.J. 1998. Surveys of the whorl snail

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. 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.	<i>Vertigo angustior</i> in Cumbria & North Lancashire. Unpublished report. English Nature. KILLEEN, I. J. 2010 A condition assessment of <i>Vertigo angustior</i> at Gait Barrows, Cumbria. Report for Natural England.
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: Supporting habitat: structure/function - Soils, substrate and nutrient cycling deleted as this feature occurs on limestone pavement. Supporting processes (on which the feature and/or its supporting habitat relies) - Water quantity/quality deleted as this species is not dependent on water levels. Supporting habitat: structure/function - Grazing pressure deleted as the limestone pavement habitat of the species at this site is not grazable. Supporting habitat: structure/function - vegetation structure deleted as the habitat at this site is not fen meadow. Supporting habitat: structure/function – ground moisture class deleted as the feature does not occur on soil. Supporting processes (on which the feature and/or its supporting habitat relies) - Salinity (coastal sites) deleted as this is not a coastal site.				

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