



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

**Eller's Wood and Sand Dale Special Area of Conservation (SAC)
Site Code: UK0030039**



© Natural England 2014

Date of Publication: 25 January 2019

About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Eller's Wood and Sand Dale SAC.

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

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

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

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

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

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

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

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

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

About this site

European Site information

Name of European Site	Eller's Wood and Sand Dale Special Area of Conservation (SAC)
Location	North Yorkshire
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	4.09 ha
Designation Changes	None
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	Eller's Wood and Sand Dale SSSI The SSSI is approximately twice as large as the SAC
Relationship with other European or International Site designations	None

Site background and geography

Eller's Wood and Sand Dale SAC lies within the Dalby Forest area of the North York Moors National Park. The site comprises a series of springs and associated fen along the lower slopes of Sand Dale. The springs drain into Thornton Beck which forms the eastern boundary of Eller's Wood.

Diverse base-rich fen vegetation follows the seepage lines from springs with nearby patches of *Molinia* meadow and fen meadow vegetation. Blunt-flowered rush *Juncus subnodulosus* and black bog-rush *Schoenus nigricans* are abundant with a range of grasses, rushes and sedges present including sharp-flowered rush *J. acutiflorus*, long-stalked yellow sedge *Carex lepidocarpa* and broad-leaved cotton grass *Eriophorum latifolium*. Bryophytes form a patchily abundant layer beneath the taller plants and within the vicinity of the springs, including species such as *Bryum pseudotriquetrum*, *Calliergonella cuspidata* and *Cratoneuron commutatum*. Flowering forbs include bog pimpernel *Anagallis tenella*, round-leaved sundew *Drosera rotundifolia*, grass-of-Parnassus *Parnassia palustris* and meadow thistle *Cirsium dissectum*.

Between the flushes on raised banks there is more acidic grassland amongst scattered gorse *Ulex europaeus* and hawthorn *Crataegus monogyna*. A population of Geyer's whorl snail *Vertigo geyeri* exists at this site within the base-rich flushes.

Ellers Wood and Sand Dale SAC is within the North York Moors and Cleveland Hills National Character Area ([NCA 25](#)).

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:

- **Petrifying springs with tufa formation (Cratoneurion). (Hard-water springs depositing lime)**

Tufa formation is associated with hard-water springs, where groundwater rich in calcium bicarbonate comes to the surface. On contact with the air, carbon dioxide is lost from the water and a hard deposit of calcium carbonate (tufa) is formed. These conditions occur most often in areas underlain by limestone or other calcareous rocks, and particularly in the uplands of northern England and the Scottish Highlands.

Tufa-forming spring-heads are characterised by the swelling yellow-orange mats of the mosses *Cratoneuron commutatum* and *C. filicinum*. Many rare, lime-loving (calcicole) species live in the moss carpet.

The M37 *Cratoneuron commutatum*–*Festuca rubra* spring community is found at this site.

Qualifying Species:

- **Geyer's whorl snail *Vertigo geyeri***

Throughout its range the tiny Geyer's whorl snail *Vertigo geyeri* is local and found in relatively exposed, constantly humid calcareous flush-fens (including the Annex I habitat type 7230 Alkaline fens) that are fed by tufa-depositing springs (including 7220 Petrifying springs with tufa formation (Cratoneurion)). These flushes are often only a few square metres in extent. Species that have been found with it at all sites in the UK are black bog-rush *Schoenus nigricans* and yellow sedge *Carex flava* agg. It requires dense cover of low-growing grasses and sedges relatively free from *Sphagnum* and other mosses.

Vertigo geyeri flourished in post-glacial conditions, but climatic change led to a dramatic contraction of its range, and the species is vulnerable to drainage of the sites where it survives. Like all Annex II *Vertigo* species, it is highly dependent on maintenance of existing local hydrological conditions.

In the recent conservation review of British non-marine molluscs (Seddon *et al.*, 2014) *V. geyeri* is assigned the GB IUCN Status "Near Threatened" and the GB Rarity Status "Nationally Scarce".

In the UK this species is currently known from north Wales, northern England, the Scottish Highlands, the Inner Hebrides, and Northern Ireland. In total it has been recorded from approximately 30 localities.

Eller's Wood and Sand Dale provides a lowland representation of Geyer's whorl snail *Vertigo geyeri* in north-east England; the population exists at this site within the base-rich flushes.

References

Seddon, M.B., Killeen, I.J. & Fowles, A.P. 2014. *A Review of the Non-Marine Mollusca of Great Britain: Species Status No. 17*. NRW Evidence Report No: 14, 84 pp, Natural Resources Wales, Bangor.

Table 1: Supplementary Advice for Qualifying Features: H7220. Petrifying springs with tufa formation (*Cratoneurion*); Hard-water springs depositing lime

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 H7220 Petrifying springs with tufa formation (<i>Cratoneurion</i>) feature.	<p>There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored.</p> <p>The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. 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.</p> <p>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. Please note that this feature is very poorly mapped on SACs, SSSIs and in the wider countryside. The JNCC description of this feature is limited to uplands.</p> <p>The extent of H7220 Petrifying springs with tufa formation (<i>Cratoneurion</i>) is currently unquantified due to the small and scattered nature of its stands.</p> <p>Geyer's whorl snail <i>Vertigo geyeri</i> is found in relatively exposed, constantly humid calcareous flush-fens that are fed by tufa-depositing springs (including H7220 Petrifying springs with tufa formation (<i>Cratoneurion</i>)).</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments.</p> <p>Natural England, 2012. <i>Eller's Wood and Sand Dale SSSI FCT</i>. Available from Natural England on request.</p>
Extent and distribution of the feature	Spatial distribution of the feature	Maintain the distribution and configuration of the feature, including where applicable its	Distribution includes the spatial pattern or arrangement of this habitat feature, and its component vegetation types, across the site.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	within the site	component vegetation types, across the site.	<p>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.</p> <p>H7220 Petrifying springs with tufa formation (Cratoneurion) are often only a few square metres in extent.</p>	
Structure and function (including its typical species)	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.	<p>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.</p> <p>Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary.</p> <p>Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability.</p> <p>The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats.</p> <p>This means that this site is considered to be the most vulnerable sites overall and are likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority. This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or</p>	<p>Natural England, 2015. <i>Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England</i>. Available at: http://publications.naturalengland.org.uk/publication/4954594591375360</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.	
Structure and function (including its typical species)	Browsing and grazing by herbivores	Maintain appropriate levels of grazing	<p>These characteristically small-scale habitat features are often preferentially grazed and may be vulnerable to significant overgrazing pressure associated with the management of the wider local landscape.</p> <p>Extensive cattle grazing is important for maintaining the herbaceous cover on this site.</p>	
Structure and function (including its typical species)	Exposed substrate	Maintain a low cover of exposed substrate of between 5% & 25% across feature.	<p>For this wetland habitat type, maintaining some continuous extent of exposed, open ground surface is required to support the establishment and supply of those component species which often rely on wet and sparsely-vegetated conditions.</p> <p>The open nature and sometimes skeletal nature of the substrate supporting these features requires a higher, upper threshold than for some other wetlands.</p>	
Structure and function (including its typical species)	Hydrology	At a site, unit and/or catchment level (as necessary, Maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site.	<p>Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature.</p> <p>Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts.</p> <p>Wheeler <i>et al.</i> (2009) provide range and mean for summer & winter water levels for those wetland NVC types constituting Annex 1 habitats. This provides a rough guide to appropriate levels, but it is critical that individual sites and their needs are considered as there is considerable variation within the NVC</p>	<p>McBride, A., Diack, I., Droy, N., Hamill, B., Jones, P., Schutten, J., Skinner, A. & Street, M. (Eds). 2011. <i>The Fen Management Handbook</i>. Scottish Natural Heritage, Perth.</p> <p>Tratt, R. & Eades, P. 2014. <i>Fen Surveys of the North York Moors: Fen Bog, Jagger Howe, Sand Dale, Troutsdale & Rosekirkdale</i>. Sheffield Wetland Ecologists</p> <p>Wheeler, B.D., Shaw, S.C., & Tanner, K.A. 2009. <i>Wetland</i></p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>communities listed and recorded water levels.</p> <p>Water extraction features are present on this site, but they do not appear to be having a significant effect on water flow from the various springs, as these were all observed to be flowing vigorously during the summer season, and there was no evidence of dried areas of former fen.</p>	<i>Framework for Impact Assessment at Statutory Sites.</i> EA Science report.
Structure and function (including its typical species)	Hydrology	Maintain a high piezometric head and permanently high water table (allowing for natural seasonal fluctuations).	<p>Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present.</p> <p>This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Reduction in piezometric head may reduce or prevent the precipitation of tufa, which is a key component of this habitat type. Tufa is a fragile soft porous rock composed of calcium carbonate which is deposited as lime-rich subterranean water issues out from springs and chemically interacts with the air.</p>	
Structure and function (including its typical species)	Integrity of tufa features	Ensure that no more than 1% of the vegetation in which tufa is visible is showing signs of damage or disturbance	Tufa is a fragile soft porous rock composed of calcium carbonate which is deposited as lime-rich subterranean water issues out from springs and chemically interacts with the air. It is easily damaged or disturbed.	
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 feature	<p>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.</p> <p>Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>broad spectrum pesticides).</p> <p>There are no known invasive or introduced species on this site.</p>	
Structure and function (including its typical species)	Presence/cover of woody species	Maintain a low cover of woody species in flushes or springs; low <i>Salix</i> / <i>Ulex</i> spp. acceptable more than 5m from edge of spring/flush feature.	<p>Native trees and shrubs occur naturally on bog and fen surfaces but an abundance of scrub and trees on bogs and fens is sometimes regarded as detrimental because they are indicators and perpetrators of drying out and may cause damage to vegetation structure through shading effects.</p> <p>Birch, pine, willow and rhododendron (an invasive non-native species) are the main species of concern. The seeds of most invasive woody species are wind dispersed, so trees are able to establish on raised bog and fen surfaces.</p> <p>On this site gorse and willow scrub extent needs to be monitored and managed as necessary.</p>	Tratt, R. & Eades, P. 2014. <i>Fen Surveys of the North York Moors: Fen Bog, Jugger Howe, Sand Dale, Troutsdale & Rosekirkdale</i> . Sheffield Wetland Ecologists
Structure and function (including its typical species)	Supporting off-site habitat	Maintain the extent, quality and spatial configuration of land or habitat surrounding or adjacent to the site which is known to support the feature.	<p>Include only where applicable. 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.</p> <p>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 support their feeding, breeding, roosting, population dynamics ('metapopulations'), pollination or to prevent/reduce/absorb damaging impacts from adjacent land uses e.g. pesticide drift, nutrient enrichment.</p>	
Structure and function (including its typical species)	Key structural, influential and/or distinctive species	<p>Maintain the abundance of the typical species listed below to enable each of them to be a viable component of the Annex 1 habitat:</p> <p>The constant and preferential plants of the M37 <i>Cratoneuron</i></p>	<p>Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include;</p> <ul style="list-style-type: none"> • Structural species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community 	Tratt, R. & Eades, P. 2014. <i>Fen Surveys of the North York Moors: Fen Bog, Jugger Howe, Sand Dale, Troutsdale & Rosekirkdale</i> . Sheffield Wetland Ecologists

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<p><i>commutatum</i> – <i>Festuca rubra</i> spring NVC community type which forms a key component of the H7220 feature that is present within this SAC.</p>	<p>composition’).</p> <ul style="list-style-type: none"> • Influential species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • Site-distinctive species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. <p>There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available.</p> <p>This Annex 1 habitat is not well-defined in the JNCC guidance and includes a wide range of 'transitional' wetland vegetation. The typical species found on this site (for the M37 NVC community) are found in association with other alkaline mire species within the NVC community M13.</p>	
Structure and function (including its typical species)	Vegetation community composition	<p>Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types.</p> <p>M37 <i>Cratoneuron commutatum</i> – <i>Festuca rubra</i> spring</p>	<p>This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC).</p> <p>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. Appropriate NVC types (i.e. those indicating adequate supply of low nutrient base rich water and appropriate management regime) will</p>	<p>Tratt, R. & Eades, P. 2014. <i>Fen Surveys of the North York Moors: Fen Bog, Jugger Howe, Sand Dale, Troutsdale & Rosekirkdale</i>. Sheffield Wetland Ecologists</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>normally be the M37 and M38 communities, although it should be recognised the vegetation types associated with the feature have yet to be comprehensively described.</p> <p>The petrifying spring habitat is found in many of the small stream channels in the area of fen east of the track. It supports abundant <i>Cratoneuron commutatum</i> growing on the stones of channel beds, and forming large mats at some of the open springheads, merging with the surrounding M13 <i>Schoenus nigricans</i> – <i>Juncus subnodulosus</i> fen vegetation.</p>	
Structure and function (including its typical species)	Water chemistry	Maintain the low nutrient status of irrigating water, ensuring it is rich in base ions, particularly calcium.	<p>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.</p> <p>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.</p> <p>A survey carried out in 2014 found the pH and EC of the water sampled from springs and seepages supporting M13 vegetation ranged from pH 7.1-7.9 and 420-700 $\mu\text{S cm}^{-1}$.</p>	Tratt, R. & Eades, P. 2014. <i>Fen Surveys of the North York Moors: Fen Bog, Jugger Howe, Sand Dale, Troutsdale & Rosekirkdale</i> . Sheffield Wetland Ecologists
supporting processes (on which the feature relies)	Air quality	Restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH_3), oxides of nitrogen (NO_x) and sulphur dioxide (SO_2), and</p>	<p>More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System.</p> <p>Natural England, 2014. <i>Eller's Wood and Sand Dale SAC Site Improvement Plan</i>. Available at: http://publications.naturalengland.org.uk/publication/4897006237515776?category=51712328739061</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>critical loads for nutrient nitrogen deposition and acid deposition.</p> <p>There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development.</p> <p>It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p> <p>Target set to Restore because the current levels of nitrogen deposition (APIS accessed on 17/01/2019) exceed the critical load for the feature.</p>	76
Supporting processes (on which the feature relies)	Conservation measures	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to Maintain the structure, functions and supporting processes associated with the feature	<p>Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England.</p> <p>This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.</p> <p>Tufa forming flushes/springs must be maintained and allowed to run all year round (except when frozen). The extent of the flushed areas may vary seasonally. Flushes should remain dendritic so that a wide area remains soggy, and not channelled into a few fast-flowing runnels.</p>	
Version Control N/A				
Variations from national feature-framework of integrity-guidance: N/A				

Table 2: Supplementary Advice for Qualifying Features: S1013. Geyer's whorl snail; *Vertigo geyeri*

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: extent and distribution	Extent of supporting habitat	Maintain the total extent of the habitats which support the feature.	<p>In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC.</p> <p>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.</p> <p>Geyer's whorl snail <i>Vertigo geyeri</i> is found in relatively exposed, constantly humid calcareous flush-fens that are fed by tufa-depositing springs (including H7220 Petrifying springs with tufa formation (Cratoneurion)).</p> <p>The extent of H7220 Petrifying springs with tufa formation (Cratoneurion) is currently unquantified due to the small and scattered nature of its stands.</p> <p>The site is relatively small and mostly surrounded by habitat that is not suitable for Geyer's whorl snail <i>Vertigo geyeri</i>. However, relatively recent conifer felling on adjacent land outside the site may provide potential to expand suitable habitat if grazing and scrub control can be maintained.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments.</p> <p>Crawford, T. 2014. <i>Conchological survey of Eller's Springs (Sand Dale, Dalby Forest)</i>. Available from Natural England on request.</p> <p>Natural England, 2012. <i>Eller's Wood and Sand Dale SSSI FCT</i>. Available from Natural England on request.</p>
Supporting habitat: extent and distribution	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, across the site	<p>A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes.</p> <p>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 fragmentation may</p>	<p>Crawford, T. 2014. <i>Conchological survey of Eller's Springs (Sand Dale, Dalby Forest)</i>. Available from Natural England on request.</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability.</p> <p>There are base-rich spring flushes, with black bog-rush <i>Schoenus nigricans</i> on both sides of the bridleway that passes through Eller's Wood and Sand Dale SAC. These areas provide suitable habitat for S1013 Geyer's whorl snail, <i>Vertigo geyeri</i>.</p>	
Supporting habitat: structure/function	Ground moisture class	Maintain appropriate and constant ground moisture conditions within 0-5 cms of ground surface; spring-heads must remain active	<p>Ground moisture classes that can be used for monitoring:</p> <ol style="list-style-type: none"> 1. Ground dry, possibly with crack and no evidence of surface moisture; 2. Ground damp, moisture observed on the surface but water does not rise under light pressure; 3. Ground wet, no surface veneer, but water rises under light (foot) pressure; 4. Ground Wet, surface veneer of less than 1-2cm deep; 5. Ground very wet, water depth greater than 2cm, may cover the sward and tussocks. 	
Supporting habitat: structure/function	Hydro-geochemistry	Maintain the calcareous status of the supporting habitat substrate		
Supporting habitat: structure/function	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, within typical values for the supporting habitat	<p>Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms.</p> <p>Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.</p>	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/function	Vegetation structure	Maintain a sward which averages 10-20cm tall	<p>Flush community sometimes has shorter swards heights than given. This should be attained through low intensity cattle grazing. Under-grazing is likely to pose a risk to the feature, as is excessive or heavy sheep or pony grazing.</p> <p>A relatively short vegetation structure is a requirement of <i>Vertigo geyeri</i>. The majority of the area where this species is recorded should be <20cm maintained by light to moderate grazing by cattle. The area should not be allowed to revert to rank vegetation or mainly bare soil.</p> <p>Grazing management should not be allowed to change significantly (either intensify or decrease) in order to maintain suitable conditions for <i>Vertigo geyeri</i>.</p> <p>The development of willow and gorse scrub in and around flush areas could have a significant adverse impact upon populations of <i>V. geyeri</i> and should be monitored and controlled as required.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments.</p> <p>Crawford, T. 2014. <i>Conchological survey of Eller's Springs (Sand Dale, Dalby Forest)</i>. Available from Natural England on request.</p>
Supporting processes (on which the feature and/or its supporting habitat relies)	Adaptation and resilience	Maintain the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site.	<p>This recognises the increasing likelihood of supporting habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning.</p> <p>Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary.</p> <p>Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability.</p>	<p>Natural England, 2015. <i>Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England</i>. Available at: http://publications.naturalengland.org.uk/publication/4954594591375360</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being high, taking into account the sensitivity, fragmentation, topography and management of its habitats.</p> <p>This means that this site is considered to be the most vulnerable sites overall and are likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority. This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable.</p> <p>The precise vulnerability for <i>Vertigo geyeri</i> on this site is currently undefined.</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Air quality	Restore as necessary, concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	<p>The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature.</p> <p>Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH₃), oxides of nitrogen (NO_x) and sulphur dioxide (SO₂), and critical loads for nutrient nitrogen deposition and acid deposition.</p> <p>There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air</p>	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System .

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<p>pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development.</p> <p>It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.</p> <p>Target set to Restore because the current levels of nitrogen deposition (APIS accessed on 17/01/2019) exceed the critical load for the supporting habitat (rich fen) of <i>Vertigo geyeri</i>.</p>	
Supporting processes (on which the feature and/or its supporting habitat relies)	Conservation measures	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to Maintain the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	<p>Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England.</p> <p>This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.</p>	Crawford, T. 2014. <i>Conchological survey of Eller's Springs (Sand Dale, Dalby Forest)</i> . Available from Natural England on request.
Supporting processes (on which the feature and/or its supporting habitat relies)	Hydrological regime	Maintain the spring head capacity	<p>This feature is found amongst the saturated and decaying roots of vegetation associated with calcareous, spring-fed flushes that are often limited in size to a few metres square. These habitats are generally found in mosaics of suitable patches within wider fen habitat. It requires an openness of habitat that prevents succession by shade loving plants and more competitive shade loving snails. Protecting the springs which provide this habitat, and their capacity to continue to do this, will be critical to the feature.</p> <p>It is generally agreed (e.g. Willing, 2013) that the main threats to <i>V. geyeri</i> are changes to the geo-hydrology of the site itself and/or other areas of the catchment, increases in shading and/or succession of the botanical composition of the site, and changes to grazing practices.</p>	<p>Crawford, T. 2014. <i>Conchological survey of Eller's Springs (Sand Dale, Dalby Forest)</i>. Available from Natural England on request.</p> <p>Willing, M.J. 2013. <i>Geyer's whorl snail (Vertigo geyeri) surveillance on Islay 2012</i>. Scottish Natural Heritage Commissioned Report No. 617.</p>

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)	Water quantity/ quality	Where the feature or its supporting habitat is dependent on surface water and/or groundwater, Maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	<p>For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type.</p> <p>Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.</p> <p>Tufa forming flushes/springs must be maintained and allowed to run all year round (except when frozen). The extent of the flushed areas may vary seasonally. Flushes should remain dendritic so that a wide area remains soggy, and not channelled into a few fast-flowing runnels.</p>	<p>This attribute will be periodically monitored as part of Natural England's site condition assessments.</p> <p>Natural England, 2012. <i>Eller's Wood and Sand Dale SSSI FCT</i>. Available from Natural England on request.</p>
Version Control N/A				
Variations from national feature-framework of integrity-guidance: N/A				