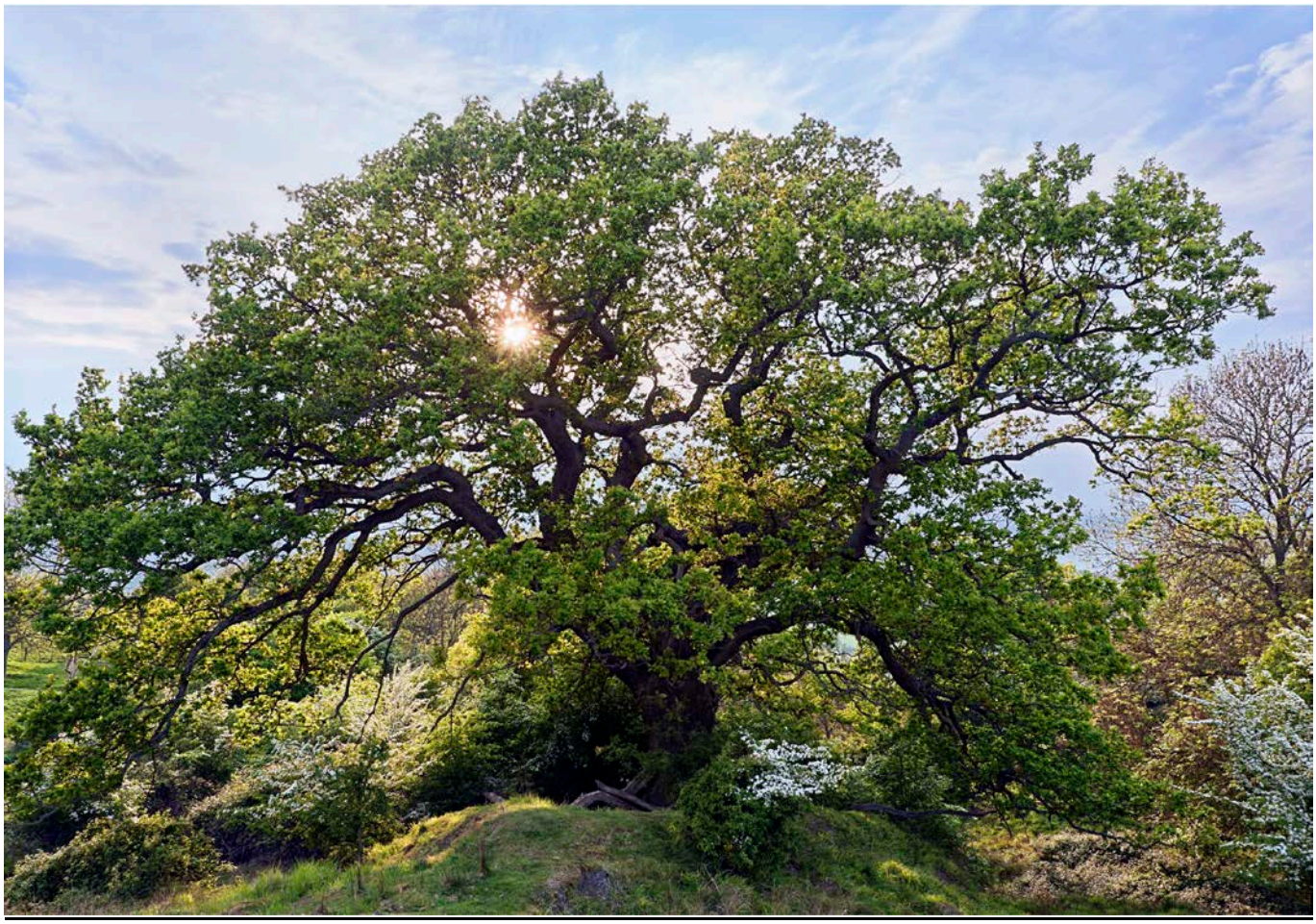
European Site Conservation Objectives: Supplementary advice on conserving and restoring site features

Bredon Hill Special Area of Conservation (SAC)
Site code: UK0012587



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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Bredon Hill 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	Bredon Hill Special Area of Conservation (SAC)
Location	Worcestershire
Site Maps	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	360.46ha
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)	Bredon Hill SSSI
Relationship with other European or International Site designations	None

Site background and geography

Bredon Hill is an outlier of the Cotswold Hills sitting above the Severn and Avon Vales, South Worcestershire, within the Severn and Avon Vales National Character Area (NCA 106). The underlying geology is a combination of gently dipping limestones, sandstones and siltstones of Jurassic age, which give the hill its characteristic slab like summit. The geomorphology is a direct result of the mass movement events which have occurred on site, leaving behind escarpments of calcareous rich soils on the northern flank. Bredon Hill has had a major influence of human settlements throughout history, with evidence of an Iron Age hill fort on the summit near Kemerton Camp. 45 hectares of the SAC is also a National Nature Reserve.

Habitat types are dominated by mixed broad leaved woodland and calcareous rich grasslands. Historically the hill was used for sheep pasture and there are a large number of open grown trees on the scarp slope which have been incorporated into pasture-woodlands and parklands first established in 1275. This historic management has resulted in a number of veteran and ancient trees on the site that give rise to deadwood habitat that is key to the survival of many saproxylic invertebrates, notably the Violet Click Beetle *Limoniscus violaceus*. Scrub areas characterised by hawthorn and ivy *Hedera helix*, with elder *Sambucus nigra*, gorse *Ulex europaeus*, blackthorn *Prunus spinosa*, goat willow *Salix caprea* and roses *Rosa* spp. provide important nectar sources for the deadwood fauna. The nearby Dixton Woods SAC, also designated for Violet Click Beetle is only 7.5 km away.

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 Species:

- **S1079 Violet click beetle *Limoniscus violaceus***

  The violet click beetle *Limoniscus violaceus* is extremely rare in the UK, and was first noted in 1937 at Windsor Forest. There are only three sites in the UK known to support this species; all are in England. It is primarily associated with ancient trees, as it develops in undisturbed wood-mould at the base of central cavities in these trees. At Windsor Forest it seems to develop exclusively in beech *Fagus sylvatica*, but at Bredon Hill and Dixton Wood ash *Fraxinus excelsior* appears to be the main species used. It is probable that a large population of ancient trees is necessary for a site to support this species. Violet click beetles are thought to breed repeatedly in the same tree until it rots away and the adults fly off to find new breeding sites.

  Violet click beetle was recorded at Bredon Hill in 1989, although there is a 1939 record from 'Tewkesbury', which may refer to Bredon Hill. It has been found in each of several years since. It is a very important site for fauna associated with decaying timber on ancient trees, including many Red Data Book and Nationally Scarce invertebrate species.

  The violet click beetle is also fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2017, making it a 'European Protected Species'. A Licence therefore be required for any activities likely to harm or disturb violet click beetle.

Violet click beetle (Roger Key/Peoples Trust for Endangered Species)

Table 1: Supplementary Advice for Qualifying Features: S1079. *Limoniscus violaceus*; Violet click beetle

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/ function	**Abundance of standing decaying-wood**	Maintain all ancient and Veteran ash and/or beech trees which have hollowed and contain wood mould in a constant humid environment.	The decaying wood and leaf litter associated with tree cavities in very old hollow ash and beech trees provides habitat for the larvae and breeding adults.	NATURAL ENGLAND. Veteran Tree Report, Bredon Hill. 2010 and 2017 survey data (NE restricted data, probability map may be shared at an appropriate scale on request) NATURAL ENGLAND. Bredon Hill SSSI Definitions of Favourable Condition. This document may be made available from Natural England upon request.
Supporting habitat: structure/ function	**Continuity of ancient trees and decaying-wood habitat**	Ensure the continuous presence of future ancient tree cohorts for long-term survival of the species.	The decaying wood and leaf litter associated with tree cavities in very old hollow ash and beech trees provides habitat for the larvae and breeding adults. It is thought adults have a close association with individual trees all their lives, only leaving when the tree rots away and no longer provides the conditions they need for breeding. Maintaining the continuity of this habitat is critical for their long-term survival. The beetle requires large circumference trees (greater than 235 cm at 30cm above ground) with basal rot cavities in the advanced stages of decay. Gouix et al (2015) suggest that in their French study site, coppicing was an important part of creating trees that developed suitable rot holes. Little is known about the dispersal dynamics of the species so the required distribution of suitable trees and appropriate woodland density is currently unknown therefore a precautionary approach should be taken. They do appear to utilise both woodland and pasture trees, it is the wood mould resource that is most critical. Partial survey from 2017 gives some data for potentially suitable trees	NATURAL ENGLAND, 2014. Bredon Hill Site Improvement Plan (SIP). Available from : http://publications.naturalengland.org.uk/publication/6073334638837760 NATURAL ENGLAND. Veteran Tree Report, Bredon Hill. 2010 and current and potential resource survey data 2017 (NE restricted data, probability map may be shared at an appropriate scale on request)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			across the NNR and part of Elmley Castle and will be updated as the work continues. A successor generation of ash or beech trees should be present and average at least 5 trees per hectare. Planning needs to be for at least 300 years into the future. Zach (2002) recommended that suitable trees should be no more than 80 metres apart as the species is considered to be a poor disperser. Outbreaks of tree disease has the potential to affect future generations of successor trees. The violet click beetle is only found in ash trees on the two SW sites, and ash dieback can affect both currently suitable and potentially suitable trees (age class gap). Recently pollarded trees are thought to be more susceptible ash die back which may affect the ability to manage valuable veteran trees.	GOUIX N et al 2015, Habitat requirements of the violet click beetle (*Limoniscus violaceus*), an endangered umbrella species of basal hollow trees, Insect Conservation and Diversity, 8, 418-427. WHITEHEAD PF 2003, Current Knowledge of the violet click beetle (*Limoniscus violaceus*) in Britain. In: Proceedings of the second pan-European conference on Saproxylic Beetles. London: People's Trust for Endangered Species. pp 1-9. ZACH P. (2002) The occurrence and conservation status of *Limoniscus violaceus* and *Ampedus quadrisignatus* (Coleoptera, Elateridae) in Central Slovakia. Proceedings of the second pan-European conference on Saproxylic Beetles. PTES

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)	**Continuity of natural processes**	Restore continuity of natural processes through timber decay and nutrient recycling to provide a continuity of wood-mould habitat for the violet click beetle	Natural processes of decomposition and decay are important in providing conditions for beetle larvae live off the nutrients derived from the mixture of leaves, decaying wood and bird droppings that they live in. It is not clear whether there are currently sufficient opportunities for deadwood invertebrates such as the violet click beetle so the target is set as restore until this has been fully assessed. Management of the woodland is targeted at retaining tree integrity, such as careful pollarding to maintain the balance of the tree to prevent premature collapse.	NATRUAL ENGLAND. Veteran Tree Report, Bredon Hill. 2010 and 2017 survey data (NE restricted data, probability map may be shared at an appropriate scale on request) NATURAL ENGLAND. SSSI condition assessment report. This document may be made available from Natural England upon request. GOUIX N *et al* 2015, Habitat requirements of the violet click beetle (*Limoniscus violaceus*), an endangered umbrella species of basal hollow trees, Insect Conservation and Diversity, 8, 418-427.
Population (of the feature)	**Occupation of wood-mould trees.**	Restore the abundance of host trees occupied by the violet click beetle, whilst avoiding deterioration from its current levels as indicated by the latest count or equivalent.	Trees which are, and can be, occupied by the beetle larvae are critical. The larvae live in the black mulch within hollow trees that forms towards the end of the cycle of decay, usually at or below ground level. Emergence trapping as described by Gouix (2011) has been trialled for getting an understanding of occupation in likely trees. However, the last attempt at emergence trapping failed, possibly because the lifecycle is biennial. Lack of capture does not mean that the beetle is not there, therefore there has been a move to resource mapping as a better way to assess the viability of the population.	NATURAL ENGLAND. Veteran Tree Survey on Bredon Hill c. 2010, and 2017 tree survey data (NE restricted data, probability map may be shared at an appropriate scale on request)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				NATURAL ENGLAND. SSSI condition assessment report. Available from: This document may be made available from Natural England upon request. GOUIX N *et al* 2011, Emergence trap, a new method to survey *Limoniscus violaceus* (Coleoptera: Elateridae) from hollow trees. Biodiversity and Conservation, 21.
Supporting processes (on which the feature and/or its supporting habitat relies)	**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 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. Agri-environment agreements only cover part of the SAC, tree survey and accompanying specific management recommendations have been identified for each veteran tree under the higher tier agreement. There is a draft NNR management plan. Management agreements will need to be arranged beyond the lifetime of the current ones and ideally include land beyond the boundary of the SAC, A continuity of dead wood, at a suitable stage of decay for the beetle, needs to be established into the long term future to ensure the survival of the violet click beetle.	NATURAL ENGLAND. Bredon Hill Site Improvement Plan (SIP). Available from: http://publications.naturalengland.org.uk/publication/6073334638837760 Agri-environment agreement coverage available to view at http://magic.defra.gov.uk/MagicMap.aspx NATURAL ENGLAND, Bredon Hill NNR Management Plan 2018-2023 (draft), Available on request from Natural England.

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 habitat(s) which support the feature at: Wood pasture and parkland = 315.3ha Woodland = 44.2ha Calcareous grassland/scrub = 0.94ha	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. The beetle depends on the production of humid wood mould where it lives for part of its life cycle within decaying trees (Gouix et al 2012); this is typically found in veteran trees where they show signs of rot. Fully dead trees dry out and become unsuitable habitat. The amount of suitable and available wood mould in part of the SAC was assessed in the 2017 survey. The adult beetle also requires a nearby nectar source provided by flowering shrubs such as bramble and hawthorn.	NATURAL ENGLAND. SSSI Condition assessment report. This document may be made available from Natural England upon request. NATURAL ENGLAND. Bredon Hill Site Improvement Plan (SIP). Available from : http://publications.naturalengland.org.uk/publication/6073334638837760 GOUIX, N. *et a*l 2012, Known status of the endangered western Palaearctic violet click beetle (*Limoniscus violaceus*) (Coleoptera), *Journal of Natural History,* **46**, p13-14.
Supporting habitat: extent and distribution	**Distribution of supporting habitat**	Restore distribution and continuity of the feature and its supporting habitat; W8 Ash woodland, with suitably decaying veteran trees and nectar providing plants, across the site.	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 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.	NATURAL ENGLAND. SSSI Condition assessment report. This document may be made available from Natural England upon request. NATURAL ENGLAND. Bredon Hill Site Improvement Plan

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			The beetle requires large circumference trees, Gouix et al (2015) suggest greater than 235 cm at 30cm above ground with basal rot cavities in the advanced stages of decay. Little is known about the dispersal dynamics of the species so the required distribution of suitable trees and appropriate woodland density is currently unknown although they do appear to utilise both woodland and pasture trees. Nectar sources, such as hawthorn *Crataegus monogyna* in hedgerows and scrub, and thistles *Cirsium* spp. in grasslands, are important feeding and mating sites for the adults of saproxylic insects. In terms of the wider ecological network, the Dixton Wood SAC (also designated for violet click beetle) is approximately 7.5 km away. Linkages between these two populations need to be identified and maintained o9r restored as appropriate	(SIP). Available from : http://publications.naturalengland.org.uk/publication/6073334638837760 GOUIX N et al 2015, Habitat requirements of the violet click beetle (*Limoniscus violaceus*), an endangered umbrella species of basal hollow trees, Insect Conservation and Diversity, 8, 418-427. WHITEHEAD PF 2003, Current Knowledge of the violet click beetle (*Limoniscus violaceus*) in Britain. In: Proceedings of the second pan-European conference on Saproxylic Beetles. London: People's Trust for Endangered Species. pp 1-9.
Supporting processes (on which the feature and/or its supporting habitat relies)	**Adaptation and resilience**	Restore 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	The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being low, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that this site is considered to be vulnerable overall but 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 advisable	A'BEAR A.D *et al* 2014, Interactive effects of temperature and soil moisture on fungal-mediated wood decomposition and extracellular enzyme activity. Soil Biology and Biochemistry, 70,

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Climate change may impact wood decay fungi and therefore the rate of formation of rot holes suitable for the beetle. The impact may be positive or negative depending on the combination of temperature and moisture. Suitable wood habitat needs to be expanded in order to provide a varied range of temperature and moisture combinations to continue to provide the correct conditions for wood decay that suit the beetle. Increased occurrence of tree disease, particularly ash dieback could cause long term problems, though may produce an increase in dead wood in the short term. The beetle uses beech trees in Windsor Great Park and has been known in other tree species across Europe (Gouix et al 2012), so provision for alternative tree species should be made for the long term. Climate change may also increase the likelihood of extreme weather conditions. For example, an increase in stormy conditions affecting the survival rate of old trees (especially in the summer) and summer droughts leading to tree deaths.	151-158. NATURAL ENGLAND. Bredon Hill Site Improvement Plan (SIP). Available from : http://publications.naturalengland.org.uk/publication/6073334638837760 GOUIX N et al 2012, Known status of the endangered western Palaearctic violet click beetle(*Limoniscus violaceus*) (Coleoptera), Journal of Natural History, 46, p13-14. NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England [Available at http://publications.naturalengland.org.uk/publication/4954594591375360].
Supporting habitat: structure/	**Soils, substrate and nutrient**	Maintain the properties of the underlying soil types, including structure, bulk density, total	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,	NATURAL ENGLAND. Agri-environment agreement coverage

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
function	**cycling**	carbon, pH, soil nutrient status and fungal:bacterial ratio, within typical values for the supporting habitat	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 the supporting habitat of this Annex II feature. The agri-environment agreements include options that are for retention of permanent grassland, low or no inputs, extensive grazing etc which help to maintain basic soil health and soil fungi.	available to view at http://magic.defra.gov.uk/MagicMap.aspx
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary), maintain natural hydrological processes to provide the conditions necessary to sustain the feature's supporting habitat 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. The moist soils of the SAC help to sustain a humid microclimate which probably enhances the wood-decay process to benefit the beetle. These damp woodland floor conditions rely on subsurface water passing through the SAC.	NATURAL ENGLAND. Bredon Hill Site Improvement Plan (SIP). Available from: http://publications.naturalengland.org.uk/publication/6073334638837760
Supporting processes (on which the feature and/or its supporting habitat 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).	The supporting habitat of this feature is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition (including food-plants) and reducing supporting habitat quality and population viability of this feature. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. 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	NATURAL ENGLAND. Bredon Hill Site Improvement Plan (SIP). Available from : http://publications.naturalengland.org.uk/publication/6073334638837760 More information about site-relevant Critical Loads and Levels for this SAC is available by using the

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. Nitrogen is currently exceeding the 10-20 kg/ha/yr at an average of 27.15. This may impact soil processes through nutrient imbalance, altered composition of mycorrhiza and ground vegetation. Acidity, Ammonia and NOx are below set limits while no limit has been set for SO_2. The impacts of air pollution are on the broad woodland habitat rather than the click beetle itself.	'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: n/a				