European Site Conservation Objectives Supplementary Advice on Conserving and Restoring Site Features

Gang Mine Special Area of Conservation (SAC)

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Gang Mine SAC. This advice should therefore be read together with the SAC Conservation Objectives which are available here.

This advice updates and replaces a previous version dated 18 May 2015

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.

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.

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.

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	Gang Mine Special Area of Conservation
Location	Derbyshire
EU Site Code	UK0012817
European Site background details (site description, boundary map, Standard Natura 2000 Data Form)	Available from http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012817
Names of component Sites of Special Scientific Interest (SSSIs)	Gang Mine SSSI
Relationship with other European Site designations	N/A

General description of the SAC

Covering an area of approximately 8.26 hectares, Gang Mine SAC is located on the south-eastern margin of the carboniferous limestone massif of the White Peak in Derbyshire. It lies at approximately 230m above sea level on the essentially flat limestone plateau. Extensive lead mining has taken place across much of the site resulting in a series of spoil heaps, hummocks and hollows of varying size and topography. Heavy metal content of the soils varies across the site, resulting in a mosaic of plant communities reflecting the complex variations in soil conditions and toxicity, as well as the size, steepness and aspect of slopes. Areas of unworked land within the site support neutral grassland and scrub habitat on deeper soils.

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.

- **H6130 Calaminarian grasslands of the *Violetalia calaminariae***

  'Calaminarian' grassland occurs on soils which have such high levels of heavy metals, such as lead, zinc, chromium and copper, that they are toxic to most plant species. The greatest extent of this habitat occurs on artificial sites associated with past mining activities. Near-natural examples in the UK are much more localised, being associated with natural outcrops of serpentine and river gravels rich in heavy metals. The vegetation of this type of grassland is typically species-poor but distinctive and contains a number of plant species principally found only in this habitat, most notably spring sandwort *Minuartia verna* and alpine penny-cress *Thlaspi caerulescens*, which are able to tolerate the toxicity of the soil. Many of the species typical of this Annex I habitat type are likely to be genetically distinct types adapted to soils rich in heavy metals. The heavy metal toxicity of the soils, perhaps combined with a low nutrient status, is believed to prevent succession and maintain a characteristically sparse, open cover of vegetation. The rarer species are favoured by this lack of competition from more vigorous colonists.

  Gang Mine SAC is an example of Calaminarian grassland in an anthropogenic (man-made) context in northern England. Natural limestone outcrops supporting species typical of

calaminarian grasslands are rare and small, with a distinctive but very impoverished flora. This site is included to provide an example of the habitat type on sedimentary rocks; it has colonised the large area of mine workings and spoil heaps on limestone. These are notable for the wide variations in slope, aspect and soil toxicity. This vegetation corresponds to the UK NVC type OV37 sheep's-fescue *Festuca ovina* – spring sandwort *Minuartia verna* community. Floristically the site contains the richest anthropogenic Calaminarian grasslands in the UK, with abundant spring sandwort *Minuartia verna* and alpine penny-cress *Thlaspi caerulescens*. Other notable species of grassland vegetation present include early-purple orchid *Orchis mascula* and dyer's greenweed *Genista tinctoria*.

Table 1: Supplementary Advice for Qualifying Features: H6130 Calaminarian grasslands of the *Violetalia calaminariae*

Attributes		Targets	Supporting and/or 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 H6130 grassland feature at between 2 – 3.5 hectares (to allow for expected natural fluctuation)	This target is included because 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. At this SAC Frith (1998) provides baseline survey data for the proportion of the OV37 *Festuca ovina – Minuartia verna* community in each area of the site within the approximate 3.5ha which potentially supports this feature and these proportions should be maintained. The minimum total area of OV37 the site should support at any one time is 2ha	Frith, J. (1998) NVC mapping of Gang Mine cSAC, Derbyshire Calaminarian Grassland Project: Inventory update within the Peak District National Park and Derbyshire. 2010. GIS data available from Natural England (eventually will be available on Webmap)
Extent and distribution of the feature	Spatial distribution of the feature within the site	The current distribution and configuration of the H6130 feature, including where applicable, its component vegetation types, across the site is maintained.	Accurate mapping is impossible because of the small localised extent of the community type, its dynamic nature and its natural occurrence in transition with other grassland types. Any part of the site which has been previously worked for lead can support the community type and it is the extent of this worked area which has been estimated, along with the proportion of this extent which should at any one time support the OV37 community type. The location of specific areas of OV37 may, however, change.	
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the H6130 feature are referable to and characterised by the following National Vegetation Classification type: OV37 *Festuca ovina – Minuartia verna* community	This habitat feature may 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).	

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	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 qualifying H6130 feature at this site; Spring sandwort *Minuartia verna*, Alpine penny-cress *Thlaspi caerulescens,* Mountain pansy*Viola lutea*	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.	Frith, J. (1998) NVC mapping of Gang Mine cSAC, Derbyshire Natural England's Condition Assessment of the SSSIs which underpin the SAC will have recorded species frequency and cover and summaries are available for SSSI units at **http://www.sssi.naturalengland.org.uk/Special/sssi/reportAction.cfm?report=sdrt13&category=S&reference=1005477**
Structure and function (including its typical species)	Vegetation: undesirable species	Maintain the frequency/cover of the following undesirable species at acceptable levels and are not encouraged or introduced by changes in surface condition, soils, nutrient levels or changes to hydrology; cow parsley *Anthriscus sylvestris,* thistles *Cirsium arvense, Cirsium vulgare,* hogweed *Heracleum sphondylium,* nettle *Urtica dioica*, coarse grasses including false oat-grass *Arrhenatherum elatius* and Yorkshire fog *Holcus lanatus* and all tree and shrub species.	There will be a range of undesirable or uncharacteristic species which, if allowed or encouraged 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 both invasive non-natives (such as Cotoneaster spp), or coarse and aggressive native species which may uncharacteristically dominate the composition of the feature.	Natural England's Condition Assessment of the SSSIs which underpin the SAC will have recorded species frequency and cover and summaries are available for SSSI units at **http://www.sssi.naturalengland.org.uk/Special/sssi/reportAction.cfm?report=sdrt13&category=S&reference=1005477**

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	Vegetation community transitions	Maintain any natural vegetation zonations/transitions between the feature (OV37 *Festuca ovina-Minuartia verna* community) and other grassland types present on the sites	Transitions between vegetation types are usually related to changes in soil depth and heavy metal content, aspect and slope. They are difficult to accurately map and measure and are dynamic in nature. At this site the vegetation comprising the Annex I feature occurs as transition with areas of acid and neutral grassland, some which corresponds to the NVC type MG5 crested dog's tail *Cynosurus cristatus*- knapweed *Centaurea nigra* community.	Frith, J. (1998) NVC mapping of Gang Mine cSAC, Derbyshire
Structure and function (including its typical species)	Soils, substrate and nutrient cycling	The properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial PLFA ratio, are maintained within typical values for the habitat	This target is included because soil and substrate 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 background soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	
Supporting processes (on which the feature relies)	Air quality	Restore concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for the H6130 feature of the site on the Air Pollution Information System	This target has been included because 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.	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).
Structure and function (including its typical species)	Supporting off-site habitat	Restore and maintain the extent, quality and spatial configuration of land or habitat surrounding or adjacent to the SAC which is known to support the feature In particular, the adjacent area of this lead rake and worked area where spoil heaps were	This target has been included where 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 the use of land surrounding the SAC 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 population dynamics, pollination or to prevent/reduce/absorb damaging impacts from adjacent land uses e.g. pesticide drift, nutrient enrichment.	Calaminarian Grassland Project: Inventory update within the Peak District National Park and Derbyshire. 2010. GIS mapping (eventually will be available on Web-

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
		levelled prior to notification.		map). This maps adjacent lead rake and spoil heaps.
Structure and function (including its typical species)	Functional connectivity with wider landscape	Any supporting features within the local landscape which provide a critical functional connection with the site are maintained in terms of their overall extent, quality and function.	This attribute and target has been included to recognise 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.	
Structure and function (including its typical species)	Adaptation and resilience of the feature and the supporting processes on which it relies	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, is not prejudiced	This attribute and target has been included to recognise 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. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being moderate, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that some adaptation action for specific issues may be required, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be required.	NATURAL ENGLAND, 2015. Climate Change Theme Plan and supporting NBCCV Assessments for SACs and SPAs [both available at http://publications.naturalengland.org.uk/publication/4954594591375360].

Attributes		Targets	Supporting and/or Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	Conservation measures	Management or other measures (within and/or outside the site boundary as appropriate) necessary to maintain the structure, functions and supporting processes associated with the H6130 feature are underway and are not being undermined or compromised.	This target has been included because 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. Typical conservation measures Include grazing, cutting, scrub management, weed control. Retention of suitable land use infrastructure/patterns to enable site management e.g. pastoral livestock farming. Maintenance of local rabbit populations where applicable	Natural England, 2014. Site Improvement Plan: Gang Mine (SIP091) Natural England's Views about the Management of the SSSIs which underpin this SAC are available from http://www.sssi.naturalengland.org.uk/Special/sssi/vam/VAM%201005477.pdf
Version Control Advice last updated: 27 May 2016; 'adaptation and resilience' attribute updated with additional supporting notes; 'typical species' attribute replaced with 'key structural, influential and/or distinctive species'; 'conservation measures' attribute updated with link to SIP				
Variations from national feature-framework of integrity-guidance: Generic attributes relating to river shingle sites have been removed as they are not relevant to this SAC. Attributes relating to surface flooding has also been removed. Species which have not been recorded at the site have been removed from the list of typical species which are an integral and distinctive component of the qualifying habitat feature.				