



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

**Tarn Moss Special Area of Conservation (SAC)
Site Code: UK0030339**



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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Tarn Moss 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	Tarn Moss Special Area of Conservation (SAC)
Location	Cumbria
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	17.03 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)	Tarn Moss SSSI
Relationship with other European or International Site designations	N/A

Site background and geography

Tarn Moss SAC is situated within the Lake District National Park and Cumbrian High Fells National Character Area ([NCA Profile 08](#)) just south of the A66 trunk road near Troutbeck half way between Penrith and Keswick. It is a National Nature Reserve and open Access Land.

The site occupies a shallow, elongated basin at about 270 m OD at the northern foot of Great Mell Fell. Its underlying geology comprises Ordovician Buttermere Formation mudstones overlain by glacial till. It comprises deep peat and receives water from several sources including groundwater, rainfall and an inflowing stream. The climate of the area is typically mild and very wet.

The site largely comprises a mixture of nutrient poor-fen and rain-fed bog vegetation which are characterised by a diverse mixture of sedges and bog mosses and other plant species varying largely according to wetness, water chemistry, nutrient levels and water flow. At the margins the moss grades out into grassland, often with a separating band of fen meadow which is particularly well developed around the western end of the basin.

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:

- **H7140 Transition mires and quaking bogs**

The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich. As a result, the vegetation normally has intimate mixtures of species considered to be acidophile and others thought of as calciphile or basophile.

In some cases the mire occupies a physically transitional location between bog and fen vegetation or may reflect the actual process of succession, as peat accumulates in groundwater-fed fen or open water to produce rainwater-fed bog isolated from groundwater influence. Many of these systems are very unstable underfoot and can therefore also be described as 'quaking bogs'.

This SAC contains some of the best examples of 'Transition mires and quaking bogs' in the UK. The site topography and water chemistry supports a variety of wetland vegetation communities. These often occur as mosaics and include transitions between mire communities, to open water and to drier habitats.

Qualifying Species:

There are no qualifying species

Table 1: Supplementary Advice for Qualifying Features: H7140. Transition mires and quaking bogs

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 feature to 17.03 ha	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. 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. The restoration target comprises the whole of the peat body within the SAC/SSSI boundary. The peat body also extends beyond this boundary (see Supporting off-site habitat target below) but that area is not included in this figure.	Area derived from citation for Tarn Moss Special Area of Conservation: http://publications.naturalengland.org.uk/publication/5919372652576768
Extent and distribution of the feature	Spatial distribution of the feature within the site	Maintain the distribution and configuration of the feature, including its component vegetation types, across the site	Distribution includes the spatial pattern or arrangement of this habitat feature, and its component vegetation types, across the site. Changes in distribution may affect the nature and range of the vegetation communities present, the operation of the physical, chemical, and biological processes in the system and the resiliency of the site and its features to changes or impacts.	Skelcher (2002) A Vegetation Survey of Tarn Moss National Nature Reserve. English Nature as revised by Jerram (2008), Tarn Moss NNR Management Plan, Natural England; Wheeler and Shaw (2009), A Wetland Framework for Impact Assessment at Statutory Sites in England and Wales. EA. Site Accounts: Tarn Moss. https://www.gov.uk/government/publications/a-wetland-framework-for-impact-assessment-at-statutory-sites-in-england-and-wales

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	Vegetation community composition	Ensure the component vegetation communities of the H7140 features include and are characterised by the following National Vegetation Classification types: M5 <i>Carex rostrata</i> – <i>Sphagnum squarrosum</i> mire M18 <i>Erica tetralix</i> – <i>Sphagnum papillosum</i> raised and blanket mire S27 <i>Carex rostrata</i> – <i>Potentilla palustris</i> tall herb fen	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature.	As for Extent target set out above.
Structure and function (including its typical species)	Typical species: flora and fauna	Maintain the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat: The constant and preferential plants of the M5, M18 and S27 NVC community types which forms a key component of the H7140 feature: <i>Andromeda polifolia</i>, <i>Angelica sylvestris</i>, <i>Brown Mosses</i>, <i>Caltha palustris</i>, <i>Calluna vulgaris</i>, <i>Cardamine pratensis</i>, <i>Carex diandra</i>, <i>Carex lasiocarpa</i>, <i>Carex nigra</i>, <i>Carex magellanica</i>, <i>Carex rostrata</i>, <i>Carex</i> spp. small to medium-sized spp., <i>Drosera</i> spp., <i>Empetrum nigrum</i>, <i>Epilobium palustre</i>,	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; • 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 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 SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<i>Erica</i> spp., <i>Eriophorum angustifolium</i> , <i>Eriophorum vaginatum</i> , <i>Equisetum fluviatile</i> , <i>Galium palustre</i> , <i>Lysimachia vulgaris</i> , <i>Lythrum salicaria</i> , <i>Mentha aquatica</i> , <i>Menyanthes trifoliata</i> , <i>Myrica gale</i> , <i>Narthecium ossifragum</i> , Non-crustose lichens, <i>Phragmites australis</i> , <i>Comarum palustre</i> , <i>Racomitrium lanuginosum</i> , <i>Rhynchospora alba</i> , <i>Selaginella selaginoides</i> , <i>Sphagnum papillosum</i> , <i>Sphagnum magellanicum</i> , <i>Sphagnum teres</i> , <i>Sphagnum contortum</i> , <i>Succisa pratensis</i> , <i>Trichophorum cespitosum</i> , <i>Vaccinium</i> spp., <i>Valeriana dioica</i> , <i>Viola palustris</i>	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. For this feature, appropriate (i.e. those indicating adequate supply of low nutrient water and appropriate management regime) bryophytes and vascular species are taken from core community constants and preferentials. This Annex 1 habitat is not well-defined in the JNCC guidance and includes a wide range of 'transitional' wetland vegetation. A much clearer definition and scope has been established in Tratt, 2013. This clarifies the various types of vegetation encompassed by the term 'transition mire' and includes some excluded by the JNCC (e.g some examples of M21) and others currently often included in other Annex 1 types, e.g. M14.	
Structure and function (including its typical species)	Invasive, non-native and/or introduced species	Ensure invasive and introduced non-native species (e.g. Sitka spruce) are either rare or absent, but if present are causing minimal damage to the feature.	Invasive or introduced non-native species can be a serious potential threat to the structure and function of these habitats, because they are able to exclude, damage or suppress the growth of their associated typical species, reduce structural diversity of the habitat and prevent the natural regeneration of characteristic site-native species. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum pesticides). Past plantations of Sitka spruce both on the site and on adjacent land have resulted in regeneration of this species within the site.	Natural England (2014) – Site Improvement Plan – Tarn Moss SAC
Structure and function (including its typical species)	Presence/cover of woody species	Maintain a low cover (<10% of the area) of scrub or trees within stands of H7140.	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. Birch,	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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.	
Structure and function (including its typical species)	Exposed substrate	Maintain a low cover of exposed substrate of between 5% & 10% across the H7140 feature.	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. Such conditions on this site are likely to be maintained by the naturally high water table and occasional grazing by deer and does not require any invasive management such as grazing by domestic stock	
Structure and function (including its typical species)	Hydrology	At a site, unit and/or catchment level maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site.	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Wheeler et al. (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 communities listed and recorded water levels. The hydrology of Tarn Moss has been modified by the redirection of the main inflow stream in the south west of the site along its southern edge to the outflow and the creation of a ditch along the northern edge of the mire both in the 19th Century. Water flow from the SE slope has been modified by the building of the A66 road. There is evidence of former flow patterns across the mire before the SW inflow stream was diverted and some flow	Wheeler and Shaw (2009), A Wetland Framework for Impact Assessment at Statutory Sites in England and Wales. EA and Site Accounts: Tarn Moss. Wheeler and Shaw (2002), Observations on enrichment problems at Tarn Moss NNR, Cumbria. English Nature.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			across the site may still occur during periods of high flow. However, despite these historic modifications to the site the water supply is still sufficient to maintain it as a wet to very wet system supporting the H7140 feature.	
Structure and function (including its typical species)	Water chemistry	Restore the surface water and groundwater supporting the hydrology of the feature at a low nutrient status.	The feature depends on clean, nutrient-poor water. Changing nutrient conditions, and in particular enrichment, can change the relative competitive ability of individual plant species and can result in: • Degradation or complete loss of high value species and communities; • A change of plant communities within the wetland; • Increasing dominance of particular plant species that are responsive to elevated levels of nutrients (e.g. common reed, nettle); • Changes in the structure of particular plant communities (such as reedbeds) that affect their function as a habitat for birds or insects. As a result of these changes, nutrient enrichment can affect the conservation interest and condition of the wetland. Detailed guidance for each wetland type is given in the reference. Investigations and any necessary actions are required to identify and address any enriched or polluted water inputs from adjacent agricultural land, and the A66 Trunk Road.	UK Technical Advisory Group on the Water Framework Directive Technical report on groundwater dependent terrestrial ecosystem (GWDTE) threshold values. V8; 23 March 2012 https://www.wfduk.org/sites/default/files/Media/Environmental%20standards/GWDTE%20chemical%20values_Final_230312.pdf Wheeler and Shaw (2002), Observations on enrichment problems at Tarn Moss NNR, Cumbria. English Nature. Natural England (2014) – Site Improvement Plan – Tarn Moss SAC
Structure and function (including its typical species)	Hydrology	Maintain a high piezometric head and permanently high water table (allowing for natural seasonal fluctuations) on groundwater dependent sites.	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Some examples of H7140 may be wholly or partly groundwater dependent. Others have a greater dependence on surface	Wheeler and Shaw (2009), A Wetland Framework for Impact Assessment at Statutory Sites in England and Wales. EA. Site Accounts: Tarn Moss.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			water or rain water inputs. It is critically important to understand the ecohydrological context of all sites. The water supply mechanisms to Tarn Moss are not completely understood but it is likely that there is some groundwater as well as surface and rainwater inputs.	
Structure and function (including its typical species)	Adaptation and resilience	Restore the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	This recognises the increasing likelihood of natural habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being moderate (Natural England, 2015) taking into account the sensitivity, fragmentation, topography and management of its habitats/supporting habitats. This means that this site is considered to be vulnerable overall but moderately so. 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 advisable.	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

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	Supporting off-site habitat	Restore the extent, quality and spatial configuration of land or habitat surrounding or adjacent to the site which is known to support the feature. This comprises the areas of the peat body around the mire's edge not included in the site and adjacent catchment that are required to provide high quality low nutrient water to the site.	The structure and function of the qualifying habitat, including its typical species, relies upon the continued presence of areas which surround and are outside of the designated site boundary. Changes in surrounding land-use may adversely (directly/indirectly) affect the functioning of the feature and its component species. This supporting habitat may be critical to the typical species of the feature to 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. The whole of the peat body should be included within the site to ensure that it is managed appropriately to allow the natural functioning of the mire system. The adjacent catchment should be managed to ensure that the mire is supplied with sufficient low nutrient and clean water of the appropriate chemical composition.	Wheeler and Shaw (2009), A Wetland Framework for Impact Assessment at Statutory Sites in England and Wales. EA. Site Accounts: Tarn Moss. Natural England (2014) – Site Improvement Plan – Tarn Moss SAC
Supporting processes (on which the feature relies)	Air quality	Restore the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	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	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). Natural England (2014) – Site Improvement Plan – Tarn Moss SAC

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			technology and measures to tackle diffuse air pollution, within realistic timescales. The H7140 feature is modelled as exceeding the critical load for nitrogen deposition and acidity. The site is also likely to be subject to additional inputs from the adjacent A66 Trunk Road.	
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.	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	Natural England (2014) – Site Improvement Plan – Tarn Moss SAC
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				