



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

**Fen Bog Special Area of Conservation (SAC)
Site Code: UK0030332**



Photo credit: Eades & Tratt 2015

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Fen Bog 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	Fen Bog 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	27.49 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)	Newtondale SSSI
Relationship with other European or International Site designations	N/A

Site background and geography

Fen Bog SAC covers an extensive area of wetland at the head of Newton Dale, a curving glacial channel within the North York Moors National Park and North York Moors and Cleveland Hills National Character Area ([NCA Profile 25](#)). The climate is mild, with high rainfall. The wetland occupies a trough at the watershed of the Pickering Beck (flowing south) and Eller Beck, flowing north. The peat deposits are up to 18m deep and the site is of exceptional palaeo-ecological interest.

The North Yorkshire Moors Railway (NYMR) line bisects the site and the Yorkshire Wildlife Trust's Fen Bog Nature Reserve includes the eastern part of the site. Fen Bog is mapped as open Access land and the long distance Lyke Wake Walk permissive path follows the northern boundary of the site. The site is grazed extensively by sheep from the neighbouring moorlands.

Much of Fen Bog supports rain-fed acidic vegetation characterised by abundant Sphagnum moss and dwarf shrubs. On the eastern margin of Fen Bog there are several springs and flushes that feed into the main wetland area and are associated with complex mosaics of pools and soakways. In the northern part of the site some of these springs and flushes are quite base-rich, and support many species characteristic of Alkaline Fen. In a mosaic with these areas are vegetation types that are less base-rich, with mixtures of species typical of Alkaline Fen and other species more characteristic of base-poor habitats. These areas are considered to be examples of Transition Mire and Quaking Bog habitat.

Further south and west, and on the west side of the railway line, the marginal springs and flushes are base-poor and the associated pools and soakways lack the base-rich 'indicator species' found in the northern part of the site.

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; very wet mires often identified by an unstable 'quaking' surface**

This habitat is an Annex 1 habitat and the primary reason for the site being designated.

The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and alkaline fen, 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'.

From the range of plant communities present on Fen Bog from acid bog to alkaline fens the whole of the site could be considered a 'Transition Mire'. However, in terms of underpinning plant communities large parts of Fen Bog support 'bog' vegetation (NVC communities: M18 *Erica tetralix*– *Sphagnum papillosum* bog and M21 *Narthecium ossifragum*–*Sphagnum papillosum* valley mire) and these are not considered to be Transition Mire and Quaking Bog in the Annex 1 definition. These 'bog' vegetation types are listed as the Annex 1 habitats 'Active raised bogs'; 'Blanket bogs' (M18); and 'Rhynchosporion' (interpreted as some types of vegetation classified as the NVC community M21).

However, as discussed by Eades & Tratt 2015, Fen Bog is not a raised or blanket bog, and the extensive areas of M21 vegetation do not represent Rhynchosporion vegetation. Although M21 is excluded from the current Annex 1 definition, it is a vegetation type of national and European importance, and it does support some of the characteristic species listed in the interpretation manual under the Transition Mire and Quaking Bog heading, particularly in the M21a sub-community (e.g. *Rhynchospora alba* and *Carex lasiocarpa*) and its prevalence and importance in association with the communities listed below should be noted.

The following underlying National Vegetation, NVC communities are considered as core transition mire vegetation at this site:

- M4 *Carex rostrata* – *Sphagnum recurvum* mire
- M14 *Schoenus nigricans* – *Narthecium ossifragum* mire

Qualifying Species:

There are no qualifying species.

Table 1: Supplementary Advice for Qualifying Features: H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable 'quaking' surface

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	<p>Maintain the total extent of H7140 features to include the component vegetation:</p> <p>NVC community M4 estimated area: 0.023ha</p> <p>NVC community M14 estimated area: 0.075ha</p> <p>And the associated mosaic of vegetation within H7140 including M21 <i>Nartheicum ossifragum-Sphagnum papillosum</i> valley mire to a total area of 27.49ha.</p>	<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.</p> <p>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.</p> <p>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.</p> <p>The area of qualifying habitats as defined by Annex 1 as explained above, are limited, however the associated surrounding vegetation mosaics found within the bog include similar species to those within the definition and the site as a whole could be considered a transition mire.</p>	<p>Eades & Tratt 2015</p> <p>Eades <i>et al.</i> 2018</p>
Extent and distribution of the feature	Spatial distribution of the feature within the site	Maintain the distribution and configuration of the H7140 feature, including where applicable its component vegetation types, across the site	Distribution includes the spatial pattern or arrangement of this habitat feature, and its component vegetation types, across the site. Changes in distribution may affect the nature and range of the vegetation communities present, the operation of the physical, chemical, and biological processes in the system and the resiliency of the site and its features to changes or impacts.	<p>Eades & Tratt 2015</p> <p>Eades <i>et al.</i> 2018</p>
Structure and function (including its typical	Vegetation community composition	Ensure the component vegetation communities of the feature are referable to and characterised by the following	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	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species)		<p>National Vegetation Classification types:</p> <p>M4 <i>Carex rostrata</i> – <i>Sphagnum recurvum</i> mire</p> <p>M14 <i>Schoenus nigricans</i> – <i>Narthecium ossifragum</i> mire</p>	<p>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.</p> <p>The defined underlying Annex 1 habitats are included here only but the importance of the associated wetland vegetation particularly the M21a <i>Narthecium ossifragum</i>-<i>Sphagnum papillosum</i> valley mire, <i>Rhynchospora alba</i>-<i>Sphagnum auriculatum</i> sub-community should be considered.</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>Greacewort <i>Aneura pinguis</i>, Giant sparmoss <i>Calliergon giganteum</i>*, Yellow Starry Feather-moss <i>Campylium stellatum</i>, Dioecious sedge <i>Carex dioica</i>, Star sedge <i>C. echinata</i>, Slender sedge <i>C. lasiocarpa</i>*, Bog sedge <i>C. limosa</i>*, Carnation sedge <i>C. panicea</i>, Bottle sedge <i>C. rostrata</i>, Cross leaved heath <i>Erica tetralix</i>, Few-flower spike-rush <i>Eleocharis quinqueflora</i>, Many stalked spike-rush <i>E. multicaulis</i>, Broad leaved cotton-grass <i>Eriophorum latifolium</i>*, Bogbean <i>Menyanthes trifoliata</i>, Bog-myrtle <i>Myrica gale</i>, bog asphodel <i>Narthecium ossifragum</i>, Marsh cinquefoil <i>Potentilla palustris</i>, Common butterwort <i>Pinguicula</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"> • 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.</p> <p>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>Several notably uncommon vascular plant species and bryophytes of local distinctiveness are present on the site and included in the list, these are marked with *.</p>	<p>Eades & Tratt 2015</p> <p>Eades <i>et al.</i> 2018</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		<i>vulgaris</i> *, White beak-sedge <i>Rhychospora alba</i> , Black sedge <i>Schoenus nigricans</i> *, <i>Scorpidium scorpioides</i> *, <i>S. cossonii</i> / <i>revolvens</i> *, Spikemoss <i>Selaginella selaginoides</i> *, <i>Sphagnum fallax</i> , <i>S. denticulatum</i> , <i>S. palustre</i> , <i>S. teres</i> *, Bog cranberry <i>Vaccinium oxycoccus</i> .		
Structure and function (including its typical species)	Invasive, non-native and/or introduced species	<p>Ensure invasive and introduced non-native species are either rare or absent, but if present are causing minimal damage to the feature.</p> <p>Monitor the extent of patches of stunted common reed <i>Phragmites australis</i> in soakaway areas and investigate the feasibility of reducing the spread of robust reed-swamp in the southern part of the site by lowering water levels in the flooded ditch.</p>	<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. Once established, the measures to control such species may also impact negatively on the features of interest (e.g. use of broad spectrum pesticides).</p> <p>The presence of dense common reed <i>Phragmites australis</i> reed-swamps along the south-eastern side of the railway, and its apparent spread upstream, is of concern. This may be related to the backing up of silt-rich water from Thack Sike because the outflow beyond the western edge of Fen Bogs has become blocked with sediment or vegetation. There is evidence that robust <i>Phragmites</i> (as opposed to the stunted <i>Phragmites</i> seen in some of the water flow tracks and pools on the bog) is spreading into areas of bog vegetation. If this were to continue it would have a detrimental effect upon the integrity of the bog vegetation. There is also anecdotal evidence that <i>Phragmites</i> is spreading in some of the pools and water flow tracks. In these areas the reed is very stunted and at present creates a sparse cover over the other plants. Its extent should be monitored to see whether it is spreading. The extent of these <i>Phragmites</i> patches was accurately mapped using a GPS to mark the outer limits of each area by Eades et al. 2018 and should be used as the basis of future monitoring.</p>	Eades <i>et al.</i> 2018
Structure and function (including its	Presence/cover of woody	Restore 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	Eades <i>et al.</i> 2018

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)	species	Clear areas of species-poor willow scrub along the south-western side of the railway, to prevent their encroachment into flanking areas of diverse swamp vegetation.	<p>out and may cause damage to vegetation structure through shading effects. Birch, pine, willow and rhododendron (an invasive non-native species) are the main species of concern. The seeds of most invasive woody species are wind dispersed, so trees are able to establish on raised bog and fen surfaces.</p> <p>In the southern and western parts of the site, extensive patches of willow scrub are associated with the reed-swamp in the partially-flooded ground that flanks the railway, particularly on its eastern and south-eastern side. It is recommended that these areas are partially or completely cleared in order to prevent scrub from overwhelming the more diverse herbaceous plant communities that flank them. These areas would then need a programme of rotational scrub clearance for long-term control.</p>	
Structure and function (including its typical species)	Exposed substrate	Maintain a low cover of exposed substrate of between 5% & 10% across 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.	
Structure and function (including its typical species)	Hydrology	At a site, unit and/or catchment level (as necessary, restore 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. 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 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.</p>	Wheeler, <i>et al.</i> 2009.
Structure and function (including its typical species)	Water chemistry	Maintain the surface water and groundwater supporting the hydrology of the bog at a low nutrient status.	UKTAG (2012) provides threshold values for nitrate concentration in groundwaters for different wetland types. The threshold values will mainly be used in the characterisation of GWDTE status for the WFD, primarily as a risk screening tool, to assess if sites are 'at risk' or 'not at risk' from groundwater mediated nutrient pressure. Due to the complex	UKTAG. 2012.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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.	
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 water or rain water inputs. It is critically important to understand the ecohydrological context of all sites.	
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. 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.</p>	<p>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</p>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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.	
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	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. 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.	
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 (NH₃), oxides of nitrogen (NO_x) 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.</p> <p>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.</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 (www.apis.ac.uk).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature 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	<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. 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. This habitat in most cases requires ongoing cutting or grazing maintain its open character.</p> <p>Opportunities for management and restoration are detailed by Eades et al. in the 2018 Ecohydrological Assessment and where possible these opportunities should be investigated and actioned where necessary to restore the site.</p>	Eades <i>et al.</i> 2018
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

References

EADES, P. & TRATT, R. 2015. 2014 Fen surveys of the North York Moors: Fen Bog, Jugger Howe, Sand Dale, Troutsdale & Rosekirkdale. Unpublished report to Natural England.

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