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

Emer Bog Special Area of Conservation (SAC)
Site Code: UK0030147

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Emer 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	Emer Bog Special Area of Conservation (SAC)
Location	Hampshire
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	37.50 ha
Designation Changes	Not applicable
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)	Baddesley Common SSSI. A small (c.1.5 ha) section on the southern edge of the SSSI is not part of the SAC.
Relationship with other European or International Site designations	None

Site background and geography

The site comprises an extensive valley bog together with associated damp acidic grassland, heathland and developing woodland over Bracklesham Beds in the Hampshire Basin. Emer Bog SAC is part of the South Hampshire Lowlands National Character Area (NCA 128).

Emer Bog is an excellent example of a valley bog with a rich flora and fauna which includes most typical bog species. The main elements of the bog vegetation include a mixed association of sedges, especially white sedge *Carex curta*, bottle sedge *C. rostrata* and star sedge *C. echinata*, with notable quantities of marsh cinquefoil *Comarum palustris* and bogbean *Menyanthes trifoliata*, together with marsh violet *Viola palustris* and southern marsh-orchid *Dactylorhiza praetermissa*. The bog grades downstream into mature alder carr and upstream into heathland.

Emer Bog is not only unique in Hampshire, but unparalleled in lowland England as an example of a young ologotrophic /mesotrophic basin mire.

The invertebrate fauna of the bog and heath is of considerable interest and a very wide range of moths have been recorded.

To the south and west of Emer Bog, the site includes remnants of former common land, now acidic grassland dominated by purple Moor-grass *Molinia caerulea*, but with a rich flora, including petty whin *Genista anglica*, dwarf gorse *Ulex minor*, meadow thistle *Cirsium dissectum* and cross-leaved heath *Erica tetralix*.

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)**

The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and H7230 Alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich. 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, as for example on the marginal lagg of raised bog or associated with certain valley and basin mires. In other cases these intermediate properties 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'.

Transition mires and quaking bogs can occur in a variety of situations, related to different geomorphological processes: in flood plain mires, valley bogs, basin mires and the lagg zone of raised bogs, and as regeneration surfaces within mires that have been cut-over for peat or areas of mineral soil influence within H7130 Blanket bogs (e.g. ladder fens).

Emer Bog lies in a wet infilled hollow on the developed eastern hinterland of the New Forest. Apart from scattered willow *Salix* scrub, it is largely open, and dominated by bottle sedge *Carex rostrata* and marsh cinquefoil *Comarum palustris*, with frequent common cottongrass *Eriophorum angustifolium*, and occasional pools with bogbean *Menyanthes trifoliata*. White sedge *Carex curta* and the bog-mosses *Sphagnum fimbriatum* and *S. squarrosum* become common at the edge of the bog, with the rushes *Juncus effusus* and *J. acutiflorus*. There are also patches of common reed *Phragmites australis*. The basin is surrounded by more mature willow *Salix* woodland and open heathland.

Qualifying Species:

None.

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**	Restore the total extent of the feature on substrates capable of supporting the feature under natural hydrological conditions.	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 extent of the Annex I habitat feature covers the sum extent of all of the component vegetation communities present and includes transitions and mosaics with other closely-associated habitat features particularly M6 *Carex echinata* - *Sphagnum recurvum*/*auriculatum* mire. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Some areas that were historically mire have been colonised by wet woodland and should be restored.	SANDERSON, N. 2005. *Vegetation Survey of Emer Bog Nature Reserve* This attribute will be periodically monitored as part of Natural England's site condition assessments.
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Maintain the distribution and configuration of the 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. The transition mire lies within unit 2 of Baddesley Common SSSI.	SANDERSON, N. 2005. *Vegetation Survey of Emer Bog Nature Reserve* This attribute will be periodically monitored as part of Natural England's site condition assessments.
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	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)
			as practicable, in order to ensure the feature's long-term viability. 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. This means that this site is considered to be amongst the most vulnerable sites overall and is likely to require the most adaptation action, most urgently. A site based assessment should be carried out as a priority. This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable. Restoring the condition and extent of the mire and its surrounding habitats will improve its resilience to environmental change.	
Structure and function (including its typical species)	**Exposed substrate**	Maintain a low cover of exposed substrate of below 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. High levels of bare ground are unlikely to be desirable, considering the small size of the mire.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Hydrology**	At a catchment level Restore 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	ALLEN, R. 2002. *Ecohydrological appraisal of Emer Bog cSAC* ALLEN, R. 2003. *Surface water quality and ecohydrological regime of Emer Bog cSAC* ALLEN, R. 2017. *Emer Bog And Baddesley Common Hydrological Desk Study*.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			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. Site hydrology needs to be restored to address the issue of high nutrient levels in the mire.	Above studies available from from: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment WHEELER, B.D., SHAW, S.C. & TANNER, K.A. 2009. *Wetland Framework for Impact Assessment at Statutory Sites*. EA Science report. MCBRIDE, A., DIACK, I., DROY, N., HAMILL, B., JONES, P., SCHUTTEN, J., SKINNER, A. & STREET, M. (Eds.) 2011. *The Fen Management Handbook*. Scottish Natural Heritage, Perth. Available at: https://www.nature.scot/sites/default/files/Publication%202011%20-%20Fen%20Management%20Handbook.pdf
Structure and function (including its typical species)	**Hydrology**	Maintain a high piezometric head and permanently high water table (allowing for natural seasonal fluctuations).	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	**Invasive, non-native and/or introduced**	Ensure invasive and introduced non-native species are either rare or absent, but if present are	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	This attribute will be periodically monitored as part of Natural England's site condition

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)	**species**	causing minimal damage to the feature	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).	assessments.
Structure and function (including its typical species)	**Presence/ cover of woody species**	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 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. Currently the mire contains a large quantity of highly persistent scrub and needs to be restored to a low scrub cover.	NATURAL ENGLAND, 2015. *Emer Bog SAC – Site Improvement Plan*. Available at: http://publications.naturalengland.org.uk/publication/6367668705689600 This attribute will be periodically monitored as part of Natural England's site condition assessments.
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	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. The SAC contains numerous other habitats including lowland fen, reed-bed, purple moor-grass and rush pasture, acid grassland, dry heath, wet heath, ponds, running water, and wet woodland. A number of these habitats extend beyond the boundary of the SAC and are joined by other habitats including neutral grassland. These habitats support wider populations of the flora and fauna that characterise the transition mire and need to be well managed to support the mire's diversity and resilience.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			The above habitats are hydrologically linked with the SAC in addition to other habitats and land of lower conservation value including semi improved and improved grassland and built up areas and gardens. All such areas will need to be managed and maintained in such a way as to avoid negative impacts on the mire hydrology. Currently not all of the surrounding habitats are in good condition and the mire is also receiving high levels of nutrients.	
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Restore the abundance of the typical species listed below to enable each of them to be a viable component of the Annex 1 habitat: The constant and preferential plant species for the M5 and S27 NVC communities in addition to white sedge *Carex curta* and fringed bogmoss *Sphagnum fimbriatum* which are characteristic of the M5 community on this site.	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 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. Botanical diversity needs restoring as some species have	SANDERSON, N. 2005. *Vegetation Survey of Emer Bog Nature Reserve* This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			declined or disappeared, most likely as a result of high nutrient levels.	
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification types: M5 *Carex rostrata - Sphagnum squarrosum* mire S27 *Carex rostrata - Potentilla palustris* swamp	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. M6 *Carex echinata - Sphagnum recurvum/auriculatum* mire also forms part of the transition mire feature on this site although it is only the M5 and S27 communities that enable the mire to be defined as a H7140 transition mire.	
Structure and function (including its typical species)	**Water chemistry**	Restore the surface water and groundwater supporting the hydrology of the bog to 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 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. The Levels of Nitrate and Phosphate in the mire are currently extremely high and are likely principal the cause of the continuous degradation of the mire vegetation of this SAC.	ALLEN, R. 2002. *Ecohydrological appraisal of Emer Bog cSAC* ALLEN, R. 2003. *Surface water quality and ecohydrological regime of Emer Bog cSAC* ALLEN, R. 2017. *Emer Bog And Baddesley Common Hydrological Desk Study*. Above studies available from from: https://www.testvalley.gov.uk/planning-and-building/planningpolicy/evidence-base/evidence-base-environment NATURAL ENGLAND, 2015. *Emer Bog SAC – Site Improvement Plan*. Available at: http://publications.naturalengland.org.uk/publication/636766870568

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				9600 UKTAG. 2012. *Technical report on groundwater dependent terrestrial ecosystem (GWDTE) threshold values.* Available at: http://www.wfduk.org/resources%20/groundwater-dependent-terrestrial-ecosystem-threshold-values
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).	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 (NH_3), oxides of nitrogen (NO_x) and sulphur dioxide (SO_2), 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. Target set to Restore because the current levels of nitrogen and acid deposition (APIS accessed 31 January 2019) exceed the critical loads for H7140 feature.	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).
Supporting	**Conservation**	Restore the management	Active and ongoing conservation management is needed to	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
processes (on which the feature relies)	**measures**	measures within and outside the site boundary which are necessary to Restore the structure, functions and supporting processes associated with the feature	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 requires ongoing cutting or grazing maintain its open character. Additionally, other habitats along with land outside the site boundary will need to be managed in such a way as to reverse the current negative impacts to the water chemistry and hydrology of the mire and prevent further issues occurring. Surrounding habitats should also be managed to support the wider populations of the flora and fauna of the mire.	
Version Control: N/A				
Variations from national feature-framework of integrity-guidance: N/A				