European Community Directive
on the Conservation of Natural Habitats
and of Wild Fauna and Flora
(92/43/EEC)

Second Report by the United Kingdom under Article 17

on the implementation of the Directive from January 2001 to December 2006

Conservation status assessment for :

H3140: Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

H3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Audit trail compiled and edited by JNCC and the UK statutory nature conservation agencies Freshwater Lead Coordination Network.

This paper and accompanying appendices contain background information and data used to complete the standard EC reporting form (Annex D), following the methodology outlined in the commission document "Assessment, monitoring and reporting under Article 17 of the Habitats Directive, Explanatory Notes and Guidelines, Final Draft 5; October 2006". The superscript numbers below cross-reference to the headings in the corresponding Annex D reporting form. This supporting information should be read in conjunction with the UK approach for habitats (see 'Assessing Conservation Status: UK Approach').

1. National-biogeographic level information

1.1 General description and correspondance with National Vegetation Classification (NVC) and other habitat types

Table 1.1.1 provides a summary description of H3140 and its relations with UK classifications.

Chara lakes are typically hard water, low nutrient systems whose ecology is driven by dense lawns of stoneworts (*Chara* spp.), usually covering muddy marl (calcium carbonate) deposits. They are characterised by high pH, low nutrient levels and very clear water. Many examples of this habitat type are marl lakes.

This habitat type is characterised by water with a high base content, most often calcium but very rarely magnesium, and is usually confined to areas of limestone and other base-rich substrates, from which the dissolved minerals are derived. In part the rarity of the habitat type is due to the fact that since calcareous rocks are free-draining, waterbodies occur on the surface of these rocks only very rarely.

Hard oligo-mesotrophic waters occur in three main situations:

Lakes on a predominantly limestone substrate.
Coastal sites based on calcium-rich shell-sands (known as machair lochs in Scotland).
Lakes with nutrient inputs from other base-rich influences, e.g. serpentine and boulder clays.

The first type is most common in the UK. This lake type may also develop in abandoned mineral workings, dammed river valleys and other artificial situations. Artificial examples are included within the Annex I definition (e.g. Bosherston Lakes, Pembrokeshire).

The EU Interpretation Manual is unclear in its definition of this habitat. Part of the interpretation suggests that only marl lakes should be included, but the list of characteristic species includes *Nitella* spp, *Nitellopsis* and *Lamprothamnium*, which are not characteristic of marl lakes. *Nitella* spp. are not considered characteristic of this habitat in the UK. Extensive carpets of these species rarely occur in high alkalinity environments but are frequent in some other habitat types, notably H3150 Natural Eutrophic Lakes with *Magnopotamion* or *Hydrocharition*-type vegetation and H3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*.

There is overlap with other Natura 2000 habitat types, especially H3150, which also occur predominantly in base-rich environments but in more nutrient-rich situations. In reality these two habitat types probably represent a continuum in the UK, differing predominantly in the relative cover of *Chara* spp. and broadleaved pondweeds. A small proportion of moderate alkalinity water bodies classified as H3130 may overlap with this habitat. UK Guidance for monitoring this habitat (JNCC 2005) emphasises a whole-lake ecosystem approach, including low levels of available nutrients, high *Chara* cover and clear water.

Table 1.1.1 Summary description of habitat H3140 and its relations with UK vegetation/habitat classifications

Classification	Correspondence with Annex I type	Comments
EU Interpretation Manual	C1.14 Submerged carpets of stoneworts in oligotrophic waterbodies.	See http://eunis.eea.europa.eu/habitats-factsheet.jsp?idHabitat=2434 for details.
NVC	Not well represented in NVC – best match seems to be A11 *Potamogeton pectinatus – Myriophyllum spicatum* community. *Chara* spp. also occurs in A13 *Potamogeton perfoliatus – Myriophyllum alterniflorum* community. However, both are eutrophic lake types.	NVC types probably represent partially degraded examples of true *Chara* lakes.
BAP priority habitat type	Mesotrophic Lakes (part). Natural Eutrophic Lakes (part).	*Chara* dominated lakes tend to be base rich examples of either of these lake types. Some 'natural eutrophic lakes' are degraded *Chara* lakes (e.g. Norfolk Broads).
CSM reporting categories	For SACs, the corresponding Annex I habitat is identified, i.e. 3140. For ASSI/SSSIs, the closest corresponding feature categories as used for 2006 reporting to JNCC are: • Marl Lake • Hard water lake • *Chara* lake • Machair loch • Base-rich lake	Many SSSIs were notified in the absence of data on their reference condition. Consequently, a large proportion of SSSIs that have been selected as eutrophic lakes may represent moderately enriched examples of H3140.
Duigan *et al.* (2006) Lake Typology	No exact match. The following groups are particularly important: Group E Northern, often large, low altitude and coastal, above-neutral lakes with high diversity of plant species, including *Littorella uniflora*, *Myriophyllum alterniflorum*, *Potamogeton perfoliatus* and *Chara* spp. Group I Widespread, mostly moderately large, base-rich lowland lakes with *Chara* spp., *Myriophyllum spicatum* and a diversity of *Potamogeton* species.	Some examples may be degraded. Many sites in these groups are marl lakes on limestone, chalk or machair. A few sites may also occur in Groups B, C2, F and G. These are not considered further here.
Water Framework Directive Lakes Typology (UKTAG, 2004)	Marl Lakes (all subtypes) High Alkalinity (all subtypes) (part) Moderate Alkalinity (all subtypes) (part) Brackish Lakes	All marl lakes are likely to represent this type These lake types are likely to represent a mixture between H3140 and H3150 Natural eutrophic lakes. A small proportion of moderate alkalinity lakes may consist of H3140. These lake types are likely to represent a mixture between H3140 and H3150 Natural eutrophic lakes.

The best examples are usually dominated by larger, heavily encrusted species such as *C. aspera* and *C. hispida*.

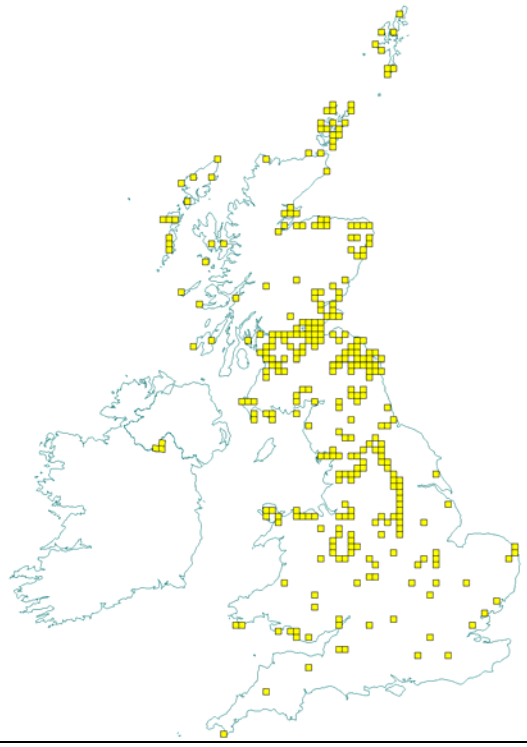
2. Range [2.3]

2.1 Current range

Range surface area [2.3.1]: **113,952 km²**
Date calculated [2.3.2]: **May 2007**
Quality of data [2.3.3]: **Moderate**

Maps 2.1.1 and 2.1.2 show the range and distribution of H3140 in the UK. Our understanding of the range of this habitat is poor and depends partly upon interpolation of other data. The following methods have been used to estimate the range and extent of this habitat:

1. Species records. These comprise the Important Stonewort Areas of the UK dataset (Stewart 2004), and data on *Chara* species extracted from the JNCC standing waters database and the UK Lakes Inventory.
2. Habitat type records. This includes all lakes identified as Groups E or I in the Duigan *et al*. (2006) typology, and all lakes identified as potentially suitable using the UK Lakes dataset.

Map 2.1.1 Habitat range map [1.1] for H3140	**Map 2.1.2** Habitat distribution map [1.2] for H3140
	
Range envelope shown in blue/grey shade in above map is a minimum convex polygon constructed using JNCC Alpha Shapes tool (see Technical note I for details of methodology).	Each yellow square represents a 10x10km square of the National Grid and shows the known and/or predicted occurrence of this habitat. 10-km square count: 315

See Section 7.1 for map data sources

On the whole this coincides reasonably well with the distribution of known sites, though some moderate alkalinity sites in central northern Scotland appear to be classified as other types using this method. Although the extent of suitable geology in southern Britain is much greater than in the north, this effect is counterbalanced by the greater frequency of natural lakes in northern Britain. In the south, artificial water bodies including the Norfolk Broads are important habitats. Stewart (2004) provides a summary map of

Important Stonewort Areas (Map 2.3.2), which gives a good impression of the range of species typical of this habitat. It should be noted that some of these sites are calcareous fens.

2.2 Trend in range since c.1994

Trend in range[2.3.4]: Stable
Trend magnitude[2.3.5]: Not applicable
Trend period[2.3.6]: 1994-2006
Reasons for reported trend[2.3.7]: Not applicable

The range of this habitat is unlikely to have changed significantly in the respect that the water bodies are generally still present. Very small water bodies may have been lost through land drainage activity and some examples in coastal location may have been lost as a result of dynamic processes but in general the number of lakes is likely to have remained constant. However, many water bodies of this type are severely degraded as a result of nutrient enrichment. Consequently, in many areas of the range there are now no good examples of this habitat type and the characteristic vegetation is restricted to small waters (ponds and ditches) within catchments with lower anthropogenic pressure. The broad range of H3150 is considered to have remained stable since 1994.

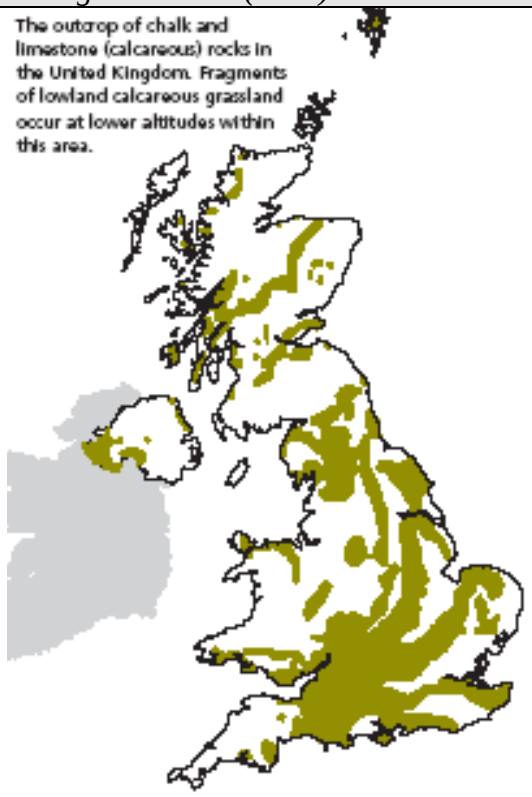
2.3 Favourable reference range

Favourable reference range[2.5.1]: 113,952 km^2

Section 3.2.1.3 of 'Assessing Conservation Status: UK Approach' sets out how favourable reference range estimates for habitats have been determined in the UK. Based on this approach, the current surface area, 113,952 km^2, has been set as the favourable reference area. Reasons for this are discussed below.

The natural range of this habitat in the UK is determined by a combination of geology/soils, climate and topography. The extent of calcareous rocks (Map 2.3.1) is particularly important for this habitat type. The range is extended by dune systems, which frequently contain base-rich water bodies suitable for stoneworts. Other than water chemistry there do not seem to be any other limiting factors within the British Isles, as this habitat type is widespread over suitable geology from Shetland to Kent and Devon. It is also widespread in Ireland.

This habitat is widely distributed across the UK, and the range shows little fragmentation, apart from southern England where occurrences are more isolated. The concern is mainly the quality of the existing water bodies which have been impacted rather than lost. Given the wide range and distribution therein, the range is considered to be sufficient for H3140 to maintain itself. The range is considered to equate the potential range and the Favourable reference range.

Map 2.3.1 Distribution of chalk and limestone rocks in the UK *From: English Nature (2001)*	**Map 2.3.2** Important Stonewort Areas in the UK *From: Stewart (2004)*
	

2.4 Conclusions on range

Conclusion[2.6.i]: **Favourable**

The current is considered to have been stable since 1994 and to occupy most of its potential natural range. It is considered to be viable.

3. Area [2.4]

3.1 Current area

Total UK extent [2.4.1]: **58.8km^2**
Date of estimation [2.4.2]: **May 2007**
Method [2.4.3]: **3 = ground based survey**
Quality of data [2.4.4]: **Moderate**

Table 3.1.1 provides information on the area of H3140 in the UK.

The estimated total UK extent is between 1000 and c. 10,000 ha, of which at least half (and perhaps as much as 95%) occurs within Scotland. The extent of this habitat is not measured in Countryside Survey. Jackson and McLeod (2002) estimated the total UK extent of this habitat to be around 1,000 ha. However, this figure was based on expert judgment and has low confidence. More recent data (presented below) suggest that the extent of this habitat may be greater than previously thought.

Duigan *et al.* (2006) analysed a large dataset of plant species records to query the JNCC lakes database to look for lakes with high *Chara* cover (frequent or greater on the DAFOR scale). This gives a figure of 5,820 ha of *Chara* lakes. The JNCC lakes database is not exhaustive, so this may underestimate the true extent of this habitat.

The UK Lakes inventory also holds plant record data. A query of this database for the most sensitive charophytes revealed 5,859 ha of suitable water bodies. It is likely that this number would increase substantially if less characteristic species such as *C. virgata, C. globularis* and *C. vulgaris* were included.

Table 3.1.1 Extent (ha) of H3140 *Hard oligo-mesotrophic waters with benthic vegetation of* Chara *spp.* in the UK. The figures provided are based on several data sources, including expert opinion

Source	Confidence Level	England	Scotland	Wales	Northern Ireland	UK total
Best current estimate		600	5,000	100	180	5,900
1. Jackson and McLeod (2002) (H3140)	Low	Present	Present	Present	180	1000
2. Extent within SAC series (H3140)	High	TBC	TBC	67	TBC	TBC
3. JNCC Lakes Database: high *Chara* cover	High	360	5435	25	No data	5820*
4. Stoneworts records from the UKLakes inventory	High	557	5263	39	No data	5859*
5. Duigan *et al.* (Groups E and I)	Moderate	1300	8256	192	No data	9748*
6. UKLakes inventory physico-chemical estimate	High	900[2]	4436	250[1]	No data	5766*

* Total is for GB only.

Duigan *et al.* (2006) published a revised lakes typology that includes data from a large number of British lakes. *Chara* spp. occur in a number of types, but were particularly prevalent in Groups E and I. The known area of lakes of this type is 9,748 ha – however, not all lakes of these types will be *Chara* dominated, and this figure is therefore likely to be an overestimate.

An alternative, indirect approach is to utilise the GB Lakes dataset to look for lakes with suitable water chemistry to sustain this habitat (high alkalinity and low nutrient conditions). Using these criteria gives a total area of 5,766 ha.

In conclusion, use of both species and habitat-based measures suggests that there is around 5,900 ha of H3140 in Britain. This is significantly more than the area proposed by Jackson and McLeod (2002), and represents about 2.4% of the total British standing water resource of 240,400 ha (Palmer and Roy 2002).

It should be emphasised that this value is a total figure of water body surface area and not of *Chara* lawns themselves. Charophyte beds will only occupy a proportion of the available water body. Although in some circumstances this may be relatively high, deeper water bodies may contain only a belt of charophytes in shallower water.

Of this total extent, 694 ha is estimated to occur within Special Areas of Conservation (SACs). The habitat is not well represented on Sites of Special Scientific Interest (SSSIs) and Areas of Special Scientific Interest (ASSIs).

[1] Corrected for errors in geology. Reservoirs excluded as being generally unsuitable.

Table 3.1.1 Area of H3140 in the UK.

	Area (ha)	Method [2.4.3]	Quality of data [2.4.4]
England	600	3	Moderate
Scotland	5000	3	Moderate
Wales	100	3	Moderate
Northern Ireland	180	3	Moderate
Total UK extent [2.4.1]	5,880	3	Moderate

Method used to estimate the habitat surface area: 1 = only or mostly based on expert opinion; 2 = based on remote sensing data; 3 = ground based survey. Only the most relevant class is given if more than one applies.
Quality of habitat surface area data: 'Good' e.g. based on extensive surveys; 'Moderate' e.g. based on partial data with some extrapolation; 'Poor' e.g. based on very incomplete data or on expert judgement

3.2 Trend in area since c.1994

Trend in area[2.4.5]: **Unknown**
Trend magnitude[2.4.6]: **Not applicable**
Trend period[2.4.7]: **1994-2006**
Reasons for reported trend[2.4.8]: **Not applicable**

Lakes are rarely 'lost' in the conventional sense, although small water bodies may be in-filled or drained. However, many lakes have been severely degraded to the extent that they no longer support characteristic plant or animal communities. As a consequence area assessments show little significant change over time in spite of nutrient enrichment. Degraded sites are not considered lost because of the way in which lake types are defined.

There may have been losses of lakes or ponds, which could have been offset by creation of water bodies on adequate substrate. It is possible that the area of individual lakes in some areas has been reduced through drainage and water abstraction.

Historically there has been no systematic monitoring of lakes in the UK. Recently (post 2005) the introduction of Common Standards Monitoring (CSM) protocols has driven a programme of SAC and SSSI lake monitoring using a single consistent method. These data are insufficient to estimate trends in area since 1994.

3.3 Favourable reference area

Favourable reference area[2.5.2]: **Unknown**

There have been very substantial losses of this habitat since around 1900 and especially since around 1950 due to eutrophication (Stewart 2004). Water Framework Directive (WFD) macrophyte studies (Willby *et al*. unpublished) suggest that a charophyte dominated community was the reference condition for many lowland lakes in England. Palaeolimnological studies of specific sites (e.g. Zhao *et al*. 2006) and analysis of historic plant records (Stewart 2004; Willby unpublished) support this conclusion.

The potential area of this habitat has been estimated using WFD typology work. The total area of lakes in Britain for which reference TP values have been calculated and that are considered to correspond to H3140 (see section 4.2) is 9,318 ha. There are an additional 26,619 ha of additional standing waters for which no reference data exist. However, approximately 75% of high alkalinity lakes where reference data are available have a predicted TP value within the ecological range of *Chara* lakes. Therefore, an additional 19,845 ha (75% of 26,619) is likely to comprise H3140. This gives a potential total area of 29,163 ha (12% of the UK standing water resource).

There is insufficient data to reach any judgement on viability for this habitat in terms of area. The viability of this habitat type within the UK is largely dependent on the current and future condition of structures and functions; this is discussed in detail in section 4.

3.4 Conclusions on area covered by habitat

Conclusion[2.6.ii]: Unknown

Existing data on H3140 is considered insufficient to assess a trend in area since 1994 and to determine if the area is viable.

4. Specific structures and functions (including typical species)

4.1 Main pressures [2.4.10]

Charophyte-dominated lakes are largely restricted to situations where the catchment or aquifer from which they are supplied with water remains relatively unaffected by intensive land-use or other sources of nutrients, and they are most often found in areas supporting mosaics of semi-natural vegetation. The main pressures affecting H1240 are listed below. The related EC codes are shown in brackets.

- Pollution (**421 disposal of household waste, 701 water pollution**)

Nutient enrichment is the major factor affecting lakes in the UK with evidence that over 80% of lakes in England are affected (Carvalho and Moss 1995). Palaeolimnological techniques have been applied to a number of lakes of this type with reference and historic nutrient conditions inferred from diatom transfer functions (e.g. Bennion *et al.* 2004). This palaeolimnological work supports the widely held view that many lakes in lowland UK have suffered considerable enrichment, both Oak Mere and Hatchet Pond which are SACs for this habitat type show evidence of enrichment since the early 1900s (Bennion and Monteith 1996).

The main driver of this eutrophication is phosphorus although there is increasing evidence that (in some lakes at least) nitrogen may also play a significant role (James *et al*. 2005). This phosphorus has both point source and diffuse source origins. Significant progress has been made in reducing significant point sources through investment in phosphorus stripping at major waste water treatment works. However, there are few lakes that directly receive such discharges. Small discharges, many of which are unconsented, are generally of greater significance for smaller standing waters. Diffuse sources are more difficult to manage and this habitat type may be particularly susceptible to diffuse nutrient pollution due to the high porosity of sandy substrates. Recovery of sites impacted by elevated nutrient loads is generally slow due to the limited flushing potential of many smaller lakes and internal loading issues.

- Air pollution (**702 Air pollution**)

The UK Air Pollution Information System (APIS) www.apis.ac.uk has a single ecosystem category for all types of freshwaters, and identifies the major impacts of air pollutants on grasslands in the UK as resulting from nutrients (especially nitrogen deposition), acid deposition, heavy metals, POPs and radioactive particles. Nitrogen deposition is of particular concern for oligotrophic water bodies, especially where there are elevated phosphate levels. Hydrophyte species richness is negatively related to winter nitrate concentration in European shallow lakes (James *et al*. 2005). Acid deposition is thought to be a minimal risk for *Chara* lakes, which are generally very well buffered. Other air pollution threats have largely unknown impact, but are not generally viewed as being of major concern at present.

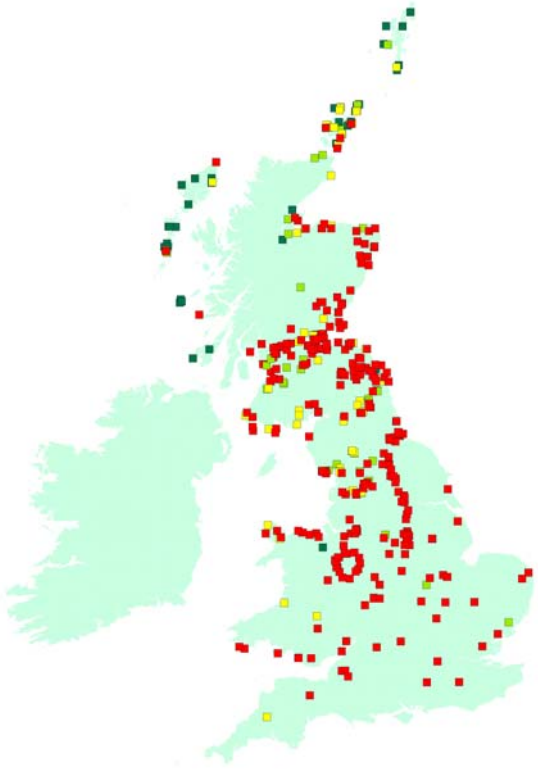
- Sea level rise (**930 submersion**)

Sea level rise leads to increased salinity of lake, modifying its chemistry and species composition. Overtopping (i.e. during winter storms) and groundwater penetration of seawater as well as deposition of sea spray are enough – though the latter is not sufficient on its own – to alter *Chara* lakes, especially as the sea gets closer to the water bodies with sea level rise. Once the salinity reaches a certain level the lake would become a brackish lagoon and when plants such as seaweeds start to establish, the habitat can probably be regarded as lost.

4.2 Current condition

An analysis of data collated in the UK Lakes inventory, based on work carried out by Carvalho *et al*. (2005), has generated map 4.2.1

Map 4.2.1 Condition of H3140 as determined by modelled reference phosphorus concentration (>25µg/l P).



Coloured points correspond to modelled current total phosphorus concentration (export coefficient modelling). Modelled total phosphorus concentrations can be broadly equated with condition (as affected by nutrient enrichment):

- <25µg/l (dark green): favourable (high confidence)
- 25-35µg/l (green): favourable (low confidence)
- 35-50µg/l (yellow): unfavourable (medium confidence)
- >50µg/l (red): unfavourable (high confidence)

Note: Many of the water bodies shown here are <5ha in area.

From: the UK Lakes inventory, based on work carried out by Carvalho *et al*. (2005)

Eutrophication is widely considered to be the most serious threat to this habitat type, and CSM Targets of 35µg/l TP or less reflect this. Modelled TP data suggests that the majority of water bodies predicted to be H3140 are likely to have nutrient levels significantly above this level (Map 4.2.1), and are therefore likely to be functionally eutrophic or hypertrophic.

4.2.1 CSM condition assessments

Condition assessments based on CSM (see http://www.jncc.gov.uk/page-2199) provide a means to assess the structure and functioning of H3140 in the UK. The following attributes were examined for all CSM assessments relevant to the habitat:

- Extent.
- Composition of macrophyte community.
- Macrophyte community structure.
- Water quality.
- Hydrology.

SAC condition assessments

Table 4.2.1 and Map 4.2.1 summarise the CSM condition assessments for UK SACs supporting habitat H3140. These data were collated in January 2007. The maps give an impression of the overall spread of where unfavourable and favourable sites exist (summary statistics for the map are given in Section 7.2). The combined assessments show that of the SACs assessed:

- 62% of the area and 57% of the number of assessments was unfavourable; and
- at least 7% of the total UK habitat area was in unfavourable condition.

Table 4.2.1 CSM condition assessment results for UK SACs supporting H3140. See notes below table for details. Information on the coverage of these results is given in Section 7.2

Condition	Condition sub-categories	Area (ha)	Number of site features
Unfavourable	Declining	172	1
	No change	195	3
	Unclassified	39	2
	Recovering	30	2
	Total	435	8
	% of all assessments	***62%***	***57%***
	% of total UK resource	***7%***	***unknown***
Favourable	Maintained	112	3
	Recovered		
	Unclassified	154	3
	Total	266	6
	% of all assessments	***38%***	***43%***
	% of total UK resource	***5%***	***unknown***

Notes

1. Data on features that have been partly-destroyed have been excluded from this table because they are not relevant to the consideration of present condition.
2. The data included are from CSM assessments carried out between April 1998 and December 2006. NB: these include additional and some up-date data form those used in the six year report produced by JNCC. (Williams, J.M., ed. 2006. *Common Standards Monitoring for Designated Sites: First Six Year Report*. Peterborough, JNCC).
3. Only assessments made for qualifying interest features on SAC have been included in this analysis.
4. Area figures for CSM assessments have been calculated using the data presented on the standard Natura 2000 data forms submitted to the EU.

SSSI/ASSI condition assessments

Table 4.2.2 and Maps 4.2.2 and 4.2.3 summarise the CSM condition assessments that were judged to be either strongly or weakly indicative of the condition of the Annex I habitat on SSSI/ASSIs (see Technical note II for details of methodology behind this). These data were collated in January 2007. The maps give an impression of the overall spread of where unfavourable and favourable sites exist (summary statistics for the maps are given in Section 7.2). The combined condition assessments show that of the SSSI/ASSI assessments considered:

- 26% of weakly indicative assessments were unfavourable.

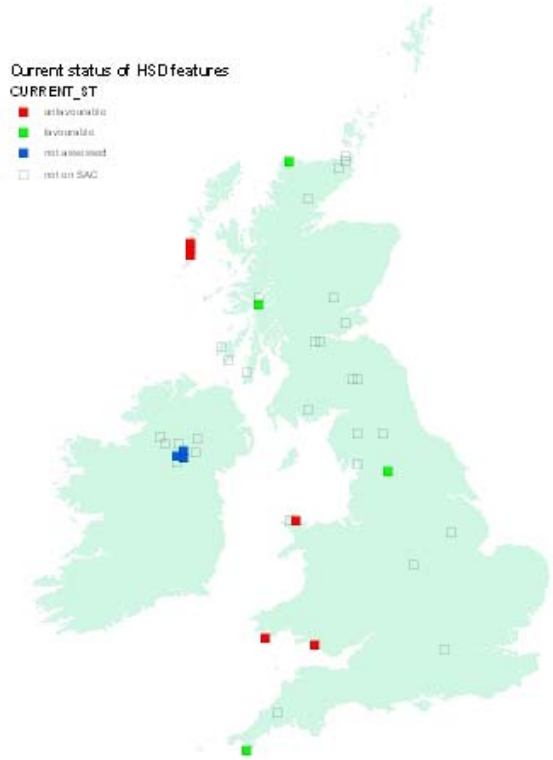
Table 4.2.2 CSM condition assessment results for UK SSSI/ASSIs that were judged to be either strongly or weakly indicative of the condition of H3140 on SSSI/ASSIs. See notes below table and Technical note II for further details

Condition	**Condition sub-categories**	**Number of assessments**	
		Strongly indicative assessments (Category 1)	**Weakly indicative assessments (Category 2)**
Unfavourable	Declining		12
	No change		7
	Unclassified		
	Recovering		1
	Total		20
	% of all assessments	***%***	***26%***
Favourable	Maintained		56
	Recovered		
	Unclassified		
	Total		56
	% of all assessments	***%***	***74%***

Notes

1. Data on features that have been partly-destroyed have been excluded from this table because they are not relevant to the consideration of present condition.
2. The data included are from CSM assessments carried out between April 1998 and December 2006.

Current Condition of H3140 based on CSM condition assessments (See Sections 4.2 and 7.2 for further information)

Map 4.2.1 SAC assessments	**Map 4.2.2** Assessments strongly indicative of the condition on SSSI/ASSIs	**Map 4.2.3** Assessments weakly indicative of the condition on SSSI/ASSIs
	Not applicable	
Key Red = unfavourable, i.e. the square contains at least one SAC where this habitat feature is present and has been judged to be unfavourable Green = favourable, i.e. the square contains at least one SAC where this habitat feature is present and has been assessed as favourable but there are no unfavourable SAC features Blue = SAC not assessed, i.e. the square contains at least one SAC supporting this habitat feature but no assessment has been reported Transparent = SAC feature not present, i.e. the square does not contain any SAC features of this habitat type	Key* Green – 80 – 100% of assessed features on 10km square are favourable Yellow - 50 – 80% of assessed features on 10km square are favourable Orange - 20 – 50% of assessed features on 10km square are favourable Red - 0 – 20% of assessed features on 10km square are favourable *This is the same key as was used for JNCC CSM Report 2006	

4.3 Typical species

Typical species[2.5.3]: None used

Typical species assessment[2.5.4]: Not applicable

Characteristic species for this habitat are listed in the CSM Guidance (JNCC 2005). These comprise a range of *Chara* species, especially *C. aspera* and *C. hispida*. Rarer charophytes such as *C. curta, C. fragifera, C. intermedia, C. pedunculata* and *C. rudis* are also characteristic of this habitat. Associated species often include broad-leaved pondweeds such as *Potamogeton coloratus, P.lucens, P. alpinus* and *P. praelongus*, as well as other aquatic plants favouring calcareous waters such as *Hippuris vulgaris* and *Potamogeton filiformis*. It was not possible to assess the faithfulness of these species to the habitat, so available trend data at the UK-level is not particularly meaningful and has not been utilised here.

4.4 Conclusions on specific structures and functions (including typical species)

Conclusion[2.6.iii]: Unfavourable – Bad and deteriorating

The EC Guidance states that where "more than 25% of the area of the habitat is unfavourable as regards its specific structures and functions", the conclusion should be Unfavourable – Bad. In the UK this was generally taken to mean that more than 25% of the habitat area in unfavourable condition.

CSM site condition assessments for SACs and SSSI/ASSIs show that a large part of this habitat is classed as in unfavourable condition. The value for assessed SACs is as high as 62% of the area, whilst for relevant categories on SSSI/ASSIs it is c. 26%. A quarter of the area under SAC is reported as declining. Taken together, these show that the necessary structures and functions for the habitat are not in place, and that significant deteriorations and pressures exist.

5. Future prospects

5.1 Main factors affecting the habitat

5.1.1 Conservation measures

- Protection within designated sites

All the resource of H2110 lies within SACs with management measures specifically aimed at maintaining and enhancing the features for which they are designated, and to address some of the pressures listed within section 4.1 and the future threats listed in section 5.1.2. A significant proportion of the resource of this habitat also lies within the SSSI/ASSI series where similar management measures are in place.

- Water Framework Directive

In addition to the drive for improvement generated by the SAC and SSSI network, the Water Framework Directive (WFD) is adding considerable impetus for widespread action on issues affecting the resource of this habitat such as abstraction licences and pollution.

- UK BAP

The habitat is partially covered by two action plans: *Eutrophic lakes* and *Mesotrophic standing waters* under the UK Biodiversity Action Plan (see http://www.ukbap.org.uk), as well as under country and local biodiversity action plans and strategies, with targets to maintain, improve, restore and expand the resource.

- Management

In Wales, the general condition of the turlough has improved since 2002 due to the removal of willows from within the turlough, reduced road drainage into the groundwater catchment, reduced agricultural pollution through negotiation with farmers and the use of agri-environment payments. In Northern Ireland, the implementation of a management plan advocating scrub clearance and reintroduction of

grazing has resulted in a partial improvement in condition of the resource. Further management plans are anticipated in the near future.

5.1.2 Main future threats[2.4.11]

The most obvious major future threats to H3180 are listed below, several of which are referred to in Section 4.1. The related EC codes are shown in brackets. All are being addressed by management interventions.

- Pollution (**421 disposal of household waste, 701 water pollution**)
- Sea level rise (**930 submersion**)
- Air pollution (**702 Air pollution**)

Based on an assessment of relevant literature, this habitat is potentially sensitive to air pollution, but it has not been possible to undertake an assessment of its potential future impact based on critical loads because of the poor equivalence between this habitat and those for which critical loads are set (see Technical note III).

- Climate change (**900 Erosion, 952 Eutrophication**)

Based on the literature review (Technical note IV) climate change is considered a major threat to the future condition of this habitat especially in the long term. The main foreseen effect will be its contribution to erosion and coastal squeeze through increased sea-level rise and storminess. Climate change may affect this habitat type by altering ecosystem processes in such a way as to increase the probability of a forward switch to turbid, phytoplankton dominated conditions (Mooij *et al*. 2005). Many sites are close to sea level and vulnerable to sea level rise. However, there is a high degree of uncertainty in defining future climate threats on habitats and species due to uncertainty in: future greenhouse gas emissions; the consequential changes in climatic features (for instance temperature, precipitation CO_2 concentrations); the responses of habitats and species to these changes (for instance location, phenology, community structure) and the role of other socio-economic drivers of environmental change. The scale of change in habitats and species as a result of climate change will vary across ecosystems. Small changes in the climate are more likely to have a substantial impact on habitats and species which exist within a narrow range of environmental conditions. The future impacts of climate change on UK biodiversity will be exacerbated when coupled with other drivers of environmental change.

5.2 Future condition **(as regards range, area covered and specific structres and functions)**

The potential future state of this habitat can be predicted from CSM data. However, this prediction is probably overoptimistic as it assumes that all currently favourable sites will remain favourable and that recovering sites will continue to recover. Long-term concerns about the effects of climate change may make management actions necessary even on some sites currently viewed as favourable. Sea level rise may cause the loss of some sites in the long term, either by direct flooding or by saline intrusion of groundwater. Sites in the south and east of the UK are particularly vulnerable to this sea level rise.

5.2.1 CSM condition assessments

The CSM condition assessments reported in Sections 4.2.1-2 provide a basis to predict the potential future condition of H3140 in the UK. This involved treating all assessments currently identified as either favourable or unfavourable recovering as future-favourable: remaining categories were treated as future-unfavourable – see Table 5.2.1.1. There are a number of caveats to this approach, which are set out beneath this table.

SAC condition assessments

Table 5.2.1 and Map 5.2.1 summarise the predicted potential future condition of H3140 on UK SACs. This is based on the approach described above. The maps give an impression of the overall spread of where future-unfavourable and future-favourable sites are predicted to occur (summary statistics for the map are given in Section 7.2). The combined assessments show that of the SACs assessed:

- 42% of the area and 57% of the number of assessments fall within the future-favourable category; and

- at least 5% of the total UK habitat area falls within the future-favourable category.

Table 5.2.1 Predicted future condition of UK SACs supporting H3140 based on current CSM condition assessments. See notes below table for details. Information on the coverage of these results is given in Section 7.2

Future condition	Present condition	Area (ha)	Number of site features
Future-unfavourable	Unfavourable declining	172	1
	Unfavourable no change	195	3
	Unfavourable unclassified	39	2
	Total	406	6
	% of assessments	***58%***	***43%***
	% of total UK extent	***7%***	***Unknown***
Future-favourable	Favourable maintained	112	3
	Favourable recovered		
	Unfavourable recovering	30	2
	Favourable unclassified	154	3
	Total	295	8
	% of assessments	***42%***	***57%***
	% of total extent	***5%***	***Unknown***

Note that the scenario presented above is based on the same information as used to construct the Table in section 4.1. It is based on the following premises:
(i) the unfavourable-recovering condition assessments will at some point in the future become favourable;
(ii) all unfavourable-unclassified sites will remain unfavourable, which is probably overly pessimistic;
(iii) sympathetic management will be sustained on sites already classified as favourable and these will not be seriously damaged by any unforeseen events.
IMPORTANT NOTE: We do not have information on the timescale of the predicted recovery, which may be influenced by many past, natural and human related factors. A sustained, sympathetic management regime is more likely to result in 'favourable' condition being attained.

Table 5.2.2 Predicted future condition of H3140 on SSSI/ASSIs based on CSM assessments that were judged to be either strongly or weakly indicative of the condition. See notes below table and Technical note II for further details

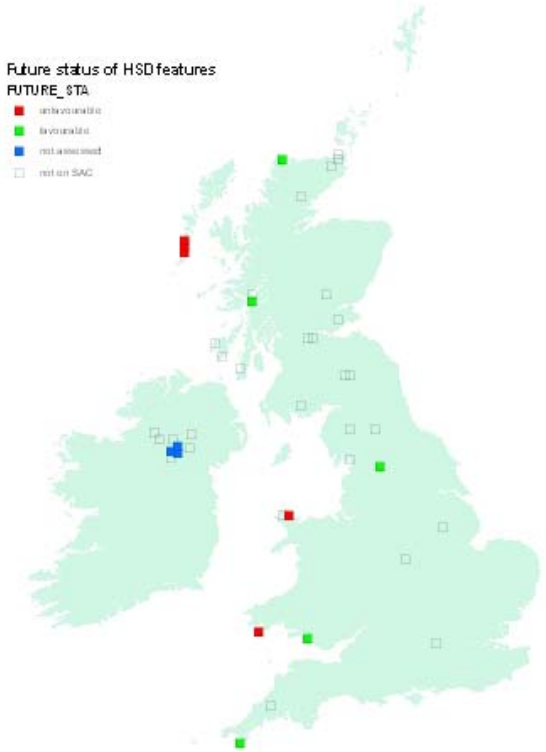
Future condition	Present condition	Number of assessments	
		Strongly indicative assessments (Category 1)	Weakly indicative assessments (Category 2)
Future-unfavourable	Unfavourable declining		12
	Unfavourable no change		7
	Unfavourable unclassified		
	Total		***19***
	% of assessments	***%***	***25%***
Future-favourable	Favourable maintained		56
	Favourable recovered		
	Unfavourable recovering		1
	Favourable unclassified		
	Total		57
	% of assessments	***%***	***75%***

Note that the scenario presented above is based on the same information as used to construct the Table 4.2.2. It is based on the following premises:
(i) the unfavourable-recovering condition assessments will at some point in the future become favourable;
(ii) all unfavourable-unclassified sites will remain unfavourable, which is probably overly pessimistic;
(iii) sympathetic management will be sustained on sites already classified as favourable and these will not be seriously damaged by any unforeseen events.
IMPORTANT NOTE: We do not have information on the timescale of the predicted recovery, which may be influenced by many past, natural and human related factors. A sustained, sympathetic management regime is more likely to result in 'favourable' condition being attained.

SSSI/ASSI condition assessments

Table 5.2.2 and Maps 5.2.2 and 5.2.3 summarise the predicted potential future condition of H3140 on UK SSSI/ASSIs. This is based on the approach described above and utilises condition assessments that were judged to be either strongly or weakly indicative of the condition of the Annex I habitat on SSSI/ASSIs (see Technical note II for details of methodology behind this). The maps give an impression of the overall spread of where unfavourable and favourable sites exist (summary statistics for the maps are given in Section 7.2). The combined condition assessments show that of the SSSI/ASSI assessments considered:

- 75% of weakly indicative assessments fall within the future-favourable category.

Predicted Future Condition of H3140 based on CSM condition assessments (See Sections 5.2 and 7.2 for further information on these maps)		
Map 5.2.1 SAC assessments	**Map 5.2.2** Assessments strongly indicative of the condition on SSSI/ASSIs	**Map 5.2.3** Assessments weakly indicative of the condition on SSSI/ASSIs
	Not applicable	
Key Red = future-unfavourable, i.e. the square contains one or more SACs where this habitat feature is present and has been predicted to be future-unfavourable Green = future-favourable, i.e. the square contains at least one SAC where this habitat feature is present and has been predicted to be future-favourable Blue = SAC not assessed, i.e. the square contains at least one SAC supporting this habitat feature but no assessment has been reported Transparent = SAC feature not present, i.e. the square does not contain any SAC features of this habitat type	Key* Green – 80 – 100% of assessed features on 10km square are favourable Yellow - 50 – 80% of assessed features on 10km square are favourable Orange - 20 – 50% of assessed features on 10km square are favourable Red - 0 – 20% of assessed features on 10km square are favourable *This is the same key as was used for JNCC CSM Report 2006	

5.3 Conclusions on future prospects (as regards range, area covered and specific structres and functions)

Conclusion[2.6.iv]: Unfavourable – Inadequate and and deteriorating

The EC Guidance states that where habitat prospects are intermediate between "good with no significant impacts from threats expected and long-term viability assured" and "bad with severe impacts from threats expected and long-term viability not assured", the judgement should be Unfavourable – Inadequate. In the UK, this was generally taken to mean that range and/or area are stable or decreasing, and between 75-95% of the habitat area is likely to be in favourable condition in 12-15 years.

CSM results show that 58% of SAC area is expected to remain unfavourable in the future. A quarter of the SACs assessments are expected to be declining. However, 75% of SSSI assessments are expected to be in favourable condition. There are concerns that under the current agricultural climate the opportunities and incentives for appropriate management of the whole resource are inadequate. The coastal sites are vulnerable to sea level rise, and habitat creation may be needed in the long term to reach favourable conservation status. For both coastal and inland sites, stringent diffuse nutrient control measures are also needed to safeguard the future of this habitat. At present, no effective mechanism exists either to create new habitats from scratch or to manage diffuse nutrient sources, and the long-term prospects for this habitat appear poor. Given progress already made and some additional recovery once further conservation measures are put into place, the expectation is that less than 25% of the habitat will remain in unfavourable condition in the next 10-15 years.

6. Overall conclusions and judgements on conservation status

Conclusion[2.6]: Unfavourable – Bad and deteriorating

On the basis of Structure and Function, the overall conclusion for this habitat feature is Unfavourable – Bad.

Table 6.1 Summary of overall conclusions and judgements

Parameter	Judgement	Grounds for Judgement	Confidence in judgement *
Range	Favourable	Range is stable and not less than the favourable reference range.	3
Area covered by habitat type within range	Unknown	Insufficient information to make a judgement.	1
Specific structures and functions (including typical species)	Unfavourable – Bad and deteriorating	More than 25% of the habitat area is considered to be unfavourable as regards its specific structures and functions. Significantly more of the resource in unfavourable condition is declining than improving.	3
Future prospects (as regards range, area covered and specific structures and function)	Unfavourable – Inadequate and deteriorating	Habitat prospects considered to be intermediate between "good with no significant impacts from threats expected and long-term viability assured" and "bad with severe impacts from threats expected and long-term viability not assured. Further measures are required to address threats to future extent and structure and function for the overall UK resource.	1
Overall assessment of conservation status	Unfavourable – Bad and deteriorating	One individual judgement is Unfavourable – Bad and deteriorating.	1

Key to confidence in judgement: 1 = High; 2 = Medium; 3 = Low

7. Annexed material **(including information sources used 2.2)**

7.1 References

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Map data sources

JNCC International Designations Database. Joint Nature Conservation Committee.

7.2 Further information on CSM data as presented in Sections 4.2 and 5.2

Table 7.2.1 Summary of the coverage of the data shown in Tables 4.2.1 and 5.2.1

Data	Value
Number of SACs supporting feature (a)	15
Number of SACs with CSM assessments (b)	14
% of SACs assessed (b/a)	93
Extent of feature in the UK – hectares (c)	5,900
Extent of feature on SACs – hectares (d)	707
Extent of features assessed – hectares (e)	701
% of total UK hectarage on SACs (d/c)	12
% of SAC total hectarage that has been assessed (e/d)	99
% of total UK hectarage that has been assessed (e/c)	12

Notes

1. Extent of features on SACs (d) includes only those features that have been submitted on the official Natura 2000 data form as qualifying features. This figure is based on the habitat extent figures presented on standard Natura 2000 data forms.
2. The data included are from CSM assessments carried out between April 1998 and December 2006. NB: these include additional and some up-date data form those used in the six year report produced by JNCC (Williams, J.M., ed. 2006. *Common Standards Monitoring for Designated Sites: First Six Year Report*. Peterborough, JNCC)

Table 7.2.2 Summary of grid square map data shown in Maps 4.2.1-3 and 5.2.1-3

Status	Number of squares	Proportion of all squares
Current – Unfavourable (red)	6	14%
Current – Favourable (green)	4	10%
On SAC but not assessed (blue)	3	7%
Not on SAC (transparent)	29	69%
Total Number of 10km squares (any colour)	42	100%
Future – Unfavourable (red)	5	12%
Future – Favourable (green)	5	12%