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 :

H3110: Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

H3110 Oligotrophic waters containing very few minerals of sandy plains *(Littorelletalia uniflorae)*

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 & correspondence with National Vegetation Classification (NVC) and other habitat types

Table 1.1.1 provides a summary description of H3110 and its relations with UK classifications.

The H3110 standing water habitat is associated with sandy drift deposits of glacial origin or with de-calcified dune systems. These substrates generally result in oligotrophic and moderately acidic conditions. The water is generally very clear but may be coloured by humic substances where there is a significant body of peat in the catchment. The habitat type is characterised by the presence of *Littorelletalia*-type vegetation – the presence of water lobelia *Lobelia dortmanna*, shoreweed *Littorella uniflora*, or quillwort *Isoetes lacustris* or *I. echinospora*. Floristically H3110 is similiar to the Annex 1 H3130 (Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*) but only one *Littorelletalia* species needs to be present to conform with the definition of H3110. The depauperate *Littorelletalia* flora in many of these lakes may be explained in part by their geographical isolation from the stronghold of H3130 waters and H3110 must be considered as a rare variant of the the more widespread and locally abundant H3130, the main distinction being the underlying substrate. The solid and drift geology of the UK means that oligotrophic waters of sandy plains are generally associated with the lowlands in the south although the examples in best condition are in NW Scotland on the machair of South Uist (Western Isles).

This is a rare habitat type throughout the Atlantic Biogeographical Region of Europe. It is restricted to sandy plains that are acidic and low in nutrients. These conditions are associated with fluvial or glacial deposits or with sand deposits of marine origin. Such situations are relatively rare in the UK compared to other areas of Europe.

Table 1.1.1 Summary description of habitat H3110 and its relations with UK vegetation/habitat classifications

Classification	Correspondence with Annex I type	Comments
EU Interpretation Manual	PAL.CLASS.: 22.11 x 22.31. Description: Shallow oligotrophic waters with few minerals and base poor, with an aquatic to amphibious low perennial vegetation belonging to the *Littorelletalia uniflorae* order, on oligotrophic soils of lake and pond banks. This vegetation consists of one or more zones, dominated by *Littorella*, *Lobelia dortmana* or *Isoetes*, although not all zones may be found at a given site.	PAL.CLASS: Palaearctic codes from the classification of Palaearctic habitats, based upon the CORINE classification.
NVC	A22: *Littorella uniflora-Lobelia dortmanna* community; A23*: Isoetes lacustris*/*setacea* community.	NVC does not accurately reflect the range of aquatic vegetation community types. However, communities A22 and A23 are the closest approximations to the characteristic assemblage of this habitat type.
BAP priority habitat type	Broad reporting category: Standing open water and canals. Priority habitat type: none	The BAP reporting category is very broad and does not correspond well to H3110.
Phase 1 Habitat Classification	G1.3 Standing water: oligotrophic (part)	The Phase 1 standing water, oligotrophic category is broader than H3110 as it includes lakes of H3130.
British Lakes Classification (Duigan *et al.* 2006)	Lake groups: A (part), B, C1 (part) and C2 (part).	The revised British lakes classification does not distinguish H3110 clearly from other low nutrient status lakes which may support similar plant species. Thus there is considerable overlap with H3130 (oligo-mesotrophic lakes) and also H3160 (dystrophic lakes).
Water Framework Directive Lakes Typology (UKTAG, 2004)	Low Alkalinity (all depth subtypes) (part). Moderate Alkalinity (all depth subtypes) (part).	The majority of H3110 lakes will correspond closely with the low alkalinity type lakes in the UK WFD typology with some falling into the moderate alkalinity type. However, both of these WFD types are much broader than H3130.

2. Range [2.3]

2.1 Current range

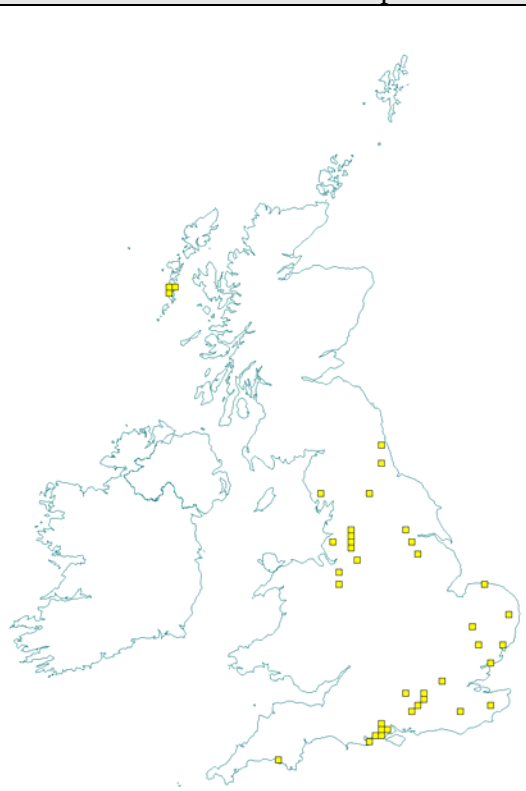
Range surface area [2.3.1]: **12,950 km²**
Date calculated [2.3.2]: **May 2007**
Quality of data [2.3.3]: **Moderate**

The surface area estimate was calculated within alpha hull software, using extent of occurrence as a proxy measure for range (see Map 2.1.1). The value of alpha was set at 25 km; the alpha was clipped to include inland areas only.

The ecological value of habitats such as lakes is better measured through numbers of sites rather than the total area. Maps 2.1.1 and 2.1.2 show the range and distribution of H3110 in the UK by considering all water bodies which coincide with lowland heathland or acid grassland (habitats which generally occur on similar geology). As data are only available for the current extent of these two terrestrial habitats the map

is likely to under-represent the number of waters likely to correspond to H3110 in some areas (see Figure 1). The analysis has focused on England as the habitat is only known from England and NW Scotland.

In general terms H3110 is associated with drift geology that supports acid lowland heath in southern England and the 'machair' grassland of the Outer Hebrides. Accordingly, the best examples are found in South Uist (Hebrides) and where extensive lowland heath remains e.g. the New Forest, Studland (Dorest) and the Cheshire plain. Degraded examples are present, though not widespread, in the other major areas of lowland heath e.g. Surrey and Hampshire.

Map 2.1.1. Habitat range map [1.1] for H3110	**Map 2.1.2.** Habitat distribution map [1.2] for H3110
	
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: 39

See Section 7.1 for map data sources

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**

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 range assessments show no 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. The broad range of H3110 is considered to have remained stable since 1994, although there may have been localised losses.

2.3 Favourable reference range

Favourable reference range[2.5.1]: **12,950 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, 12,950 km^2, has been set as the favourable reference area. Reasons for this are discussed below.

The potential range of this habitat type corresponds with the extent of fluvial and glacial acidic sand deposits in England (and Wales) and the limited extent of 'machair' grassland in the Outer Hebrides. Accordingly, H3110 is rare in the UK being constrained to certain geological conditions. The favourable reference range for this habitat should encompass the full extent of ecological variation within the UK. Two variants of H3110 can be distinguished (southern and northern), these reflect differences in the distribution of acidic drift geology in the UK.

Oligotrophic waters are common and widespread in Scotland but most are located on hard-rock geology; the machair of South Uist provides unique conditions in Scotland where lakes on a sandy substrate are fed by acidic waters from peat dominated upper catchments. The gradient from extensive blanket bog with associated low pH, low nutrient waters through to more calcareous substrates influenced by sea spray creates background conditions that can support a range of lake types of which H3110 is a characteristic type. Consequently, the machair lakes of South Uist represent an important element of the full suite of lakes types present in Scotland and are probably a unique expression of H3110 in Europe.

Loss of lowland heath throughout the UK (see for example Figure 1) and land drainage for agricultural improvement may have resulted in the loss of smaller water bodies of this type but in general larger examples (>1 ha) have not been lost although they have been severely degraded by a range of pressures (see section 4). The result of this is that in many areas of the range there are now no good examples of this habitat type and the characteristic vegetation is largely absent from some lowland areas of the UK. Aspects of the *Littorelletalia* vegetation do occur in a number of artificial reservoirs and gravel pits within these areas of the UK. The effect of these reservoirs may have offset some of the loss in area but is unlikely to have changed range which is determined by underlying geology.

In contrast oligotrophic waters are rare in the south east of the UK and hence examples of H3110 lakes are important habitats for a number of oligotrophic species with a more southerly distribution. For example, *Isoetes echinospora* is less widely distributed in the UK than the more common *Isoetes lacustris* and tends to be associated with finer sediments (Preston and Croft 1997); H3110 is particularly important for this species. Consequently, the southern variant of H3110 is important as a distinct sub-type of the UK range.

The range appears to be very fragmented, with a large proportion of isolated dots within it. This makes it vulnerable should lakes be lost. It is also rather limited, and spread thinly over England, with an occurrence on South Uist. However, lakes of this habitat type have probably naturally scarce.

2.4 Conclusions on range

Conclusion[2.6.i]: Favourable

The potential range of this habitat has not changed significantly (in that the underlying geology remains unchanged) but the extent of good examples is now restricted to a very small part of the range.

3. Area [2.4]

3.1 Current area

Total UK extent [2.4.1]: 5km^2
Date of estimation [2.4.2]: May 2007
Method [2.4.3]: 1 = only or mostly based on expert opinion
Quality of data [2.4.4]: Poor

Table 3.1.1 provides information on the area of H3110 in the UK. The total UK extent given by Jackson and McLeod (2002) of 500 ha is probably an underestimate as a rough analysis of Site of Special Scientific Interest (SSSI) lakes (non-Special Area of Conservation (SAC)) in England indicates that there are at least 206 ha which broadly correspond with H3110. Deriving accurate estimates of the areal extent of this habitat type is difficult because many examples have been degraded and no longer support characteristic flora or physico-chemical characteristics.

Note that surface area is an inadequate variable to describe the standing water habitat, as it takes no account of depth, volume, flushing rate, area of substrate available for colonisation by macrophytes, nor the fact that management anywhere in the catchment may affect the entire habitat of the lake. The latter is more relevant to lakes than to terrestrial habitats. In addition, other than in terms of viability, area is not generally a consideration when assessing the value of individual lakes. These factors result in standing waters normally being discussed in terms of number of lakes, rather than area of surface water. A further complication related to using areal data from Scottish SAC or SSSI assessments is that generally, only one lake per SSSI (whether underpinning SAC or not) was examined. If a lake was found to be in unfavourable condition, the site was also described this way. However, this means that in sites with more than one lake per feature, it cannot be assumed that the entire area of the qualifying feature within the site is in unfavourable condition.

Table 3.1.1 Area of H3110 in the UK

	Area (ha)	**Method** [2.4.3]	**Quality of data** [2.4.4]
England	Present	-	-
Scotland	Present	-	-
Wales	Not present	-	-
Northern Ireland	Not present	-	-
Total UK extent [2.4.1]	500	1	Poor

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 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 H3110 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]

Many of the factors affecting this habitat type are common to other standing water types in the UK and across Europe as a whole. The pressures may operate at the catchment level and hence largely be related to land use and management practices or be 'in-lake' pressures such as fish stocking and invasive plant species. The following overview indicates the key factors, highlighting particular issues for 3110 where appropriate. The related EC codes are shown in brackets.

- Pollution (**701 Water pollution, 952 Eutrophication**)

Nutrient 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.

Many examples of this habitat type in England are in areas of heath which are surrounded by urban development. There are a number of examples where urban runoff has resulted in elevated sediment and contaminant loads impacting lakes.

In England and Wales, a review of all discharge consents affecting SACs is being undertaken, which should lead to significant reductions in pollution stress on this Annex 1 habitat. A considerable amount of improvement work is also being undertaken on SSSI lakes under national legislation. The EU Water Framework Directive is unlikely to drive further improvements for many lakes other than those already designated as SAC due to a 50 ha size threshold being applied in the UK. In England, a major supportive campaign (the England Catchment Sensitive Farming Delivery Initiative, ECSFDI) has been launched to help farmers adopt practices that control nutrient and silt pollution, in advance of the application of new policies including reserve regulatory powers. The ECSFDI is focused on the catchments of SACs and

SSSIs under particular threat from agricultural pollution. Incomplete understanding of the relative importance of diffuse loads for many lakes may require this initiative to be broadened in scope at a later stage. It is likely that the supportive approach of the ECSFDI will bring about limited improvement, and that new regulatory measures will need to be applied to control agricultural sources effectively.

- Land use (**900 Erosion**)

Some areas of lowland heath are subject to land use activities other than agriculture (military uses, recreation) which cause erosion of sandy soils leading to the sedimentation issues.

- Hydrological Pressures (**853 Management of water levels, 920 Drying up, 930 submersion**)

The high hydrological conductivity of sandy substrates has the result that H3110 may be susceptible to changes to surface and groundwater hydrology. Reductions in water levels or changes in seasonal fluctuations could impact on the littoral zone which is an important sub-habitat within this lake type supporting characteristic lawns of isoetid growth forms. Examples of this habitat type on machair may suffer from increasing salinity with saline incursion or increasing storminess. Global climate change may exacerbate these hydrological pressures.

- Recreation Pressures (**220 Leisure fishing**)

The major recreational pressure affecting this habitat type in England is angling and the associated stocking of many lakes with benthic feeding fish, particularly carp. In recent years there has been huge growth in this area of coarse angling and most lakes which are easily accessible to anglers have some level of stocking (legal or illegal). The impact of high biomass of benthivorous fish is well documented and in England there is an agreement on stocking of designated water bodies. However, in many circumstances stocking is historic or illegal and there are currently no mechanisms or funds to remove fish or reduce biomass to an appropriate level.

- Non-native species (**954 invasion by a species, 971 competition**)

There are a number of non-native plant species with the propensity to become invasive in aquatic habitats. In particular Australian swamp stonecrop (*Crassula helmsii*) and parrot's feather (*Myriophyllum spicatum*) seem to be able to rapidly colonise and change the ecology of small standing water habitats. H3110 is particularly vulnerable to invasions by *Crassula helmsii* which occupies a similar niche to *Littorella uniflora*. *Crassula* is now widespread in much of England (>10,000 sites) and there are increasing numbers of records from Scotland and Wales. Two of the three SACs in England are currently threatened by *Crassula* which is either present in the water body and spreading or in nearby waters .

Tackling non-native species issues is difficult and the emphasis must be on preventing problems. The withdrawal of diquat for aquatic use has limited control options for species such as *Crassula*. There is an increasing awareness of non-native species as a problem in the UK but as yet there is no organisation with overall responsibility for control of problems. A strategic approach to managing both problems and risks with the full support of all stakeholders is being advocated as the appropriate response.

- Grazing (**140 Grazing**)

The presence of large numbers of feral geese is a localised issue which may be significant where it occurs. Large congregations of geese (usually Canada geese *Branta canadensis*) can exert considerable grazing pressure on submerged vegetation and also import nutrients when feeding elsewhere. Additionally, geese can cause considerable damage to marginal and emergent fringing vegetation.

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

Acidification arising from atmospheric deposition may be an issue for H3110 as there is limited buffering capacity in the acidic sandy soils. Managing acidification risk is focused on the determination of critical loads for sites and predicted exceedence of these loads. There has been a general trend of declining SO_X

deposition in the UK but NO_X loads continue to increase with possible implications for eutrophication as well as acidification.

4.2 Current condition

An analysis of data collated in the GB Lakes Inventory (Hughes *et al*. 2004) has generated map 4.2.1.

Map 4.2.1 was generated by intersecting UK Lakes inventory data with the distribution of Lowland Heathland and Lowland acid grassland. Condition was assessed by screening for lakes with modelled reference (not impacted) total phosphorus concentrations of 20µg/l. There are errors and uncertainties around the modelling approach for reference phosphorus and where these data were not available it was not possible to map lakes. Notwithstanding the uncertainties surrounding this analysis, Map 4.2.1 does suggest that the range of good quality examples of H3150 has reduced significantly. This decline in the range of good quality examples can probably be associated with increasing population growth, particularly in England and the widespread intensification of agriculture. Map 4.2.1 supports the view that there are very few good examples of H3110 across large areas of the range.

Map 4.2.3 Estimated range of H3110 based on water bodies coinciding with current distribution of lowland heathland and lowland acidic grassland

Coloured points correspond to modelled current total phosphorus concentration (export coefficient modelling). All data from GB Lakes Inventory (Hughes et al., 2004). Modelled total phosphorus concentrations can be broadly equated with condition (as affected by nutrient enrichment):

- <20µg/l (blue): favourable (high confidence)
- 20-40µg/l (green): unfavourable (low confidence)
- 40-100µg/l (yellow): unfavourable (medium confidence)
- >100µg/l (red): unfavourable (high confidence)

All data from GB Lakes Inventory (Hughes *et al.* 2004).

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 H3110 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.

The current status of H3110 in the UK can be determined from (a) condition of SAC sites; (b) condition of SSSI water bodies of this type; (c) condition of lakes of this type in the wider countryside i.e. outside statutory designated sites. Confidence in these assessments decreases from (a) through to (b).

The assessments of condition for (a) and (b) are based on CSM Guidance for standing waters (JNCC 2003); favourable condition table 3 relates to H3110. The CSM guidance identifies attributes associated with the structure and function of the habitat (vegetation composition and structure, water quality, hydrology, substrate character) and sets generic targets for these attributes. These targets are quantitative where possible and qualitative where there is insufficient information or understanding to set numerical targets. Whilst all SACs have been assessed according to this guidance not all SSSI lakes have yet been subject to this more systematic assessment process.

An analysis of the status of 3110 lakes beyond the boundaries of designated sites is only possible by reference to broad desk (GIS) based assessments for lakes in general i.e. not specific to the habitat type in question.

SAC condition assessments

Table 4.2.1 and Map 4.2.1 summarise the CSM condition assessments for UK SACs supporting habitat H3110. 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:

- 78% of the area and 50% of the number of assessments was unfavourable; and
- at least 63% of the total UK habitat area was in unfavourable condition.

Table 4.2.1 CSM condition assessment results for UK SACs supporting H3110. 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		
	No change		
	Unclassified		
	Recovering	313	2
	Total	313	2
	% of all assessments	***78%***	***50%***
	% of total UK resource	***63%***	***unknown***
Favourable	Maintained	69	1
	Recovered		
	Unclassified	22	1
	Total	91	2
	% of all assessments	***22%***	***50%***
	% of total UK resource	***18%***	***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. This was

based on expert sub-setting of SSSI data in each country agency. 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:

- 13% 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 H3110 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		3
	No change		2
	Unclassified		
	Recovering		
	Total		5
	% of all assessments	***%***	***13%***
Favourable	Maintained		33
	Recovered		
	Unclassified		
	Total		33
	% of all assessments	***%***	***87%***

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.

Non-designated lakes

The risk assessment exercise undertaken for Water Framework Directive River Basin Characterisation report (UKTAG 2005) for England and Wales indicated that 41% and 14% of 'water bodies' (433) were at risk of failing to meet good ecological status due to nutrient (phosphorus) and acidification pressures, respectively. WFD risk assessment data gives an idea of the pressures affecting lakes across the UK.

Current Condition of H3110 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]: ***Subularia aquatica, Baldellia ranunculoides, Elatine hexandra, Lobelia dortmanna***

Typical species assessment[2.5.4]: Change in 10 km square occupancy across UK over last 25 years

The characteristic plants (typical species) listed in EU Interpretation Manual for H3110 are: *Isoetes lacustris*, *I. echinospora*, *Littorella uniflora*, *Lobelia dortmanna*, *Deschampsia setacea*, *Subularia aquatica*, *Juncus bulbosus*, *Pilularia globulifera*, *Luronium natans*, *Potamogeton polygonifolius*; in the Boreal region also *Myriophyllum alterniflorum*, *Drepanocladus* spp., *Warnstorfia* spp. and *Fontinalis* spp. Many of these species also occur in the closely related lake types H3130 and H3160.

Several species show a medium to very high degree of faithfulness to this habitat or at least to the related community types (A22 and A23) within the NVC. Trends in the occurrence of these species across the UK during the last 25 years are set out in the table below. All but one showed significant increases, mostly of less than 25%. These data suggest that at least some species associated with H3110 have increased in occurrence, though not necessarily within this lake type. The New Atlas of the British and Irish Flora (Preston *et al.* 2002) clearly demonstrates losses of lowland sites for *Littorella uniflora*, *Isoetes echinospora* and *Pilularia globulifera* since 1970 and to some extent this can be linked to deterioration of type H3110 standing waters.

Table 4.3.1 Trends and faithfulness of selected typical species for H3110

Typical species	**Faithfulness to habitat H3110 (based on analysis of NVC synoptic tables)**	**Trend over last 25 years from BSBI atlas – based on change in 10 km square occupancy across UK (see http://www.jncc.gov.uk/page-3254)**
Subularia aquatica	Very high	Significant increase, of >=25% in 25yrs
Baldellia ranunculoides	High	Significant decline, but <25% in 25yrs
Elatine hexandra	Medium	Significant increase, of >=25% in 25yrs
Lobelia dortmanna	Medium	Significant increase, but <25% in 25yrs

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

Conclusion[2.6.iii]: Unfavourable – Bad but improving

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.

The current status of structures and functions of H3110 is unfavourable. Map 2.2.3 shows the extent to which lakes are likely to have been affected by nutrient enrichment; at least 39% of the lakes included are predicted to have phosphorus concentrations in excess of levels required to safeguard the specific character of this habitat type. In common with most lake types in the UK, oligotrophic waters of sandy plains have suffered significantly from nutrient enrichment and in-lake pressures such as stocking with benthic feeding fish or the impact of feral geese. The hydrological connectivity of sandy substrates is such that this habitat type is also susceptible to changes in hydrological regime in both surface and groundwater catchments. A fuller description of the pressures affecting the habitat type is given in Section 4.1 above. The decline in range of a number of typical plant species may be further evidence of the loss of good quality examples of this habitat. As the pressures affecting the structure and function of this habitat type continue to act across the range further deterioration must be assumed. However, CSM data show that all the unfavourable SAC resource is reported as recovering which represents nearly 70% of the total UK resource.

5. Future prospects

5.1 Main factors affecting the habitat

5.1.1 Conservation measures

- Protection within designated sites

Around 62% of 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/ Area of Special Scientific Interest (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. Considerable progress has been made in reducing the contribution of large waste water treatment works to nutrient loading but diffuse sources and the cumulative effect of small discharges continue to cause problems for many sites. Tackling these remaining nutrient sources will require a shift in land management practices and the regulatory regimes for small point sources. Pilot projects (such as ECSFDI, see Section 4.1) are beginning to demonstrate how such problems may be addressed but a step change is required before these solutions result in real ecological benefits on a broad scale. Measures currently being developed to deliver the WFD in the UK will have some benefit for H3110 beyond the SAC network but the net benefit of these measures may depend upon how widely they are applied outside of the very limited WFD 'water body' network.

- UK BAP

The habitat is covered by the *Standing open waters and canals action plan* 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.

5.1.2 Main future threats[2.4.11]

The most obvious major future threats to H3110 are listed below, several of which are referred to in Section 4.1. The related EC codes are shown in brackets.

- Pollution (**701 Water pollution, 952 Eutrophication**)
- Hydrological Pressures (**920 Drying up, 930 submersion**)
- Recreation Pressures (**220 Leisure fishing**)
- Non-native species (**954 invasion by a species, 971 competition**)
- Air pollution (**702 Air pollution**)

- Climate change (**853 Management of water levels, 954 invasion by a species**)

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. Global climate change and increasing population growth within the south-east of the UK are factors which are likely to increase in importance in the short – medium term and together these factors may have serious implications for the hydrological integrity of 3110 lakes. Increased demand for water (and for opportunities for recreation) in the south – east may directly impact upon these lakes many of which are close to large urban areas. The potential for climate change to exacerbate the threat posed by non-native invasive species is significant. 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 structures and functions)**

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 H3110 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 H3110 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:

- 100% of the area and 100% of the number of assessments fall within the future-favourable category; and
- at least 81% of the total UK habitat area falls within the future-favourable category.

Table 5.2.1 Predicted future condition of UK SACs supporting H3110 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		
	Unfavourable no change		
	Unfavourable unclassified		
	Total		
	% of assessments	***0%***	***0%***
	% of total UK extent	***0%***	***Unknown***
Future-favourable	Favourable maintained	69	1
	Favourable recovered		
	Unfavourable recovering	313	2
	Favourable unclassified	22	1
	Total	404	4
	% of assessments	***100%***	***100%***
	% of total extent	***81%***	***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.

SSSI/ASSI condition assessments

Table 5.2.2 and Maps 5.2.2 and 5.2.3 summarise the predicted potential future condition of H3110 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:

- 87% of weakly indicative assessments fall within the future-favourable category.

Table 5.2.2 Predicted future condition of H3110 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		3
	Unfavourable no change		2
	Unfavourable unclassified		
	Total		5
	% of assessments	***%***	***13%***
Future-favourable	Favourable maintained		33
	Favourable recovered		
	Unfavourable recovering		
	Favourable unclassified		
	Total		33
	% of assessments	***%***	***87%***

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.

Predicted Future Condition of H3110 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 structures and functions)

Conclusion[2.6.iv]: Favourable

The EC Guidance states that where "habitat prospects are good with no significant impacts from threats expected and long-term viability assured", the judgement should be Favourable. In the UK, this was generally taken to mean that range and/or area are stable or increasing, and more than 95% of the habitat area is likely to be in favourable condition in 12-15 years.

CSM results show that 100% of SAC area is expected to be favourable in the future, which represents 81% of the total UK resource of H3110, and a large part of the resource in SACs is improving. However, there remain pressures that have no clear solution – e.g. non-native species and inadequate protection for the wider resource (outside SAC/SSSI). Under current proposals for EU WFD implementation most examples of this type will receive little protection and there will be no drivers for enhancement or restoration. Given progress already made and some additional recovery once further conservation measures are put into place, the expectation is that less than 5% 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 but improving

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	Current range is stable and not less than the favourable reference range.	2
Area covered by habitat type within range	Unknown	Insufficient information to make a judgement.	1
Specific structures and functions (including typical species)	Unfavourable – Bad but improving	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 improving than declining.	2
Future prospects (as regards range, area covered and specific structures and functions)	Favourable	Habitat prospects over the next 12-15 years considered to be good with no significant impacts from threats expected and long-term viability assured.	2
Overall assessment of conservation status	Unfavourable – Bad but improving	On individual judgement is Unfavourable – Bad and improving.	2

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)	4
Number of SACs with CSM assessments (b)	4
% of SACs assessed (b/a)	100
Extent of feature in the UK – hectares (c)	500
Extent of feature on SACs – hectares (d)	404
Extent of features assessed – hectares (e)	404
% of total UK hectarage on SACs (d/c)	81
% of SAC total hectarage that has been assessed (e/d)	100
% of total UK hectarage that has been assessed (e/c)	81

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)	2	50%
Current – Favourable (green)	2	50%
On SAC but not assessed (blue)	0	0%
Not on SAC (transparent)	0	0%
Total Number of 10km squares (any colour)	4	100%
Future – Unfavourable (red)	0	0%
Future – Favourable (green)	4	100%