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

Fourth Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2013 to December 2018

Supporting documentation for the
conservation status assessment for the habitat:

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

WALES

IMPORTANT NOTE - PLEASE READ

- The information in this document is a country-level contribution to the UK Report on the conservation status of this habitat, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive.
- The 2019 Article 17 UK Approach document provides details on how this supporting information was used to produce the UK Report.
- The UK Report on the conservation status of this habitat is provided in a separate document.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Explanatory notes (where provided) by the country are included at the end. These provide an audit trail of relevant supporting information.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was only relevant at UK-level (sections 10 Future prospects and 11 Conclusions).
- For technical reasons, the country-level future trends for Range, Area covered by habitat and Structure and functions are only available in a separate spreadsheet that contains all the country-level supporting information.
- The country-level reporting information for all habitats and species is also available in spreadsheet format.

Visit the JNCC website, https://jncc.gov.uk/article17, for further information on UK Article 17 reporting.

Report on the main results of the surveillance under Article 17 for Annex I habitat types (Annex D)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (Wales information only)**
1.2 Habitat code	**3140 - Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.**

2. Maps

2.1 Year or period	2007-2017
2.3 Distribution map	Yes
2.3 Distribution map Method used	Based mainly on extrapolation from a limited amount of data
2.4 Additional maps	No

BIOGEOGRAPHICAL LEVEL

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	**Atlantic (ATL)**
3.2 Sources of information	Baxter E, Stewart N. 2015. Macrophyte Survey of Welsh Lakes for Habitats Directive and Water Framework Directive Monitoring, 2014. NRW Evidence Report No: 52, 78pp, Natural Resources Wales. Bennion H, Johnes P, Ferrier R, Phillips G, Haworth E. 2005. A comparison of diatom phosphorus transfer functions and export coefficient models as tools for reconstructing lake nutrient histories. Freshwater Biology, 50, 1651-1670. Burgess A, Goldsmith B, Hatton-Ellis T. 2006. Site Condition Assessments of Welsh SAC and SSSI Standing Water Features. CCW Contract Science Report 705. Bangor, CCW. Davidson T, Bennion H, Yang H, Appleby P, Luckes S. 2002. Investigation of environmental change at the Bosherston Lakes, Pembrokeshire. CCW Contract Science Report 496. Bangor, Countryside Council for Wales (CCW). Davidson T, Appleby PG. 2003. The Environmental History of Kenfig Pool. CCW Contract Science Report 561. Bangor, Countryside Council for Wales (CCW). Davidson TA, Clarke GC, Rawcliffe R, Rose N, Roe K, Sayer C, Turner S, Hatton-Ellis TW. 2009. Defining lake restoration targets at Llyn Cadarn - a palaeolimnological approach. CCW Contract Science Report 871. Bangor, Countryside Council for Wales. Davidson TA, Burgess A, Clarke G, Hoare D, Frings P, Hatton-Ellis TW. 2012. The application of palaeolimnology to evidence-based lake management and conservation: examples from UK lakes. Aquatic Conservation: Marine and Freshwater Ecosystems, 22, 165-180. Goldsmith, B., Lambert, S.J., Davidson T.A., Salgado, J., Yang, H. and Sayer, C.D. 2013. Restoration of Anglesey Marl Lakes: germination of plants in deep sediments. CCW Contract Science Report No: 1027, 31pp, CCW, Bangor. Goldsmith B, Salgado, Bennion, H. & Goodrich. 2014a. Lake Ecological Surveys (Wales) 2013. NRW Evidence Report No: 28.19 pp, Natural Resources Wales, Bangor Goldsmith B., E.M. Shilland, H. Yang, J. Shilland, J. Salgado & S.D. Turner. 2014b. Condition Assessment of Eight Standing Waters in Sites of Special Scientific Interest (SSSIs). NRW Evidence Report No: 29,147pp, Natural Resources Wales, Bangor. Goldsmith B, Turner S, Shilland E, Goodrich S. 2016. Ecological Surveys of Welsh Lakes 2015. NRW Evidence Report No 145. 25 pp, Natural Resources Wales,

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Hatton-Ellis TW. 2016. Evidence Review of Lake Nitrate Vulnerable Zones in Wales. NRW Evidence Report No: 135, 163pp, Natural Resources Wales, Bangor.
Haycock RJ, Bennett I. 2008. In at the deep end: restoring open water in Bosherston Lakes. Natur Cymru Summer 08, 36-41.
Holman IP, Davidson T, Burgess A, Kelly A, Eaton J, Hatton-Ellis TW. (2009) Understanding the effects of coming environmental change on Bosherston Lakes as a basis for a sustainable conservation management strategy. CCW Contract Science Report 858. Bangor, Countryside Council for Wales.
Interagency Freshwater Group. 2015. Common Standards Monitoring Guidance for Freshwater Lakes. JNCC, Peterborough. Available online at http://jncc.defra.gov.uk/pdf/0315_CSM_Freshwater_lakes.pdf
Joint Nature Conservation Committee (JNCC) 2005. Common Standards Monitoring Guidance for Standing Waters. Version March 2005. JNCC, Peterborough. 80 pp. ISSN 1743-8160.
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Wiik E, Bennion H, Sayer CD, Willby NJ (2013) Chemical and biological responses of marl lakes to eutrophication. Freshwater Reviews 6(2): 35-62.
Willby, N. J., J.-A. Pitt, and G. Phillips. 2009. The ecological classification of UK lakes using aquatic macrophytes. SC010080/SR. Environment Agency, Bristol.

4. Range

4.1 Surface area (in km²)
4.2 Short-term trend Period

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4.3 Short-term trend Direction	Stable (0)		
4.4 Short-term trend Magnitude	a) Minimum	b) Maximum	
4.5 Short-term trend Method used			
4.6 Long-term trend Period			
4.7 Long-term trend Direction			
4.8 Long-term trend Magnitude	a) Minimum	b) Maximum	
4.9 Long-term trend Method used			
4.10 Favourable reference range	a) Area (km²)		
	b) Operator		
	c) Unknown	No	
	d) Method		
4.11 Change and reason for change in surface area of range	No change		
	The change is mainly due to:		
4.12 Additional information			

5. Area covered by habitat

5.1 Year or period	2014-014-		
5.2 Surface area (in km²)	a) Minimum	b) Maximum	c) Best single value 0.855
5.3 Type of estimate	Best estimate		
5.4 Surface area Method used	Complete survey or a statistically robust estimate		
5.5 Short-term trend Period	2007-2017		
5.6 Short-term trend Direction	Stable (0)		
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used	Complete survey or a statistically robust estimate		
5.9 Long-term trend Period	1995-2017		
5.10 Long-term trend Direction	Stable (0)		
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used	Based mainly on expert opinion with very limited data		
5.13 Favourable reference area	a) Area (km²)		
	b) Operator		
	c) Unknown	No	
	d) Method		
5.14 Change and reason for change in surface area of range	No change		
	The change is mainly due to:		
5.15 Additional information			

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum 0.05	Maximum 0.34
	b) Area in not-good condition (km²)	Minimum 0.49	Maximum 0.78
	c) Area where condition is not known (km²)	Minimum 0.09	Maximum 0.09

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6.2 Condition of habitat Method used	Complete survey or a statistically robust estimate
6.3 Short-term trend of habitat area in good condition Period	2007-2017
6.4 Short-term trend of habitat area in good condition Direction	Stable (0)
6.5 Short-term trend of habitat area in good condition Method used	Complete survey or a statistically robust estimate
6.6 Typical species	Has the list of typical species changed in comparison to the previous reporting period? No
6.7 Typical species Method used	
6.8 Additional information	

7. Main pressures and threats

7.1 Characterisation of pressures/threats

Pressure	Ranking
Agricultural activities generating point source pollution to surface or ground waters (A25)	H
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Other invasive alien species (other then species of Union concern) (I02)	H
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Management of fishing stocks and game (G08)	M

Threat	Ranking
Agricultural activities generating point source pollution to surface or ground waters (A25)	H
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Other invasive alien species (other then species of Union concern) (I02)	H
Sea-level and wave exposure changes due to climate change (N04)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Management of fishing stocks and game (G08)	H
Invasive alien species of Union concern (I01)	H

7.2 Sources of information

7.3 Additional information

8. Conservation measures

8.1 Status of measures	a) Are measures needed?	Yes
	b) Indicate the status of measures	Measures identified and taken

8.2 Main purpose of the measures taken	Restore the habitat of the species (related to 'Habitat for the species')
8.3 Location of the measures taken	Both inside and outside Natura 2000
8.4 Response to the measures	Medium-term results (within the next two reporting periods, 2019-2030)

8.5 List of main conservation measures

- Reduce/eliminate point pollution to surface or ground waters from agricultural activities (CA10)
- Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)
- Reducing the impact of (re-) stocking for fishing and hunting, of artificial feeding and predator control (CG03)
- Management, control or eradication of other invasive alien species (CI03)
- Reduce impact of mixed source pollution (CJ01)
- Restore habitats impacted by multi-purpose hydrological changes (CJ03)
- Other measures related to mixed source pollution and multi-purpose human-induced changes in hydraulic conditions (CJ04)
- Implement climate change adaptation measures (CN02)
- Recreate Annex I agricultural habitats (CA07)

8.6 Additional information

9. Future prospects

9.1 Future prospects of parameters

a) Range
b) Area
c) Structure and functions

9.2 Additional information

10. Conclusions

10.1. Range
10.2. Area
10.3. Specific structure and functions (incl. typical species)
10.4. Future prospects
10.5 Overall assessment of Conservation Status
10.6 Overall trend in Conservation Status

10.7 Change and reasons for change in conservation status and conservation status trend

a) Overall assessment of conservation status

No change

The change is mainly due to:

b) Overall trend in conservation status

No change

The change is mainly due to:

10.8 Additional information

11. Natura 2000 (pSCIs, SCIs, SACs) coverage for Annex I habitat types

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11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (in km² in biogeographical/ marine region)	a) Minimum	0.66
	b) Maximum	0.73
	c) Best single value	
11.2 Type of estimate		Best estimate
11.3 Surface area of the habitat type inside the network Method used		Complete survey or a statistically robust estimate
11.4 Short-term trend of habitat area in good condition within the network Direction		Stable (0)
11.5 Short-term trend of habitat area in good condition within network Method used		Complete survey or a statistically robust estimate
11.6 Additional information		

12. Complementary information

12.1 Justification of % thresholds for trends	
12.2 Other relevant information	

Distribution Map

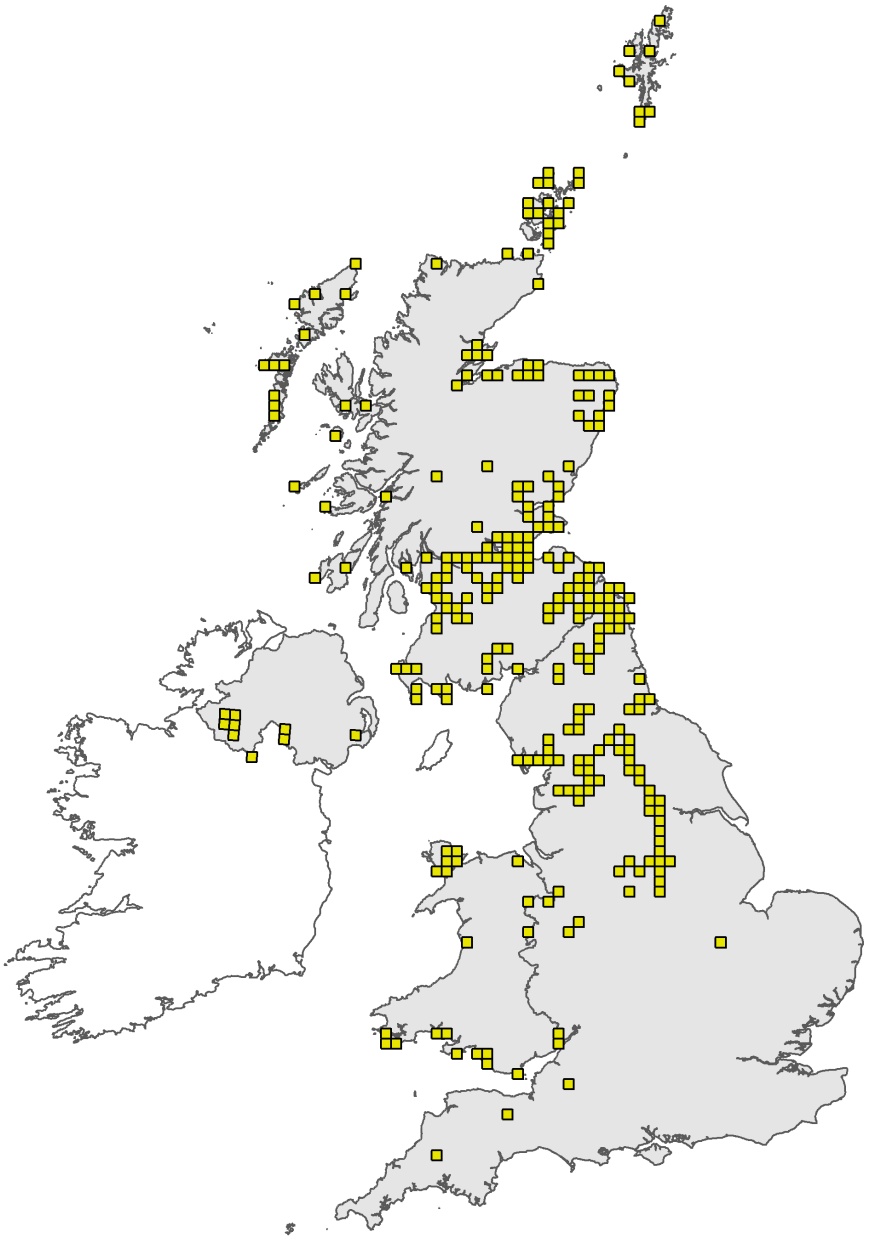

Figure 1: UK distribution map for H3140 - Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The 10km grid square distribution map is based on available habitat records which are considered to be representative of the distribution within the current reporting period. For further details see the 2019 Article17 UK Approach document.

Range Map

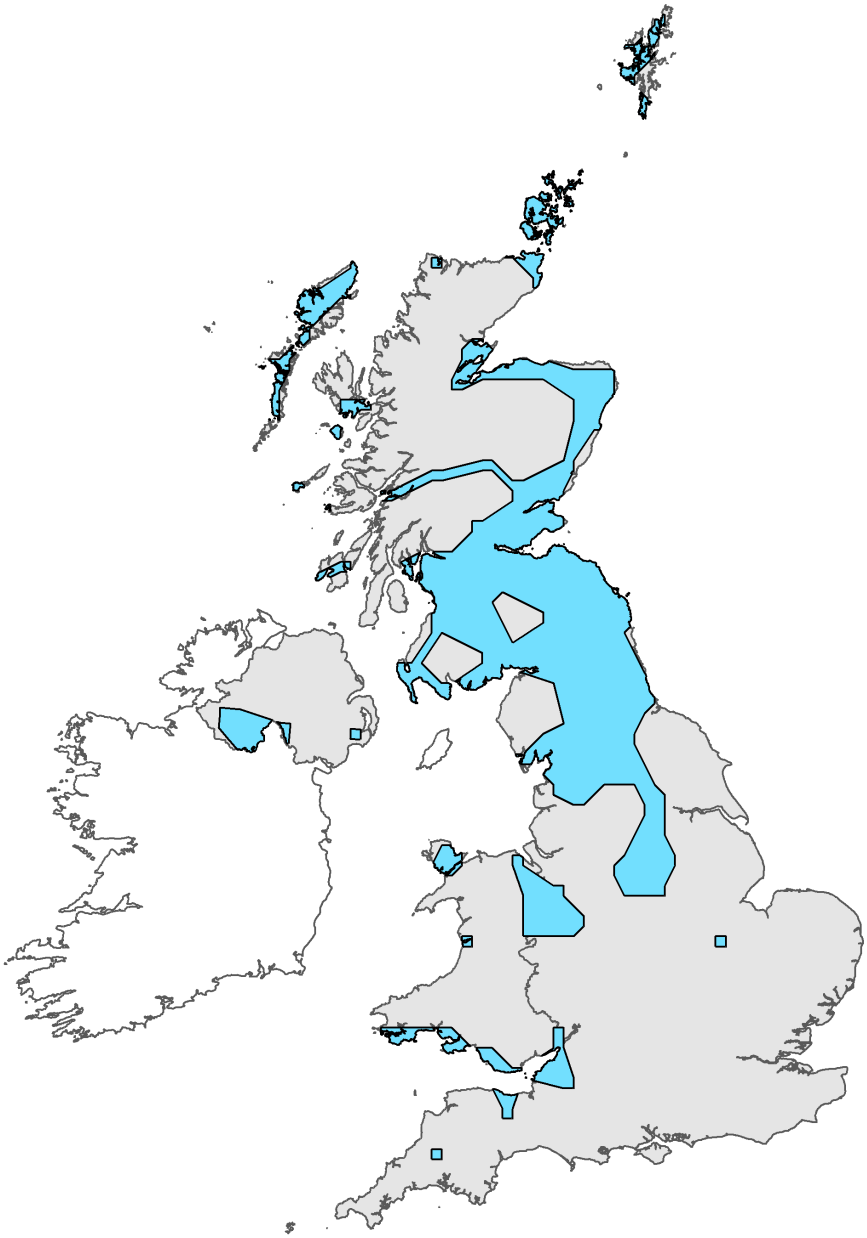

Figure 2: UK range map for H3140 - Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The range map has been produced by applying a bespoke range mapping tool for Article 17 reporting (produced by JNCC) to the 10km grid square distribution map presented in Figure 1. The alpha value for this habitat was 25km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Habitat code: 3140

Field label	Note
2.3 Distribution map; Method used	Method The extent map has been updated using a combination of NRW Lake survey data (Baxter & Stewart 2015; Goldsmith et al. 2013, 2014a, 2014b, 2016; Shilland et al. in press) and the recent review of Welsh stonewort distribution (Stewart, in prep). Squares were included where (i) lake survey data confirmed presence of the habitat or (ii) where there were post 1994 records for key charophyte species (Chara aculeolata; C. aspera; C. baltica; C. contraria; C. curta; C. hispida; C. rudis; Tolypella glomerata) that could be linked to examples of this habitat type. In some cases we were unable to confirm the presence of this habitat in individual previously recorded 10km squares and these have therefore been removed from the analysis. Results The distribution of this habitat in Wales is extremely localised, with records from only seventeen 10km squares. Of these, the large majority have small areas of habitat, estimated at 1ha or less in extent (Map 1). These are mainly small, shallow ponds in dune slacks or calcareous fen. Only two 10km squares have extensive areas of this habitat, SR99 in Pembrokeshire (Bosherston Lakes) and SS78 in Bridgend (Kenfig Pool). Although the larger examples of this habitat are well studied, small stonewort ponds that account for a high proportion of the distribution are not. Based on updated locations of lakes within the UK Lakes Inventory, cross-checked against aerial photographs, GIS map of limestone geology, records of critical Chara taxa, and survey data, converted to 10km grid squares. See Hatton-Ellis (2014) for details. All data used are from 2007-17 but where no groundtruthing data was available, predicted habitat occurrence was used. This is likely to affect range/distribution more than area. Seven 10km squares have habitat presence predicted but not confirmed; the remainder are all ground-truthed with survey data. We think it is unlikely that more than five 10km squares in Wales contain this habitat but have not been mapped.

Habitat code: 3140 Region code: ATL

Field label	Note
4.1 Surface area	This habitat is scarce in Wales and most 10km squares contain only a single lake. This makes this habitat relatively vulnerable to contractions in range.
4.3 Short term trend; Direction	No known changes in range over this period in Wales. Range extensions are likely to be due to new sites being discovered. However, it is possible that range extensions may occur through abandonment and flooding of limestone quarries.
5.2 Surface area	Hatton-Ellis (2014) revised the area of this and other lake habitats in Wales in the light of the most recent data then available. An issue with defining habitat loss is the tendency of nutrient enriched H3140 to become H3150 and then fine-leaved pondweed dominated. This habitat is usually termed degraded rather than destroyed, hence changes to surface area tend to underestimate the true extent of loss. See JNCC (2007) for a discussion. The area provided here includes both water bodies in the UK Lakes inventory and the location of other stonewort ponds, where known. The latter category consists of ad hoc records and does not represent a complete dataset. However, due to the small size of most such ponds it is unlikely that missing records account for more than about 5% of the total area.

5.4 Surface area; Method used	Hatton-Ellis (2014) revised the area of this and other lake habitats in Wales in the light of the most recent data then available, using data from the UK Lakes inventory combined with available survey data. It is unlikely that any significant undiscovered examples of this habitat occur in Wales and thus the surface area estimate is considered reasonably complete. Monitoring since 2012 has occurred in all protected sites supporting this habitat plus Ysceifiog Lake, which was suspected of supporting H3140. This represents just over 90% of the Welsh favourable reference area of this habitat type.
5.6 Short term trend; Direction	Differences in area estimates are due to a revision of the estimated area rather than an actual loss of habitat between reporting periods (see 5.14).
5.7 Short term trend; Magnitude	See 5.6.
5.8 Short term trend; Method used	Based primarily on SAC monitoring. However, more than 70% of the area of the habitat within Wales is a designated SAC feature.
5.10 Long term trend; Direction	This 'trend' is due to a revision of the estimated area rather than an actual loss of habitat between reporting periods (see 5.14).
5.12 Long term trend; Method used	Accurate estimates of the extent of this habitat in Wales were not available prior to 2014.
6.1 Condition of habitat	The area of uncertainty in the Good / Not Good estimates is the status of Kenfig Pool (0.29 km2) whose condition is uncertain. Detailed analysis of the extensive available data is required to accurately determine this.
6.2 Condition of habitat; Method used	A monitoring method for typical species, structure and function of this habitat is identified in the recently updated Common Standards Monitoring Guidance (JNCC 2005; IAFG 2015). This has been used on all relevant SACs and SSSIs in Wales (Burgess et al. 2009; Hatton-Ellis 2012a,b; Burgess et al. 2013). At present, all available assessments have been carried out using the older guidance. This is considered unlikely to substantially affect the conclusions as changes to the revised guidance are mainly to provide clearer, more repeatable targets. Monitoring has been carried out since 2012 in all protected sites supporting this habitat plus Ysceifiog Lake, which was suspected of supporting H3140. This represents just over 90% of the Welsh favourable reference area of this habitat type.
6.4 Short term trend of habitat area in good condition; Direction	The area of this habitat in good condition in Wales is very low, but is not thought to be deteriorating further at present. There is still the potential for some sites to deteriorate further in quality in response to pressures (see section 7).
6.7 Typical speces; Method used	There have been minor changes to the typical species list in the IAFG (2015) guidance, mainly the removal of a series of associate species with consequent greater focus on Chara spp. This is not thought likely to have a material effect on the result of Welsh monitoring. In Wales, the most important typical species for this habitat type are Chara aspera and C. hispida. C. aculeolata, C. curta and C. rudis also occur in this habitat in Wales but have either only been recorded from small fen pools or occur in only very restricted areas. A recent review of the status of charophytes in Wales (Stewart in prep) concluded that all of the various Chara species critical for the favourable structure and function of this habitat in Wales are threatened.

7.1 Characterisation of pressures/ threats	Pressures:The most widespread problem with this habitat is nutrient pollution from phosphates and nitrates (A25, A26, J01). Although these are primarily from agricultural sources, there is also historic phosphorus pollution of lake sediments originating from now diverted sewage treatment works at one large site (Bosherston Lakes Eastern Arm). On Anglesey, two small kettle-hole lakes have been affected by changes to drainage patterns resulting in polluted and relatively low alkalinity water entering the lakes. This has resulted in major changes to lake ecology. Invasive species (I02), notably the non-native Elodea canadensis, frequently reach high cover in these water bodies. At Kenfig Pool, increasing Canada goose Branta canadensis numbers are causing nutrient problems. Fishery management (G08) is a pressure at Bosherston Lakes and Kenfig Pool. Although both fisheries are well managed, fishery management interacts strongly with nutrient pressures and so great care needs to be taken to ensure suitable management of fisheries into the future. Threats: The threats are considered to be largely the same as the pressures, though fishery management issues are likely to intensify as warmer temperatures will result in increased recruitment of coarse fish. Bosherston, which is only just above sea level, is at risk from sea level rise. The invasive killer shrimp Dikerogammarus villosus is established at Eglwys Nunnydd Reservoir, close to Kenfig Pool. Although biosecurity measures are in place at Eglwys Nunnydd, there is a risk that it may spread to Kenfig Pool by natural means. The highly invasive Lagarosiphon major also occurs in Bosherston Quarry, close to the Lakes.
8.5 List of main conservation measures	At Bosherston Lakes, action is needed to control the nutrient impacts in the Eastern Arm (CJ01). This large section of the lakes has suffered significantly from nutrient pollution, and although the main sources are under control, large amounts of phosphorus remain in the bottom muds. It is possible that mud pumping or treatment with a product such as Phoslock may be needed to restore natural processes. Agricultural impacts are partly controlled via a Nitrate Vulnerable Zone covering the catchment, but it is not certain that NVZ measures can deliver sufficient nutrient reductions to reach favourable status. It is possible that further measures may be needed (CA10, CA11). Tidal flaps need to be installed in the outflow dam to lessen the risk of storm surges causing seawater to overtop it (CN02). Control measures for E. canadensis at Bosherston should be investigated (CI03): however, reductions to nutrient levels (CJ01) should also help to achieve higher Chara cover. An attempt should be made to eradicate invasive Lagarosiphon major from Bosherston Quarry (CI03). At the Anglesey Fens, action is required to restore hydrological conditions so far as possible (CJ03/CJ04). By ensuring that these lakes are mainly or entirely groundwater-fed, the pH and alkalinity can be increased to levels where marl precipitation again occurs, and ingress of nutrient-rich silt can be prevented. At Kenfig Pool, carp removal (CG03) and control of Canada geese and Canadian pondweed need to be investigated (CI03). In addition, monitoring for killer shrimp should take place. Biosecurity measures at Eglwys Nunnydd have already been implemented. Ponds can currently be created in Glastir, the Welsh agri-environment scheme, but it is not clear if any are H3140. The creation of ponds suitable for supporting stonewort dominated habitats in limestone areas (CA07) should be encouraged by future agri-environment schemes. The rare starry stonewort Nitellopsis obtusa recently colonised Cosmeston Lakes, the first Welsh record. This species probably favours more eutrophic waters than is typical for H3140, and its arrival may reflect climate change.

9.1 Future prospects of parameters	9.1a Future prospects of -range. Negative. The future range of this habitat in Wales is fragile. Many grid squares contain extremely small patches of habitat and even the few larger areas are whole lakes that are vulnerable to an increasing number of pressures and threats (see section 7). Although there has been no reduction in range over the current reporting period, a substantial reduction in range could result from the loss of a few relatively small ponds. 9.1b Future prospects of - area. Unknown. There is no reason to expect major areal losses of open water habitat in the foreseeable future. However, the problems in terms of structure and function mean that large areas of this habitat are at risk of becoming different lake types such as H3150. 9.1c Future prospects of - structure and function. Very negative. In Wales, very little of this habitat is in Good condition. Although management of catchments and fisheries has improved, long-term pressures and threats such as nutrient enrichment, invasive species and climate change mean that improving structure and function is a major challenge.
11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network	Minimum: 0.66km2 (72.9%) The minimum surface area includes only water bodies >1ha in extent, based on data from the UK Lakes inventory. Maximum: 0.73km2 The maximum surface area includes the digitised area of known stonewort ponds within the Natura 2000 network (4.74ha) plus a margin of 10% to allow for currently unidentified water bodies. It should be noted that although individually small in area, many small water bodies have high charophyte cover and are therefore disproportionately important for diversity and connectivity.
11.3 Surface area of the habitat type inside the network; Method used	Sites have been regularly monitored as part of CSM. These data indicate no loss of habitat area. The area of this habitat within the SAC network is reasonably well known. The main area of uncertainty relates to small water bodies (see below).
11.5 Short term trend of habitat area in good condition within the network; Method used	All relevant SACs have been monitored.