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:

H7230 - Alkaline fens

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	**7230 - Alkaline fens**

2. Maps

2.1 Year or period	1979-2014
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	Acreman, M.C., Blake, J.R., Mountford, O., Stratford, C., Prudhomme, C., Kay, A., Bell, V., Gowing, D., Rothero, E., Thompson, J., Hughes, A., Barkwith, A. and van de Noort, R. (2013). Guidance on using the Wetland Toolkit for Climate Change. A contribution to the Wetland Vision Partnership. Centre for Ecology and Hydrology, Wallingford. Averis, A.M., Averis, A.B.G., Birks, H.J.B., Horsfield, D., Thompson, D.B.A & Yeo, M.J.M. (2004). An Illustrated Guide to British Upland Vegetation. Joint Nature Conservation Committee. Birch, K.S., Jones, P.S., Bosanquet, S.D.S, Reed, D.K & Turner, A.J. (in prep). Application of vegetation survey data for detailed planning and implementation of rich-fen restoration on Anglesey and Llyn, north-west Wales. In: Hanson, J., Jones, P.S. & Farr, G. (in prep.). The Anglesey & Llyn Fens LIFE Project: Proceedings of the Technical Workshop held in October 2013. Natural Resources Wales, Bangor. Birch, K.S., Guest, J.E., Shepherd, S., Milner, P, Jones, P.S. & Hanson, J. (2015). Responses of rich-fen Annex 1 and related habitats to restoration and management undertaken as part of the Anglesey & Lleyn Fens LIFE Project. Final Report of the Anglesey & Lleyn Fens LIFE Project, Technical Report No. 7. Birks, H.J.B. & Ratcliffe, D.A. (1980). Classification of upland vegetation types in Britain. Nature Conservancy Council, Edinburgh Blackstock, T.H., Howe, E.A., Stevens, J.P., Burrows, C.R. & Jones, P.S. (2010). Habitats of Wales: a comprehensive field survey, 1979-1997. University of Wales Press, Cardiff. 229 pp. Diack, I. (2016). Favourable Conservation Status, England Contribution: H7230 Alkaline Fens. Natural England, Peterborough. Farr, G. Whiteman, M., Jones, P.S. & Breen, R. (in prep.) , Wetlands and the Water Framework Directive: Key challenges for achieving good ecological status at the Anglesey and LLyn Fens SACs. In: Hanson, J., Jones, P.S. & Farr, G. (in prep.). The Anglesey & Llyn Fens LIFE Project: Proceedings of the Technical Workshop held in October 2013. Natural Resources Wales, Bangor. Farr, G., Hall, J.,Jones, L., Whiteman, M., Haslam, A. & Philips, N. (2018). Source apportionment of nutrient pressures at groundwater dependent wetlands: Case studies from England and Wales. Report to the Environment Agency; British Geological Survey Internal Report Reference OR/17/021.

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4. Range

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

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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	Improved knowledge/more accurate data The change is mainly due to: Improved knowledge/more accurate data	
4.12 Additional information		

5. Area covered by habitat

5.1 Year or period	1979-2014		
5.2 Surface area (in km²)	a) Minimum	b) Maximum	c) Best single value 1.387
5.3 Type of estimate	Best estimate		
5.4 Surface area Method used	Based mainly on extrapolation from a limited amount of data		
5.5 Short-term trend Period	2007-2018		
5.6 Short-term trend Direction	Decreasing (-)		
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used	Based mainly on extrapolation from a limited amount of data		
5.9 Long-term trend Period	1994-2018		
5.10 Long-term trend Direction	Uncertain (u)		
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used	Insufficient or no data available		
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	Improved knowledge/more accurate data The change is mainly due to: Improved knowledge/more accurate data		
5.15 Additional information			

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum 0.033	Maximum 0.033
	b) Area in not-good condition (km²)	Minimum 0.519	Maximum 0.519
	c) Area where condition is not known (km²)	Minimum 0.835	Maximum 0.835
6.2 Condition of habitat Method used	Based mainly on extrapolation from a limited amount of data		
6.3 Short-term trend of habitat area in good condition Period	2007-2018		

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6.4 Short-term trend of habitat area in good condition Direction	Increasing (+)
6.5 Short-term trend of habitat area in good condition Method used	Based mainly on expert opinion with very limited data
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
Abandonment of management/use of other agricultural and agroforestry systems (all except grassland) (A07)	H
Extensive grazing or undergrazing by livestock (A10)	H
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Mixed source air pollution, air-borne pollutants (J03)	H
Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02)	H
Conversion into agricultural land (excluding drainage and burning) (A01)	M
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	M
Other industrial and commercial activities and structures generating point pollution to surface or ground waters (F15)	M

Threat	Ranking
Abandonment of management/use of other agricultural and agroforestry systems (all except grassland) (A07)	H
Extensive grazing or undergrazing by livestock (A10)	H
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Mixed source air pollution, air-borne pollutants (J03)	H
Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02)	H
Conversion into agricultural land (excluding drainage and burning) (A01)	M
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	M
Other industrial and commercial activities and structures generating point pollution to surface or ground waters (F15)	M
Droughts and decreases in precipitation due to climate change (N02)	M

7.2 Sources of information

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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, but none yet taken
8.2 Main purpose of the measures taken		
8.3 Location of the measures taken		
8.4 Response to the measures		
8.5 List of main conservation measures		

Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures (CA04)

Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes (CL01)

Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)

Restore habitats impacted by multi-purpose hydrological changes (CJ03)

Manage drainage and irrigation operations and infrastructures in agriculture (CA15)

Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land (CA01)

Adapt/manage extraction of non-energy resources (CC01)

Reduce impact of mixed source pollution (CJ01)

Manage/reduce/eliminate air pollution from resource exploitation and energy production (CC10)

Reduce/eliminate air pollution from agricultural activities (CA12)

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

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (in km² in biogeographical/ marine region)	a) Minimum b) Maximum c) Best single value 0.55
11.2 Type of estimate	Best estimate
11.3 Surface area of the habitat type inside the network Method used	Based mainly on extrapolation from a limited amount of data
11.4 Short-term trend of habitat area in good condition within the network Direction	Increasing (+)
11.5 Short-term trend of habitat area in good condition within network Method used	Based mainly on expert opinion with very limited data
11.6 Additional information	

12. Complementary information

12.1 Justification of % thresholds for trends	
12.2 Other relevant information	

Distribution Map

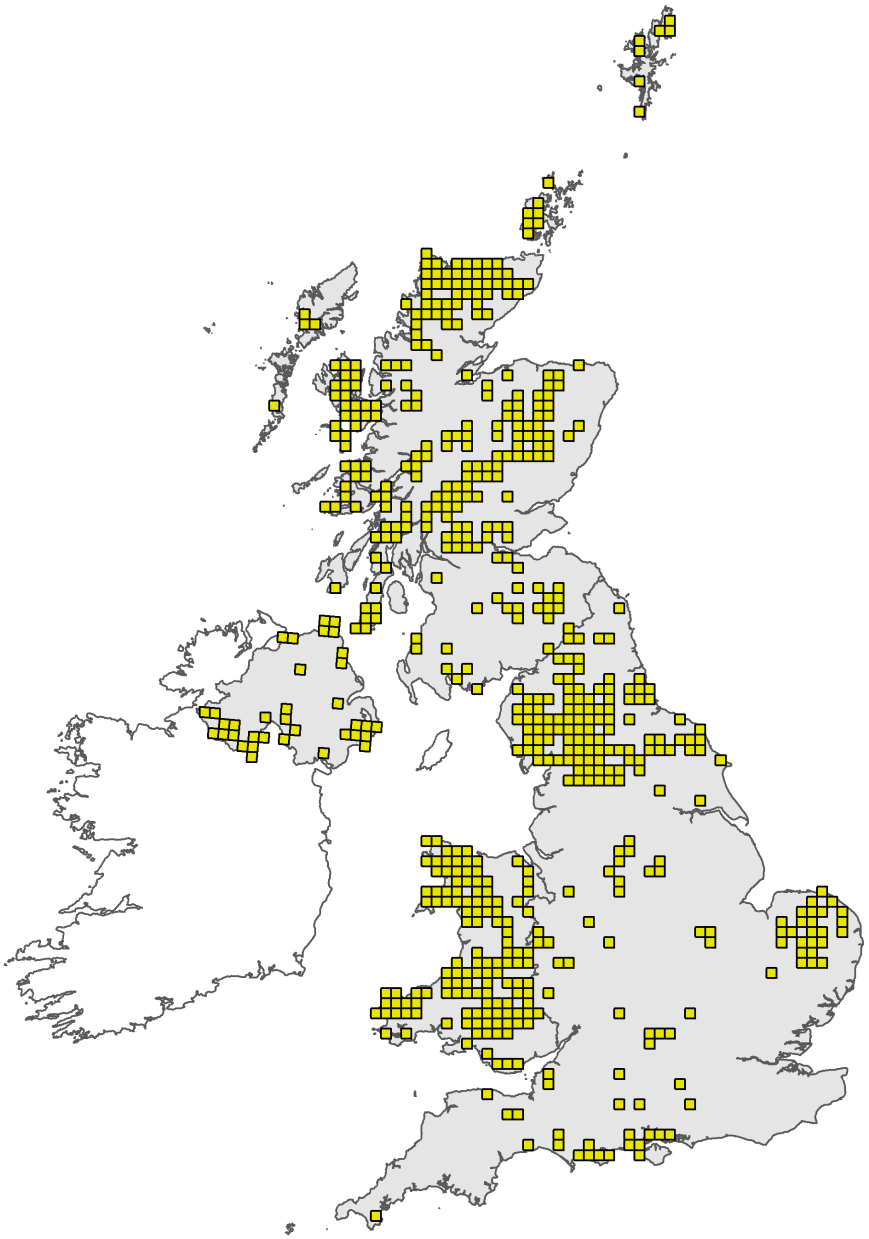

Figure 1: UK distribution map for H7230 - Alkaline fens. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

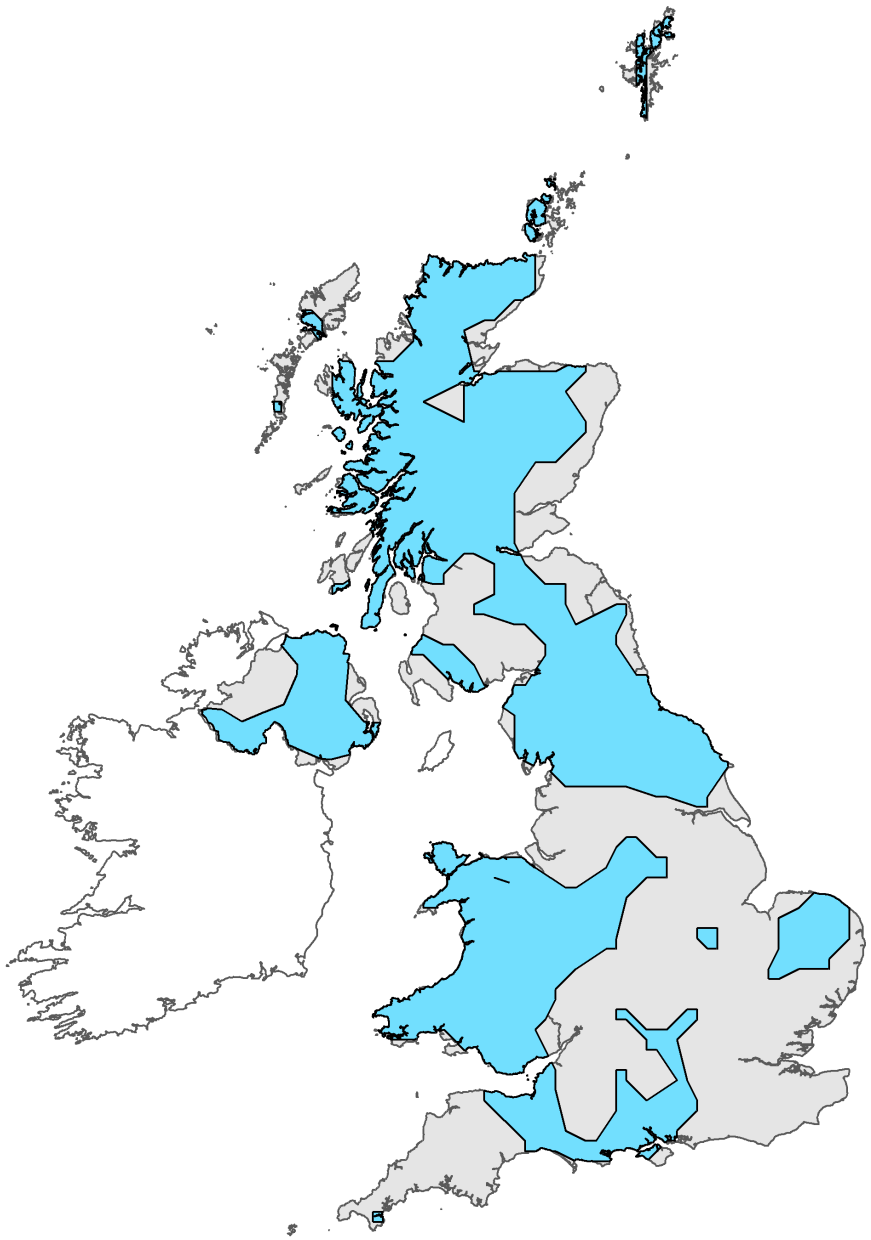

Figure 2: UK range map for H7230 - Alkaline fens. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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: 7230

Field label	Note

2.3 Distribution map; Method used	The distribution map provided for this habitat is a slightly revised version of the new map for this habitat used for the 2013 Article 17 reporting round (Stevens, 2012a), with four new hectads added from the Lowland Peatland Survey of Wales (LPSW) (Jones et al., 2011) for SH37, and the Lowland Grassland Survey of Wales (LGSW) (Stevens et al., 2010) for SH24, SH68, & SN44. The definition of this habitat is considered in more detail in Stevens (2012) and Jones et al (2012). The distribution map is based on GIS analysis of Phase 2 (plant community level) and Phase 1 data. Phase 2 mapping yields polygon records assigned to NVC communities/sub-communities and non-NVC units mapped to 1:2500 and transferred to a Mapinfo and then subsequently an ArcGIS platform. Polygons (whether relating to individual vegetation types or mosaics) for plant communities/sub-communities judged as conforming to this habitat have been selected and used to create a GIS inventory for this habitat. It is anticipated that most hectad occurrences of the NVC community M13 Schoenus nigricans mire in Wales have been captured in the data presented here: coverage for the lowland SAC resource for this key component of alkaline fen is believed to be near complete. However, many lowland sites (particularly highly vulnerable non-statutory examples) remain un-surveyed, so information on extent is incomplete. Many examples of M10 still lack survey coverage. The 2018 map is based on the 2707 records ('records' in this context refer to individual pure or mixed polygons containing this habitat and based on field mapping evidence) for H7230 from the 2012 inventory, together with a further 54 records from the LGSW and LPSW (2761 in total). These 'new' records are a blend of genuinely new records resulting from field survey undertaken since 2012, as well as records for H7230 plant communities recorded by the LGSW which were not included in the 2012 inventory. The main record elements are described further below. M9 (136 records, 1989-current). Records for M9 from the LPSW for data up until 2012 were accepted from the following contexts: all soligenous fen or alkaline flush records and records for topogenous or unclassified fen, but only where lacking Cladium mariscus (the presence of Cladium would indicate placement in H7210). This resulted in 118 records. Records for M9 from the LGSW were not included in 2012. A further 18 M9 records have been added through inclusion of the Lowland Grassland Survey of Wales records (12 records, 1989-2003) and a further 6 LPSW records spanning the date range 2000-2014. Records included since 2012 include stands of M9 in all contexts. M10 (1775 records, 1987-current). Data for the 2012 report included all records for the M10 Carex dioica - Pinguicula vulgaris mire community collected by the Lowland Grassland Survey of Wales 1987 - 2004 (Stevens et al., 2010) - 1338 records, the Lowland Peatland Survey of Wales 2004 - ongoing (Jones et al., 2011) - 144 records, the Lowland Heathland Survey of Wales 1993-2001 (Sherry, 2007) - 12 records, and Phase 2 (community level) surveys of upland vegetation undertaken for the following sites: Mynydd Eglwyseg (2002) - 6 records, Glydeiriau (1996-1998 & 2002) - 70 records, Mynydd Llangatwg-Mynydd Llangynidr (2003) - 27 records, Migneint - Dduallt (2002) - 19 records, Mynydd Preseli SSSI (2004-5) - 107 records, Brecon Beacons SSSI (2004) - 4 records, Carneddau (2002) - 38 records, Elenydd (1994-2000) - 6 records - see Stevens (2012a) for further details. The 2018 report includes 4 additional records from the Lowland Peatland Survey of Wales. In essence, M10 is regarded as conforming to H7230 in all ecological situations. This is the most widely distribution element of H7230 in Wales and accounts for a majority of the hectad records. M13 (787 records 2004-current). Data for the 2012 reporting round were confined to 684 records from the Lowland Peatland Survey of Wales, and included all examples in soligenous contexts and all topogenous and unclassified examples where lacking Cladium mariscus (the latter would indicate placement in H7210 instead). M13 records for the Lowland Grassland Survey of Wales were not considered in 2012 but these have now been added, contributing a further 13 records for examples of this plant community in all contexts. Some records for M14 have also been included. Basic flush (E.2.2) (Lowland component of Phase 1 Survey, 1987-1997, 55 records). Records for basic flush (E.2.2) for the lowland element of the Habitat Survey of Wales (Blackstock et al., 2010) were used, subject to comparison of

	polygons against the Phase 1 scans to make sure they were coded 'B' (basic) in the original map (Stevens, 2012a). This data-source yielded 55 records. There is some concern that this might include habitat falling outside the Annex I definition, but even if this is sometimes the case the amount is unlikely to be significant. Ratcliffe & Birks categories H3F, H3G (Upland Vegetation Survey component of Phase 1 Survey, 1979-1989): Data used here also include upland records for two Birks & Ratcliffe (1980) communities from the Upland Vegetation Survey of Wales (included as part of the overall Habitat Survey of Wales, Blackstock et al., 2010a), namely H3f Carex nigra - brown moss communities (included in the lists of synonyms for M10 by Averis et al., 2004) and H3g sub-montane Carex rostrata - brown moss mire (~M9 sensu Averis et al). These data amounted to 13 records for the following sites; Black Mountains, Brecon Beacons, Cothi Twyi & Mynydd Mallaen, Halkyn Mountain, Berwyn, the Arans, and Cadair Idris. Other sources of recent evidence were checked to determine if further hectad records could be added. Survey work in support of the Wylfa Newydd application on Anglesey (Horizon Nuclear Power, 2018) has yielded important new site records for M13, but no new hectads. Phase 1 data was only used where NVC survey information was lacking and the overwhelming majority of records (2693 or 97.5%) are based on high quality Phase 2 (plant community [NVC] level) survey undertaken in-house as part of the LGSW and LPSW programmes, and as part of the mainly out-sourced Lowland Heathland and Upland Habitat NVC Surveys. All of the Phase 2 data post-dates 1987. The LPSW is still ongoing and further significant lowland records for this habitat will arise leading up to completion of the Lowland Peatland Survey of Wales programme. Further survey effort for this habitat is required to update and revise the increasingly ageing combined Phase 2 dataset and to characterise priority un-surveyed sites: survey of upland calcareous flushes remains a critical gap given the significant gaps in upland NVC survey coverage. Together these sources provide records for 120 hectads in Wales and a reasonable impression of the distribution of this habitat, but for the reasons identified here the overall dataset is not regarded as comprehensive. The 2012 data and the additions used for this reporting round (2018) are contained in Jones (2018a).

Habitat code: 7230 Region code: ATL

Field label	Note
4.3 Short term trend; Direction	See 4.11
4.11 Change and reason for change in surface area of range	The change is due to the addition of records for four hectads which are in addition to those noted during the 2012 reporting round. These new hectad records still lie within the overall distribution envelope of this habitat in Wales so the overall change is relatively insignificant.

5.2 Surface area	The extent estimate for H7230 is based on the GIS inventory developed by Stevens (2012a) and described under section 4 above. The original estimate of 120.54 ha has been revised to 138.7 ha by adding records totalling 18.23 ha from the Lowland Grassland and Lowland Peatland Surveys - see section 2 above and Jones (2018a). The current figure is close to the 140 ha estimate for basic flush across Wales resulting from the Habitat Survey of Wales (Blackstock et al., 2010). Inevitable uncertainty surrounds the extent estimate of 1.387 km2. Firstly, this figure excludes a number of known locations for H7230 which remain un-surveyed by the Lowland Peatland Survey - these include a number of sites for M13 within the Anglesey heartland of this element of the habitat in Wales. Second, much of the data on which this estimate is based derives from survey undertaken some time ago: 99.1% of the extent data for H7230 arise from surveys undertaken prior to the last reporting round (date range 1984-2011), with 51.5% (71.54 ha) arising from surveys undertaken in excess of 20 years ago (date range 1984-1997) and 89.2% (123.7 ha) from survey data at least a decade old (date range 1984-2007). Loss of habitat or reductions in habitat area are known to have occurred at a number of surveyed sites and a much better system for systematically monitoring and documenting losses is urgently required. Finally, some data from Lowland Peatland Survey sites have yet to be added to the inventory. The core community composition of H7230 in Wales breaks down as follows: 5.6 ha of M9, 38.6 ha of M10, 30.6 ha of M13 and 2.4 ha of M14. The M13 resource is of particular concern and interest given the recent losses of this habitat and the ease with which it becomes degraded as a result of lack of or inappropriate management. A total of 716 polygons of this community have been recorded by the Lowland Grassland and Lowland Peatland Surveys of Wales (excluding Cors Geirch) across a total of 31 sites. The vast majority of the M13 resource (30.3 ha) is centered on Anglesey and Llyn. The national (UK) significance of the Anglesey and Llyn resource is highlighted by comparison with the estimated total area of M13 in England (Diack, 2016) which ranges from 20 ha of habitat \'unambiguously referable to M13\' to a total calculated polygon area of 31.9 ha and another 7 ha of vegetation with affinities to M13.
5.7 Short term trend; Magnitude	This assessment is based on the known almost complete loss of this habitat from two Anglesey sites since 2007 (LGSW sites SH48/2 Graigfryn and SH48/4 Brynteg Meadows), coupled with loss of habitat due to dereliction.
5.14 Change and reason for change in surface area	Expansion of this habitat has occurred in response to the Anglesey & Lleyn Fens LIFE project actions. Definate loss of habitat (M13) has occurred on at least one Anglesey site since the last reporting period (Ratcliffe, 2017) - this is due to agricultural improvement. Loss at other non-statutory sites is suspected but cannot be quantified due to lack of survey evidence. The extent estimate has actually risen since the last reporting round due to the availability of new survey information and more detailed analysis of survey data collected prior to the 2012 reporting round.
6.1 Condition of habitat	The derivation of these figures in based on Jones (2018b). This assumes that for any SAC site where this feature is judged as unfavourable (see 6.2 below) then the whole feature area is unfavourable on that site. The total extent of the H7230 resource within the SAC series is estimated as 55.2 ha in this reporting round (Milner, 2018) - this figure has been derived using a GIS overlay of SAC boundaries on the H7230 habitat inventory and is more accurate than the extent figures for H7230 given in the N2K data-sheets. For the Corsydd Mon SAC, an estimated 10% of the area of H7230 (3.3 ha out of a total of 33.4) has been assessed as in Favourable Condition following the application of the Anglesey & Llyn LIFE project actions (Hanson, 2015), based on a combination of expert judgement and site visits (P.S. Jones) supported by the trends of improvement in condition noted by Birch et al. (2015). The remaining area of this habitat in the SAC series (55 ha) is regarded as being in Unfavourable Condition for the reasons given above. The difference between these figures and the total estimate extent of H7230 in Wales (138.7 ha) is 83.5 ha and has to be regarded as being in unknown condition due to lack of data.

6.2 Condition of habitat; Method used	Assessment of structure and function within SACs is based on the results of common standards monitoring visits undertaken between 2007 and 2012 (NRW, 2018a). The spreadsheet cited as NRW (2018a) has been analysed to extract monitoring data for SAC sites for alkaline fen features graded as A-C. The related spreadsheet NRW (2018b) has then been checked to see if any monitoring results have been reported which do not figure in NRW (2018b). SAC monitoring data indicates this feature is in unfavourable condition on the 7 Welsh SACs where it occurs as a B-C graded feature. Condition was assessed as favourable - unclassified on Mynydd Preseli, but this dates from December 2004 and only low confidence can be attached to its applicability in this reporting round. Only two sites have been formally assessed since the last reporting round - Cwm Cadlan (B feature - Wilkinson, 2017a) and Gweunydd Blaencleddau (C feature - Wilkinson, 2017b), with judgements of Unfavourable - unclassified for both. The assessment of the area of this habitat in good condition is based on the rationale given above under 6.1.
6.4 Short term trend of habitat area in good condition; Direction	This is based on the judgement that the area of H7230 in good condition on the Anglesey & Llyn Fens has expanded. Continuation of this trend is contingent on continuation and expansion of the current programme of after-LIFE site management actions (subject to extra resourcing).

7.1 Characterisation of pressures/ threats

Overview Analysis of Pressures and Threats has utilised a number of data sources, with NRWs Action Database (NRW, 2018c) serving as a critical resource. This provides information on 'issues' affecting habitats and species within the protected sites series in Wales and contains a total of 595 management issue entries against the 'alkaline fen' feature description, of which 461 management issues remain categorised as 'C' and requiring ongoing control. These apply across a total of 100 management units (many units have more than one management issue recorded) on 16 SSSI, including all of the SACs for which this habitat is a feature. References to individual management issues against the pressures and threats considered below are usually expressed as a percentage (in brackets) of the 100 total management units figure. Restricting the search term to 'alkaline fen' means that only data for SAC SSSI are reported here - this amounts to 55.2 ha or only 39.8% of the Welsh resource of H7230. These data are thus not wholly representative of the wider resource as it is to be expected that conservation measures would better mitigate pressures and threats inside the SAC series. However, use of the more general 'Flush and spring -soligenous mire' and 'Fen - topogenous mires in valleys, basins and flood plains' search terms would lead to many more records and apply to fen habitats other than H7230. Pressures: A07. Abandonment of management/use of other agricultural and agroforestry systems (all except grassland). This is closely linked to A10, with insufficient cutting/mowing acknowledged as an issue on 44 units across 12 SSSI, 11 of which lie within the Anglesey Fens or Llyn Fens SAC (NRW, 2018). Insufficient cutting/mowing is recognised as a high priority and high urgency issue on the Corsydd Mon and Corsydd Llyn SACs in the Prioritised Improvement Plans for these sites and as a high priority in the Gweunydd Blaencleddau PIP. Cutting/mowing (sometimes in conjunction with controlled burns) are a necessary prerequisite for achieving sustainable grazing of this habitat. Lack of burning management is also covered under this heading and affects 10 units across 4 SSSI. Habitat fragmentation is cited as an issue for 34 units and 10 SSSI and relates to a combination of this pressure but also AO1. A10 Extensive grazing or undergrazing by livestock Management neglect remains a key factor for this habitat, resulting typically in over-dominance of graminoids to the detriment of low-growing short-sedges, dicots and bryophytes: this also has an important impact on a wide range of specialist and often rare invertebrate species, particularly those which require some exposed wet substrate such as the soldierfly Stratiomys chamaeleon and the Southern Damselfly Coenagrion mercuriale (Howe, in prep.). This pressure was a major factor on the Anglesey & Llyn Fens SAC sites at the start of the LIFE project (Hanson, 2015) and the project demonstrated the restoration of derelict H7230 using combinations of mowing and then grazing. However, achieving appropriate grazing regimes can be difficult, particularly on sites under third party management/ownership where nature conservation is not the primary driver, but also on areas under NRWs management where resources constrain the extent of after-LIFE actions on the Anglesey & Llyn sites; consequently, this pressure has remained a key factor throughout the 2013-18 reporting period. Insufficient grazing is cited as an issue on 23 units (23% of all units with alkaline fen) across 12 SSSI (NRW, 2018c). Grazing type or timing affects 57 units (57%) on 13 SSSI: these two issues together overlap (i.e. some SSSI units have both issues cited) and in total 72 units on 16 SSSI (i.e. all SSSI recorded in NRW [2018c] as supporting the Annex I habitat feature in Wales) have one or both of these issues recognised. The situation is less clear-cut for the SACs: grazing type and/or timing and /or insufficient grazing are listed as medium or high priority issues in the respective Prioritised Improvement Plans (PIPs) on 5 of the 6 SACs on which this habitat occurs as a feature (with urgency scores of medium or high for five of the sites), but insufficient grazing alone is only regarded as a medium or high priority issue for three of the sites. This is not considered to represent the true scale of this pressure - for example under-grazing of H7230 is a locally significant issue on Corsydd Llyn but this pressure is scored as low in the PIP. A26 Agricultural activities generating diffuse pollution to surface or ground waters Inorganic nitrogen concentrations in groundwater still exceed the site-

specific threshold for N in groundwater for at least parts of the H7230 resource (Farr et al., 2018), with agriculture the most likely immediate source (SWS, 2010; Farr et al, in prep.). This is reflected by the currently 'poor' overall status of both the Ynys Mon Central Carboniferous Limestone (WFD Water Body Identification Number GB41001G204200) and Llyn & Eryri (GB41002G204600) groundwater bodies, in both cases due to chemical (enrichment) pressures (NRW, 2018d). Water pollution from diffuse sources is cited as an issue for 22 units (22%) across 6 SSSI (NRW, 2018c) and as a high priority and high urgency issue for the Corsydd Llyn Prioritised Improvement Plan (NRW, 2016a - its status as a low priority/low urgency issue in the Corsydd Mon PIP is regarded as erroneous - it should score 'High' for both based on the evidence above; 'agricultural run-off' is recognised as an important issue for the Anglesey fens [NRW,2014, 2016b]). The overall representation of A26 as an issue in NRW (2018c) is regarded as likely to have been under-recorded. Fertiliser use is recorded as an issue on 5 units across 4 SSSI in NRW (2018c) and the pressures A19 - Application of natural fertilisers on agricultural land and A20 - Application of synthetic (mineral) fertilisers on agricultural land can be considered as contributing factors even though neither is likely to be applied directly to H7230. JO3 Mixed source air pollution, air-borne pollutants Air pollution is cited as a current issue for 17 units across 3 SSSI (Cadair Idris, Cwm Cadlan and Preseli) in NRWs Actions Database (NRW, 2018c). This excludes the Corsydd Mon, Eryri, and Gweunydd Blaencleddau SACs where air pollution is cited as a medium or high priority and urgency issue for H7230 in NRWs Prioritised Improvement Plans (NRW, 2016). The extent of the H7230 resource in Wales subject to N deposition in excess of the critical load for this habitat (15 kg N/ha/yr) has been assessed using the approach of Guest (2012) and using updated deposition data, but based on the original 2012 extent figure of 120.54 ha. Using a data overlay method in ARC GIS (Kay, 2018), 71% of the habitat by area (polygon data) was recorded at or above the relevant lower Critical Load limit. L02 Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) This pressure is closely linked to A07 and A10 (and in many respects can be considered a consequence of these pressures and their interaction with JO3) and manifests mainly as the overdominance of key herbaceous species, and scrub encroachment into under-managed stands - this latter factor is cited as an issue on 33 units across 10 SSSI and is the reason for the judgement of Unfavourable condition for H7230 at Cwm Cadlan SAC (Wilkinson, 2017a). Overdominance by non-woody species is widespread, with dense growths of Molinia caerulea and Juncus sp. the cited reason for the feature being unfavourable at Gweunydd Blaencleddau (Wilkinson, 2017b) and this is a widespread issue affecting many sites. Lack of grazing typically leads to the development of very dense growths of Schoenus nigricans in M13 examples of H7230, and this remains a significant issue on the non NNR sections of the Anglesey & Lleyn Fens SAC, despite the advances achieved during the LIFE project (Hanson, 2015). Overdominance by these non-woody taxa is probably the most common reason for failing condition in H7230 across Wales. AO1 Conversion into agricultural land (excluding drainage and burning) Attempts to increase the agricultural productivity of sites supporting H7230 resulted in three cases being subject to enforcement measures during the current reporting period and under the Welsh Governments Environmental Impact Assessment (Agriculture) (Wales) Regulations 2017 (Welsh Government, 2017). All three sites were on Anglesey and all three affected M13. Ongoing impacts remain at 2 of the 3 sites (June 2018). CO1. Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) This is cited (as 'Aggregate extraction') as a medium priority high urgency issue in the Corsydd Mon PIP (NRW,) and a current issue for two units within the Cwm Cadlan SAC (NRW, 2018c); the issue for both sites concerns the current and ongoing extraction of Carboniferous Limestone from quarries closely adjacent to the two SACs and consequent potential hydrological impacts. The pressure F15. Other industrial and commercial activities and structures generating point pollution to surface or ground waters is closely related and relates to infill of part of the quarry void at the site adjacent to Corsydd Mon and the

potential for leachate entering part of the SAC. N02 - Droughts and decreases in precipitation due to climate change N01 - Temperature changes (e.g. rise of temperature & extremes) due to climate change There is no specific evidence indicating impacts due to these pressures at the present time, though any such effects would be similar to the widely observed consequences of dereliction. Threats: These were assessed in a similar way to pressures. However, issues in the Actions Database which had been 'completed' or were 'underway' were not included in the assessment of threats. Threats related to insufficient management or management neglect (A07, A10 & I02) will continue for the foreseeable future due to the following principal factors: (i) lack of resources for promoting and funding management agreements on statutory sites under third party management, (ii) the inadequacy of current mechanisms for promoting and where necessary enforcing the sustainable management of examples outside the protected sites series, particularly where these occur as small elements within otherwise intensively farmed contexts, and (iii) insufficient resources for bringing the whole NNR resource under restoration management. A26 Agricultural activities generating diffuse pollution to surface or ground waters Resolution of this threat requires comprehensive catchment-level integration of a range of existing and new measures aimed at reducing and mitigating nutrient inputs, coupled with much more intensive monitoring of groundwater and shallow marginal seepage pathways to determine the effectiveness of measures. This intervention is not currently underway or planned. JO3 Mixed source air pollution, air-borne pollutants Despite modest projected reductions in the overall deposition rates for atmospheric nitrogen in the UK, air pollution is expected to remain a High pressure (threat) to the habitat in Wales. A provisional analysis using projected exceedance data for 2030 indicates that the area of SAC (on which H7230 is a feature) which falls in areas where deposition is above the relevant critical load will not fall at all from the 2013-2015 estimate of 82.42% by 2030 (JNCC, 2018). N02 - Droughts and decreases in precipitation due to climate change The sensitivity of lowland fens in general is classed as 'High' by Natural England & RSPB (2014). Use of the Wetland Toolkit for Climate Change (Acreman et al., 2013;) indicates there is a 30% chance of a medium impact in terms of lowered mean annual minimum water levels for the M13 plant community (one element of H7230) in western Wales occurring between 2040 and 2069 under medium UKCP09 emissions scenarios (these are the scenarios included in the toolkit algorithm). Although this date range lies beyond the threat period covered by the next two reporting periods (2019-2030), use of higher emissions scenarios or more sensitive impact monitoring could feasibly conclude larger impacts and/or impacts occurring by 2019. DO 5. Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants). Development of the Wylfa B Nuclear Power Generating Station on Anglesey (if granted consent) poses a threat to one site supporting H7230 - Tre'r Gof SSSI - over the next two reporting periods (2019-2030). The threat is posed by hydrological and hydrochemical pressures posed by bedrock and superficial aquifer removal and dewatering and by dumping of over-burden adjacent to the site. The impact could involve degradation or loss of M13 H7230. The development company has identified compensation sites in an attempt to mitigate this loss, through creation/re-creation of M13 habitat, however.

8.5 List of main conservation measures	The majority of measures are not fully implemented. A total of 55.3 ha of this habitat is included within this SAC series (this figure is based on overlap of the GIS habitat layer on the SAC series and not the N2K data-forms areas), with a total notified area of 75 ha (Milner, 2018). CA04. Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures. This concerns the need to address insufficient grazing and the lack of cutting and in some cases burning on sites under third party management. Measures to address cutting/mowing have been registered as completed across 8 units on 6 SSSI, with insufficient grazing addressed on 21 units across 8 SSSI and grazing type/timing on 7 units across 5 SSSI (NRW, 2018c). The Anglesey & Llyn Fens LIFE project (Hanson, 2015) has successfully demonstrated the measures which need to be taken to restore derelict H7230 and these are being pursued within the NNR sections of the Corsydd Mon and Llyn SACs to some extent in the after-LIFE phase (see CL01) and also on some areas of third party ownership. However, some critical locations for H7230 remain effectively un-managed, including the Cors y Farl and Cors Bodeilio Common sections of the Corsydd Mon SAC and parts of Cors Goch within the same SAC, and further resources are needed to address this. CL01. Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes This is interpreted as pursuing essentially the same measures described above under CA04 but on land under NRWs direct management as NNRs. The after-LIFE phase of management is proving effective where it is being employed but needs to be extended through additional resources to cover the whole of the H7230 resource under direct conservation ownership/management. CA11 Reduce diffuse pollution to surface or ground waters from agricultural activities & CJ01 Reduce impact of mixed source pollution. This is the major measure required to reduce nutrient income to the sites supporting H7230 from both runoff and groundwater discharge - it applies mainly to Corsydd Mon and Corsydd Llyn. Evidence to date suggests that agri-environment measures have been ineffective in this regard, with limited uptake to the scheme and then limited application of measures within the scheme which might be used to reduce nutrient ingress. The Anglesey & Llyn Fens LIFE project has begun addressing this issue through the use of constructed wetlands on the edges of sites to intercept and remove nutrients; however this only deals with point-source inputs (addressed on just 3 units across 3 SSSI to-date, and remaining a current issue on 14 units across 6 SSSI, NRW [2018c]), and not the wider issue of diffuse pollution. Work done under the Anglesey & Lleyn Fens LIFE project (Hanson, 2015) enabled the production of unbiased Nutrient Efficiency Reports (NER) for 16 farms within the catchments of the Anglesey & Lleyn Fens SACs (Lathwood et al., 2015). Soil test results and nutrient efficiency studies identified opportunities at 12 out of the 16 farms to reduce the amount of fertilisers applied to the land. Subsequent contact with the participating farmers indicated that 12 of the 16 intended to change their nutrient management practice and adopt all of the NER recommendations. This represents a potentially highly cost-effective means of reducing leakage of excess nutrients into the fens from their catchments and is commended as an approach which could be utilised more widely under a Water Framework Directive Programme of Measures to address failing groundwater quality within the groundwater bodies underpinning the two SACs. However, in the after-LIFE phase we are uncertain how many of the participating farms subsequently implemented nutrient application reduction measures, and this needs to be followed up as part of a concerted and coordinated programme to use all available measures to seek nutrient reduction. However, a key finding of both the LIFE project and a technical workshop (Whiteman, 2011) held in 2010 to discuss catchment level intervention options for reducing nutrient loading within the groundwater bodies of the two SACs is that it is unclear whether the primary mechanisms which Natural Resources Wales could deploy within protected sites catchments will be sufficient to yield appropriate water quality in groundwater. This suggests the need for a new mechanism to operate off protected sites but within their catchments which offers financially realistic incentives for nutrient

	reduction measures. The combined catchment area of the Corsydd Llyn and Corsydd Mon fen sites is only 736 ha (Jones & Hanson, in prep.), so appropriate focussing of effort is achievable. Measures to address diffuse terrestrial pollution could be an effective means of reducing the impact of air pollution (CJ01) by reducing overall nutrient loading. CJ03. Restore habitats impacted by multi-purpose hydrological changes and CA 15 Manage drainage and irrigation operations and infrastructures in agriculture Significant progress has been made for these measures under the Anglesey & Llyn Fens LIFE project, but further intervention is required across both these SACs to address a wide range of hydrological impacts posed by agricultural drainage and the management of water courses and hydrological inputs. CA01. Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land. Damage and habitat loss of H7230 has occurred on at least three non-statutory sites on Anglesey alone since the last reporting period - in all cases due to agricultural intensification. Dialogue needs to be established with the owners/managers of all non-statutory sites for this habitat (and particularly all examples supporting M13) and incentives for securing positive management put in place. CC01. Adapt/manage extraction of non-energy resources Quarrying activity at one location poses a potential threat to this habitat within each of the Corsydd Mon and Cwm Cadlan SACs. The primary requirement for action here is to ensure monitoring of the effects of quarrying on groundwater levels is capable of detecting early changes which might be reversible through appropriate quarrying practice. 8. CC10 Manage/reduce/eliminate air pollution from resource exploitation and energy production, & CA12 Reduce/eliminate air pollution from agricultural activities. National regulations are in place but have been insufficient to prevent continued high levels of N deposition nationally (CC10) and locally increasing ammonia pollution from expansion of poultry units (CA12). The area of this habitat subject to critical load exceedance is not expected to reduce between now and 2030.
9.1 Future prospects of parameters	No significant change in range is expected. This assessment is based on two elements; the probable ongoing loss or contraction of stands of H7230 on non-statutory sites due mainly to pressure A01, and the contraction of stands due to successional change in under-managed/derelict examples. It is unclear to what extent this trend may be offset by expansion in the area of this habitat at Cae Gwyn (Cors Erddreiniog) which has been achieved as a result of the Anglesey & Llyn Fens LIFE project (see Jones et al., 2015). Increases in area due to new survey information are not considered here. This reflects the currently poor or unknown condition of the majority of the resource (see section 6) coupled with the relatively modest inclusion of this habitat in agri-environment and NRW management agreements. Glastir Advanced agreements only cover a maximum possible area of 17.9 ha of this habitat (Milner, 2018 - this figure assumes no overlap in prescriptions), with Glastir Entry covering a maximum possible area of 5.5 ha and Glastir Commons 50.1 ha; NRW management agreements extend to just 5.3 ha. This assessment also reflects the nature of the threats described under section 7 and the significant area of this habitat which lies outside the SSSI series; during the 2012 assessment the area of this habitat within SSSI including 'flush & spring - soligenous mire' as a feature was just 59.1 ha (<50% of the resource) and there has been minimal notification activity since
11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network	The estimate used for the 2012 reporting round was 0.53 km2. The difference is probably due to the inclusion of additional H7230 polygons resulting from survey since 2012: some of the difference may also result from the use of a different GIS platform (ARC as opposed to Mapinfo in 2012).

11.4 Short term trend of habitat area in good condition within the network; Direction	This assessment is somewhat challenging due to the lack of condition data for large parts of the habitat resource across the SAC series. Current SAC monitoring infers broader condition based on plot assessments at a limited number of stands and a more systematic assessment of all key stands of H7230 is required. There are two important but unquantified trends at play - namely that positive management in the after-LIFE phase is proving effective over part of the resource on the Corsydd Llyn and Corsydd Mon SACs, but that other parts of the resource on these SACs are in unfavourable condition due to either lack of resources or lack of/ineffective management by third parties.