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 species:

S1099 - River lamprey (*Lampetra fluviatilis*)

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 species, 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 species 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; (iii) the field was not relevant to this species (section 12 Natura 2000 coverage for Annex II species) and/or (iv) the field was only relevant at UK-level (sections 9 Future prospects and 10 Conclusions).
- For technical reasons, the country-level future trends for Range, Population and Habitat for the species 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 11 for Annex II, IV and V species (Annex B)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (Wales information only)**
1.2 Species code	**1099**
1.3 Species scientific name	**Lampetra fluviatilis**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	River lamprey

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2007-2018
2.3 Distribution map	Yes
2.4 Distribution map Method used	Based mainly on extrapolation from a limited amount of data
2.5 Additional maps	No

3. Information related to Annex V Species (Art. 14)

3.1 Is the species taken in the wild/exploited?	No	
3.2 Which of the measures in Art. 14 have been taken?	a) regulations regarding access to property	No
	b) temporary or local prohibition of the taking of specimens in the wild and exploitation	No
	c) regulation of the periods and/or methods of taking specimens	No
	d) application of hunting and fishing rules which take account of the conservation of such populations	No
	e) establishment of a system of licences for taking specimens or of quotas	No
	f) regulation of the purchase, sale, offering for sale, keeping for sale or transport for sale of specimens	No
	g) breeding in captivity of animal species as well as artificial propagation of plant species	No
	h) other measures	No

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3.3 Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit

b) Statistics/ quantity taken	Provide statistics/quantity per hunting season or per year (where season is not used) over the reporting period					
	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
Min. (raw, ie. not rounded)						
Max. (raw, ie. not rounded)						
Unknown	No	No	No	No	No	No

3.4. Hunting bag or quantity taken in the wild Method used

3.5. Additional information

BIOGEOGRAPHICAL LEVEL

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

Atlantic (ATL)

4.2 Sources of information

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5. Range

5.1 Surface area (km²)	
5.2 Short-term trend Period	
5.3 Short-term trend Direction	Stable (0)

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5.4 Short-term trend Magnitude	a) Minimum	b) Maximum
5.5 Short-term trend Method used		
5.6 Long-term trend Period		
5.7 Long-term trend Direction		
5.8 Long-term trend Magnitude	a) Minimum	b) Maximum
5.9 Long-term trend Method used		
5.10 Favourable reference range	a) Area (km²) b) Operator c) Unknown d) Method	
5.11 Change and reason for change in surface area of range	No change The change is mainly due to:	
5.12 Additional information		

6. Population

6.1 Year or period	2007-2018	
6.2 Population size (in reporting unit)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	2156
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit b) Minimum c) Maximum d) Best single value	
6.5 Type of estimate		
6.6 Population size Method used	Based mainly on extrapolation from a limited amount of data	
6.7 Short-term trend Period	2007-2018	
6.8 Short-term trend Direction	Unknown (x)	
6.9 Short-term trend Magnitude	a) Minimum b) Maximum c) Confidence interval	
6.10 Short-term trend Method used	Insufficient or no data available	
6.11 Long-term trend Period		
6.12 Long-term trend Direction		
6.13 Long-term trend Magnitude	a) Minimum b) Maximum c) Confidence interval	

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6.14 Long-term trend Method used	Insufficient or no data available	
6.15 Favourable reference population (using the unit in 6.2 or 6.4)	a) Population size b) Operator c) Unknown d) Method	2156 with unit N/A
6.16 Change and reason for change in population size	Use of different method The change is mainly due to:	 Use of different method
6.17 Additional information		

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (to maintain the species at FCS)?	No
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	Yes
7.2 Sufficiency of area and quality of occupied habitat Method used	Complete survey or a statistically robust estimate	
7.3 Short-term trend Period	2007-2018	
7.4 Short-term trend Direction	Unknown (x)	
7.5 Short-term trend Method used	Insufficient or no data available	
7.6 Long-term trend Period		
7.7 Long-term trend Direction		
7.8 Long-term trend Method used		
7.9 Additional information		

8. Main pressures and threats

8.1 Characterisation of pressures/threats

Pressure	Ranking
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	M
Modification of hydrological flow or physical alteration of water bodies for agriculture (excluding development and operation of dams) (A33)	M
Wind, wave and tidal power, including infrastructure (D01)	M
Hydropower (dams, weirs, run-off-the-river), including infrastructure (D02)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Development and operation of dams (K03)	H
Modification of hydrological flow (K04)	M
Physical alteration of water bodies (K05)	M

Discharge of urban waste water (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water (F12)	M
Change of habitat location, size, and / or quality due to climate change (N05)	M

Threat	Ranking
Modification of hydrological flow or physical alteration of water bodies for agriculture (excluding development and operation of dams) (A33)	M
Wind, wave and tidal power, including infrastructure (D01)	H
Hydropower (dams, weirs, run-off-the-river), including infrastructure (D02)	H
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Development and operation of dams (K03)	H
Modification of hydrological flow (K04)	M
Physical alteration of water bodies (K05)	M
Discharge of urban waste water (excluding storm overflows and/or urban run-offs) generating pollution to surface or ground water (F12)	M
Change of habitat location, size, and / or quality due to climate change (N05)	M
Other climate related changes in abiotic conditions (N09)	M

8.2 Sources of information

8.3 Additional information

9. Conservation measures

9.1 Status of measures

a) Are measures needed? Yes

b) Indicate the status of measures Measures identified and taken

9.2 Main purpose of the measures taken: Restore the habitat of the species (related to 'Habitat for the species')

9.3 Location of the measures taken: Both inside and outside Natura 2000

9.4 Response to the measures: Medium-term results (within the next two reporting periods, 2019-2030)

9.5 List of main conservation measures

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)
Reduce/eliminate point source pollution to surface or ground waters from industrial, commercial, residential and recreational areas and activities (CF04)

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9.6 Additional information

10. Future prospects

10.1 Future prospects of parameters	a) Range b) Population c) Habitat of the species
10.2 Additional information	

11. Conclusions

11.1. Range	
11.2. Population	
11.3. Habitat for the species	
11.4. Future prospects	
11.5 Overall assessment of Conservation Status	
11.6 Overall trend in Conservation Status	
11.7 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:
11.8 Additional information	

12. Natura 2000 (pSCIs, SCIs and SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network (on the biogeographical/marine level including all sites where the species is present)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	777
12.2 Type of estimate	Best estimate	
12.3 Population size inside the network Method used	Based mainly on extrapolation from a limited amount of data	
12.4 Short-term trend of population size within the network Direction	Unknown (x)	
12.5 Short-term trend of population size within the network Method used	Insufficient or no data available	
12.6 Additional information		

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13. Complementary information

13.1 Justification of % thresholds for trends

13.2 Trans-boundary assessment

13.3 Other relevant Information

Distribution Map

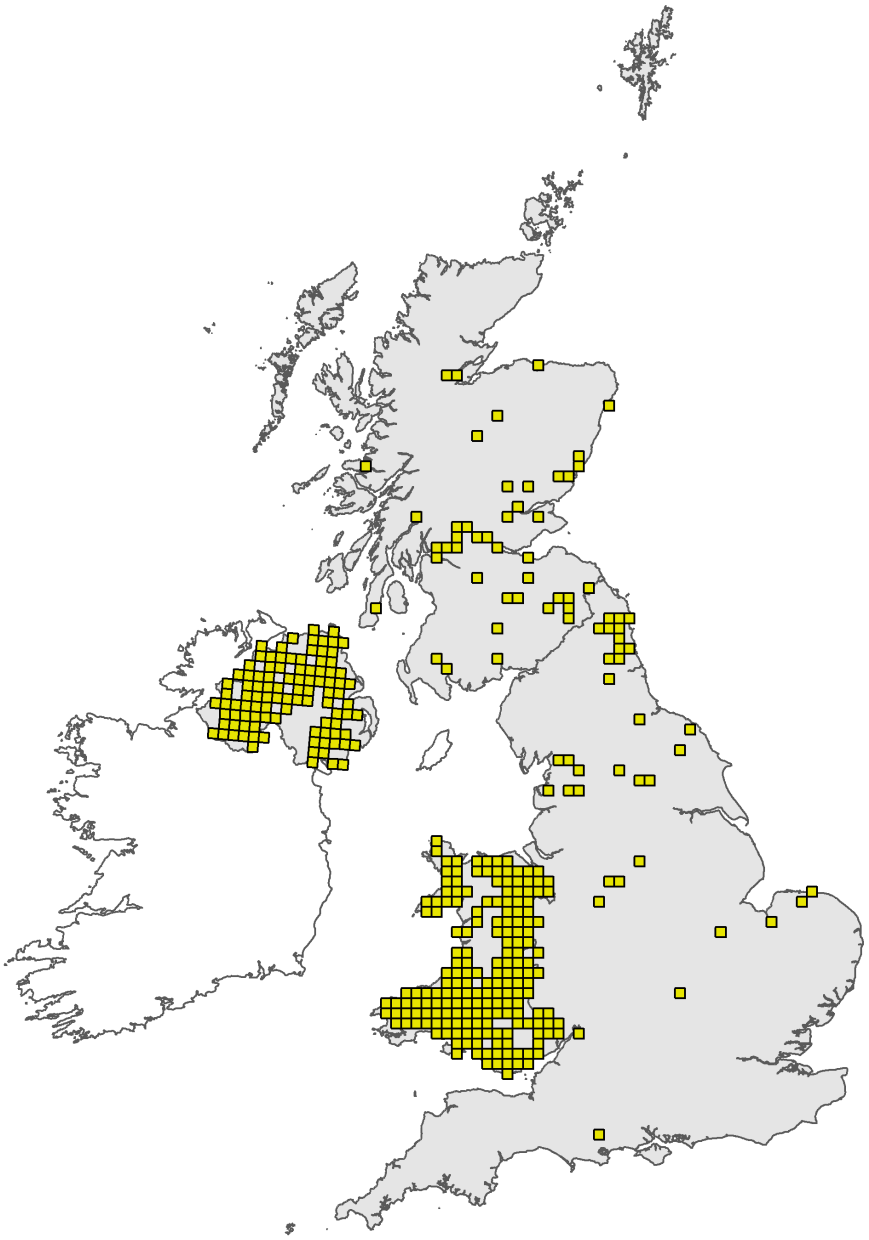

Figure 1: UK distribution map for S1099 - River lamprey (*Lampetra fluviatilis*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The 10km grid square distribution map is based on available species records within the current reporting period. For further details see the 2019 Article 17 UK Approach document.

Range Map

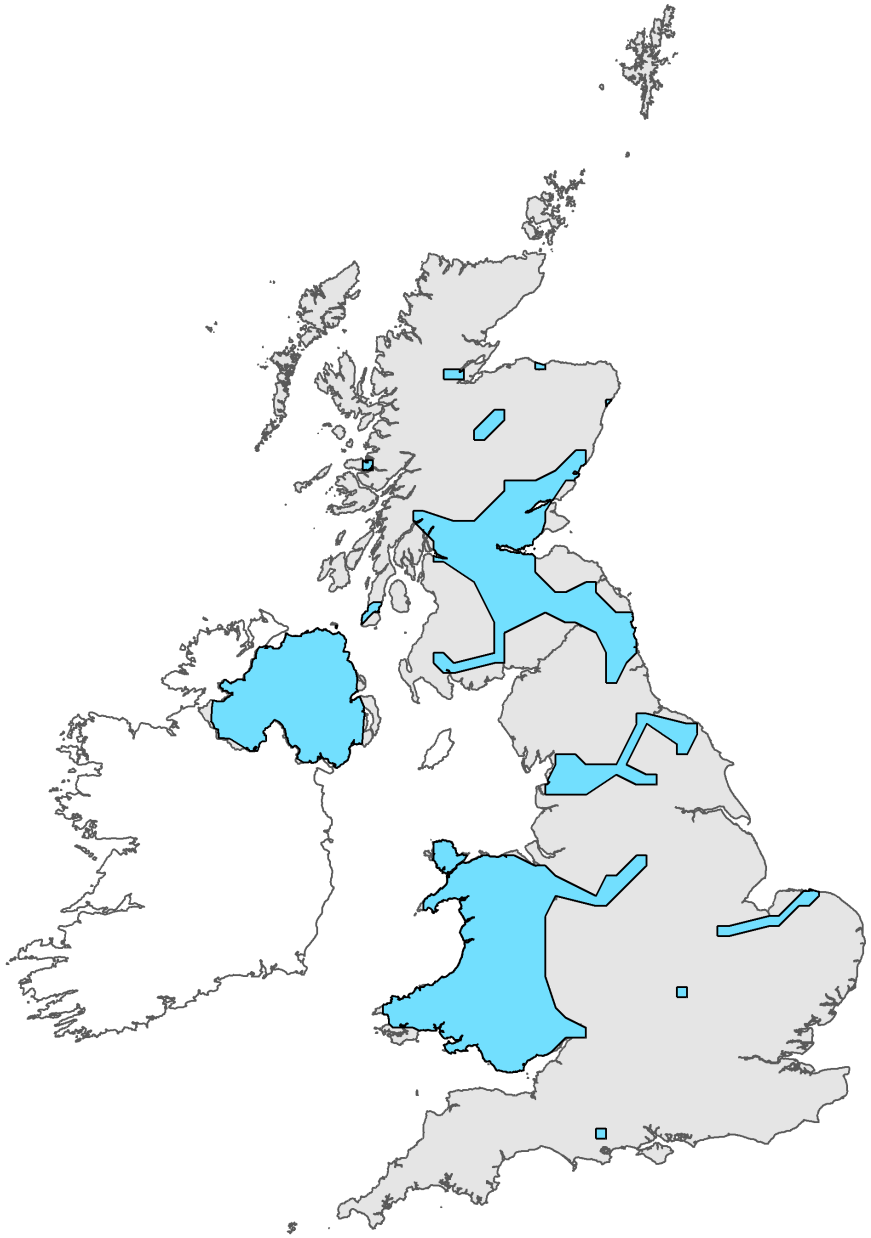

Figure 2: UK range map for S1099 - River lamprey (*Lampetra fluviatilis*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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 species was 25km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Species name: Lampetra fluviatilis (1099)

Field label	Note
2.4 Distribution map; Method used	Figures 2 & 4 respectively show the population size at 1 km square resolution and the population range at 10km square. The maps are based on records of larval river lamprey that have metamorphosed sufficiently to be identified to species level in the field (NRW, 2017). Data held by Welsh Local Record Centres and the Biological Records Centre were also checked and additional records were found. The connecting river corridor downstream of the occupied square was deemed to also be occupied and modelled at 1 km grid resolution (IAFG, 2017). This widespread species is expected to be present in the majority of water courses although it would be naturally absent from upland streams. It is not possible to distinguish between river lamprey & brook lamprey at the early larval life stage (Gardiner, 2003) and very few adult records are available. The larval stage lasts between 4 - 6 years and the morphology of each species becomes more distinguishable as they grow and metamorphose towards adulthood (Hardisty, 2006). These 'transformers' can often be identified in the field and these records confirm the presence of both brook and river lamprey. For example, in a River Dee lamprey survey 421 Lampetra larvae were caught of which five were 'transformers' identified as river lamprey and two as brook lamprey. (Teague et al, 2012). In a typical lamprey larva survey the number of transformers is always relatively low (Garrett, pers obs). The relatively small sample size of 'transformers' means that the population size and range may be under- estimated.
3.1 Is the species take in the wild/ exploited	There is some evidence of fishermen using lamprey as dead bait when angling for pike, zander, etc (Angling Times, 2017) but there is no commercial exploitation of lamprey in Wales for this market. All the 'lamprey eel' bait used in the UK seem to be imported from mainland Europe (Maitland, 2003).

Species name: Lampetra fluviatilis (1099) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	See 5.11
5.11 Change and reason for change in surface area of range	The evidence suggests that the range has not changed since the previous Article 17 reporting for Habitats Directive in 2013. A similar approach using a combination of records and modelled data was used in 2013 to calculate distribution (IAFG, 2017; NRW, 2013; 2017) (See Figure 3). In-river works for multiple fish species access, completed by NRW or others, during this reporting period may have improved access (NRW, 2018). Though for this particular species the evidence for impact on range is limited and consequently not deemed to have changed range. River lamprey are under-recorded in Wales and there is very little regular monitoring activity outside the SAC network. The range is therefore likely to be an underestimate.
6.2 Population size	(Total 1km2 count for Wales = 2,229 but includes 73 transboundary 1 km squares which JNCC have requested should be reported by NE) (NRW, 2017). This estimate includes both squares containing confirmed transformer and adult river lamprey records, and squares along the river network that they have either accessed to reach these squares or are considered likely to use (IAFG, 2017). The resulting count gives a judicious approximation, although probably an under-estimate, of the number of occupied 1km squares of river lamprey in Wales (See section 2, Figure 1).
6.3 Type of estimate	River lamprey are under-recorded in Wales so this is likely to be an under-estimate.

6.6 Population size; Method used	Lamprey data were extracted from the National Fish Populations Database (NFPD) 2007 - 2017 which consists of data collected by Environment Agency Wales & its successor body Natural Resources Wales (NRW, 2017). Using Arc View GIS, the records were converted to 1 x 1 km squares. Counts of 1 x 1 km grids with positive records (occupied) & assumed occupation were completed to calculate the population size. This data was interpreted using guidance agreed with Inter-Agency Freshwater Group (IAFG, 2018).
6.8 Short term trend; Direction	Also see 6.16
6.9 Short term trend; Magnitude	There is insufficent data available to assess the short term trend in Wales. There is no clear evidence of population decrease.
6.13 Long term trend; Magnitude	There is no clear evidence of population decrease.
6.15 Favourable reference population	2,156 km2 as best single value (Total 1km2 count for Wales = 2,229 but includes 73 transboundary 1 km squares which JNCC have requested should be reported by NE). A Favourable Reference Value (FRV) for population was detemined in agreement with JNCC and other SNCBs as part of this Article 17 reporting exercise. Note that field 6.15 a) ii is empty, as the spreadsheet will only accept numerical input in that field, so the unit km2 could not be entered.
6.16 Change and reason for change in population size	Presumed occupation was not calculated in 2013 so any apparaent increase in population size in 2018 is mainly due to the change in method.
6.17 Additional information	Population assessment is incomplete due to a lack of data for reproduction and mortality attributes, however, age structure could be assessed using larvae data from SAC river populations; age structure met the Common Standards Monitoring (CSM) criteria in all the SAC rivers where Lampetra species are a feature: Dee (Garrett, 2015),Teifi (Garrett, 2016a), Cleddau (Garrett et al, 2013a), Tywi (Garrett & Thomas, 2012), Usk (Garrett et al, 2013b) & Wye (Garrett, 2017). These results have been used to infer that the Welsh population is not deviating from a normal population recruitment pattern.
7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (to maintain the species at FCS)? NO - area = No, partial and permanent artificial barriers are thought to reduce river lamprey access to suitable freshwater habitat. -quality = water quality requirements in the freshwater and marine environment are unknown but it is assumed that Good Ecological Status (GES) is required (WFD classification). Most river waterbodies in Wales are on the Good / Moderate border. Transitional and coastal water bodies are also mostly classed as Moderate except Bury Inlet which is Poor (NRW, 2015; 2017a;2017b;2017c;2017d;2017e). Reasons for failure to reach GES include levels of Dissolved Inorganic Nitrogen, mercury compounds, tributyltin based biocides & organobromine compounds. Overall = No b) If NO, is there a sufficiently large area of occupied & unoccupied habitat of suitable quality (to maintain the species at FCS)? YES sufficient occupied = better habitat quality probably required. sufficient unoccupied = modifications to artificial river obstructions would allow access to additional suitable habitat. Overall = Yes River lamprey depend on different habitats at each stage in their complex life history. These habitats are: clean river gravels for spawning and organic silt & sand beds in shallow river water (< 1 metre) for the lengthy larval stage. Adults inhabit estuaries and shallow coastal waters where a wide range of prey fish species are available (IUCN, 2017). There is no reliable river lamprey freshwater habitat dataset for Wales although there is no reason to believe that extent of river lamprey is declining. There is very little known about river lamprey estuarine and coastal waters habitat and their quality requirements.

7.2 Sufficiency of area and quality of occupied habitat; Method used	Habitat quality was assessed using WFD 2015 river quality classification data for Wales (NRW, 2015). Due to limited range data no attempt was made to remove upland water bodies where lamprey may be absent. The applicability of river habitat data to river lamprey is uncertain but it was assumed that Good Ecological Status (GES) represented habitat quality sufficient to support the feature in favourable conservation status (JNCC, 2015). The ecological status of the 717 water bodies in Wales were classified as follows; 3 Bad (49km length), 55 Poor (523 km length), 374 Moderate (3837 km length), 286 Good (2736 km length), 0 High. In Wales most of the river habitat quality can be classed as close to the Good-Moderate boundary. River lamprey were present in water bodies of which 31 were rated Good (427 km length) and 54 classed as Moderate (776 km length). It appears that this species will tolerate Moderate water quality status although the level of tolerance would be affected by both the pressure type driving this classification and the altitude of the water body type (See section 2, Map 2). For example, Himalayan balsam (Impatiens glandulifera) and Japanese knotweed (Fallopia japonica) are both non-native invasive alien species which are frequently recorded on river banks. The growth habit of these plants supress the growth of native flora and the bare river banks are vulnerable to erosion when the non-native species die back in the Autumn. The exposed bare banks are likely to erode and the released sediment will detrimentally affect water quality and fish spawning habitat (NNSS, 2018a; 2018b). The quality of the river habitat was assessed on the three SAC rivers where lamprey is a feature: The two above invasive plant species were recorded in nine of the 16 waterbodies on the Afon Teifi, (Baxter et al, 2017), three out of five on the River Wye, and similarly two of the eleven waterbodies on the Usk. All three rivers failed to meet the CSM target (Garrett & Thomas, 2016; Garrett, 2016a). Lampetra larval density is estimated in optimal and sub-optimal habitat when assessing population condition using the Common Standards Monitoring (CSM) criteria. This analysis was done on the following SAC rivers: Dee, Teifi, Cleddau, Tywi, Usk & Wye. The Afon Teifi, Tywi, Dee & Wye met the density criteria whereas the Usk & Cleddau did not (Garrett et al. 2013a; 2015; 2016a; 2017; NRW, 2015. Thomas, et al. 2012). It is assumed that these population densities are indicative of suitable habitat availability for all the Lampetra populations across Wales. These results indicate that habitat quality is locally variable even across SAC rivers which represent the best sites in Wales.
7.5 Short term trend; Method used	We would not advocate comparison of changes in water body classification between reporting cycles as a method for assessing the availability of suitable habitats. There is uncertainty around presumed habitat occupation and whether 'moderate' status sustains an appropriate habitat. No appropriate repeat habitat survey datasets were available to analyse trends.

8.1 Characterisation of pressures/ threats	River lamprey are exposed to a variety of pressures, reflecting the wide range of habitats that they use for spawning, feeding & migration. Barriers to fish migration (river connectivity) (A33, D01, D02, K01, K03, K04, K05): Physical modifications (e.g. dams, weirs & other waterbody modifications) resulting in morphological changes & artificial barriers are the leading pressure on river lamprey in the freshwater & estuarine environment (Maitland, 2003). Other physical modifications to the water course, can affect instream carrying capacity by reducing wetted area, and changing the characteristics and dispersal of silts. Abstractions and discharges are regulated but physical modifications are unlikely to have been through a similar process so these impacts can be an issue when river restoration opportunities for fish arise. Modification or removal of artificial barriers that cause a permanent or temporary barrier to river lamprey migration will help enable access to additional habitat which may alleviate the impact of some of the additional pressures cited here. Other physical modifications to the water course can also affect instream carrying capacity by reducing wetted area, cover & food supply (JNCC, 2013). Climate change (N01, N05): Climate change is a pressure on both the freshwater & marine environment and the potential impact on river lamprey is uncertain. In rivers increased precipitation leading to unseasonal flooding and warmer than average river water temperatures could alter flow regimes and negatively affect habitat quality e.g. wash-out of silt beds during floods and / or habitat fragmentation due to drought (Lasalle & Rochard 2009). Marine ecosystems, in the Northeast Atlantic, have responded to ocean temperature changes by a shift towards a warmer regime leading to marked changes in the distribution of other fish species and oscillations in oceanic currents (Davidson & Hazlewood, 2007; Delworth et al, 2016). This could affect prey availability and quality for river lamprey. The overall impact on river lamprey populations is unknown although, as a thermophilous species, it is possible that some aspects of climate change could benefit the species (Moss, 2015: NRW, 2013). Diffuse pollution (A26, C11, F12, J01): diffuse sources of pollution were one of the leading reasons for WFD river water bodies being non-compliant for fish & failing to reach Good Ecological status. Diffuse pollution mainly arises from agricultural management, accidental discharges and some abandoned mines, especially those that release sediment into water courses (NRW, 2015). Point source pollution (J01, A25) discharges from waste water treatment works are a significant contributor in some localised areas. Certain agricultural practices are also implicated in point source pollution incidents although these have decreased in recent years (NRW, 2015).
9.5 List of main conservation measures	Access to freshwater habitat (CJ03): Measures to improve condition predominantly relate to modifications to flow regimes (especially abstraction consents), abstraction structures (Improvements to fish screening, reducing mortality), and alterations to migration barriers (Maitland, 2003). Fish pass installation opportunities are identified in the annual Sustainable Fisheries Programme by each NRW Operational area. Where possible, fish passes are designed to accommodate multiple fish species. Most schemes are realised through working in partnership with local authorities and other agencies or NGOs when wider projects arise (Charlesworth pers comm, 2018). Maintain / improve freshwater habitat quality: (CJ01, CJ04): Although river lamprey are not thought to be especially sensitive to pollution, in comparison to other fish species, the Water Framework Directive (NRW, 2015) and agri-environment measures (Emmett, et al. 2017) to improve biological quality and fisheries will continue to benefit river lamprey. Maintain / improve coastal water habitat quality (CF04): Through existing legislation and good practice suitable estuarine conditions should be maintained and free from pollution. Sustainable populations of prey fish species should be available.

10.1 Future prospects of parameters	Wales = overall stable. The range for river lamprey is not expected to alter significantly in Wales in the next 12 years assuming that more suitable habitat becomes accessible and that the magnitude of the impact of threats do not become too large e.g. excessive drought or flooding. Based on the analysis of SAC lamprey larval survey data the population appears to be stable because most of the populations met the density and demographic targets. It is assumed that this is the pattern for all lamprey populations across Wales. Pressures and threats have been identified along with suitable conservation measures that will help safeguard habitat and prevent population decline. Appropriate conservation measures should be indentified / implemented during river restoration projects and as good practice for river management during other infrastructure development / maintenance schemes (NRW, 2018).These measures would potentially have a positive impact on habitat over the medium term and improve population resilience.
12.1 Population size inside the pSCIs, SCIs and SACs network	Population = 797 occupied or assumed occupation, of which 20 are partial transboundary cells (Dee & Wye). Total = 777 1 x 1 km cells wholly in Wales.