Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A

2019-2024

Conservation status assessment for the species:

S6965 - Bullhead

(*Cottus gobio*)

Wales

Cyfoeth Naturiol Cymru
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JNCC

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Important note - Please read

- The information in this document represents the Wales Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A, for the period 2019-2024.
- It is based on supporting information provided by Natural Resources Wales, which is documented separately.
- The Habitats Regulations reporting 2019-2024 Approach Document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- Maps showing the distribution and range of the species are included.
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the assessments. Further underpinning explanatory notes are available in the related country reports.
- 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 not relevant to this species (section 12 National Site Network coverage for Annex II species).

Further details on the approach to the Habitats Regulations Reporting 2019-2024 are available on the JNCC website.

Assessment Summary: Bullhead

Distribution Map

Range Map

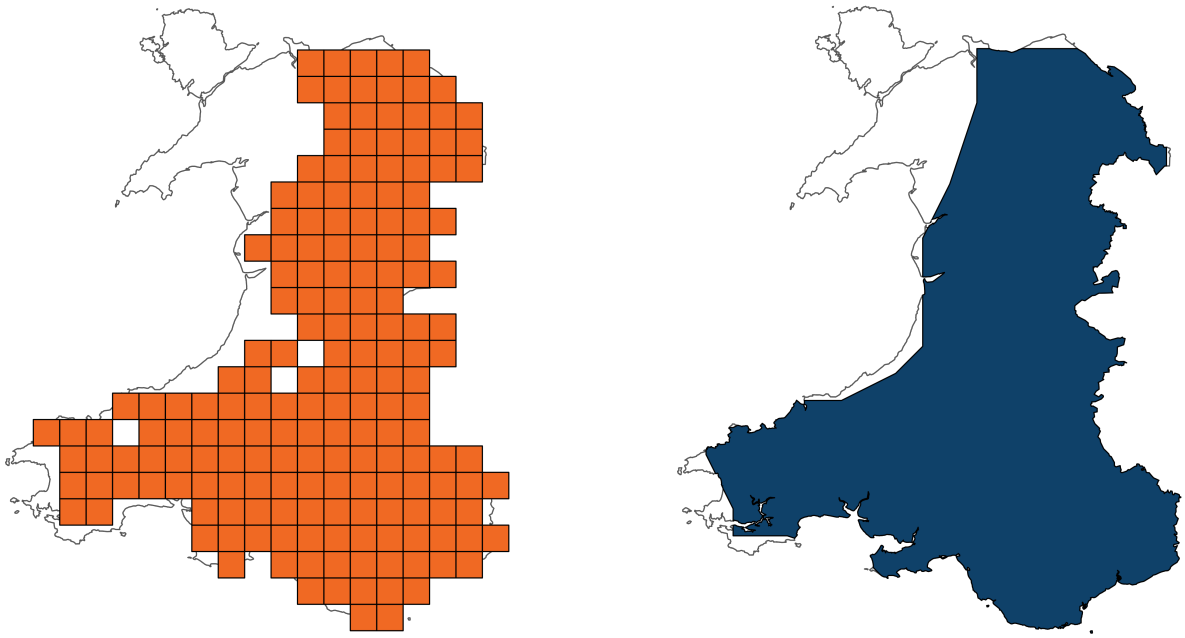

Figure 1: Wales distribution and range map for S6965 - Bullhead (*Cottus gobio*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available species records within the current reporting period.

Table 1: Table summarising the conservation status for S6965 - Bullhead (*Cottus gobio*). Overall conservation status for species is based on assessments of range, population, habitat for the species, and future prospects.

Overall Conservation Status (see section 11)

Unfavourable-inadequate (U1)

Breakdown of Overall Conservation Status

Range (see section 5)	**Favourable (FV)**
Population (see section 6)	**Favourable (FV)**
Habitat for the species (see section 7)	**Unfavourable-inadequate (U1)**
Future prospects (see section 10)	**Unfavourable-inadequate (U1)**

List of Sections

National Level

1. General information

1.1 Country	Wales
1.2 Species code	S6965
1.3 Species scientific name	*Cottus gobio*
1.4 Alternative species scientific name	
1.5 Common name	Bullhead
Annex(es)	II

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2013-2024
2.3 Distribution map	Yes
2.4 Distribution map; Method used	Based mainly on extrapolation from a limited amount of data

2.5 Additional information

No additional information

3. Information related to Annex V Species

3.1 Is the species taken in the wild / exploited?

3.2 What measures have been taken?

a) Regulations regarding access to property
b) Temporary or local prohibition on the taking of specimens in the wild and exploitation
c) Regulation of the periods and/or methods of taking specimens
d) Application of hunting and fishing rules which take account of the conservation of such populations

e) Establishment of a system of licences for taking specimens or of quotas

f) Regulation of the purchase, sale, offering for sale, keeping for sale, or transport for sale of specimens

g) Breeding in captivity of animal species as well as artificial propagation of plant species

Other measures

Other measures description

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

a) Unit

Table 2: Quantity taken from the wild during the reporting period (see 3.3a for units). For species with defined hunting seasons, Season 1 refers to 2018/2019 (autumn 2018 to spring 2019), and Season 6 to 2023/2024. For species without hunting seasons, data are reported by calendar year: Year 1 is 2019, and Year 6 is 2024.

	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
b) Minimum	-	-	-	-	-	-
c) Maximum	-	-	-	-	-	-
d) Unknown	-	-	-	-	-	-

3.4: Hunting bag or quantity taken in the wild; Method used

3.5: Additional information

No additional information

Biogeographical Level

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs	ATL

4.2 Sources of information

See section 14 References

5. Range

5.1 Surface area (km²)	17,720.65
5.2 Short-term trend; Period	2013-2024
5.3 Short-term trend; Direction	Stable
5.4 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	
d) Unknown	No
e) Type of estimate	
f) Rate of decrease	
5.5 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data
5.6 Long-term trend; Period	1990-2024
5.7 Long-term trend; Direction	Stable
5.8 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Rate of decrease	

5.9 Long-term trend; Method used	Based mainly on extrapolation from a limited amount of data

5.10 Favourable Reference Range (FRR)

a) Area (km²)	
b) Pre-defined increment	Current range is less than 2% smaller than the FRR
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	moderate

5.11 Change and reason for change in surface area of range

a) Change	No
b) Genuine change	
c) Improved knowledge or more accurate data	
d) Different method	
e) No information	
f) Other reason	
g) Main reason	

5.12 Additional information

No additional information

6. Population

6.1 Year or period	2019-2024

6.2 Population size (in reporting unit)

a) Unit	number of map 1x1 km grid cells
b) Minimum	
c) Maximum	

d) Best single value	2,249
6.3 Type of estimate	Best estimate
6.4 Quality of extrapolation to reporting unit	

6.5 Additional population size (using population unit other than reporting unit)

a) Unit	
b) Minimum	
c) Maximum	
d) Best single value	
e) 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	2013-2024
6.8 Short-term trend; Direction	Stable
6.9 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	
d) Unknown	
e) Type of estimate	
f) Rate of decrease	
6.10 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data
6.11 Long-term trend; Period	2001-2024
6.12 Long-term trend; Direction	Unknown
6.13 Long-term trend; Magnitude	

a) Minimum	
b) Maximum	
c) Confidence interval	
d) Rate of decrease	
6.14 Long-term trend; Method used	Insufficient or no data available

6.15 Favourable Reference Population (FRP)

ai) Population size	
aii) Unit	
b) Pre-defined increment	Current population is less than 5% smaller than the FRP
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	moderate

6.16 Change and reason for change in population size

a) Change	No
b) Genuine change	
c) Improved knowledge or more accurate data	
d) Different method	
e) No information	
f) Other reason	
g) Main reason	

6.17 Additional information

No additional information

6.18 Age structure, mortality and reproduction deviation	Unknown

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat (for long-term survival)

a) Is area of occupied habitat sufficient?	No
b) Is quality of occupied habitat sufficient?	No
c) If No or Unknown, is there a sufficiently large area of unoccupied habitat of suitable quality?	No

7.2 Sufficiency of area and quality of occupied habitat; Method used

a) Sufficiency of area of occupied habitat; Method used	Based mainly on extrapolation from a limited amount of data
b) Sufficiency of quality of occupied habitat; Method used	Complete survey or a statistically robust estimate

7.3 Short-term trend; Period	2013-2024
7.4 Short-term trend; Direction	Uncertain
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

No additional information

8. Main pressures

8.1 Characterisation of pressures

Table 3: Pressures affecting the species, including timing and importance/impact ranking. Pressures are defined as factors acting currently and/or during the reporting period (2019–2024). Rankings are: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Pressure	Timing	Ranking
PL06: Physical alteration of water bodies (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PA23: Physical alteration of water bodies (including dams, channels, etc.)	Ongoing and likely to be in the future	High (H)
PL05: Modification of hydrological flow (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PA17: Agricultural activities generating pollution to surface or ground waters (including marine)	Ongoing and likely to be in the future	High (H)
PA20: Live stock farming generating pollution	Ongoing and likely to be in the future	High (H)
PL01: Abstraction from groundwater, surface water or mixed water (mixed or unknown drivers)	Ongoing and likely to be in the future	High (H)
PK01: Mixed source pollution to surface and ground waters (limnic and terrestrial)	Ongoing and likely to be in the future	High (H)
PL04: Development and operation of dams (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PA19: Agricultural activities generating soil pollution	Ongoing and likely to be in the future	Medium (M)
PL02: Drainage (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PJ01: Temperature changes and extremes due to climate change	Ongoing and likely to be in the future	Medium (M)

8.2 Sources of information

See section 14 References

8.3 Additional information

No 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	Maintain the current range, population and/or habitat for the species
9.3 Location of the measures taken	Both inside and outside National Site Network
9.4 Response to measures	Medium-term results (within the next two reporting periods, 2025–2036)

9.5 List of main conservation measures

Table 4: Key conservation measures addressing current pressures and/or anticipated threats during the next two reporting periods (2025–2036). Measures are ranked by importance/impact: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Conservation measure	Ranking
MK01: Reduce impact of mixed source pollution	High (H)
MK02: Reduce impact of multi-purpose hydrological changes	High (H)
MK03: Restoration of habitats impacted by multi-purpose hydrological changes	High (H)
MK04: Other measures related to mixed source pollution.	High (H)
MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities	High (H)
MC13: Other measures related to extraction and energy exploitation activities	High (H)
MS03: Restoration of habitat of species from the directives	High (H)
MJ01: Implement climate change mitigation measures	Medium (M)
MF04: Reduce/eliminate pollution to surface or ground waters from commercial, residential and recreational areas and activities, and from industrial activities and structures	Medium (M)

MA14: Other measures related to agricultural practices	Medium (M)
MC12: Manage water abstraction for resource extraction and energy production	Medium (M)
MA13: Manage agricultural drainage and water abstraction (incl. the restoration of drained or hydrologically altered habitats)	Medium (M)
MB10: Reduce diffuse or point source pollution to surface or ground waters (incl. marine) from forestry activities	Medium (M)
MB14: Manage drainage and water abstraction for forestry (inc. restoration of drained or hydrologically altered habitats)	Medium (M)
MC04: Reduce impact of hydropower operation and infrastructure (incl. the restoration of freshwater habitats)	Medium (M)
MF09: Adapt the management of water abstraction for public supply and for industrial and commercial use to reduce negative impacts on habitats and species (incl. restoration of habitats)	Medium (M)

9.6 Additional information

No additional information

10. Future prospects

10.1a Future trends of parameters

ai) Range	Overall stable
bi) Population	Overall stable
ci) Habitat for the species	Overall stable

10.1b Future prospects of parameters

aii) Range	Good
bii) Population	Good
cii) Habitat for the species	Poor

10.2 Additional information

No additional information

11. Conclusions

11.1 Range	Favourable (FV)
11.2 Population	Favourable (FV)
11.3 Habitat for the species	Unfavourable-inadequate (U1)
11.4 Future prospects	Unfavourable-inadequate (U1)
11.5 Overall assessment of Conservation Status	Unfavourable-inadequate (U1)
11.6 Overall trend in Conservation Status	Stable

11.7 Change and reason for change in conservation status

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

11.7 Change and reason for change in conservation status trend

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

11.8 Additional information

No additional information

12. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network

a) Unit	number of map 1x1 km grid cells
b) Minimum	
c) Maximum	
d) Best single value	848
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	Stable
12.5 Short-term trend of population size within the network; Method used	Based mainly on extrapolation from a limited amount of data
12.6 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Direction	Stable
12.7 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Method used	Complete survey or a statistically robust estimate

12.8 Additional information

No additional information

13. Complementary information

13.1 Justification of percentage thresholds for trends

No justification information

13.2 Trans-boundary assessment

No trans-boundary assessment information

13.2 Other relevant information

No other relevant information

14. References

Biogeographical and marine regions

4.2 Sources of information

Garrett HM. In prep. Afonydd Cleddau SAC Monitoring Summary note. Bullhead (Cottus gobio) population condition assessment. Internal report.

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Yeomans WE, Murray DS, Stevenson C, McGillivray C, McColl D, Dodd JA, Thomas, Rh. 2008. Monitoring of bullhead in Welsh SAC rivers: rivers Usk and Wye. CCW Science Report No. 818

Main pressures

8.2 Sources of information

No sources of information

15. Explanatory Notes

Field label	Note
2.4: Distribution map; Method used	The 10 km square mapped range is based on records extracted from the National Fish Populations database held on Kieco (NRW, 2024a). There is no specific survey in place for bullhead in Wales, they are recorded as by-catch in routine surveys for salmonids and other fish species. As a non-target species bullheads tend to be under-represented in these surveys and only recorded on a presence/absence basis.
5.3: Short-term trend; Direction	Records from the 2019-24 reporting period indicates no substantial change in range compared to the previous reporting period. Both the 10km and 1km map for the current reporting period show a similar distribution compared to the previous reporting period. Bullhead are widespread throughout Wales with the exception of the far west and north. Furthermore it is known from routine surveys that the range of bullhead in Wales has remained constant over the last 25 years.
5.11: Change and reason for change in surface area of range	The evidence suggests that the range has not changed since the previous two rounds of Article 17 reporting for Habitats Directive in 2013 and 2018. A similar approach using a combination of records and modelled data was used in 2013 and 2018 to calculate distribution (IAFG, 2017; NRW, 2013; NRW, 2018). In-river works for multiple fish species access, completed by NRW or others, during this reporting period may have improved access to as well as the amount of available habitat (NRW, 2024b). However for this particular species the evidence for impact on range is limited and consequently not deemed to have changed range. Bullhead 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	There is no specific survey in place for bullhead in Wales, they are recorded as by-catch in routine surveys for salmonids and other fish species. As a non-target species bullheads tend to be under-represented in these surveys and only recorded on a presence/absence basis. The majority of data for the current cycle is compiled from four surveys for fish other than bullhead (coarse fish, juvenile salmonid surveys and invertebrate kick sampling) and has been extracted from the National Fish Populations database held on Kieco (NRW, 2024a). Use of bullhead records extracted from juvenile salmonid monitoring surveys can result in under-recording of bullheads due to differences in bullhead biology and ecology. Juvenile salmonid electrofishing surveys are usually conducted between June and September and three survey methods are used: quantitative (Q), semi-quantitative (SQ) and timed electrofishing (5-minute fishing - 5MF). Densities cannot be calculated using the 5MF data as the area is not measured. Bullhead do not respond to the electric current as well as salmonids and so the catch total may be lower than the habitat conditions suggest. The optimal survey period for juvenile salmonid survey is June and July whereas bullhead should ideally be surveyed between mid-August and October. Surveys before the August period are more likely to pick up juvenile bullheads and there is the potential for damage to juvenile development. This measure includes both squares containing actual bullhead records, and squares along the river network that bullhead must have accessed to reach these squares, following the procedure agreed by IAFG (2018). The resulting count gives a reasonable estimate of the number of occupied 1km squares of bullhead in Wales, showing a comprehensive and widespread distribution. Bullhead are significantly under-recorded in Wales and

	there is very little monitoring outside the SAC network. The population is therefore likely to be an underestimate. In addition, the modelling approach tends to overemphasise the important of upstream spawning locations that may be of marginal importance to the overall population. The current population size is a reduction compared to the previous reporting round (80%), but this is likely to reflect variation in the sampling effort and / or natural variation rather than a cause for concern. Sampling effort was much reduced in 2019-2024 compared with 2013-2018, partly due to covid restrictions and partly due to monitoring resource. In addition it is known from routine surveys that the distribution of bullhead has remained constant over the last 25 years.
6.3: Type of estimate	Bullhead is under recorded in Wales and we therefore think it likely this is an underestimate.
6.6: Population size; Method used	Bullhead data were extracted from the National Fish Populations Database (NFPD) on Kieco 2019-2024 – which consists of data collected by Environment Agency Wales and its successor body Natural Resources Wales (NRW, 2024a). 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) and assumed occupation were completed to calculate the micro distribution as a proxy for population size. This data was interpreted using guidance agreed with Inter-Agency Freshwater Group (IAFG, 2018).
6.8: Short-term trend; Direction	The current estimate of population size based on 2019-2024 data is 2249 1km squares, a decrease from the 2798 1km squares reported in 2018. This decrease is largely due to a reduction in survey effort, partly due to covid restrictions and partly due to monitoring resource. Therefore the overall conclusion is that the population size has remained stable between the two reporting periods. Nunn et al. (2023) assessed the extinction risk of bullhead

	as least concern in Wales using the Red Data List criteria. Whilst this does not imply that there is no concern about bullhead and the methodology based on 1km occupancy and assumed occupancy to assess population in the current assessment may mask trends in actual population size, the population does appear to be broadly stable.
6.12: Long-term trend; Direction	Not applicable- data from 2007 and 2013 report is not comparable due to new methodology in 2018.
6.18: Age structure, mortality and reproduction	This would require analysis of the age histograms of fish caught, unfortunately it has not been possible to carry this out for the current reporting round. However there is no reason to think that age structure, mortality or reproduction are deviating from normal. However, there are no known issues with reproduction, mortality or age structure in the major populations.
7.1: Sufficiency of area and quality of occupied habitat	Occupied area Partial and permanent artificial barriers reduce bullhead access to suitable freshwater habitat that would be necessary to maintain the species at FCS. Occupied habitat quality Water quality requirements are unknown but it is assumed that Good Ecological Status (GES) is required (WFD classification). Of 469 river water bodies with bullhead present, less than half are in good status based on 2020-2023 data (NRW 2024b). Failing WFD elements include phosphate, copper, macrophytes and phytobenthos, zinc, priority substances and fish. WFD Tools are optimised to measure river ecological quality in generic terms and therefore the applicability of these data to bullhead distribution data is uncertain. The current distribution of bullhead throughout moderate status waterbodies suggests that they can tolerate certain levels of pollution; although the level of tolerance would be affected by both the pressure type driving this classification

and the altitude of the water body type. A limiting factor appears to be Dissolved Oxygen; bullheads can tolerate high concentrations of nitrogen compounds as long as oxygen saturation remains high. Of the waterbodies bullhead are present in, only 10 (2%) failed on Dissolved Oxygen. Furthermore bullhead are known to be sensitive to siltation of river habitats which is not measured in WFD assessments.

Bullhead are probably more sensitive to morphological than water quality impacts which is supported by the fact that 420 (90%) of these water bodies are classed as Natural in terms of modification designation. However, morphological impacts are inadequately reflected in the existing classification data. Bullhead favour natural channel forms with associated riffle and pool structures which provides the necessary substrates and flows (Tomlinson and Perrow 2003).

Furthermore, the population data in this report is based on distribution data rather than densities. This could be masking the impact of habitat quality since it is likely that bullhead will be present in sub optimal habitat but in lower numbers.

Unoccupied habitat

Total area of unoccupied suitable habitat in Wales is 845km (based on presumption that good ecological status is equivalent to suitable).

This does not take into account artificial river obstructions which restrict bullhead access to suitable habitat. Furthermore bullhead are very slow to repopulate rivers (for instance following a fish kill due to a pollution incident).

The ecological status of the 249 river water bodies in Wales where bullhead are not currently present are classified as follows; 8 bad (68km), 23 poor (183km), 113 moderate

	(888km) and 104 Good (845km). In Wales most of the river habitat quality can be classed as close to the Good-Moderate boundary (NRW, 2015). The applicability of river habitat data to bullhead is uncertain but it is assumed that Good Ecological Status (GES) represents habitat quality sufficient to support the feature in favourable conservation status.
7.2: Sufficiency of area and quality of occupied habitat; Methods used	Area Area of occupied habitat was based on the population distribution data for bullhead, with presence in 1km2 and assumed presence in 1km2 added together for the total length of river habitat. This is broadly similar with the area in the previous reporting round if calculated using the same method. Quality Quality of occupied habitat was based on the ecological status (under the Water Framework Directive) of all water bodies with bullhead present. Firstly, a list of all water bodies which intersected with the km2 of bullhead presence (known and presumed) was ascertained. Habitat quality was assessed using WFD 2024 river quality classification data for Wales (NRW, 2024b). Due to limited range data, no attempt was made to remove upland water bodies where bullhead may be absent. The applicability of river habitat data to bullhead 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). Of the 469 river water bodies with bullhead present, six are bad (1%), 55 are poor (12%), 206 (44%) are moderate and less than half (202water bodies, 43%) are in good status based on 2020-2023 data (NRW 2024b).

	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. 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).
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 and quality of suitable habitats. There is uncertainty around presumed habitat occupation and over the impact of barriers where fish passage issues have been addressed as bullhead are not always the target feature. In terms of habitat quality, it is unclear whether good ecological status sustains an appropriate habitat. No appropriate repeat habitat survey datasets were available to analyse trends.
8.1: Characterisation of pressures	Bullhead require clean, hard substrates of clean gravel and stones to complete their reproductive cycle (Mills and Mann 1983) and are therefore sensitive to modifications that reduce habitat availability. Changes in flow also have a negative effect due to lack of natural processes (washing out of silt which cleans gravels) as well as too low flows and higher temperatures etc. Natural, unmodified channels with appropriate substrates and flows as well as wooded riparian corridors and shade support greater densities of bullhead. Physical modifications that impair fish passage are also significant pressures since they lead to fragmentation of populations. Vertical structures of 18–20 cm in height are impassable to bullhead, with populations upstream of such

	structures vulnerable to population fragmentation, isolation and ultimately extinction (Utzinger et al. 1998). Consequently, obstructions that other fish pass with relative ease can be partial or complete barriers to bullhead. These particularly include weirs and dams constructed for various purposes, but even bridge footings can have a significant impact. Bullhead also prefer moderate flow velocities and will suffer in very low flows when oxygen concentrations reduce and temperature increases. They are not strong swimmers and are adapted to seeking refuge behind large stones, woody debris and macrophytes/leaf litter. Siltation is a significant problem for bullhead with silt deposition over hard, coarse substrate reducing the available habitat that is necessary for reproduction and shelter. Intensive agriculture in the catchment can cause increased levels of silt input to rivers; impacts are exacerbated by modifications to morphology and flow. The impact of climate change on bullhead is uncertain, although altered flow regimes would negatively affect habitat quality and increased temperatures would be detrimental.
9.1: Status of measures	Between 2019 and 2024, there has been an increase in work to restore natural processes in rivers, corridors and floodplains as well as work to address pollution across catchments in Wales. There are now several large scale river restoration projects (DeeLIFERiver, 4 Rivers for LIFE, Upper Wye) which have resulted in significant lengths of rivers improved. This is in addition to NRW's River Restoration Programme, Salmon for Tomorrow and work by external organisations such as the National Trust and Rivers Trusts across Wales via the Inland Fisheries Habitat Grant. Together, this work has improved, protected or restored 854km of river environment, created, protected or restored 100ha of river

	habitat, addressed 77 barriers to migration and improved access for migratory fish to 954km of river (NRW 2024c). Note this length will be significantly less for bullhead as some of the fish passes put in place will not be accessible for bullheads. There has also been significant work to reduce point source and diffuse pollution via Dwr Cymru's AMP6 programme of sewage treatment work improvements, NRW's SAC Rivers project and Welsh Government's Control of Agricultural Pollution regulations.
9.2: Main purpose of the measures taken	It should be noted that restoring habitat will also result in restoration of the range and population size of bullhead in Wales.
9.5: List of main conservation measures	Measures selected are specifically to address pressures identified in Section 8. The highest priority actions are to continue to improve habitat quality for bullhead which is achieved through works designed to improve habitat for other fish including salmon and trout as well as pollution management. Appropriate conservation measures should be implemented during river restoration projects and as good practice for river management during other infrastructure development / maintenance projects.
10.1: Future trends and prospects of parameters	Future prospects of population Bullhead are a widespread species which does not appear to be under any immediate threat. The population seems to be stable in Wales and is expected to remain so. Future prospects of habitat for species 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 identified / implemented during river restoration projects and as good practice for river management during other infrastructure development / maintenance projects. These measures would potentially

	have a positive impact on habitat over the medium term and improve population resilience.
11.1: Range	Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is approximately equal to the Favourable Reference Range.
11.2: Population	Conclusion on Population reached because:(i) the short-term trend direction in Population size is stable; (ii) the current Population size is approximately equal to the Favourable Reference Population; and iii) reproduction, mortality and age structure does not have data available.
11.3: Habitat for the species	Conclusion on Habitat for the species reached because: (i) the area of occupied habitat is not sufficiently large for long-term survival of the species (ii) the quality of occupied habitat is not suitable for the long-term survival of the species; and iii) there is a not a sufficiently large area of occupied and unoccupied habitat of suitable quality for long term survival (iv) the short-term trend in area of habitat is uncertain; and v) expert opinion determines that the habitat quality of occupied and unoccupied habitat is not bad; and vi) expert opinion determines that the habitat area is insufficient, but not clearly so.
11.4: Future prospects	Conclusion on Future prospects reached because: (i) the Future prospects for Range are good; (ii) the Future prospects for Population are good; and (iii) the Future prospects for Habitat for the species are poor.
11.5: Overall assessment of Conservation Status	Overall assessment of Conservation Status is Unfavourable-inadequate because two of the conclusions are Unfavourable-inadequate.
12.1: Population size inside the pSCIs, SCIs and SACs network	Best single value = Individual 1 x 1 km grids = 848 By-catch records from surveys where bullhead are not the target species introduces a sampling bias so the population size is probably under-estimated.
12.3: Population size inside the network; Method used	Common Standards Monitoring guidance recommends that agencies assess bullhead populations using either data from a systematic quantitative sampling survey or utilise

	any available non-quantitative (by-catch) records generated primarily by salmonid surveys (JNCC, 2015). NRW uses by-catch records from the following surveys within the SAC river boundary: coarse fish, juvenile salmonid surveys and invertebrate kick sampling. All bullhead samples should be counted and a sub-sample of bullhead are measured so that the population demographic can be evaluated for evidence of recruitment. For further details, see additional information statement on bullhead evidence (Garrett, 2018). This estimate includes both squares containing confirmed bullhead records (NRW, 2017), 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 reasonable estimate of the number of occupied 1km squares of bullhead in Wales.
12.4: Short-term trend of the population size within the network; Direction	Population size within the boundary of the six SAC rivers where bullhead is a feature is stable.
6.15: Favourable Reference Population (FRP)	The UK-level FRV for population was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh experts and considered appropriate for use in Wales based on current population trends and abundance.
5.10: Favourable Reference Range (FRR)	The UK-level FRV for range was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh

experts and considered appropriate for use in Wales based on current distribution and trends.