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

2019-2024

Conservation status assessment for the species:

S6353 - Whitefish

(*Coregonus lavaretus*)

Wales

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JNCC

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This report was produced by JNCC in collaboration with Natural Resources Wales.

This document should be cited as:

Natural Resources Wales and JNCC. (2026). Conservation status assessment for the species: S6353 Whitefish (*Coregonus lavaretus*).

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: Whitefish

Distribution Map

Range Map

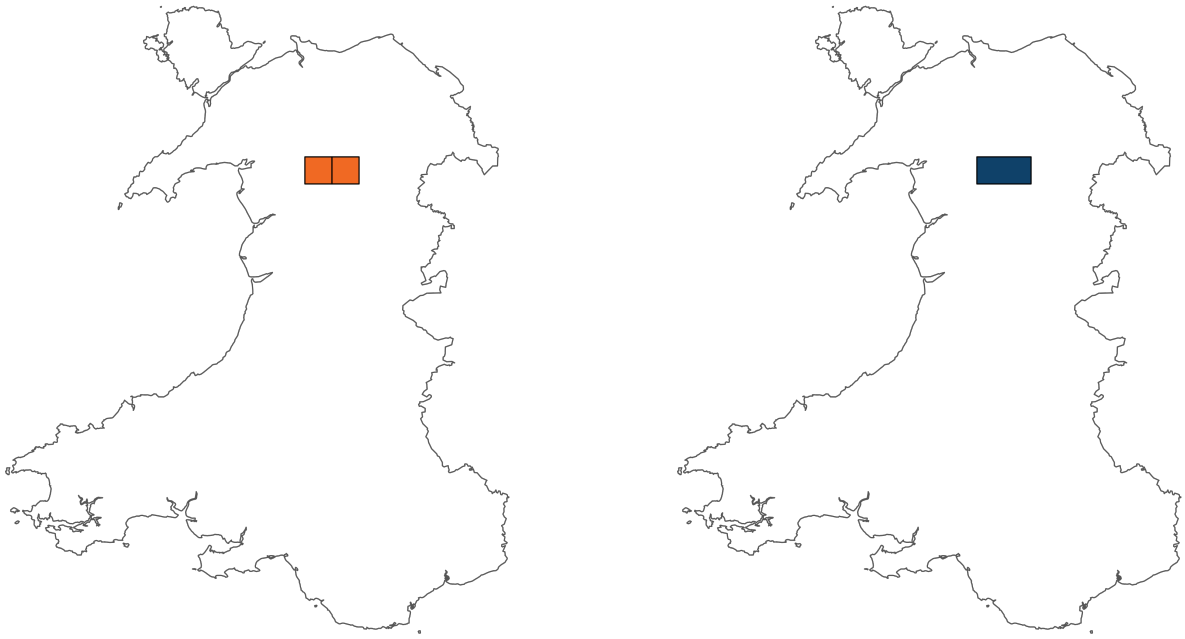

Figure 1: Wales distribution and range map for S6353 - Whitefish (*Coregonus lavaretus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available species records within the current reporting period.

Table 1: Table summarising the conservation status for S6353 - Whitefish (*Coregonus lavaretus*). 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)	**Unfavourable-inadequate (U1)**
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	S6353
1.3 Species scientific name	*Coregonus lavaretus*
1.4 Alternative species scientific name	
1.5 Common name	Whitefish
Annex(es)	V

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2014-2024
2.3 Distribution map	Yes
2.4 Distribution map; Method used	Complete survey or a statistically robust estimate

2.5 Additional information

No additional information

3. Information related to Annex V Species

3.1 Is the species taken in the wild / exploited?	No

3.2 What measures have been taken?

a) Regulations regarding access to property	No
b) Temporary or local prohibition on the taking of specimens in the wild and exploitation	Yes
c) Regulation of the periods and/or methods of taking specimens	Yes
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	Yes
f) Regulation of the purchase, sale, offering for sale, keeping for sale, or transport for sale of specimens	Yes
g) Breeding in captivity of animal species as well as artificial propagation of plant species	No
Other measures	No
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	No	No	No	No	No	No

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)	200
5.2 Short-term trend; Period	2014-2024
5.3 Short-term trend; Direction	Stable
5.4 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	Increasing 0 - 12%
d) Unknown	No
e) Type of estimate	Best estimate
f) Rate of decrease	
5.5 Short-term trend; Method used	Based mainly on expert opinion with very limited 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	Complete survey or a statistically robust estimate

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	high

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 individuals
b) Minimum	
c) Maximum	

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

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

a) Unit	number of map 1x1 km grid cells
b) Minimum	
c) Maximum	
d) Best single value	13
e) Type of estimate	Best estimate
6.6 Population size; Method used	Insufficient or no data available
6.7 Short-term trend; Period	2014-2024
6.8 Short-term trend; Direction	Unknown
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	Insufficient or no data available
6.11 Long-term trend; Period	2007-2024
6.12 Long-term trend; Direction	Decreasing
6.13 Long-term trend; Magnitude	

a) Minimum	
b) Maximum	
c) Confidence interval	
d) Rate of decrease	Decreasing >1% (more than one percent) per year on average
6.14 Long-term trend; Method used	Based mainly on extrapolation from a limited amount of data

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	high

6.16 Change and reason for change in population size

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

6.17 Additional information

No additional information

6.18 Age structure, mortality and reproduction deviation	Yes, but not strongly deviating from normal

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?	Yes
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	Complete survey or a statistically robust estimate
b) Sufficiency of quality of occupied habitat; Method used	Complete survey or a statistically robust estimate
7.3 Short-term trend; Period	2014-2024
7.4 Short-term trend; Direction	Stable
7.5 Short-term trend; Method used	Complete survey or a statistically robust estimate
7.6 Long-term trend; Period	1997-2024
7.7 Long-term trend; Direction	Stable
7.8 Long-term trend; Method used	Based mainly on extrapolation from a limited amount of data

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
PA17: Agricultural activities generating pollution to surface or ground waters (including marine)	Ongoing and likely to be in the future	High (H)
PF07: Residential and commercial activities and structures generating pollution to surface or ground waters	Ongoing and likely to be in the future	Medium (M)
PJ10: Change of habitat location, size, and / or quality due to climate change	Ongoing and likely to be in the future	High (H)
PJ14: Other climate related changes in abiotic conditions	Only in future	High (H)
PL05: Modification of hydrological flow (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PI01: Invasive alien species of Union concern	Ongoing and likely to be in the future	Medium (M)
PI02: Other invasive alien species (other than species of Union concern)	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, but none yet taken

9.2 Main purpose of the measures taken

9.3 Location of the measures taken

9.4 Response to measures

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
MA02: Restore small landscape features on agricultural land	High (H)
MA03: Maintain existing extensive agricultural practices and agricultural landscape features	High (H)
MA05: Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning)	Medium (M)
MA08: Adapt soil management practices in agriculture	High (H)
MA09: Manage the use of natural and synthetic fertilisers as well as chemicals in agricultural for plant and animal production	High (H)
MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities	High (H)
MA13: Manage agricultural drainage and water abstraction (incl. the restoration of drained or hydrologically altered habitats)	High (H)
MI02: Management, control or eradication of established invasive alien species of Union concern	High (H)
MJ01: Implement climate change mitigation measures	High (H)
MJ02: Implement climate change adaptation measures	High (H)

9.6 Additional information

No additional information

10. Future prospects

10.1a Future trends of parameters

ai) Range Overall stable

bi) Population	Unknown
ci) Habitat for the species	Negative - slight/moderate deterioration

10.1b Future prospects of parameters

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

10.2 Additional information

No additional information

11. Conclusions

11.1 Range	Favourable (FV)
11.2 Population	Unfavourable-inadequate (U1)
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	
b) Minimum	
c) Maximum	
d) Best single value	
12.2 Type of estimate	
12.3 Population size inside the network; Method used	
12.4 Short-term trend of population size within the network; Direction	
12.5 Short-term trend of population size within the network; Method used	
12.6 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Direction	
12.7 Short-term trend of habitat for the species inside the pSCIs, SCIs and SACs network; Method used	

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

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Main pressures

8.2 Sources of information

No sources of information

15. Explanatory Notes

Field label	Note
3.2: Which of the measures in Art. 9a have been taken?	Gwyniad is strictly protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), which makes it an offence to intentionally kill, injure, take, possess, damage or destroy a place of shelter. Llyn Tegid is also designated as an SSSI, which provides additional protection for the habitat. General fisheries regulations and byelaws also provide additional protection for the species.
5.5: Short-term trend; Method used	There have been very few recent surveys to assess the status of the gwyniad population in Llyn Tegid.
5.11: Change and reason for change in surface area of range	The range has not changed since the previous Article 17 reporting for Habitats Directive in 2019. The range of the species is limited to the existing lakes because they do not migrate. The species was first translocated into a lake near to Llyn Tegid in 2003 to create a refuge population (Winfield et al, 2003; 2008), but this was within the existing 10km2 distribution of the species and so has not affected the range. The existing range is equal to the Favourable Reference Range in Wales.
6.2: Population size	Unit = No. of individuals: Minimum = Unknown Maximum = Unknown Best Single Value = Unknown No recent monitoring of either gwyniad population has been carried out.

6.5: Additional population size	This count includes the refuge population.
6.8: Short-term trend; Direction	There are insufficient data to determine a short-term population trend, due to a lack of recent survey data.
6.12: Long-term trend; Direction	Garrett (2019) reported that a population decline may be occurring.
6.14: Long-term trend; Method used	This trend is based mainly on the earlier conclusions of Garrett (2019), who reported a short-term declining trend. In the absence of more recent data, it is assumed that this is continuing.
6.18: Age structure, mortality and reproduction	Winfield et al. (2015) states “Under the whitefish assessment protocol, gwyniad abundance passed its performance indicator in 2014 as it did in 2003, 2004, 2005, 2006, 2007, 2008, 2009 and 2012, while its population demographic structure failed due to a failure to record the required percentage (90%) of young fish, as it did in all earlier years with the exception of 2009“. The failure to detect the required percentage population of young fish would suggest that there is little recruitment, however, the population remains quite large. It is likely that the sampling method under-records juvenile size fish and does not fully reflect population recruitment.
7.1: Sufficiency of area and quality of occupied habitat	Occupied habitat area Combined area of deeper water in Llyn Tegid (274ha) and the entire area of Llyn Arenig Fawr (35ha) = total habitat area of 309 ha. Occupied habitat quality The likely critical factor for gwyniad in Llyn Tegid is the concentration of dissolved oxygen in the hypolimnion in summer. This has consistently been at Moderate WFD status since 2014. At present, dissolved oxygen levels in Llyn Tegid are therefore Inadequate, but stable (Hatton-Ellis 2025, Fig. 7.1).

The main drivers of dissolved oxygen in Llyn Tegid are phytoplankton concentrations, which in turn are mainly driven by a combination of nutrients and weather conditions. After the lake stratifies in early summer, no additional oxygen can reach the hypolimnion until the lake mixes again due to high winds. Large algal blooms result in lower dissolved oxygen in the hypolimnion as dying algal cells sink and rot, using up of the oxygen stored below the thermocline more rapidly. Hence, total phosphorus and WFD phytoplankton status are good indicators of risk.

The results of the phytoplankton tool indicate that Llyn Tegid met WFD Good Status in the 2021 and 2024 classifications. However, the lake is subject to occasional blue-green algae warnings, such as in August 2021. Llyn Arenig Fawr is less well monitored, but was classified as WFD High Status in 2021 and 2024.

Total Phosphorus (TP) results are less encouraging, and indicate a significant risk of population extinction in Llyn Tegid. For phosphorus, Llyn Tegid was classed as Poor and Llyn Arenig Fawr as Good in 2024. Although elevated phosphorus levels are not a direct cause of gwyniad mortality, they significantly increase the risk of a severe algal bloom that could in turn cause a catastrophic fall in the dissolved oxygen of the hypolimnion.

All habitat

Gwyniad are at the southernmost part of their sub-arctic range. They have a highly specialised habitat requirement and no dispersal ability which means that the distribution range of this species is highly limited thus making it more vulnerable to the impacts of detrimental nutrient levels.

The apparently successful translocation to Llyn Arenig Fawr suggests that other lakes in Wales may be capable of supporting gwyniad. However, a detailed assessment of

	suitability would be required to assess this (see Winfield 2001; Winfield et al. 2013).
7.5: Short-term trend; Method used	Dissolved oxygen profiles in Llyn Tegid are apparently broadly stable (Hatton-Ellis 2025, Fig. 7.1), reflecting chlorophyll concentrations (Hatton-Ellis 2025, Fig. 7.2). There is some indication that Total Phosphorus concentrations may be increasing, but this could be a data artefact.
7.8: Long-term trend; Method used	The only reliable data before 2003 is a single survey in 1997 (Monteith 1997). Regular measurements of dissolved oxygen in Llyn Tegid were carried out during the 2000's as part of the gwyniad translocation project (Winfield et al. 2003; Winfield et al. 2005; Winfield et al. 2006; Winfield et al. 2008; Winfield et al. 2009; Winfield, J. M. Fletcher, et al. 2010a; Winfield, Fletcher, et al. 2013a), as well as site condition monitoring (Burgess et al. 2006). These data show considerable fluctuations, with some years when conditions were significantly better than today, but also years when conditions were very poor. This likely reflects the interaction of climatic fluctuations with the elevated nutrient conditions in the lake (Hatton-Ellis 2025, Figure 7.2). Llyn Arenig Fawr has been monitored less frequently but assessments in 2010 and 2012 (Winfield, J. M. Fletcher, et al. 2010b; Winfield, Fletcher, et al. 2013b) showed it to be very well oxygenated. Taken together, these indicate broadly stable but inadequate conditions, though the potential for large environmental fluctuations is a serious cause for concern.
8.1: Characterisation of pressures	Pressures: Water quality (PA17, PF07): The principal impact on Llyn Tegid is nutrient enrichment which has caused algal blooms and dissolved oxygen sags in the lake. There was an agri-environment scheme pilot (2005 – 2007) in part of the

catchment which worked to improve poor quality farm infrastructure by separating clean and dirty water.

Gwyniad also require clean gravels for spawning that could be affected by silt deposition via tributaries in the catchment.

Other pressures of note include the following:

Water quantity (PL05): gwyniad require deep, cool lake water and clean gravels. Both Llyn Arenig Fawr and Llyn Tegid are natural lakes which are managed as reservoirs with controlled outflows. The water levels in Llyn Tegid are kept artificially higher in summer and lower in winter to provide buffering capacity for flooding downstream of Bala town. A conservation water level was set in the 1950s when the Dee regulation scheme was set-up.

It is not known whether these artificial hydrological regimes adversely affect the gwyniad. Drawdown of the lake after the spawning season has the potential to leave the developing eggs exposed.

Invasive species (PI01, PI02):

Two invasive plant species, Australian swamp stonecrop Crassula helmsii and Nuttalls water-thyme Elodea nuttallii have spread to Llyn Tegid, probably as escapes from garden ponds or aquaria. The former has the potential to be a threat as it could overgrow gwyniad spawning grounds, as has happened in Derwent Water (Winfield, Janice M. Fletcher, et al. 2010).

Ruffe (Gymnocephalus cernuus) have been introduced to Llyn Tegid, and are potential predators of gwyniad eggs, but are not considered to be a serious problem at present (Winfield et al. 2007).

Threats:

	Water quality (PA17, PF07): Gwyniad are dependent on good water quality (especially oxygen) in the hypolimnion (deeper parts of the lake) in summer, because they cannot tolerate warmer surface waters. This means that they are vulnerable to warm dry summers that favour algal blooms and long periods of stratification. Nutrient enrichment exacerbates this situation by promoting phytoplankton growth. They are also vulnerable to flooding that may likewise stimulate algal blooms by washing nutrients into the water. Water quantity (PL05) & Climate change (PJ10, PJ14): Gwyniad are at the southernmost part of their range. They have a highly specialised habitat requirement and no dispersal ability which means that the distribution range of this species is highly limited, thus making it more vulnerable to the impacts of climate change on nutrient levels, thermal & hydrological regimes in the lake. Climate change is predicted to increase the duration of stratification in summer (Woolway et al. 2021), resulting in a longer period when gwyniad are at risk from oxygen depletion. It may also encourage increased algal production and increased cyanobacterial dominance (Mooij et al. 2005), which can be expected to increase the oxygen demand in the hypolimnion. More extreme rainfall events are likely to cause rapid transport of nutrients from the catchment into the lake, while warmer winters will lengthen the growing season for algae. As a result, climate change can be expected to aggravate the impacts of elevated nutrient levels (Beklioğlu 2014; Noges et al. 2014). These threats are likely to mean a worsening of habitat conditions for gwyniad, especially in Llyn Tegid.
9.1: Status of measures	A catchment management project is needed in the Llyn Tegid catchment, to reduce the rate of nutrient runoff into

	the lake. This should focus mainly on agricultural sources, the sewage works at Llanwchllyn, and reducing inputs from septic tanks and private sewage treatment plants. The measures indicated in 9.5 summarise the key needs of such a project.
9.5: List of main conservation measures	No specific actions have been carried out for gwyniad within the current cycle. A funded, long-term programme of measures is needed in the catchment of Llyn Tegid, to help reduce runoff, nutrient pollution and sediment entering the lake. This will require working with both farmers and other sectors of the local community, including residents of Bala, Llanwchllyn and surrounding areas. It will also require the participation of Dwr Cymru / Welsh Water. Such a project could have significant societal and cultural benefits, as the lake is important to the regional economy for tourism and as a water resource. Additional actions could be trialled to control or eradicate Crassula helmsii in the lake, though realistically it is unlikely to be possible to achieve effective control now the species is established.
11.1: Range	This conclusion has been reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is equal to the Favourable Reference Range.
11.2: Population	Conclusion on Population reached because:(i) the short-term trend direction in Population size is unknown; (ii) the current Population size is approximately equal to the Favourable Reference Population; and iii) reproduction, mortality and age structure not strongly deviating from normal.
11.3: Habitat for the species	Conclusion on Habitat for the species reached because: i) the area of occupied habitat is sufficiently large for the 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 ivi) the short-term trend in area of habitat is stable; 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 unknown; and (iii) the Future prospects for Habitat for the species are poor.
11.5: Overall assessment of Conservation Status	The overall assessment of the Conservation Status of gwyniad (whitefish) is Unfavourable-inadequate because three of the conclusions (Population, Habitat for the Species and Future Prospects) are Unfavourable-inadequate.
10.1: Future trends and prospects of parameters	Future prospects of -range The range of gwyniad is expected to remain stable over the next 12 years. However, there is significant uncertainty around this, as the warming climate has greatly increased the likelihood of a catastrophic algal bloom causing population loss in Llyn Tegid. The translocated population in Llyn Arenig Fawr is considered to be at low risk. Future prospects of -Population The population trend of gwyniad is unknown over the next 12 years. However, the warming climate has greatly increased the likelihood of a catastrophic algal bloom causing a population crash in Llyn Tegid, as has occurred

	in other coregonid populations in response to elevated nutrients and climate change (Winfield, Bean, et al. 2013; Kangur et al. 2020; Helminen and Sarvala 2021). As Llyn Tegid likely supports over 90% of the Welsh population, a reduction in this population would have serious consequences. In 2016, an unusually warm period in winter resulted in almost total mortality of salmonid eggs in South Wales. It is unclear whether this also affected the gwyniad population, or whether other unseasonal events might disrupt spawning. Due to its oligotrophic status and remote location, the translocated population in Llyn Arenig Fawr is considered to be at low risk. Future prospects of -Habitat of the species As outlined in Section 8, climate change will exacerbate the impact of the existing nutrient enrichment in Llyn Tegid by increasing nutrient inwash into the lake, algal production in the lake, and in all likelihood, the duration of stratification. These three factors are likely to result in lower hypolimnetic dissolved oxygen concentrations, and an increase in the probability of a severe algal bloom causing complete hypoxia.
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. Following expert review, a Wales-level FRV was derived based on population trend and abundance data specific to Wales, rather than adopting the UK-level value. The revised FRV has been set as unpublished NRW GIS

	analysis indicated that the Wales FRP could be estimated at 13 1 x 1 km grid squares, with the current population being approximately equal. Therefore the operator of less than 5% smaller than FRP was selected for this species.
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. Following expert review, a Wales-level FRV was derived based on distribution and trend evidence specific to Wales, rather than adopting the UK-level value. The revised FRV has been set as unpublished NRW GIS analysis indicated that the Wales FRR could be 200 1 x 1 km grid squares with the current range being approximately equal to this. Therefore the operator of 'less than 2% smaller than the FRR' was selected for this species.