



CORE MANAGEMENT PLAN INCLUDING CONSERVATION OBJECTIVES FOR Afon Teifi / River Teifi SAC



Version	Date	Summary of changes made	Approved by
Version 5	November 2024	Addition of lake water quality targets. Updated feature status to reflect existing published information.	Ann Weedy
Version 4	September 2022	Revision of water quality targets for river features, updated formatting, clarification of relationship between Conservation Objectives and Performance Indicators.	Ann Weedy
Version 3	September 2017	Update to water quality standards	Dave Drewett
Version 2	April 2011	(Minor map edit August 2012)	Charlotte Gjerlov
Version 1.8	April 2008		Tracey Lovering

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Preface

This document provides the main elements of Natural Resources Wales' management plan for the site named. It sets out what needs to be achieved on the site, and advice on the action required. This document is made available through Natural Resources Wales' web site and may be revised in response to changing circumstances or new information. This is a technical document that supplements summary information on the Natural Resources Wales' web site.

One of the key functions of this document is to provide Natural Resources Wales' statement of the Conservation Objectives for the relevant Special Area of Conservation (SAC) and Special Protection Area (SPA) site(s). This is required to implement changes through the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 in addition to the existing Conservation of Habitats and Species Regulations 2017. As a matter of Welsh Government Policy, the provisions of those regulations are also to be applied to Ramsar sites in Wales.

Vision for the site

This is a descriptive overview of what needs to be achieved for conservation on the site. It brings together and summarises the [Conservation Objectives](#) into a single, integrated statement about the site.

The purpose of the designation of SAC and SPA sites is to help secure the maintenance or restoration of habitats and species to favourable conservation status for the foreseeable future. Given that we foresee a changing climate, despite the uncertainty of the nature, degree and timing of those changes, we must address the need to ensure the resilience of each site to that changing environment. This will be achieved in the first instance by ensuring favourable condition of the important features, since a healthy feature is likely to be more resilient to the effects of climate change than one which is already stressed. Secondly, consideration must be given to those structures, functions and processes which maintain or boost the resilience of ecosystems to climate stress, including the avoidance, reduction or mitigation of other stress factors such as invasive species, nutrient enrichment, habitat and population fragmentation.

This site forms part of a wider network, and is ecologically connected with its surroundings and with other designated sites in the region. Although the focus of this document is on the individual site, the conservation objectives and management requirements need to be considered in the wider context. A connected network of sites is more robust than sites in isolation, and more resilient to pressures such as climate change.

The Afon Teifi/River Teifi SAC will be maintained or, where necessary, restored to high ecological status, including its largely unmodified and undisturbed physical character, so that all of its special features are able to sustain themselves in the long-term as part of a naturally functioning ecosystem. Allowing the natural processes of erosion and deposition to operate without undue interference and maintaining or restoring connectivity maintains the physical river habitat, which forms the foundation for

this ecosystem. The quality and quantity of water, including natural flow variability, and the quality of adjacent habitats will be maintained or restored to a level necessary to maintain the features in favourable condition for the foreseeable future.

The aquatic plant communities that characterise parts of the river are not only attractive but also give a good indication of the overall quality of the environment. They will contain the variety and abundance of species expected for this type of river, in conditions of suitably clean water and bed substrate combined with a relatively stable flow regime. Patches of whiteflowered water-crowfoots will continue to be widespread in the main river and in many of the tributaries. In the more shaded reaches mosses and liverworts predominate.

Five special fish species will be present in numbers that reflect a healthy and sustainable population supported by well-distributed good quality habitat. Bullhead and brook lamprey complete their entire life cycles within the river. Migratory species such as the Atlantic salmon, sea and river lamprey, which swim up river to spawn and go through their juvenile stages in the river, will be able to complete their migrations and life cycles unhindered by artificial barriers such as weirs, pollution, or depleted flows.

The abundance of prey and widespread availability of undisturbed resting and breeding sites will allow a large otter population to thrive. They will continue to be found along the entire length of the river and its main tributaries.

There will be healthy populations of floating water-plantain in the Teifi Pools and in the river around Tregaron. The Teifi Pools will continue to contain their current range of distinctive aquatic plants that are characteristic of these clear-water upland lakes.

The presence of the Afon Teifi/River Teifi SAC and its special wildlife will continue to enhance the economic and social values of the area by providing a high quality environment for ecotourism, outdoor activities and peaceful enjoyment by local people and visitors. The river catchment's functions of controlling flooding and supplying clean water will be recognised and promoted through appropriate land management. The river will remain a focus for education to promote increased understanding of its biodiversity and the essential life support functions of its ecosystems.

Site description

Area and designations covered by this plan

Grid reference: SN515508

Unitary authorities: Ceredigion; Caerfyrddin/ Carmarthenshire; Penfro/ Pembroke-shire

Area (hectares): 715.58

Designations covered: Afon Teifi SSSI (the SAC and SSSI boundaries are concurrent)

The Afon Teifi/River Teifi SAC flows through (dissects) Cors Caron SAC, NNR and SSSI, Elenydd SSSI and Elenydd-Mallaen SPA, but these latter sites are each dealt with in separate management plans. The underpinning SSSI designations do not overlap.

Detailed maps of the designated sites are available on the Natural Resources Wales web site.

Outline Description

At 122 km, the Afon Teifi is one of the longest rivers in Wales, with one of the most pristine river catchments in lowland Britain. From its source in the oligotrophic Teifi Pools, situated at 455m in the Cambrian Mountains, the river descends steeply through the upland pastures and flows through the raised mire complex of Cors Caron. Below Cors Caron the Teifi meanders through lowland farmland, joined by a number of small tributaries from either side of the valley. Rocky, tree-lined sections are a feature of the lower part of the river, and there are several impressive gorges, particularly at Alltycafán, Henllan and Cilgerran, with spectacular waterfalls at Cenarth. Below Cilgerran gorge the estuary begins, winding its way past the wildlife-rich Teifi Marshes and the town of Cardigan before flowing out into Cardigan Bay. The whole of the river from source to sea is included in the SAC, as are ten tributaries: the Groes, Brefi, Dulas, Grannell, Clettwr, Cerdin, Tyweli, Ceri, Cych and Piliau.

The underlying geology consists of Ordovician and Silurian mudstones, siltstones and sandstones, which are extensively mantled by Quaternary deposits of variable, but sometimes considerable thicknesses. These consist of sands and gravels, glacial lake clays, alluvium and peat. This geology produces a generally low to moderate nutrient status and a low to moderate base-flow index, making the river characteristically flashy. The run-off characteristics and nutrient status are significantly modified by land use in the catchment, which is predominantly pastoral with some woodland and commercial forestry in the headwaters and a limited amount of arable in the lower catchment.

The ecological structure and functions of the site are dependent on hydrological and geomorphological processes (often referred to as hydromorphological processes), as well as the quality of riparian habitats and connectivity of habitats. Animals that move

around and sometimes leave the site, such as migratory fish and otters, may also be affected by factors operating outside the site.

Hydrological processes, in particular river flow (level and variability) and water chemistry, determine a range of habitat factors of importance to the SAC features, including current velocity, water depth, wetted area, substrate quality, dissolved oxygen levels and water temperature. Maintenance of both high 'spate' flows and base-flows is essential. Reductions in flow may reduce the ability of the adults of migratory fish to reach spawning sites. Watercrowfoot vegetation thrives in relatively stable, moderate flows and clean water. The flow regime should be as near to natural as constraints will allow in order to support the functioning of the river ecosystem. Two of the Teifi Pools, Llyn Teifi and Llyn Egnant, are artificially regulated for water abstraction, and this affects the species composition of the oligotrophic lake vegetation they contain. The compensation flows released below the dams ensure that downstream river flow is not adversely affected.

Geomorphological processes of erosion by water and subsequent deposition of eroded sediments downstream create the physical structure of the river habitats. While some sections of the river are naturally stable, especially where they flow over bedrock, others undergo continual and at times rapid change through the erosion and deposition of bed and bank sediments as is typical of meandering sections within floodplains (called 'alluvial' rivers). These processes help to sustain the river ecosystem by allowing a continued supply of clean gravels and other important substrates to be transported downstream. In addition, the freshly deposited and eroded surfaces, such as shingle banks and earth cliffs, enable processes of ecological succession to begin again, providing an essential habitat for specialist, early successional species. Processes at the wider catchment scale generally govern processes of erosion and deposition occurring at the reach scale, although locally factors such as the effect of grazing levels on riparian vegetation structure may contribute to enhanced erosion rates. In general, management that interferes with natural geomorphological processes, for example preventing bank erosion through the use of hard revetments or removing large amounts of gravel, are likely to be damaging to the coherence of the ecosystem structure and functions. At Cors Caron, the Afon Teifi flows through an area of fine-grained lake sediments and provides an exceptional opportunity for studying fluvial transport processes dominated by suspended sediment movement. It provides a marked contrast with the upstream and downstream reaches where coarse bed-load transport is dominant, which is more typical of upland rivers in mid-Wales.

Riparian habitats, including bank sides and habitats on adjacent land, are an integral part of the river ecosystem. Diverse and high quality riparian habitats have a vital role in maintaining the SAC features in a favourable condition. The type and condition of riparian vegetation influences shade and water temperature, nutrient run-off from adjacent land, the availability of woody debris to the channel and inputs of leaf litter and invertebrates to support in-stream consumers. Light, temperature and nutrient levels influence in-stream plant production and habitat suitability for the SAC features. Woody debris is very important as it provides refuge areas from predators, traps sediment to create spawning and juvenile habitat and forms the base of an important aquatic food chain. Otters require sufficient undisturbed riparian habitat for breeding and resting sites. It is important that appropriate amounts of tree cover, tall vegetation and other semi-natural habitats are maintained on the riverbanks and in adjacent areas, and that they are properly managed to support the SAC features.

This may be achieved for example, through managing grazing levels, selective coppicing of riparian trees and restoring adjacent wetlands. The mobility of the Teifi has resulted in the formation of significant areas of off-channel habitat in the form of oxbows, wet woodlands, willow scrub etc. These are predominantly away from the main channel, and form important areas for otter to rest-up in or support breeding sites. In the few urban sections the focus may be on maintaining the river as a communication corridor but this will still require that sufficient riparian habitat is present and managed to enable the river corridor to function effectively.

Habitat connectivity is an important property of river ecosystem structure and function. Many of the fish that spawn in the river are migratory, depending on the maintenance of suitable conditions on their migration routes to allow the adults to reach available spawning habitat and juvenile fish to migrate downstream. For resident species, dispersal to new areas, or the prevention of dispersal causing isolated populations to become genetically distinct, may be important factors. Naturally isolated feature populations that are identified as having important genetic distinctiveness should be maintained. Artificial obstructions including weirs and bridge sills can reduce connectivity for some species. In addition, reaches subject to depleted flow levels, pollution, or disturbance due to noise, vibration or light, can all inhibit the movement of sensitive species. The dispersal of semi-terrestrial species, such as the otter, can be adversely affected by structures such as bridges under certain flow conditions; therefore these must be designed to allow safe passage. The continuity of riparian habitats enables a wide range of terrestrial species, to migrate and disperse through the landscape. Connectivity should be maintained, or restored where necessary, as a means to ensure access for the features to sufficient habitat within the SAC. Where the Teifi flows through Cors Caron, a 1.5 km reach in the centre of the bog was artificially straightened at the end of the 19th century. This has had the effect of reducing the naturalness and habitat diversity of the river and its connectivity with the surrounding fen and mire habitats of Cors Caron SAC. The previous meandering channel still exists in the form of cut off meanders, and restoration of this section to its previous course would enhance the river ecosystem structure and function, and its connectivity with the raised bog system.

External factors, operating outside the SAC, may also be influential, particularly for the migratory fish and otters. For example, salmon may be affected by inshore fishing and environmental conditions prevailing in their north Atlantic feeding grounds. Otters may be affected by developments that affect resting and breeding sites outside the SAC boundary.

Outline of past and current management

There are many different aspects to the management of this large and complex site that may affect its conservation status. These are summarised in the Site Management Statement for the Afon Teifi SSSI.

Management Units (SAC)

The area covered by this plan has been divided into management units to enable practical communication about features, objectives, and management. This will also allow us to differentiate between the different designations where necessary. In this plan the management units have been based on the following:

- SAC/SSSI boundary
- Natural hydromorphology, where there are significant differences in management issues/key features between reaches
- Estuary: the reach below the tidal limit is treated as a separate unit
- Artificial barriers, where they significantly affect one or more of the features' range (the Llyn Teifi dam)
- Tenure boundaries: Cors Caron NNR

The units include one or more of Natural Resources Wales River Basin Management Plan water bodies; as far as is practicable, unit boundaries coincide with these water body boundaries. Each unit has a unique reference number as part of the SSSI and SAC series for the whole of Wales. For ease of reference when using the plan as a working document, they have also been allocated additional reference numbers 1-7, as shown in the table below.

The locations of the management units are shown in Figures 1 and 2 below. Maps showing the management units referred to in this plan can also be viewed on Welsh Government's interactive website [Map Data Cymru](#).

The entire SAC is also the Afon Teifi SSSI. The following table confirms the relationships between the SAC management units, WFD water body IDs, and any further designations covered:

NRW internal reference	SAC management unit	NRW owned/ managed	Water body IDs within unit	Other designations
1	1553		GB110062039070, GB110062039160, GB110062043563	
2	1554		GB110062038950, GB110062039020, GB110062039130, GB110062038980, GB110062039010, GB110062039041, GB110062039090, GB110062039110, GB110062039170, GB110062039190, GB110062043563, GB110062043564	

NRW internal reference	SAC management unit	NRW owned/ managed	Water body IDs within unit	Other designations
3	1555		GB110062043565, GB110062039140, GB110062039220, GB110062043564	
4	1556		GB110062043565, GB110062039200, GB110062039230, GB110062039250, GB110062043490, GB110062039210, GB110062039240, GB110062043470, GB110062043501, GB110062043566	
5	1557	✓	GB110062043501	Cors Caron SAC, Ramsar & NNR
6.1	1558		GB110062043540, GB110062043501	
6.2	2983		GB110062043540	Elenydd-Mal- laen SPA
7	1612		GB110062043540	Elenydd-Mal- laen SPA

Table 1. Relationship between SAC Management Units and Water Bodies.

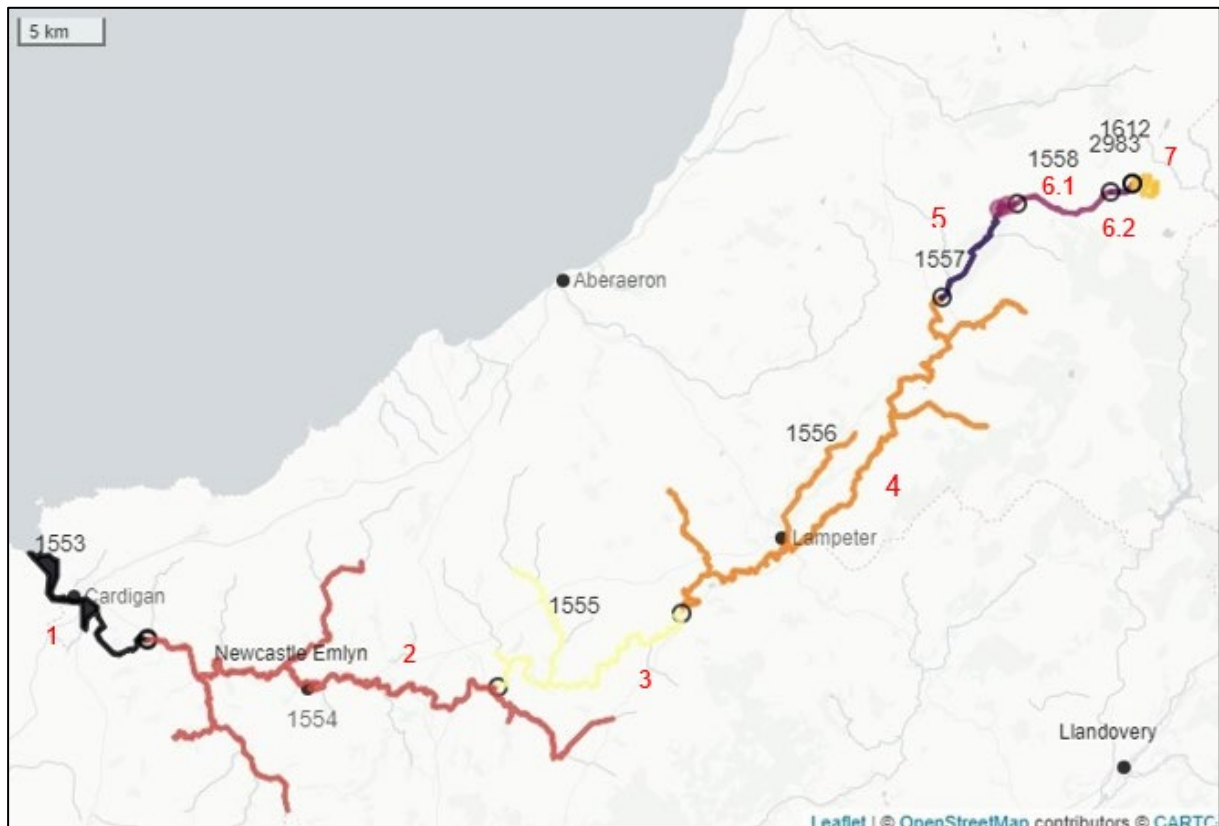


Figure 1. SAC management units in the Afon Teifi SAC. Points where units join are indicated by transparent circles. Colour is used as a visual aid alongside the circles to tell management units apart. SAC management unit numbers are shown in black; corresponding plan numbers in red. Filled circles indicate locations where small additional parts of unit 1558 (6.1) adjoin unit 1557 (5). See Figure 2 for additional detail. © Natural Resources Wales. All rights reserved.

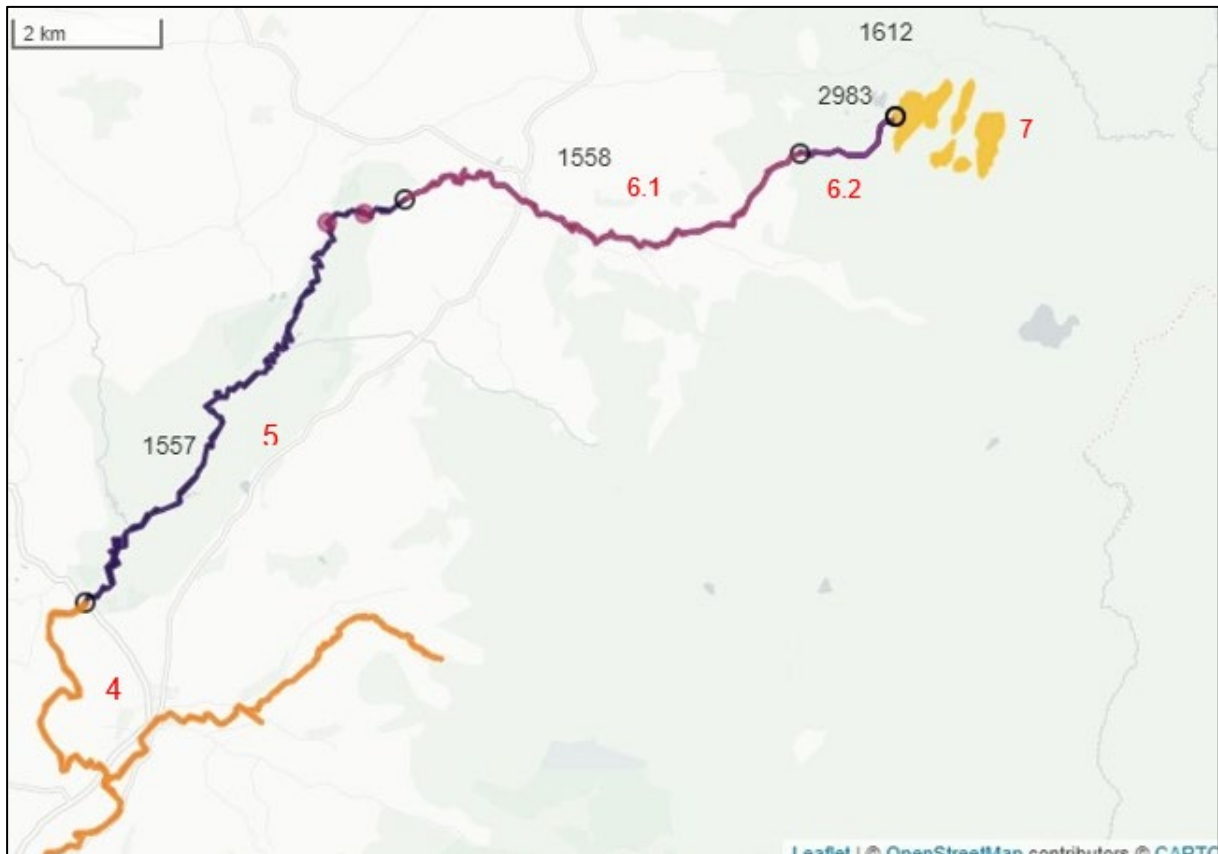


Figure 2. Zoomed-in SAC management units in the upper sections of the Afon Teifi SAC. Points where units join are indicated by transparent circles. Colour is used as a visual aid alongside the circles to tell management units apart. Filled circles indicate locations where small additional parts of unit 1558 (6.1) adjoin unit 1557 (5). There are no ecological differences between units 1558 (6.1) and 1559 (6.2). The unit has only been split to reflect the additional conservation designations. © Natural Resources Wales. All rights reserved.

The Features

Confirmation of Features

SAC feature (Annex I habitats and Annex II species)	Primary reason for site selection?	Relationships, nomenclature etc
Sea lamprey <i>Petromyzon marinus</i>	No	EU Species Code: 1095
Brook lamprey <i>Lampetra planeri</i>	Yes	EU Species Code: 1096
River lamprey <i>Lampetra fluviatilis</i>	Yes	EU Species Code: 1099
Atlantic salmon <i>Salmo salar</i>	Yes	EU Species Code: 1106
Bullhead <i>Cottus gobio</i>	Yes	EU Species Code: 1163
European otter <i>Lutra lutra</i>	Yes	EU Species Code: 1355
Floating water-plantain <i>Luronium natans</i>	Yes	EU Species Code: 1831
Watercourses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	Yes	EU Habitat Code: 3260
Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>	No	EU Habitat Code: 3130

Table 2. Summary of SAC Features.

SSSI features
Running water
Standing water
Marginal inundation communities
Marshy grassland
Swamp
Saltmarsh
Semi-natural woodland
Fluvial geomorphology of Wales
Water sedge <i>Carex aquatilis</i>
Dotted sedge <i>Carex punctata</i>
Cetti's warbler <i>Cettia cettia</i>
Toadflax leaf beetle <i>Chrysolina sanguinolenta</i>
Multi-fruited river-moss <i>Dendrocryphaea lamyana</i>
Club-tailed dragonfly <i>Gomphus vulgatissimus</i>
Graceful pondweed <i>Potamogeton x olivaceus</i>
Violet crystalwort <i>Riccia huebeneriana</i>
Cornish moneywort <i>Sibthorpia europaea</i>
A blackfly: <i>Simulium morsitans</i>
Brown hairstreak <i>Thecla betulae</i>
Assemblage of RDB and/or Nationally Scarce and/or Atlantic-Western British bryophytes
Assemblage of RDB and/or Nationally Scarce vascular plants
Breeding bird assemblage of lowland open waters and their margins

Table 3. List of SSSI Features.

Features and management units

This section sets out the relationship between the designated features and each management unit. This is intended to provide a clear statement about what each unit should be managed for, taking into account the varied needs of the different special features. All features are allocated to one of seven classes in each management unit. These classes are:

Key Features

KH - a 'Key Habitat' in the management unit, i.e. the habitat that is the main driver of management and focus of monitoring effort, perhaps because of the dependence of a key species (see KS below). There will usually only be one Key Habitat in a unit but there can be more, especially with large units.

KS – a 'Key Species' in the management unit, often driving both the selection and management of a Key Habitat.

Geo – an earth science feature that is the main driver of management and focus of monitoring effort in a unit.

Other Features

Sym - habitats, species and earth science features that are of importance in a unit but are not the main drivers of management or focus of monitoring. These features will benefit from management for the key feature(s) identified in the unit. These may be classed as 'Sym' (sympathetic) features because:

- they are present in the unit but may be of less conservation importance than the key feature; and/or
- they are present in the unit but in small areas/numbers, with the bulk of the feature in other units of the site; and/or
- their requirements are broader than and compatible with the management needs of the key feature(s), e.g. a mobile species that uses large parts of the site and surrounding areas: and/or
- key features (KH, KS) are closely associated with these features, and the conservation of key features depends on them being managed appropriately.

Nm - an infrequently used category where features are at risk of decline within a unit as a result of meeting the management needs of the key feature(s), i.e. under Negative Management. These cases will usually be compensated for by management elsewhere in the plan, and can be used where minor occurrences of a feature would otherwise lead to apparent conflict with another key feature in a unit.

Mn - Management units that are essential for the management of features elsewhere on a site e.g. livestock over-wintering area included within designation boundaries, buffer zones around water bodies, etc.

x – Features not known to be present in the management unit.

The table below sets out the relationship between the features and management units identified in this plan:

SAC management unit	1553	1554	1555	1556	1557	1558	2983	1612
NRW internal reference	1	2	3	4	5	6.1	6.2	7
SAC	✓	✓	✓	✓	✓	✓	✓	✓
SSSI	✓	✓	✓	✓	✓	✓	✓	✓
NNR/Natural Resources Wales managed					✓			
SAC features								
1. Rivers with floating vegetation often dominated by water-crowfoot	x	KH	KH	KH	KH	Sym	Sym	x
2. Brook lamprey	Sym	Sym	Sym	Sym	Sym	Sym	Sym	x
3. River lamprey	Sym	Sym	Sym	Sym	Sym	Sym	Sym	x
4. Sea lamprey	KS	KS	x	x	x	x	x	x
5. Atlantic salmon	KS	KS	KS	KS	KS	KS	KS	x
6. Bullhead	Sym	Sym	Sym	Sym	Sym	Sym	Sym	x

7. European otter	KS	KS	KS	KS	KS	KS	KS	Sym
8. Floating water-plantain	x	x	x	KS	KS	x	x	KS
9. Clear-water lakes with aquatic vegetation and poor to moderate nutrient levels.	x	x	x	x	x	x	x	KH
SSSI features								
Running water	KH	KH	KH	KH	KH	KH	KH	x
Standing water	Sym	Sym	Sym	Sym	Sym	Sym	Sym	KH
Marginal inundation communities	Sym	Sym	Sym	Sym	Sym	Sym	Sym	x
Marshy grassland	KH	Sym	Sym	Sym	Sym	Sym	Sym	x
Swamp	KH	Sym	Sym	Sym	Sym	Sym	Sym	x
Saltmarsh	Sym	x	x	x	x	x	x	x
Semi-natural woodland	KH	Sym	Sym	Sym	Sym	Sym	Sym	x
Fluvial geomorphology of Wales	x	Geo	x	x	Geo	x	x	x
Water sedge <i>Carex aquatilis</i>	x	Sym	Sym	Sym	Sym	x	x	x
Dotted sedge <i>Carex punctata</i>	Sym	x	x	x	x	x	x	x
Cetti's warbler <i>Cettia cettia</i>	KS	x	x	x	x	x	x	x
Toadflax leaf beetle <i>Chrysolina sanguinolenta</i>	Sym	x	x	x	x	x	x	x
Multi-fruited river-moss <i>Dendrocryphaea lamyana</i>	Sym	KS	Sym	x	x	x	x	x
Club-tailed dragonfly <i>Gomphus vulgatissimus</i>	Sym	x	x	x	x	x	x	x
Graceful pondweed <i>Potamogeton x olivaceus</i>	x	Sym	Sym	x	x	x	x	x
Violet crystalwort <i>Riccia huebeneriana</i>	x	Sym	x	Sym	Sym	x	x	x
Cornish moneywort <i>Sibthorpia europaea</i>	x	Sym	x	x	x	x	x	x
A blackfly: <i>Simulium morsitans</i>	x	x	x	x	Sym	x	x	x
Brown hairstreak <i>Thecla betulae</i>	Sym	x	x	x	x	x	x	x

Assemblage of RDB and/or Nationally Scarce and/or Atlantic-Western British bryophytes	Sym	Sym	Sym	Sym	Sym	Sym	Sym	Sym
Assemblage of RDB and/or Nationally Scarce vascular plants	Sym	Sym	Sym	Sym	Sym	x	x	KS
Breeding bird assemblage of lowland open waters and their margins	Sym	Sym	Sym	Sym	Sym	Sym	Sym	Sym

Table 4. Relationship between features and management units.

- The feature 'Rivers with floating vegetation often dominated by water-crowfoot' occurs in Units 2-6 (1554 - 1558 & 2983) and is selected as a key habitat in units 2-5 (1554 - 1557).
- Atlantic salmon migrates through Unit 1 (1553) and spawns in all the remaining units except Unit 7 (1612), so is selected as a key feature in all of these units.
- Sea lamprey is known to spawn in the lower river as far upstream as Henllan (Unit 2 /1443), and has been recorded at Llandysul in wet summers, (although the natural waterfalls at Cenarth may present a partial barrier to upstream migration). Although the distribution of sea lamprey on the Teifi is poorly understood, it is assumed to be generally absent from Unit 3 (1555) and upstream due to natural range limits. The distribution of river lamprey is very poorly known.
- Management for Atlantic salmon and sea lamprey should also be sympathetic for river/brook lamprey and bullhead.
- Specific management measures for otter relating to adjacent habitats and disturbance require its selection as a key feature in all units.
- Unit 7 (1612, the Teifi Pools) is the only unit that supports the feature 'Clear-water lakes with aquatic vegetation and poor to moderate nutrient levels'. It is selected as a key habitat in this unit.
- Floating water-plantain occurs both in Unit 7 (1612, the Teifi Pools) and in the main river in Units 4 (1556) and 5 (1557), with its river population centred around Cors Caron. Outlying plants have been recorded as far down-stream as Cwmann.

Conservation objectives

Background to conservation objectives

Outline of the legal context and purpose of conservation objectives

Conservation objectives for individual SACs and SPAs are required by the 1992 'Habitats' Directive (92/43/EEC) as implemented through the Conservation of Habitat and Species Regulations 2017 (As amended). The aim of the Habitats Directive is the maintenance, or where appropriate the restoration, of the 'favourable conservation status' (FCS) of habitats and species listed in the Annexes to the Directive (see below). Therefore FCS provides the overarching framework for defining the conservation objectives for individual SACs.

Although neither the Birds Directive nor the Ramsar Convention refer to FCS, Natural Resources Wales considers that the overall aim of both those legal instruments is sufficiently similar to FCS to make it practical and proportionate to use the same guiding principle when establishing the conservation objectives for SPAs and Ramsar sites, as well as SACs. Therefore the Habitats Directive definition of FCS is considered to provide the overarching framework for conservation objectives for all SACs, SPAs and Ramsar sites in Wales.

Favourable conservation as defined in Articles 1(e) and 1(i) of the Habitats Directive: "The conservation status of a natural habitat is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:

- its natural range and areas it covers within that range are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The conservation status of a species is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

- population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."

The achievement of FCS is not an objective that applies at the level of the individual sites. Rather it is a wider objective to which each individual site contributes. Therefore the conservation objectives for an individual site are intended to express what is considered to be that site's appropriate contribution to achieving FCS. Since SACs are the most important mechanism in the Habitats Directive for achieving FCS, and the sites represent the most important areas for conservation of the Annex I habitat types and Annex II species, the objectives for each individual SAC should seek to ensure that the site makes a substantial contribution which properly reflects its importance in a local, national and European context and the particular reasons why the site was selected for inclusion in the UK National Sites Network of SACs. A similar approach is taken to setting conservation objectives for SPAs and Ramsar sites.

Achieving the conservation objectives of individual sites requires appropriate management and the control of factors which are influencing, or may influence the features.

The conservation objectives have a number of specific roles:

- **Communication:** The conservation objectives should help convey to stakeholders what are the reasons for the designation and what it is intended to achieve.
- **Site planning and management:** The conservation objectives guide management of sites, to maintain or restore the designated habitats and species. They provide the basis for identifying what management is required both within the site boundary, and outside it, where achieving the objectives requires action to be taken outside the site.
- **River Basin Management Planning:** Conservation Objectives for aquatic and water dependent SAC and SPA features are also used as the "standards and objectives" referred to in Article 4 (1c) of the Water Framework Directive (WFD) (2000/60/EC). In 2009, Welsh Ministers decided that where SAC and SPA conservation objectives are more stringent than 'Good Ecological Status' (GES) as defined in the WFD, they (and the standards they contain) are the objectives referred to in Article 4(1c) of the WFD.
- **Assessing plans and projects:** Article 6(3) of the 'Habitats' Directive requires the assessment of proposed plans and projects in view of a site's conservation objectives. Subject to certain exceptions, plans or projects may not proceed unless it is established that they will not adversely affect the integrity of sites. There are similar requirements for the review of existing decisions and consents. Note that the assessment of plans and projects should be made in view of the entirety of the conservation objectives for the site, including the performance indicators.

Monitoring and reporting: In addition to foregoing purposes, conservation objectives provide the basis for defining the evidence that will be used for assessing the condition of a feature and the status of factors that affect it. That evidence is contained in a sub-set of conservation objectives called 'performance indicators'. The performance indicators are those conservation objectives which are quantifiable and measurable, and which provide the basis for monitoring and reporting. The performance indicators are set out in an Appendix to this document.

The conservation objectives in this document reflect Natural Resources Wales' current information and understanding of the site and its features and their importance in an international context. The conservation objectives are subject to review by Natural Resources Wales in the light of new knowledge.

Format of the conservation objectives

Each conservation objective is a composite statement defining a site-specific aspiration for each designated feature. This composite statement contains clauses that correspond to all the elements of FCS, namely:

For habitat features:

- Extent should be stable in the long term, or where appropriate increasing*;
- Quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving;
- Populations of the habitat's typical species must be being maintained or where appropriate increasing*;
- Factors affecting the extent and quality of the habitat and its typical species (and thus affecting the habitat's future prospects) should be under appropriate control.

For species features:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term;
- The distribution of the population should be being maintained;
- There should be sufficient habitat, of sufficient quality, to support the population in the long term;
- Factors affecting the population or its habitat should be under appropriate control.

The elements above constitute a generic checklist or guide to the elements that should normally be included in the conservation objectives, in order to ensure that the site makes an effective and appropriate contribution to achieving favourable conservation status for the habitats and species for which it is designated.

There is one conservation objective for each designated feature listed above. In some cases, where there are distinct areas or forms of a designated habitat or separate populations of a designated species within a site, the conservation objective is sub-divided into different sections to enable different aspirations to be expressed for different occurrences of the features within the site.

As well as describing the aspirations for the condition of the feature, each conservation objective contains a statement that the factors which significantly affect the feature are under appropriate control.

Conservation Objective for the watercourse

The ecological status of the watercourse is a major determinant of FCS for all features. The required conservation objective for the watercourse is defined below.

- The capacity of the habitats in the SAC to support each feature at near-natural population levels, as determined by predominantly unmodified ecological and hydromorphological processes and characteristics, should be maintained as far as possible, or restored where necessary.
- The ecological status of the water environment should be sufficient to maintain a stable or increasing population of each feature. This will include elements of water quantity and quality, physical habitat and community composition and structure.
- Flow regime, water quality and physical habitat should be maintained in, or restored as far as possible to, a near-natural state, in order to support the coherence of ecosystem structure and function across the whole area of the SAC.
- All known breeding, spawning and nursery sites of species features should be maintained as suitable habitat as far as possible, except where natural processes cause them to change.
- Flows, water quality, substrate quality, and quantity at fish spawning sites and nursery areas will not be depleted by abstraction, discharges, engineering or gravel extraction activities or other impacts to the extent that these sites are damaged or destroyed.
- The river planform and profile should be predominantly unmodified. Physical modifications having an adverse effect on the integrity of the SAC, including, but not limited to, revetments on active alluvial river banks using stone, concrete or waste materials, unsustainable extraction of gravel, addition or release of excessive quantities of fine sediment, will be avoided.
- River habitat SSSI features should be in favourable condition.
- Artificial factors impacting on the capability of each species feature to occupy the full extent of its natural range should be modified where necessary to allow passage, e.g. weirs, bridge sills, acoustic barriers.
- Natural factors such as waterfalls, which may limit the natural range of a species feature, or dispersal between naturally isolated populations, should not be modified.
- Flows during the normal migration periods of each migratory fish species feature will not be depleted by abstraction to the extent that passage upstream to spawning sites is hindered.
- Flow objectives for assessment points in the Teifi Catchment Abstraction Management Strategy (CAMS) as they relate to the Afon Teifi SAC will concur with the standards used by the Review of Consents process given in [Appendix 3](#) of this document.
- Water quality targets follow those in the revised Common Standards Monitoring Guidance for Rivers (JNCC 2016). These are detailed in [Appendix 2](#) with targets for organic pollution (DO, BOD and ammonia), phosphate, trophic diatom index and acidification.
- Levels of suspended solids will be set by NRW for each Water Framework Directive water body in the Afon Teifi SAC. Measures including, but not limited to, the control of suspended sediment generated by agriculture, forestry and engineering works, will be taken to maintain suspended solids below these levels.
- Potential sources of pollution not addressed in the Review of Consents, such as contaminated land, will be considered in assessing plans and projects.

Conservation Objective for Features 1 – 5 (fishes)

The 5 fishes designated under the EU Habitats Directive in the Teifi (and their corresponding EU code) are: Sea lamprey *Petromyzon marinus* (1095); Brook lamprey *Lampetra planeri* (1096); River lamprey *Lampetra fluviatilis* (1099); Atlantic salmon *Salmo salar* (1106); and bullhead *Cottus gobio* (1163). Brook lamprey and river lamprey are generally indistinguishable for the purposes of monitoring; however, management requirements are similar.

Vision for features 1 – 5

The vision for these features is for them to be in a favourable conservation status, where all of the following conditions are satisfied:

FCS component	Supporting information / current knowledge
The conservation objective for the watercourse as defined in the section above must be met	
The population of the feature in the SAC is stable or increasing over the long term.	Refer to Status assessment sections for current assessments of feature populations. Entrainment in water abstractions directly impacts on population dynamics through reduced recruitment and survival rates. Fish stocking can adversely affect population dynamics through competition, predation, introduction of disease and alteration of population genetics.
The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches where predominantly suitable habitat for each life stage exists over the long term. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms e.g. suitable flows to allow upstream migration, depth of water and substrate type at spawning sites, and ecosystem structure and functions e.g. food supply (as described in Site description and Assessment of status). Suitable habitat need not be present throughout the SAC but where present must be secured for the	Some reaches of the Afon Teifi SAC are more suitable for some features than others. These differences influence the management priorities for individual reaches and are used to define the site units described in section Features and management units. Further details of feature habitat suitability are given in the Assessment section. In general, management for one feature is likely to be sympathetic for the other features present in the river, provided that the components of favourable conservation status for the watercourse as defined in the section above are secured. The characteristic channel morphology provides the diversity of water depths, current velocities and substrate types necessary to fulfil the habitat requirements of the features. The close proximity of different habitats facilitates movement of fish to new preferred habitats with age. Upland coniferous forestry plantations in parts of the upper catchment, including the Groes, Berwyn

FCS component	Supporting information / current knowledge
foreseeable future. Natural factors such as waterfalls may limit the natural range of individual species. Existing artificial influences on natural range that cause an adverse effect on site integrity, such as physical barriers to migration, will be assessed.	and Breifi catchments, adversely affect the run-off and sediment characteristics and water quality of the river. In a few locations there are also problems with toxic run-off from abandoned metal mines. Measures should be taken to restore the hydrological characteristics of headwater areas including wetland functions. Salmon migration can be affected by acoustic barriers and by high sediment loads, which can originate from a number of sources including construction works.
There is, and will continue to be, a sufficiently large habitat to maintain the feature's population in the SAC on a long-term basis.	

Table 5. Vision for fish Features 1-5.

Conservation Objective for Feature 6:

European otter *Lutra lutra* (EU Species Code: 1355)

Vision for feature 6

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

FCS component	Supporting information / current knowledge
The population of otters in the SAC is stable or increasing over the long term and reflects the natural carrying capacity of the habitat within the SAC, as determined by natural levels of prey abundance and associated territorial behaviour.	Refer to Assessment section for current assessment of feature population
The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches that are potentially suitable to form part of a breeding territory and/or provide routes between breeding territories. The whole area of the Teifi SAC is considered to form potentially suitable breeding habitat for otters. The size of breeding territories may vary depending on prey abundance. The population size should not be limited by the availability of suitable undisturbed breeding sites. Where these are insufficient they should be created through habitat enhancement and where necessary the provision of artificial holts. No otter breeding site should be subject to a level of disturbance that could have an adverse effect on breeding success. Where necessary, potentially harmful levels of disturbance must be managed.	Survey information shows that otters are widely distributed in the Teifi catchment. While the breeding population on the Teifi is not currently considered to be limited by the availability of suitable breeding sites, there is some uncertainty over the number of breeding territories which the SAC is capable of supporting given near-natural levels of prey abundance. The decline in eel populations may be having an adverse effect on the population of otters on the Teifi.
The safe movement and dispersal of individuals around the SAC is facilitated by the provision, where necessary, of suitable riparian habitat, and underpasses, ledges, fencing etc at road bridges and other artificial barriers.	Road and bridge improvement schemes within the catchment should take appropriate measures towards achievement of this objective.

Table 6. Vision for Otter *Lutra lutra*.

Conservation Objective for Feature 7: Floating water-plantain *Luronium natans* (EU Species Code: 1831)

Vision for feature 7

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

FCS component	Supporting information / current knowledge
The conservation objective for the watercourse as defined in the section above must be met.	
The floating water-plantain populations will be viable throughout their current distribution in the SAC (maintaining themselves on a long-term basis). Each floating water-plantain population must be able to complete sexual and/or vegetative reproduction successfully. Potential for genetic exchange between floating water-plantain populations, in and/or outside the SAC, must be evident in the long-term. Dispersal of floating water-plantain must be unhindered.	Floating water-plantain populations are known to be present in the main river reaches through and downstream of Cors Caron (units 1556 and 1557), and in each of the Teifi Pools (unit 1612). Vegetative reproduction is believed to be the main means of regeneration and dispersal for these populations, but they are known to flower periodically in the Teifi Pools during dry summers. Sexual reproduction is important, especially in the long-term, as this provides an alternative means of dispersal and genetic exchange over short and long distances.
The SAC will have sufficient suitable habitat to support floating water-plantain populations within their current distribution. There will be no contraction of the current floating water-plantain distribution in the SAC. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms e.g. water levels in Teifi Pools, water depth, stability of river flows, stability of bed substrate, ecosystem structure and functions e.g. nutrient levels, and shade (as described in section Outline description).	Adverse factors may include elevated nutrient levels, artificial regulation of water levels ('draw-down') in the reservoirs at Llyn Teifi and Llyn Egnant, altered river flow and/or sediment regimes, and shading. Species indicative of unfavourable condition for this feature e.g. filamentous algae associated with eutrophication, invasive non-native species, should be maintained or restored below an acceptable threshold level, indicative of high ecological status within the SAC.

Table 7. Vision for floating water-plantain *Luronium natans*.

Conservation Objective for Feature 8: Watercourses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation (EU Habitat Code: 3260)

Vision for feature 8

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

FCS component	Supporting information / current knowledge
The conservation objective for the watercourse as defined in the section above must be met	
The natural range of the plant communities represented within this feature should be stable or increasing in the SAC. The natural range is taken to mean those reaches where predominantly suitable habitat exists over the long term. Suitable habitat and associated plant communities may vary from reach to reach. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms e.g. depth and stability of flow, stability of bed substrate, and ecosystem structure and functions e.g. nutrient levels, shade (as described in Outline description section). Suitable habitat for the feature need not be present throughout the SAC but where present must be secured for the foreseeable future, except where natural processes cause it to decline in extent.	Stands of this feature are known to be widespread in the Afon Teifi SAC including many of the tributaries. However, further information on its natural range, distribution and variation is desirable. Sympathetic management will be promoted wherever the feature is present. Species indicative of unfavourable condition for this feature e.g. filamentous algae associated with eutrophication and invasive non-native species, should be maintained or restored below an acceptable threshold level, indicative of high ecological status within the SAC.
The area covered by the feature within its natural range in the SAC should be stable or increasing.	Adverse factors may include elevated nutrient levels, shading or altered flow and/or sediment regimes. It is possible that reaches with slightly elevated nutrient levels and/or regulated flows may have a higher cover of the feature than under natural conditions, though species composition may also be affected.

FCS component	Supporting information / current knowledge
The conservation status of the feature's typical species should be favourable. The typical species are defined with reference to the species composition of the appropriate JNCC river vegetation type for the particular river reach, unless differing from this type due to natural variability when other typical species may be defined as appropriate.	

Table 8. Vision for Rivers with Ranunculion habitat.

Conservation Objective for Feature 9: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (EU Habitat Code:3130)

Vision for feature 9

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

FCS component	Supporting information / current knowledge
The conservation objective for the watercourse as defined in the section above must be met.	
The <i>Littorelletea uniflorae</i> aquatic upland lake community will be present in all five of the Teifi Pools (Llyn Hir, Llyn Teifi, Llyn Egnant, Llyn y Gorlan and Llyn Bach), and will be self-maintaining on a long-term basis.	Stands of this upland lake plant community are present in each of the Teifi Pools. Adverse factors may include elevated nutrient levels, artificial regulation of water levels ('draw-down') in the reservoirs at Llyn Teifi and Llyn Egnant, and poaching of exposed lake shores by livestock during periods of low water levels. Species indicative of unfavourable condition for this feature e.g. filamentous algae associated with eutrophication, invasive non-native species, should be maintained or restored below an acceptable threshold level, indicative of high ecological status within the SAC.
A fully developed <i>Littorelletea</i> community will be present in Llyn Hir, including all of the component species typical of the SAC feature, as represented in the Afon Teifi SAC. The typical species are defined with reference to the species composition of the JNCC standing water type for the SAC feature, unless differing from this type due to natural variability when other typical species may be defined as appropriate.	It is considered necessary to maintain a fully developed <i>Littorelletea</i> community in Llyn Hir only. The development of the community in Llyn Bach and Llyn y Gorlan is restricted by the small size of these lakes. The development of the community in Llyn Egnant and Llyn Teifi is restricted by the current management of these two lakes as reservoirs, since several of the key component species of the <i>Littorelletea</i> community are unable to cope with the effects of frequent draw-down.
For each of Llyn Teifi, Llyn Egnant, Llyn y Gorlan and Llyn Bach, the extent and species composition of the <i>Littorelletea</i>	These latter four lakes, in their current condition, contribute to maintaining the feature as a whole in favourable condition, but it is not

FCS component	Supporting information / current knowledge
community will be stable or increasing in range. There will be no deterioration in the conservation status of the feature as represented in these lakes.	necessary for them to support a fully developed <i>Littorelletea</i> community.

Table 9. Vision for Oligotrophic lakes with Littoreletea.

Assessment of status and management requirements

This section provides a summary of the assessment of the status of each feature, and a summary of the management issues that need to be addressed to maintain or restore each feature.

Status and management requirements of Feature 1: *Petromyzon marinus*

Status of Feature: Unfavourable (Medium Confidence) (2020)

Sea lamprey monitoring undertaken in 2004 (Campbell et al., 2005) failed to find juvenile sea lamprey at any sites either on the main river Teifi or any of the tributaries. Therefore the Afon Teifi SAC failed the JNCC target threshold, and targets for spawning site & ammocoete distribution. The LIFE Teifi field trials study in 2002 (Harvey & Cowx, 2003) found only a single ammocoete.

Migrating adult sea lamprey, spawning adults and dead individuals are reported from the lower reaches of the Teifi each year, regularly occurring as far upstream as Henllan (Unit 2 / 1554). In 2007 (a wet summer) spawning adults were recorded at Llandysul. However, most of the spawning is believed to be below Cenarth (Davies 2020).

In the second reporting cycle, no sea lamprey were caught and so the population attributes did not meet any of the targets. Spawning activity was not assessed. All the environmental attribute targets were passed with the exception of pH (Thomas et al, 2012). Adult sea lamprey regularly ascend the river to spawn and are detected by the ARIS fish counter, with an estimated run of 133 individuals in 2019 (Davies 2020).

A lack of juvenile sea lamprey in surveys of this type is common to a number of rivers despite the presence of spawning adults. The contractors postulate that separation of habitat is occurring between brook/river lamprey and sea lamprey, the former spawning earlier in the year (March/April) compared to sea lamprey, which spawn in June. They consider that juvenile sea lamprey are being excluded from optimum habitat and are having to utilise silt beds in deeper water, habitat that is not monitored as part of the standard assessment.

Management requirements

The impacts of barriers to migration and flow depletion are highlighted in the assessment of conservation status for this feature. The most significant potential obstruction to migration of lamprey is the Cenarth Falls (Unit 2 /1554). Although sea lamprey are known to get past them, as noted above, the falls are of a size that they may present a significant barrier to lamprey movement at certain flows. In addition to Cenarth Falls, four small weirs exist on the Ceri that may prevent access to the upper parts of

this tributary for migratory lamprey. There is also another group of weirs fairly low down in the Clettwr sub-catchment, which may prevent access to the majority of this tributary. The impact of artificial barriers should be assessed on a case-by-case basis. Physical modification of these barriers is required where depth/velocity /duration of flows is unsuitable to allow passage.

Entrainment in water abstractions directly impacts on population dynamics through reduced recruitment and survival rates. Information on likely rates of entrainment of lamprey ammocoetes is required before acceptable levels can be assessed.

The extent and quality of suitable sea lamprey habitat must be maintained. Elevated levels of fines (particles <0.83 mm) within spawning substrates can interfere with egg survival. Spawning habitat consists of well-oxygenated gravel/pebble substrate of >10 cm depth in a range of water depths (0.2 to 1.5 m). Sea and river lamprey tend to spawn in deeper water than brook lamprey. Nursery habitat consists of open-structured, aerated, silty and sandy substrates between 2 and 40 cm depth generally in shallow (<0.5 m) slack-water channel margins.

Status and management requirements of Feature 2 and 3: *Lampetra planeri* and *Lampetra fluviatilis*

Status of Features: Favourable, (Low confidence) (2020)

Brook/river lamprey monitoring undertaken in 2004 (Campbell, Clarke & Williams, 2005) showed the overall catchment mean ammocoete density to be 2.9 m⁻² (sd ±0.7). This does not meet the target of 5 m⁻² in the JNCC (2005) guidance. The mean density in optimal habitat was 6.9 m⁻² (sd ± 1.2), which was below the guidance target of 10 m⁻², and thus the catchment was considered to be in unfavourable condition.

When the sites were assessed individually, only 10 of the 28 (36%) sites surveyed met the target of 10 m⁻² for optimal habitat. The remaining optimal sites did not meet the density requirement to be considered favourable. Taking the SAC sites in isolation, the mean optimal habitat density of *Lampetra* spp. was 7.2 m⁻² (sd ± 1.6). The mean density for all habitat in the SAC was 3.2 m⁻² (sd ±0.9). Six of 18 (33%) sites thus met the density requirement to achieve favourable status within the SAC. The age structure and distribution targets were met. There did not appear to be any grading in the geographic distribution or densities of *Lampetra* spp.; rather a patchy distribution across the catchment.

In the second reporting cycle, the features met all the population targets (Webb et al). All the environmental attribute targets were passed with the exception of pH, because the headwaters are at risk from acidification (Thomas et al, 2012).

It has not been possible to distinguish between these two species during monitoring, due to the reliance on juvenile stages (ammocoetes). Anecdotal evidence suggests that both species are likely to be present in many reaches, though brook lamprey are expected to predominate in the headwaters and river lamprey may be the more abundant species in the main channel and the lower reaches of larger tributaries. More information on the relative abundance of these two species in different parts of

the Afon Teifi SAC is desirable. Records of spawning adult river lampreys would be particularly useful.

Management requirements

The extent and quality of suitable habitat for brook and river lamprey must be maintained. Elevated levels of fines (particles <0.83 mm) within spawning substrates can interfere with egg survival. Spawning habitat consists of well-oxygenated gravel/pebble substrate of >10 cm depth in a range of water depths (0.2 to 1.5 m). Sea and river lamprey tend to spawn in deeper water than brook lamprey. Nursery habitat consists of open-structured, aerated, silty and sandy substrates between 2 and 40cm depth generally in shallow (<0.5 m) slack-water channel margins.

Entrainment in water abstractions directly impacts on population dynamics through reduced recruitment and survival rates. Information on likely rates of entrainment of lamprey ammocoetes is required before acceptable levels can be assessed.

The impacts of barriers to migration and flow depletion are highlighted in the assessment of conservation status for this feature. The most significant potential obstruction to migration of lamprey is the Cenarth Falls (unit 1554). Although sea lamprey are known to get past them, no transforming *Lampetra* spp. were found above the falls in the 2004 study, so it is not known whether they present an obstruction to the smaller river lamprey. The falls are of a size that they may present a significant barrier to lamprey movement at certain flows. In addition to Cenarth Falls, four small weirs exist on the Ceri that may prevent access to the upper parts of this tributary for migratory lamprey. There is also another group of weirs fairly low down in the Clettwr sub-catchment, which may prevent access to the majority of this tributary. The impact of artificial barriers should be assessed on a case-by-case basis. Physical modification of these barriers is required where depth/velocity/duration of flows is unsuitable to allow passage.

Brook and river lamprey are likely to benefit from positive management for the other SAC features, and may see improvement in condition as a result. On-going monitoring will allow a better understanding of population fluctuations, distributional changes etc.

Status and management requirements of Feature 4: *Salmo salar*

Status of Feature: Unfavourable, (High Confidence) (2020)

Monitoring of Atlantic salmon in the Teifi relies on two methods,

1. Estimation of adult run size from angling catch returns, supported by fish counter data,
2. Electro-fishing for juveniles in nursery areas

The estimate of adult numbers is converted into an estimate of numbers of eggs deposited which is compared against an Egg Deposition Target (EDT), calculated by considering the area of suitable spawning habitat within the catchment. The equivalent adult run to achieve the EDT is described in terms of a Conservation Limit, which must be exceeded 4 years in 5 for the Management Target to be considered attained. Electro-fishing for juveniles is either quantitative or semi-quantitative, and estimated juvenile densities are classified in one of six categories A to F. The monitoring guidance produced by the LIFE in UK Rivers project recommends that ideally juvenile densities should be compared to predicted densities for the sample reach using the HABSCORE model (Cowx & Fraser, 2003). These targets are calculated and monitored by Natural Resources Wales as part of the Salmon Action Plan for the Teifi.

The Conservation Limit for salmon egg deposition for the Teifi is set at 8.65 million eggs and this has been failed in recent years, with a significant shortfall in the numbers of eggs. This has led to the Teifi being classed as “at Risk” in 2019 and is predicted to remain “at Risk” in 2024 (ICES, 2020). This is a highly significant downward trend in salmon. The unfavourable status results from a combination of assessment of salmon population and the presence of a number of adverse factors. In the past, invertebrate depletion due to sheep dip pollution and acidification from forestry had significant impacts. Over recent years, multiple pressures are impacting on the salmon population in the Teifi, including climate change, river habitat quality, diffuse pollution and marine survival rates (NRW, 2020).

In the second reporting cycle, population (adult run size), water quality (soluble reactive phosphate), flow and river morphology (artificial barriers) attributes pass the target. However, population (juvenile densities), water quality (biological quality, chemical quality, suspended solids), river morphology (physical features) and river substrate attributes fail the target.

Management requirements

The Atlantic salmon is the focus for much of the management activity carried out on the Teifi. The relatively demanding water quality and spawning substrate quality requirements of this feature mean that reduction in diffuse pollution and siltation impacts is a high priority. Measures to address these problems include the establishment of buffer zones on reaches adjacent to intensively managed livestock grazing or arable land. Tree management, especially coppicing and pollarding to increase light levels to the channel, is also carried out. In-stream liming, using limestone sand, has been trialled in the acidified Berwyn tributary. Much of this work has been supported or directly undertaken by Environment Agency Wales and latterly by Natural Resources Wales under the ‘Sustainable Fisheries’ programme. Other work has included reduction in exploitation pressure through the introduction of ‘catch and release’ angling (both mandatory, through NRW byelaws, and voluntary, encouraged by the local angling clubs).

Elevated levels of fines (particles <0.83mm) within spawning substrates can interfere with egg and fry survival. Clean substrate free from excessive siltation should predominate at suitable spawning sites. Spawning habitat is defined as stable coarse substrate without an armoured layer, in the pebble to cobble size range (16-256 mm) but with the majority being <150 mm. Water depth during the spawning and

incubation periods should be 15-75 cm. Fry habitat is indicated by water of <20 cm deep and a gravel/pebble/cobble substrate. Parr habitat is indicated by water 20-40 cm deep and similar substrate. Holding areas are defined as pools of at least 1.5 m depth, with cover from features such as undercut banks, vegetation, submerged objects and surface turbulence. Coarse woody debris should not be removed from rivers as it plays a significant role in the formation of new gravel beds, and provides cover for fish and a source of food for invertebrates.

In the Teifi catchment, the most significant sources of diffuse pollution and siltation are from agriculture, including fertiliser run-off, livestock manure, silage effluent and soil erosion from ploughed land. The most intensively used areas such as heavily trampled gateways and tracks can be especially significant sources of polluting run-off. Preventative measures can include surfacing of tracks and gateways, moving feeding areas, and separating clean and dirty water in farmyards. Farm operations should avoid ploughing land which is vulnerable to soil erosion or leaving such areas without crop cover during the winter.

Among toxic pollutants, sheep dip and silage effluent present a particular threat to aquatic animals in this predominantly rural area. Contamination by synthetic pyrethroid sheep dips, which are extremely toxic to aquatic invertebrates, has a devastating impact on invertebrate populations and can deprive fish populations of food over large stretches of river. These impacts can arise if recently dipped sheep are allowed access to a stream or hard standing area, which drains into a watercourse. Pollution from organophosphate sheep dips and silage effluent can be very damaging locally. Pollution from slurry and other agricultural and industrial chemicals, including fuels, can kill all forms of aquatic life. All sheep dips and silage, fuel and chemical storage areas should be sited away from watercourses or bunded to contain leakage. Recently dipped sheep should be kept off stream banks. Used dip should be disposed of strictly in accordance with Natural Resources Wales Regulations and guidelines. Statutory and voluntary agencies should work closely with landowners and occupiers to minimise the risk of any pollution incidents and enforce existing regulations.

Measures to control diffuse pollution in the water environment, including 'Catchment Sensitive Farming', may be implemented as a result of the Water Framework Directive and, along with existing agri-environment schemes, will help to achieve the conservation objectives for the SAC.

Discharges from sewage treatment works, urban drainage, engineering works such as road improvement schemes, contaminated land, and other domestic and industrial sources can also be significant causes of pollution, and must be managed appropriately. Current consents for discharges entering, or likely to impact upon the site should be monitored, reviewed and altered if necessary.

Overhanging trees provide valuable shade and food sources, whilst tree root systems provide important cover and flow refuges for juveniles.

In all river types, artificial barriers should be made passable. On the Teifi artificial barriers are not considered to be a major issue, but local problems exist. The impact of existing barriers should be assessed on a case-by-case basis. Physical modification of barriers is required where depth/velocity/duration of flows is unsuitable to allow

passage. Complete or partial natural barriers to potentially suitable spawning areas should not be modified or circumvented.

Development activities that may cause long-term or temporary physical, acoustic, chemical and sediment barrier effects will need to be addressed in the assessment of specific plans and projects.

Entrainment in water abstractions directly impacts on population dynamics through reduced recruitment and survival rates. Intake screens must meet statutory requirements under the Salmon & Freshwater Fisheries Act.

In the past a small-scale salmon rearing and stocking programme was carried out on the lower Teifi by a local angling association, using brood-stock taken from the river, but this ceased in 2012. The management objectives for SAC salmon populations are to attain naturally self-sustaining populations. Salmon stocking should not be routinely used as a management measure. Salmon stocking represents a loss of naturalness and, if successful, obscures the underlying causes of poor performance (potentially allowing these risks to perpetuate). It carries various ecological risks, including the loss of natural spawning from brood-stock, competition between stocked and naturally produced individuals, disease introduction and genetic alterations to the population. There should therefore be a presumption against salmon stocking in the Afon Teifi SAC.

The presence of artificially high densities of other fish species can create unacceptably high levels of predatory and competitive pressure on juvenile salmon and the aim should be to minimise these risks in considering any proposals for stocking. Escapes from fish farms are a form of uncontrolled introduction and should be prevented by effective screening on all intakes and discharges.

Controls on exploitation should include migratory passage to the SAC within territorial waters, including estuarine and coastal net fisheries, as well as exploitation within the SAC from rod fisheries. Net Limitation Orders are used to control the estuarine fishery. Exploitation of salmon by rod fisheries is regulated by Natural Resources Wales licensing and byelaws controlling the fishing season and allowable methods.

Status and management requirements of Feature 5: *Cottus gobio*

Status of Feature: Unknown (2020)

Records obtained from juvenile salmon monitoring show that bullhead are widespread in the main river and tributaries. There is a need for quantitative information on bullhead abundance.

Management requirements

Vertical drops of >18-20 cm are sufficient to prevent upstream movement of adult bullheads. They will therefore prevent recolonisation of upper reaches affected by

lethal pollution episodes, and will also lead to constraints on genetic interactions that may have adverse consequences. New in-stream structures should be avoided, whilst the impact of existing artificial structures needs to be evaluated.

The extent and quality of suitable bullhead habitat must be maintained. Elevated levels of fines can interfere with egg and fry survival. Spawning habitat is defined as unsilted coarse (gravel/pebble/cobble) dominated substrate: males guard sticky eggs on the underside of stones. Larger stones on a hard substrate providing clear spaces between the stream bed and the underside of pebbles/cobbles are therefore important.

The importance of submerged higher plants to bullhead survival is unclear, but it is likely that where such vegetation occurs it is used by the species for cover against predators. Weed cutting should be limited to no more than half of the channel width in a pattern of cutting creating a mosaic of bare substrate and beds of submerged plants. Slack-water areas provide important refuges against high flow conditions. Suitable refuges include pools, submerged tree root systems and marginal vegetation with >5 cm water depth.

Bullheads are particularly associated with woody debris in lowland reaches, where it is likely that it provides an alternative source of cover from predators and floods. It may also be used as an alternative spawning substrate. Debris dams and woody debris should be retained where characteristic of the river/reach. Woody debris removal should be minimised, and restricted to essential activities such as flood defence.

Maintenance of intermittent tree cover in conjunction with retention of woody debris helps to ensure that habitat conditions are suitable. Some reaches may naturally have lower tree cover.

The presence of artificially high densities of salmonids and other fish will create unacceptably high levels of predatory and competitive pressure on juvenile and adult bullhead. Stocking of fish should be avoided in the SAC.

Escapes from fish farms are a form of uncontrolled introduction and should be prevented by effective screening on all intakes and discharges.

Bullheads are relatively sedentary and interactions between populations in different parts of the catchment and in different catchments are likely to be limited, suggesting the existence of genetically discrete populations. Since they are of no angling interest, deliberate transfers between sites are unlikely to have been undertaken in the past, such that the genetic integrity of populations is likely to be intact. There should be no stocking/transfers of bullhead unless agreed to be in the best interests of the population.

In general, management for other SAC features is expected to result in favourable habitat for bullhead, through improvements in water quality and flow regime and maintenance of suitable physical habitat.

Status and management requirements of Feature 6: *Lutra lutra*

Status of Feature: Unfavourable (Medium) (2020)

The conservation status of otters in the Afon Teifi SAC is determined by monitoring their distribution, breeding success, and the condition of potential breeding and feeding habitat outlined in the Performance Indicators. Whereas past monitoring (Liles 2004) and the results of the 4th (2002) and 5th (2009-10) Otter Survey Wales indicated the condition of the otter population to be favourable, results from the 6th Otter Survey of Wales (2015-18) shows a significant fall in the proportion of survey sites from which otter signs were recorded. The proportion of positive records from the population area within which this SSSI sits is below the 80% target set by NRW's terrestrial mammals specialist, and the condition of the feature is now considered unfavourable. Due to the scale of the decline since 2009-10, it is very likely that this did represent a reduction in the size of the local otter population. The reasons for this apparent decline are unknown.

This assessment is based on the results from the 6th Otter Survey Wales (2015-18). It reflects an evaluation of the status of the (sub) population which the otters utilizing the SSSI fall within. The (sub) population considered is one of three broad groups identified on the basis of genetic analysis of UK otter populations by Hobbs et al. (2011). The results show a significant decline in the proportion of survey sites from which otter signs have been recorded since the previous survey in 2009: the frequency of sites with positive records dropping from 90% to 69% in the South West (sub)population area; from 94% to 77% in the East (sub) population area; and 86% to 66% in the North (sub)population area. All three (sub)populations now fall below the provisional target of 80% of sites with positive signs, set by NRW's specialist advisor on terrestrial mammals.

Management requirements

Past monitoring (Liles, 2004) suggested that the otter population on the Teifi may well have been at the carrying capacity for the catchment at that time, although it is possible that, if all the breeding sites were to achieve optimal habitat conditions and fish and amphibian stocks secured, the catchment could then support further breeding animals. However, the amount of compression of home ranges that otters will accept cannot as yet be determined.

Although it is not possible to conclude whether the overall number of potential breeding sites in the catchment is high or low (in relation to the total length of watercourse), there does appear to be a marked difference in the number and distribution of sites in the two halves of the catchment. In particular, an assessment of otter breeding habitat has indicated that there may be a shortage of suitable breeding sites in the upper half of the catchment, which may affect the long-term viability of the population. This could be addressed by habitat enhancement, including stock exclusion from suitable woodlands near to the river, coppicing discrete areas close to the bank edge to promote scrub growth, and the construction of log-pile otter holts.

Management should aim to ensure that there is sufficient undisturbed breeding habitat to support an otter population of a size determined by natural prey availability and associated territorial behaviour. The involvement of river users and land managers will be important in improving potential breeding habitat near to the river. Agri-environment and woodland creation schemes provide possible mechanisms for maintaining suitable sites, such as lightly grazed woodlands, areas of dense scrub, and tussocky fens with purple moor-grass.

Food availability is an important factor. Fish biomass should stay within expected natural fluctuations. A potential problem appears to be the decline in eel populations, and similar concerns are apparent with respect to amphibian numbers on a UK scale. Recent survey work on the upper reaches of the river has suggested a possible decline in otter use of these stretches, and this may in turn be linked to reduced fish populations, as a knock-on effect of invertebrate depletion due to sheep dip pollution.

Measures to ensure the safe movement of otters around the catchment will be promoted, in particular the provision of ledges, tunnels and fencing on new road bridge schemes. Where bridges are being repaired or replaced, or at especially bad locations for otter road deaths, such features may be retro-fitted.

Pollution of rivers with toxic chemicals, such as PCBs, was one of the major factors identified in the widespread decline of otters during the last century. There should be no increase in pollutants potentially toxic to otters.

Status and management requirements of Feature 7: *Luronium natans*

Status of Feature: Favourable (High Confidence) (2020)

The condition assessment is based on monitoring of this feature at the Teifi Pools (Southey & Broughton, 2004), and on observational data from the main river in and downstream of Cors Caron (2000, 2002).

Subsequent monitoring data has shown continuous *Luronium natans* presence in the Teifi Pools in multiple years (Burgess *et al.* 2006; Baxter & Stewart 2014; Goldsmith *et al.* 2019), although detected cover fluctuates.

Additional and more comprehensive monitoring data for the river populations would be valuable.

Management requirements

Monitoring has shown there to be healthy populations of floating water plantain in all three of the principal Teifi Pools: Llyn Teifi, Llyn Egnant and Llyn Hir. The species grows most abundantly at 1-2.5m depth, and relies predominantly on vegetative reproduction for maintenance and dispersal of the population, although it is known to flower periodically during dry summers. Llyn Teifi and Llyn Egnant are artificially regulated as reservoirs for public water supply, operated by Dŵr Cymru Welsh Water since the late 1950s. The impact of the current operation of these reservoirs has

been investigated as part of the Environment Agency's Review of Consents process (Environment Agency Wales, 2007), which concluded that the floating water-plantain is remarkably tolerant of the fluctuating water levels that result from the abstraction regime, and that there is no negative impact on the feature.

Annual flowering populations of floating water plantain are often associated with the draw-down zones of permanent water bodies such as Llyn Teifi and Llyn Egnant, probably formed by plantlets which break off from stolons on deeper plants and are washed to the margins of the lakes, where they root and form flowering stands (Lansdown and Wade). Southey & Broughton noted particularly strong colonies upon the thick, silty margins of Llyn Teifi. Seasonal fluctuations in water levels in the regulated lakes are amplified by abstraction, resulting in prolonged exposure of the lake margins, particularly in years of low rainfall (such as 1976 or 1995). Draw-down events are likely to stimulate flowering of the deep water populations of floating water plantain, leading to the production of viable seed. The Teifi Pools has been described as one of the centres for genetic diversity of floating water plantain populations (Lansdown and Wade), and the abstraction regime of the regulated lakes may contribute to this element by encouraging more frequent flowering events.

While acknowledging the lack of available information on the management of upland lakes for floating water-plantain, the LIFE report on the ecology of the species (Lansdown & Wade, 2003), quoting Welsh data, suggests that upland lake populations are amongst the most stable, and that management is unlikely to be needed unless there is a change in the water chemistry or processes suppressing succession.

Llyn Hir is known to have been limed by Dŵr Cymru Welsh Water in 1985, but there is no recorded indication of a negative impact on the aquatic flora. Liming of upland catchments has not been shown to affect floating water-plantain, and given the range of pH data and substrate affinities recorded, it appears unlikely that it will have any significant effect (Lansdown & Wade 2003).

NRW water quality monitoring (2004 data, quoted in Burgess et al., 2006) has indicated higher than expected phosphate levels in the three main pools, although only marginally so in Llyn Hir. Elevated phosphate levels may in theory have a negative impact on the feature by encouraging the growth of more vigorous competitive plant species, but in the Teifi Pools this appears unlikely to occur due since few other species can persist at the depth favoured by the floating water-plantain. Possible reasons for elevated nutrient levels include enrichment from livestock dung (sheep) and sediment inputs from stock-mediated soil erosion exacerbated by sheep trampling around the shores. Significant livestock reduction measures have recently been implemented in the Teifi Pools catchment under the auspices of the Tir Gofal agri-environment scheme, and these will contribute to reducing nutrient enrichment from these sources.

The principal factors influencing the river populations of this feature are broadly similar to those affecting the Ranunculus vegetation (Feature 8). These include flow, substrate quality and water quality. Favourable management for this feature is largely dependent on ensuring that sufficient depth, velocity and duration of flow and sufficiently low phosphate levels are maintained within the natural range of the feature. A favourable flow regime can be defined with reference to naturalised flows (removing the influence of artificial abstractions and discharges from flow records). While more

sophisticated analysis of depth and velocity has been carried out locally for the Review of Consents process, a flow level criterion is generally applied to regulate abstractions. Based on current available information, the current abstraction regime in the Afon Teifi SAC is not considered to be damaging to this feature.

The maintenance of sufficient suitable habitat for the feature in terms of water quality is likely to require catchment-wide measures to control diffuse pollution from agriculture, as the principal source of phosphate. In the Afon Teifi catchment, the most significant sources of diffuse pollution and siltation are from agriculture, including fertiliser run-off, livestock manure, silage effluent and soil erosion from ploughed land. The most intensively used areas such as heavily trampled gateways and tracks can be especially significant sources of polluting run-off. Preventative measures can include surfacing of tracks and gateways, moving feeding areas, separating clean and dirty water in farmyards, and the establishment of fenced buffer zones on river reaches adjacent to intensively managed livestock grazing or arable land. Additional measures to control diffuse pollution in the water environment, including 'Catchment Sensitive Farming', may be implemented as a result of the Water Framework Directive and, along with existing agri-environment schemes, will help to achieve the conservation objectives for the SAC.

There is a risk that the introduction of invasive non-native plants, such as Australian swamp stonecrop *Crassula helmsii*, could also have a detrimental impact on this feature. A significant source of such introductions could be via the boots, clothing or equipment of anglers visiting the Teifi Pools, and angling clubs should be encouraged to follow best practice guidelines for cleansing / decontaminating clothing and equipment before travelling between angling waters.

Status and management requirements of Feature 8: Watercourses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation

Status of Feature: Unfavourable (Medium Confidence) (2020)

Baseline survey and monitoring work carried out for NRW (Southey & Broughton, 2006) previously provided information to support an assessment of favourable for this feature. The *Ranunculus* feature is widely distributed across the Teifi and many of its tributaries, with healthy examples of the three JNCC river types CB5, CB6a and CB6b each being well-represented.

The survey in the second reporting cycle was conducted in September 2012 following the wettest summer for 100 years (Met Office, 2012) and the higher flows meant that some species would have been washed out or were poorly grown. These issues may have affected both the plant community composition and the detectability of taxa (Harrison et al, 2013).

Using the LEAFPACS assessment of the Ranunculion macrophyte community, the River Teifi has been assessed as below the middle of good status for WFD and the surveyors used expert judgement to conclude that the likely problems of siltation and eutrophication on the River Teifi are widespread and not specific to a particular management unit (Harrison *et al.*, 2013). The river failed to meet the water quality targets for GQA biology and chemistry and the RHS failed to reach the target for riparian zone vegetation. The subsequent Compliance Assessment for Phosphorus (Hatton-Ellis & Jones 2021) and Water Quality (Foster *et al.* 2024) confirmed this and provided more spatially explicit maps of the locations of failures. This led to a conclusion of Unfavourable.

Management requirements

Factors that are important to the favourable conservation status of this feature include flow, substrate quality and water quality, which in turn influence species composition and abundance. These factors often interact, and can produce unfavourable conditions by promoting the growth of a range of algae and other species indicative of eutrophication. Under conditions of prolonged low flows and high nutrient status, epiphytic algae may suppress the growth of aquatic flowering plants. Favourable management for this feature is therefore largely dependent on ensuring that sufficient depth, velocity and duration of flow and sufficiently low phosphate levels are maintained within the natural range of the vegetation. A favourable flow regime can be defined with reference to naturalised flows (removing the influence of artificial abstractions and discharges from flow records). While more sophisticated analysis of depth and velocity has been carried out locally for the Review of Consents process, a flow level criterion is generally applied to regulate abstractions. Based on current available information, the recent level of flow depletion downstream of abstractions in the Afon Teifi SAC is not considered to be damaging to this feature, either through limiting its range or adversely affecting its community composition.

The level of shading is a determining factor to the presence of this feature in some reaches, particularly on certain of the tributaries. Very shaded tributaries do not support the macrophyte diversity seen in more open reaches, but these wooded reaches provide good breeding habitat for otters and the uprooting of roots as trees fall within the channel provide clean gravel runs for salmon spawning. On some reaches, some localised and selective coppicing and pollarding of bankside trees may be required, but the requirements of this feature must also be balanced with those of other SAC features such as fish species and otters.

Although the catchment has been grazed for centuries, the effects of grazing, particularly by cattle, are worth considering. Cattle grazing can damage water-crowfoot beds, introduce silt (through poaching and localised erosion), and can lead to enrichment or pollution of the river. Conversely, grazing can increase the variety of niches available to plants and animals; reduce the ingress of marginal vegetation into the main channel; and control the development of woody vegetation.

Localised water quality issues can have an impact on the feature. There are a number of smaller sewage treatment works within the SAC, which can have a detrimental effect if not operating to a high standard.

The conservation objectives require that the area covered by the feature is stable or increasing within its natural range, which is likely to require catchment-wide measures to control diffuse pollution from agriculture, as the principal source of phosphate. In the Afon Teifi catchment, the most significant sources of diffuse pollution and siltation are from agriculture, including fertiliser run-off, livestock manure, silage effluent and soil erosion from ploughed land. The most intensively used areas such as heavily trampled gateways and tracks can be especially significant sources of polluting run-off. Preventative measures can include surfacing of tracks and gateways, moving feeding areas, separating clean and dirty water in farmyards, and the establishment of fenced buffer zones on river reaches adjacent to intensively managed livestock grazing or arable land. Additional measures to control diffuse pollution in the water environment, including 'Catchment Sensitive Farming', may be implemented as a result of the Water Framework Directive and, along with existing agri-environment schemes, will help to achieve the conservation objectives for the SAC.

Invasive non-native plants may also have a detrimental impact on this feature, and control programmes for Japanese knotweed and Himalayan balsam should be considered, with the aim of reducing their extent in the SAC.

Conservation Status and management requirements of Feature 9: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

Status of Feature: Favourable (2007, 2018)

The condition assessment is based on past monitoring of this feature at the Teifi Pools (Southey & Broughton, 2004), and on work carried out in support of the Environment Agency's Review of Consents process for the Dŵr Cymru Welsh Water abstraction licences for Llyn Teifi and Llyn Egnant.

The *Littorelletea* feature is present in all five of the Teifi Pools, although the development of the community in Llyn Bach and Llyn y Gorlan is restricted to some extent by the small size of these water-bodies. Llyn Teifi and Llyn Egnant are artificially regulated as reservoirs for public water supply, operated by Dŵr Cymru Welsh Water since the late 1950s; the structure and hydrology of Llyn Hir is natural and unmodified. The selection of the Teifi Pools for their *Littorelletea* vegetation was based on primarily on the representation of a high quality example of this SAC feature in Llyn Hir, supported by the *Littorelletean* communities in Llyn y Gorlan and Llyn Bach. The primary reason for the inclusion of Llyn Teifi and Llyn Egnant within the Afon Teifi SAC is for their internationally important populations of floating water-plantain, and although they contribute to the overall representation of the *Littorelletea* feature in the SAC, it is not necessary for these two regulated lakes to support a fully developed *Littorelletea* community.

Key species	Hir	Teifi	Egnant	Gorlan	Bach
<i>Luronium natans</i>	X	X	X	X	X
<i>Subularia aquatica</i>	X				
<i>Lobelia dortmanna</i>	X				
<i>Littorella uniflora</i>	X	X	X	X	X
<i>Isoetes lacustris</i>	X	X		X	X
<i>Isoetes echinospora</i>	X	X			
<i>Sparganium angustifolium</i>	X	X	X	X	
<i>Utricularia minor</i>	X				
<i>Elatine hexandra</i>					
Total	7	5	3	4	3

Table 10. Representation of Littorelletea flora across the Teifi Pools.

Subsequent monitoring has shown that these features remain favourable (Baxter & Stewart 2015; Goldsmith et al. 2019), although formal condition assessments covering all of the lakes have not been carried out. The more recent assessment includes water quality, which Southey & Broughton (2004) did not take into account, showing that Llyn Hir has recovered from past acidification.

Management requirements

The current operation of Llyn Teifi and Llyn Egnant as reservoirs for public water supply has been investigated in considerable detail as part of the Environment Agency's Review of Consents process, and the impact of abstraction licences on the SAC features have been subjected to Appropriate Assessment (Environment Agency Wales, 2007). The outcome of the assessment with reference to the *Littorelletea* community was that although a lower abstraction rate from the regulated lakes would be of benefit to this feature, the current abstraction licences do not have a significant negative impact upon the integrity of the feature as a whole within the SAC, in terms of its conservation objectives.

Recent studies have shown that the *Littorelletea* community within Llyn Hir is the most diverse within the SAC in terms of the number of species present. The Teifi Pools as a whole contain a high diversity of macrophytes associated with the *Littorelletea* community, including seven of the eight principal species characteristic of the feature. All surveys have highlighted the consistent absence of water lobelia *Lobelia dortmanna* and awlwort *Subularia aquatica*, species that are particularly intolerant of fluctuating water levels, in the regulated Llyn Teifi and Llyn Egnant and the presence of these species in the unregulated Llyn Hir (Southey & Broughton, 2004; Pickard, 2005; Burgess et al. 2006).

The conservation objectives require a fully developed *Littorelletea* community to be maintained in Llyn Hir only; for each of the other lakes, the objective is the maintenance of community species diversity recorded as present between 1997 and 2005. The main concern regarding the two Teifi Pools abstraction licences is the concentration of high species diversity within only one of the lakes. In the event of a pollution incident within Llyn Hir, a potentially irreplaceable element of the community could be permanently lost from the SAC; hence the requirement to maintain the existing

condition of the *Littorelletea* in the remaining water bodies, allowing the possibility of species recolonisation.

Seasonal fluctuation in water levels in the regulated lakes is amplified by abstraction, resulting in prolonged exposure of the lake margins, particularly in years of low rainfall (such as 1976 or 1995). Unfortunately there is no data available on the impact of a dry year upon the existing *Littorelletea* community within Llyn Teifi and Llyn Egnant; however it is safe to assume that some populations of individual *Littorelletea* community species within the lakes will be negatively impacted in years of extreme draw-down. It is also evident that the current *Littorelletea* community within Llyn Teifi and Llyn Egnant has been able to recover from such extreme draw-down events in the past.

Both Llyn Egnant and Llyn Teifi are exposed, wind-stressed sites, which may further restrict the growth and distribution of a number of macrophyte species in the littoral zone (Burgess et al., 2006). Although wind stress reflects habitat quality and not condition, it could be an important factor if exacerbated by draw-down, for example, by making isoetids vulnerable to uprooting by wind.

NRW water quality monitoring (2004 data, quoted in Burgess et al.) has indicated elevated phosphate levels in Llyn Teifi and Llyn Egnant, but only a marginal increase in Llyn Hir. Significantly elevated phosphate levels may have a negative impact on the *Littorelletea* feature, and contribute to the absence of some macrophyte species, particularly those that are sensitive to nutrient enrichment; for example, this may have contributed to the absence of water lobelia from Llyn Egnant (Burgess et al.). Possible reasons for these elevated nutrient levels include enrichment from livestock dung (sheep) and sediment inputs from stock-mediated soil erosion exacerbated by sheep trampling around the shores. Significant livestock reduction measures have recently been implemented in the Teifi Pools catchment under the auspices of the Tir Gofal agri-environment scheme, and these will contribute to reducing nutrient enrichment from these sources, as well as reducing the impact of grazing and trampling of exposed littoral zones. Nutrient-rich droppings from the Canada geese that have recently colonised the Teifi Pools may also have a negative impact, and culling of this outlying population of an alien species should be considered.

Llyn Hir is known to have been limed by Dŵr Cymru Welsh Water in 1985, prior to the SSSI and SAC designation, but there is no record of its impact on the aquatic plant community. Liming may have a negative impact on the *Littorelletea* feature, which is characteristic of low alkalinity levels, and there is therefore a presumption against the repetition of this treatment.

There is a risk that the introduction of invasive non-native plants, such as Australian swamp stonecrop *Crassula helmsii*, could also have a detrimental impact on this feature. A significant source of such introductions could be via the boots, clothing or equipment of anglers visiting the Teifi Pools, and angling clubs should be encouraged to follow best practice guidelines for cleansing / decontaminating clothing and equipment before travelling between angling waters.

Climate change may pose a threat to the Teifi Pools through accelerated erosion of peat within the catchments, changes to temperature and rainfall regimes, subsequent increases in sedimentation and in turn, changes in macrophyte composition and

structure. Conversely, reductions in sulphur deposition and consequent increases in lake pH, ANC (acid neutralising capacity) and DOC (dissolved organic carbon) may lead to increased diversity in lake macrophyte species assemblages (Burgess et al. 2006).

Action plan

This section takes the management requirements outlined in the previous section a stage further, assessing the specific management interventions required on each management unit. This is based on a summary of the information held in Natural Resources Wales' Actions Database for sites.

Actions in Natural Resources Wales' actions database

Exported: 15.03.2021

NRW internal reference	SAC management unit	Summary of Conservation Management Issues	Action needed?
1	1553	The mosaic of freshwater-brackish transitional vegetation communities at the Teifi Marshes has deteriorated in the past due to the collapse of a culvert allowing uncontrolled tidal ingress to the Pentwdd marshes, coupled with difficulties in providing suitable grazing. This led to a loss of open communities and increasing dominance of <i>Phragmites</i>. Since the reinstatement of the culvert the Wildlife Trust has worked hard to introduce reed management and re-establish an appropriate grazing regime, with the ongoing aim of restoring a more stable and appropriate balance of communities, to the benefit of the SSSI features. Unsustainable exploitation of salmon may be contributing towards the unfavourable status of this feature. Regulation of rod and net fisheries should be kept under review and byelaws amended as appropriate to ensure the conservation of salmon stocks. Increased boat activity in the estuary, and unrestrained canoeing in Cilgerran gorge, could both have a negative impact on otters through increased disturbance. These activities need to be kept under review.	Yes

NRW internal reference	SAC management unit	Summary of Conservation Management Issues	Action needed?
		Invasive species, including Himalayan balsam and Japanese knotweed, are present locally throughout the reach. They suppress local biodiversity and can lead to bank instability.	
2	1554	Diffuse pollution and siltation: Agricultural land management affects run-off from land and has negative impacts on water quality. Thirteen unsatisfactory intermittent discharges from waste water treatment works in units 2 – 4 (1554 - 1556) require further investigation and improvement. NRW's Catchment sensitive farming project has identified incidents of slurry pollution as an issue in the lower catchment, and particularly on the Ceri. The DCWW abstraction at Llechryd has the potential to entrain juvenile river & sea lamprey migrating down river to the sea, due to inadequate screening. The NRW RoC process has identified 3 non-consumptive abstractions in unit 2 (1554) that have the potential to significantly impact on water levels and create migratory barriers for migratory fish, and to reduce or remove habitats for juvenile life stages of both migratory and resident species (Allt-cafan - Teifi, Brongest - Ceri, Dreifa Mills - Cych). Some also have screening and entrainment issues. An artificial weir at Felin Geri on the Ceri forms a partial barrier to fish migration. Invasive species, including Himalayan balsam, and occasionally Japanese knotweed, are present throughout the reach. They suppress local biodiversity and can lead to bank instability. Regulation of rod and net fisheries should be kept under review and byelaws amended as appropriate to ensure the conservation of salmon stocks.	Yes

NRW internal reference	SAC management unit	Summary of Conservation Management Issues	Action needed?
3	1555	Diffuse pollution and siltation: Agricultural land management affects run-off from land and has negative impacts on water quality. Point source pollution: the NRW RoC process has identified 13 unsatisfactory intermittent discharges from waste water treatment works in units 2 – 4 (1554 - 1556) that require further investigation and improvement. The RoC process has also identified 2 non-consumptive abstractions on the Clettwr in unit 3 (1555) (Dolbantau and Rock Mills) that have the potential to significantly impact on water levels and create migratory barriers for migratory fish, and to reduce or remove habitats for juvenile life stages of both migratory and resident species. Both also have the potential to cause entrainment of fish due to inadequate screening. The top weir at Dolbantau also forms a partial barrier to fish migration. Invasive species, including Himalayan balsam, and occasionally Japanese knotweed, are present in parts of the reach. They suppress local biodiversity and can lead to bank instability. Regulation of rod and net fisheries should be kept under review and byelaws amended as appropriate to ensure the conservation of salmon stocks.	Yes
4	1556	Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. Point source pollution: the NRW RoC process has identified the discharge at Llanddewi Brefi waste water treatment works on the Brefi as causing water quality problems downstream of the discharge point. In addition, 13 unsatisfactory intermittent discharges from waste water treatment works in units 2 – 4	Yes

NRW internal reference	SAC management unit	Summary of Conservation Management Issues	Action needed?
		(1554 - 1556) require further investigation and improvement. In the upper catchment, pollution from synthetic pyrethroid sheep dips has a negative impact on river invertebrates. Invasive species, including Himalayan balsam, and occasionally Japanese knotweed, are present in parts of the reach. They suppress local biodiversity and can lead to bank instability. Regulation of rod and net fisheries should be kept under review and byelaws amended as appropriate to ensure the conservation of salmon stocks.	
5	1557	Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. In the upper catchment, pollution from synthetic pyrethroid sheep dips has a negative impact on river invertebrates. There are also concerns about toxic pollution from a small number of abandoned metal mines. Regulation of rod and net fisheries should be kept under review and byelaws amended as appropriate to ensure the conservation of salmon stocks. Historical canalisation of a reach in the centre of the unit has reduced the naturalness and habitat diversity of the river and its connectivity with the surrounding fen and mire habitats of Cors Caron SAC. Restoration of this section to its previous channel form should be actively considered.	Yes
6.1	1558	Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. In the upper catchment, pollution from synthetic pyrethroid sheep dips has a negative impact on river invertebrates.	Yes

NRW internal reference	SAC management unit	Summary of Conservation Management Issues	Action needed?
		There are also concerns about toxic pollution from a small number of abandoned metal mines. Invasive species, including Japanese knotweed, are occasionally present in parts of the reach. They suppress local biodiversity and can lead to bank instability. Regulation of rod and net fisheries should be kept under review and byelaws amended as appropriate to ensure the conservation of salmon stocks.	
7	1612	Currently no significant management issues known to be negatively impacting the features. Recent Tir Gofal agreements are having beneficial impacts in terms of littoral grazing, trampling and dung input reductions to the Teifi Pools. Any future changes to the DCWW abstraction regime will require prior assessment.	Yes
6.2	2983	Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. In the upper catchment, pollution from synthetic pyrethroid sheep dips has a negative impact on river invertebrates. There are also concerns about toxic pollution from a small number of abandoned metal mines. Regulation of rod and net fisheries should be kept under review and byelaws amended as appropriate to ensure the conservation of salmon stocks.	Yes

Glossary

This glossary defines some of the terms used in this **Core Management Plan**. Some of the definitions are based on definitions contained in other documents, including legislation and other publications of Natural Resources Wales and the UK nature conservation agencies.

Action	A recognisable and individually described act, undertaking or project of any kind, specified in section 5 or 6 of a Core Management Plan or Management Plan , as being required for protecting, managing or enhancing one or more of the features for which a site is designated.
Attribute	A quantifiable and monitorable characteristic of a feature that, in combination with other such attributes, describes its condition .
Common standards	See JNCC common standards .
Condition	A description of the state of a feature in terms of qualities or attributes that are relevant in a nature conservation context. For example, the condition of a habitat usually includes its extent and species composition and might also include aspects of its ecological functioning, spatial distribution and so on. The condition of a species population usually includes its total size and might also include its age structure, productivity, relationship to other populations and spatial distribution. Aspects of the habitat(s) on which a species population depends may also be considered as attributes of its condition. Condition is considered favourable when all the conservation objectives are being met.
Conservation management	Acts or undertaking of all kinds, including but not necessarily limited to actions , taken with the aim of achieving the conservation objectives of a site. Conservation management includes the taking of statutory and non-statutory measures, it can include the acts of any party and it may take place outside site boundaries as well as within sites. Conservation management may also be embedded within other frameworks for land/sea management carried

out for purposes other than achieving the conservation objectives.

Conservation objective	The expression of the desired state of a feature , expressed as a composite statement defining the condition that we wish the feature to be in. Each feature has one conservation objective.
Core Management Plan	A Natural Resources Wales document containing the conservation objectives for a site and a summary of other information contained in a full site Management Plan .
Factor	Anything that has influenced, is influencing or may influence the condition of a feature . Factors can be natural processes, human activities or effects arising from natural process or human activities. They can be positive or negative in terms of their influence on features, and they can arise within a site or from outside the site. Physical, socio-economic or legal constraints on management of the site can also be considered as factors.
Favourable condition	See condition .
Favourable conservation status	The Habitats Directive definition of Favourable Conservation Status (FCS) is given in full in section Background to conservation objectives .
Feature	The species population, habitat type or other entity for which a site is designated. The ecological or geological interest which justifies the designation of a site and which is the focus of conservation management .
Integrity	See Site integrity .
JNCC common standards	A set of principles developed jointly by the UK nature conservation agencies to help ensure a consistent approach to monitoring and reporting on the features of sites designated for nature conservation, supported by guidance on identification of attributes and monitoring methodologies.
Key Feature	The habitat or species population within a management unit that is the primary focus of management and monitoring in that unit.
Management Plan	The full expression of a designated site's legal status, vision , features , conservation objectives , performance indicators and management requirements. A complete management plan may not reside in a single document, but may be contained in a number of documents (including in

particular **the Core Management Plan**) and sets of electronically stored information.

Management Unit	An area within a site, defined according to one or more of a range of criteria, such as topography, location of features , tenure, patterns of land/sea use. The key characteristic of management units is to reflect the spatial scale at which site management and monitoring can be most effectively organised. They are used as the primary basis for differentiating priorities for conservation management and monitoring in different parts of a site, and for facilitating communication with those responsible for management of different parts of a site.
Monitoring	An intermittent (regular or irregular) series of observations in time, carried out to show the extent of compliance with a formulated standard or degree of deviation from an expected norm. In monitoring of sites designated for habitat and species conservation, the formulated standard is the quantified expression of favourable condition based on attributes .
Operational limits	The levels or values within which a factor is considered to be acceptable in terms of its influence on a feature . A factor may have both upper and lower operational limits, or only an upper limit or lower limit. For some factors an upper limit may be zero.
Performance indicators	A subset of the conservation objectives that are quantifiable and measurable. They consist of attributes and factors together with their associated target values (or ranges of values) which provide the standard against which information from monitoring and other sources is used to determine the degree to which the conservation objectives for a feature are being met.
Plan or project	Project: Any form of construction work, installation, development or other intervention in the environment, the carrying out or continuance of which is subject to a decision by any public body or statutory undertaker. Plan: a document prepared or adopted by a public body or statutory undertaker, intended to influence decisions on the carrying out of projects. Decisions on plans and projects which affect SAC, SPA and Ramsar sites are subject to specific legal and policy procedures.
Site integrity	This is defined in Welsh Government policy as the coherence of a site's ecological structure and function, across its whole area, that enables it to sustain the habitat, complex

of habitats and/or the levels of populations of the species for which it is designated.

Site Management Statement (SMS)

The document containing Natural Resources Wales' views about the management of a site issued as part of the legal notification of an SSSI under section 28(4) of the Wildlife and Countryside Act 1981, as substituted.

Special Feature

See **feature**.

Specified limits

The levels or values for an **attribute** which define the degree to which the attribute can fluctuate without creating cause for concern about the **condition** of the **feature**. The range within the limits corresponds to favourable, the range outside the limits corresponds to unfavourable. Attributes may have lower specified limits, upper specified limits, or both.

Unit

See **management unit**.

Vision Statement

The statement conveying an impression of the whole site in the state that is intended to be the product of its **conservation management**. A 'pen portrait' outlining the **conditions** that should prevail when all the **conservation objectives** are met. A description of the site as it would be when all the **features** are in **favourable condition**.

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Appendix 1: Performance Indicators

These performance indicators are a sub-set of the conservation objectives and describe the evidence, including in particular evidence to be obtained from monitoring of sites and features, that will be used to inform judgements about whether or not the [Conservation Objectives](#) are being met.

The assessment of plans and projects should be made in view of the entirety of the conservation objectives, including the performance indicators.

Feature 1. Sea lamprey *Petromyzon marinus*

Performance indicators for feature condition:

Attribute	Specified limits	Comments
a) Distribution within catchment	Suitable habitat adjacent to or downstream of suitable spawning sites should contain <i>Petromyzon</i> ammocoetes. Spawning adults to be reported from units 1553 -- 1554 in at least 5 years out of 6	This attribute provides evidence of successful spawning and distribution trends. Current information regarding spawning sites is incomplete and further investigation is required. Spawning locations may move within and between sites due to natural processes and new sites may be discovered over time. Silt beds downstream of all known and potential sites will be sampled for presence or absence of ammocoetes. Where apparently suitable habitat at any site is unoccupied, feature condition will be considered unfavourable. Monitoring undertaken by APEM in 2004 failed to yield any sea lamprey ammocoetes or transformers despite reports of adult fish spawning in the system, and a HIFI study in 2002 found only a single ammocoete.
b) Ammocoete density	Ammocoetes should be present in at least four sampling sites each not less than 5km apart.	This standard CSM attribute establishes a minimum occupied spawning range, within any sampling period, of 15km.

Features 2 & 3. Brook lamprey *Lampetra planeri* and river lamprey *Lampetra fluviatilis*

Performance indicators for feature condition:

Attribute	Specified limits	Comments
a) Age/size structure of ammocoete population	Samples of < 50 ammocoetes contain at least 2 size classes Samples of > 50 ammocoetes contain at least 3 size classes	This gives an indication of recruitment to the population over the several years preceding the survey. Failure of one or more years recruitment may be due to either short or long term impacts or natural factors such as natural flow variability, therefore would trigger further investigation of the cause rather than leading automatically to an unfavourable condition assessment.
b) Distribution of ammocoetes within catchment	Present at not less than 2/3 of sites surveyed within natural range No reduction in distribution of ammocoetes	The combined natural range of these two species in terms of ammocoete distribution includes all units above the tidal limit except unit 1612 (the Teifi Pools). Presence at less than 2/3 of sample sites will lead to an unfavourable condition assessment. Reduction in distribution will be defined as absence of ammocoetes from all samples within a single unit or sub-unit/tributary, and will lead to an unfavourable condition assessment.
c) Ammocoete density	Optimal habitat: > 10 m⁻² Overall catchment mean: > 5 m⁻²	Optimal habitat comprises beds of stable fine sediment or sand ≥15cm deep, low water velocity and the presence of organic detritus, as well as, in the Teifi, shallower sediment, often patchy and interspersed among coarser substrate.

Feature 4. Atlantic salmon *Salmo salar*

Performance indicators for feature condition:

Attribute	Specified limits	Comments
a) Adult run size	Conservation Limit complied with at least four years in five	CSM guidance states: Total run size at least matching an agreed reference level, including a seasonal pattern of migration characteristic of the river and maintenance of the multi-sea-winter component. Adult run size in the Teifi is calculated using rod catch data. A fish counter is in operation, but the results are currently not considered sufficiently reliable for this purpose (NRW pers. comm.). Further details can be found in the NRW Teifi Salmon Action Plan.
b) Juvenile densities	Expected densities for each sample site using HABSCORE	CSM guidance states: These should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality. Assessed using electrofishing data.
c) Biological quality	Biological GQA class A	This is the class required in the CSM guidance for Atlantic salmon, the most sensitive feature.
d) Water quality	Water quality targets in CSM guidance for Rivers (JNCC 2016)	These are detailed in Appendix 2 with targets for organic pollution (DO, BOD and ammonia), phosphate, trophic diatom index, acidification and other pollutants.
e) Flow	Targets are set in relation to river / reach type(s)	Targets equate to those levels agreed and used in the Review of Consents (Appendix 3).

Feature 5. Bullhead *Cottus gobio*

Performance indicators for feature condition:

Attribute	Specified limits	Comments
a) Population densities	No less than 0.2 m ⁻² in sampled reaches	CSM guidance states that densities should be no less than 0.2 m ⁻² in upland rivers (source altitude >100m) and 0.5 m ⁻² in low-land rivers (source altitude ≤100m). A significant reduction in densities may also lead to an unfavourable condition assessment.
b) Distribution	Bullheads should be present in all suitable reaches. As a minimum, no decline in distribution from current.	Suitable reaches will be mapped using fluvial audit information validated using the results of population monitoring. Absence of bullheads from any of these reaches, or from any previously occupied reach, revealed by ongoing monitoring will result in an unfavourable condition assessment.
c) Reproduction / age structure	Young-of-year fish should occur at densities at least equal to adults	This gives an indication of successful recruitment and a healthy population structure. Failure of this attribute on its own would not lead to an unfavourable condition assessment.

Feature 6. European Otter *Lutra lutra*

Performance indicators for feature condition:

Attribute	Specified limits	Comments
a) Distribution	Otter signs present at 75% of Otter Survey of Wales sites (Liles, 2004)	The Otter Survey of Wales undertaken in 2002 surveyed 111 reference sites in the Teifi catchment, of which 97% were positive. This continued an upward trend in signs from 38% in 1977-78, 40% in 1984-85, and 59% in 1991.

Attribute	Specified limits	Comments
		The next full Otter Survey of Wales is planned in 2009, but NRW is also currently considering setting up a monitoring programme of OSW survey sites using a network of volunteers.
b) Breeding activity	2 reports (within the catchment) of cub/family sightings, or 2 reports of cub, lactating or pregnant female road casualties at least 1 year in 3 (Liles, 2004)	Evidence that otter breeding has taken place within the catchment is usually derived from three sources: otter road mortalities where pregnant/lactating females, and/or cubs are involved, sighting of cubs (usually together with the female); and cubs found abandoned (either separated from the family group or orphaned as a result of the death of the mother). Based on current information, 7 centres of breeding activity have been estimated within the SAC.
c) Actual and potential breeding sites	No decline in number and quality of mapped breeding sites in the Teifi catchment (Liles, 2004)	In the Teifi catchment, 47 actual or potential breeding sites have been identified, distributed throughout the catchment on the main river and tributaries.

Feature 7. Floating water-plantain *Luronium natans*

Performance indicators for feature condition:

Attribute	Specified limits	Comments
a) Distribution of floating water-plantain in the main river	Present at 90% of Upstream (principal) monitoring sites for river populations one year in six. Present at 70% of downstream (marginal) monitoring sites for river populations one year in six (sites to be determined). (CCW Monitoring Report No. 98/2/7, 1998)	The 90% and 70% figures for river populations are based on evidence that riverine floating water-plantain populations can become extinct due to the less-constant character of river environments compared with those in lakes. Downstream populations have a potential for recolonisation from the upstream locations.

Attribute	Specified limits	Comments
b) Distribution of floating water-plantain in the Teifi pools	Live vegetative material present in each of Llyn Teifi, Llyn Egnant, Llyn Hir and Llyn y Gorlan. (CCW Environmental Monitoring Report No. 13, 2004)	Floating water-plantain is also present in Llyn Bach but this very small water body is not considered critical to monitor at present, as there is no obvious threat to this population.
c) Presence of floating flowers in the Teifi pools	Present in at least one of Llyn Teifi, Llyn Egnant, Llyn Hir, Llyn y Gorlan and Llyn Bach, (or in any part of these) one year in 6. (CCW Environmental Monitoring Report No. 13, 2004)	This indicator will show that lake populations have the potential for seed dispersal and genetic exchange. It is important that there is evidence of sexual reproduction, especially in the long term. There is no requirement for floating water-plantain to flower in the river, although it is known that it does so occasionally due to the coincidence of suitable conditions for flowering and dispersal.
e) Native species	Cover of indicators of eutrophication maintained below threshold over the medium to long term	Epiphytic filamentous green algae indicative of eutrophication should have a cover value of not greater than 50% on the surface of each plant for the first 9 out of any 10 aquatic macrophytes examined, in 3 consecutive years, in any of the pools.
f) Alien / introduced species	No impact on native biota from alien or introduced species	The presence of non-native invasive plant species, including but not limited to <i>Crassula helmsii</i> , will not be tolerated in any of the Teifi Pools.
g) Water Quality	Water quality targets in CSM guidance for Rivers 2016. Applies only in areas that support <i>L. natans</i>. River targets apply in water body GB110062043501 'Teifi conf Afon Meurig to conf Afon Brennig'	These are detailed in Appendix 2 with targets for organic pollution (DO, BOD and ammonia), phosphate, trophic diatom index, acidification and other pollutants.

Feature 8. Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Performance indicators for feature condition:

Attribute	Specified limits	Comments
a) Distribution within catchment	Distribution within site units	Healthy <i>Ranunculion</i> vegetation will be present in any three representative sample stretches of suitable habitat in each of units 1554 – 1558 & 2983.
b) Typical species	Site-specific definitions for reference Healthy <i>Ranunculion</i> vegetation type (Southey & Broughton, 2006)	Should conform to appropriate JNCC type for the site unit as appropriate: 1) CB5: Atlantic bryophyte <i>Callitriche hamulata</i> <i>Ranunculus penicillatus</i> ssp. <i>penicillatus</i> rivers 6 or more of the following species <i>Ranunculus penicillatus</i>, <i>Callitriche</i> spp. (count as 1 species only), <i>Myriophyllum alterniflorum</i>, <i>Potamogeton</i> spp². (each species counts as 1), <i>Hygrohypnum ochraceum</i>, <i>H. luridum</i>, <i>Amblystegium</i> spp., <i>Fontinalis antipyretica</i>, and <i>F. squamosus</i> are present in at least one 10m stretch in each 100m sample length, Or; <i>Ranunculus penicillatus</i>, <i>Callitriche</i> spp. or a combination of both form >20% cover in at least three 10m stretches of each sample length, 2) CB6a: Slow-flowing base-poor rivers 5 or more of the following species <i>Nuphar lutea</i>, <i>Schoenoplectus lacustris</i>, <i>Potamogeton</i> spp². (each species counts as 1), <i>Sparganium</i>

² *Potamogeton* spp. refers only to those broad-leaved species widespread and typical of the Afon Teifi catchment, namely *P. polygonifolius*, *P. natans* and *P. x olivaceus*. It does not include eutrophic indicator species such as *P. pectinatus*. An increase or new occurrence of such species would be indicative of a shift to unfavourable condition.

Attribute	Specified limits	Comments
		<i>emersum/erectum</i> (count as 1 species only), <i>Ranunculus penicillatus</i>, <i>Myriophyllum alterniflorum</i>, <i>Alisma plantago-aquatica</i>, <i>Luronium natans</i>, <i>Equisetum fluviatile</i>, are present in at least one 10m stretch of each 100m sample length, 3) CB6b: Fast-flowing bryophyte-dominated rivers 5 or more of the following species <i>Hygrohypnum ochraceum</i>, <i>H. luridum</i>, <i>Fontinalis squamosa</i>/<i>F. antipyretica</i>, <i>Brachythecium plumosum</i>, <i>Sphagnum auriculatum</i>, <i>Racomitrium aciculare</i>, <i>Hycomium armoricum</i>, <i>Rhyncostegium riparioides</i>, <i>Scapania undulata</i>, <i>Amblystegium</i> spp., <i>Chiloscyphus polyanthos</i>, <i>Jungermannia atrovirens</i>, <i>Juncus bulbosus</i> and <i>Callitriche hamulata</i>, are present in at least one 10m stretch of each 100m sample length, Or; Bryophytes (species from the list above) form a minimum of 10% cover in at least four 10m stretches of each sample length.
c) Water Quality	Water quality targets in CSM guidance for Rivers (JNCC 2016)	These are detailed in Appendix 2 with targets for organic pollution (DO, BOD and ammonia), phosphate, trophic diatom index, acidification and other pollutants.
e) Flow	Targets are set in relation to river / reach type(s)	Targets equate to those levels agreed and used in the Review of Consents (Appendix 3).

Performance indicators for factors affecting the feature:

Attribute	Specified limits	Comments
a) Native species	Cover of indicators of eutrophication maintained below threshold over the medium to	CSM guidance states: Care should be taken with the setting of these targets as thresholds may vary considerably by site and conservation goals. For the Afon Teifi SAC: Algae indicative of eutrophication (<i>Enteromorpha</i> spp., <i>Cladophora</i>

	long term Ref: as above	spp. and <i>Vaucheria</i> spp.) should not have a cover value of greater than 10% in 3 consecutive years in any three representative sample stretches of suitable habitat.
b) Alien / introduced species	No impact on native biota from alien or introduced species Ref: as above	In the CSM guidance, the SERCON scoring system for naturalness of aquatic and marginal macrophytes and naturalness of banks and riparian zone, are used to assess this attribute. SERCON protocols have not been applied in the Afon Teifi SAC, therefore assessment of this attribute relies on locally defined thresholds and expert judgement. For the Afon Teifi SAC: Non-native species such as <i>Elodea</i> spp. should not be dominant in more than 20% (maximum of 1 in 5) of 10m sample stretches in any one representative sample 100m length of suitable habitat. Details for other non-natives to be confirmed.

Feature 9. Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

Performance indicators for feature condition:

Attribute	Specified limits	Comments
A. Extent of Oligotrophic to mesotrophic standing waters	<i>Upper limit:</i> none <i>Lower limit:</i> Lake areas must not be permanently less than the following: Llyn Bach: 2ha. Llyn Egnant: 14ha. Llyn Hir: 5ha Llyn Teifi: 24ha Llyn y Gorlan: 3ha	Lower limit is based upon current extent as shown in UKLakes .

Attribute	Specified limits	Comments
B. Macrophyte community composition:	i) Each of the lakes should contain characteristic oligotrophic species (JNCC 2015) as follows: Llyn Bach: ≥3 species Llyn Egnant: ≥3 species Llyn Hir: ≥6 species Llyn Teifi: ≥5 species Llyn y Gorlan: ≥4 species Characteristic species for the site are <i>Elatine hexandra</i>; <i>Eleogiton fluitans</i>; <i>Isoetes echinospora</i>; <i>I. lacustris</i>; <i>Littorella uniflora</i>; <i>Lobelia dortmanna</i>; <i>Luronium natans</i>; <i>Sparganium angustifolium</i>; <i>Subularia aquatica</i>; <i>Utricularia</i> spp.	Targets reflect the natural species diversity of the different lakes based on survey data. The flora of Llyn Bach and Llyn y Gorlan is poorly known. Other species listed in Table 6a of JNCC (2015) may be used if present but have never been recorded from the site.
	ii) No loss of characteristic species recorded from the site.	All of the following species should be present across the 5 lakes as a whole; <i>Isoetes</i> spp; <i>Littorella uniflora</i>; <i>Lobelia dortmanna</i>; <i>Luronium natans</i>; <i>Subularia aquatica</i>; <i>Elatine hexandra</i>; <i>Sparganium angustifolium</i>.
	iii) In Llyn Hir, Llyn Bach and Llyn y Gorlan, at least 60% of vegetated sample points should contain one or more characteristic species	This target is not thought to be achievable in Llyn Egnant and Llyn Teifi, as these are managed as water supply reservoirs.
C. Filamentous algae	Filamentous algal cover values of 3 (the highest cover score) should be present in no more than 20% of combined boat and wader sample points.	Cover of indicators of eutrophication maintained below threshold over the medium to long term.

Attribute	Specified limits	Comments
d) Alien / introduced species	No impact on native biota from alien or introduced species	The presence of non-native invasive plant species, including but not limited to <i>Crassula helmsii</i> , will not be tolerated in any of the Teifi Pools.
e) Water quality	Water quality should be compliant with the standards set out in JNCC's Common Standards Monitoring Guidance for Lakes (JNCC 2015), provided in Appendix 4.	Suitable water quality is crucial for the maintenance of healthy lake habitats.

Appendix 2. Water Quality Targets for River Waterbodies

(as revised in Common Standards Monitoring guidance for Rivers, JNCC 2016)

River SACs designated under the Habitats Regulations 2017 (UK Gov, 2017) overlap river water bodies designated under Water Framework Directive Regulations (NRW, 2015; UK Gov, 2015). The water quality standards that apply come from the source legislation – i.e. for the water body the WFD Regulations standards and for a SAC the Habitats Regulations standards.

Water quality standards for Special Area of Conservation (SAC) rivers are set via agreement at a UK level and presented in the JNCC Common Standards Monitoring (CSM) guidance (JNCC 2015b, 2016). However, having two sets of standards for the same area of river can lead to confusion both internally and externally as to which apply in a given situation. This Appendix sets out the standards for water quality attributes for water bodies in the Afon Teifi SAC. Where they are more stringent, WFD Regulation 2017 standards are adopted as the CSM standards.

Note that the words targets and standards are used under the various documents that sit under these two Regulations. We have interpreted these to mean the same thing and for this document we will use the term standard unless directly quoting from a specific document.

A2.1 Organic pollution

The following table (Table A1a) provides the values for the physio-chemical attributes to be applied across all river types. Standards apply throughout the Water Body, not just at sparsely distributed monitoring sites.

The standards for DO, BOD and un-ionised ammonia are the same for all river water bodies whereas the standard for total ammonia varies according to river type and previous WFD Regulations classification for ammonia (Table A1a). For the 90%ile total ammonia the CSM standard is 0.25mg/l. However, if High Status under WFD is being reached for a water body for certain river types then the more stringent WFD standard at 0.2mg/l is applied. This is due to the no deterioration principle. Total ammonia standards for all water bodies in the Afon Teifi SAC are 0.2 mg l⁻¹ because they all meet WFD high status.

Table A1a. Organic pollution standards for SAC rivers

Organic pollution attribute	Unit	Test Statistic	Standard
Dissolved Oxygen (DO)	% saturation	10%ile	≥85
Biochemical Oxygen Demand (BOD)	mg l ⁻¹	Mean calculated over a 3-year period	≤1.5
Total Ammonia	mg l ⁻¹	90%ile	Varies by water body. See Table A2.1b.
95%ile un-ionised ammonia	mg l ⁻¹	95%ile	≤0.025

Table A2.1b. Total Ammonia standards for river water bodies in the Afon Tywi SAC.

* Reason for total ammonia standard: some water bodies that meet WFD high status for ammonia have the WFD high target of 0.2 mg l⁻¹, all other water bodies have the CSM target of 0.25 mg l⁻¹.

Water Body ID	Water Body Name	Total Ammonia (90%ile, mg l ⁻¹)	Reason for total ammonia standard*
GB110062039250	Brefi - headwaters to confluence with Teifi	0.2	WFD (high)
GB110062039240	Dulas - headwaters to conf Teifi	0.2	WFD (high)
GB110062038980	Talog - headwaters to confluence with Tyweli	0.2	WFD (high)
GB110062043540	Teifi - headwaters to confluence with Meurig	0.2	WFD (high)
GB110062039230	Grannell - headwaters to confluence with Teifi	0.2	WFD (high)
GB110062043490	Groes - headwaters to confluence with Teifi	0.2	WFD (high)
GB110062043501	Teifi - conf Fflur to conf Brennig	0.2	WFD (high)

Water Body ID	Water Body Name	Total Ammonia (90%ile, mg l ⁻¹)	Reason for total ammonia standard*
GB110062043566	Teifi - Afon Breninig to Afon Dulas	0.2	WFD (high)
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	0.2	WFD (high)
GB110062039140	Cerdin - headwaters to confluence with Teifi	0.2	WFD (high)
GB110062039190	Ceri - headwaters to conf Dulas	0.2	WFD (high)
GB110062039010	Dulas - headwaters to confluence with Cych	0.2	WFD (high)
GB110062039110	Ceri - Dulas to conf Teifi	0.2	WFD (high)
GB110062039220	Clettwr - headwaters to confluence with Teifi	0.2	WFD (high)
GB110062039041	Cych - headwaters to confluence with Teifi	0.2	WFD (high)
GB110062043563	Teifi - Afon Ceri to estuary	0.2	WFD (high)
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	0.2	WFD (high)
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	0.2	WFD (high)

A2.2 Reactive Phosphorus

Phosphorus standards are set according to altitude, alkalinity, and river size, with the tightest targets in low alkalinity, high altitude headwater areas, reflecting natural variation (JNCC 2016). The process also includes an alignment procedure to ensure that standard are never less stringent than the Water Framework Directive (WFD) phosphorus standard for the same water body. If the WFD phosphorus standard for good ecological status is more stringent than the CSM standard then the WFD standard applies. Individual phosphorus standards for all waterbodies in the Afon Teifi SAC are provided in Table A2.2

Table A2.2. Phosphorus standards and typology for all waterbodies in the Afon Teifi SAC. * Phosphorus standard to be applied to annual and growing season means. Standards calculated from annual mean expressed in $\mu\text{g L}^{-1}$ SRP. ** Reason for phosphorus standard: CSM (near natural/max allowable) are derived from the CSM guidance for Rivers and WFD (good/high) from the relevant Water Framework Directive standard.

Water Body ID	Water Body Name	SAC Management Unit(s)	Phosphorus standard* ($\mu\text{g L}^{-1}$)	Reason for phosphorus standard**	CSM_Alt type	CSM_Alk type	River size
GB1100620 39250	Brefi - headwaters to confluence with Teifi	1556	10	CSM (max allowable)	high Alt >80m	low Alk <50mg/l	headwater
GB1100620 39240	Dulas - headwaters to conf Teifi	1556	20	CSM (max allowable)	high Alt >80m	low Alk <50mg/l	headwater
GB1100620 38980	Talog - headwaters to confluence with Tyweli	1554	10	CSM (max allowable)	high Alt >80m	low Alk <50mg/l	headwater
GB1100620 43540	Teifi - headwaters to confluence with Meurig	1558 2983	10	CSM (max allowable)	high Alt >80m	low Alk <50mg/l	headwater
GB1100620 39230	Grannell - headwaters to confluence with Teifi	1556	20	CSM (max allowable)	high Alt >80m	low Alk <50mg/l	river
GB1100620 43490	Groes - headwaters to confluence with Teifi	1556	10	CSM (near natural)	high Alt >80m	low Alk <50mg/l	river
GB1100620 43501	Teifi - conf Meurig to conf Bren-nig	1556 1557 1558	10	CSM (near natural)	high Alt >80m	low Alk <50mg/l	river
GB1100620 43566	Teifi - Afon Bren-nig to Afon Dulas	1556	10	CSM (near natural)	high Alt >80m	low Alk <50mg/l	river
GB1100620 43565	Teifi - Afon Dulas to Afon Clettwr	1555 1556	10	CSM (near natural)	high Alt >80m	low Alk <50mg/l	river
GB1100620 39140	Cerdin - headwaters to confluence with Teifi	1555	30	CSM (max allowable)	low Alt <80m	low Alk <50mg/l	headwater
GB1100620 39190	Ceri - headwaters to conf Dulas	1554	30	CSM (max allowable)	low Alt <80m	low Alk <50mg/l	headwater

Water Body ID	Water Body Name	SAC Management Unit(s)	Phosphorus standard* ($\mu\text{g l}^{-1}$)	Reason for phosphorus standard**	CSM_Alt type	CSM_Alk type	River size
GB1100620 39010	Dulas - headwaters to confluence with Cych	1554	20	WFD (high)	low Alt <80m	low Alk <50mg/l	headwater
GB1100620 39110	Ceri - Dulas to conf Teifi	1554	40	CSM (max allowable)	low Alt <80m	low Alk <50mg/l	river
GB1100620 39220	Clettwr - headwaters to confluence with Teifi	1555	30	WFD (good)	low Alt <80m	low Alk <50mg/l	river
GB1100620 39041	Cych - headwaters to confluence with Teifi	1554	20	WFD (high)	low Alt <80m	low Alk <50mg/l	river
GB1100620 43563	Teifi - Afon Ceri to estuary	1554	20	WFD (high)	low Alt <80m	low Alk <50mg/l	river
GB1100620 43564	Teifi - Afon Clettwr to Afon Ceri	1554 1555	20	WFD (high)	low Alt <80m	low Alk <50mg/l	river
GB1100620 39020	Tyweli - confluence with Talog to confluence with Teifi	1554	34	WFD (good)	low Alt <80m	low Alk <50mg/l	river

A2.3 Trophic diatom index

The standard should be equivalent to WFD high ecological status using the current version of the diatom classification tool (via light microscopy). This is a tool developed to measure increases in nutrient concentrations through assessing degree of change in floristic composition in benthic diatoms (algae) in streams and rivers.

A2.4 Acidification

This standard only applies to Water Bodies whose water body type is classified as siliceous or peat. Other types have good buffering ability and so will not be affected by acidification. See tables 4a and 4b for standards for water bodies in the Teifi SAC.

14 out of the 18 water bodies in the Afon Teifi SAC are classed as not at risk from acidification (Hankin *et al.* 2014).

Table A2.4a. Acidification standards for SAC rivers. *Acid Neutralising Capacity; ** Dissolved Organic Carbon

Standards for acidification	Method of assessment
ANC*: Mean ANC for all waters > 80 pH (Clear waters with DOC**<10 mg L⁻¹): mean > 6.54 pH (Humic waters with DOC>10 mg L⁻¹): mean > 5.1	Analysis of water chemistry data from environment agencies. At least 36 samples (3 years of data) are required, which must include winter samples.

Table A2.4b. Acidification standards for all waterbodies in the Afon Teifi SAC.

*Acidification risk categories taken from Hankin *et al.* 2014.

Water Body ID	Water Body Name	Acidification risk*	Acid Neutralising Capacity (ANC)	pH
GB110062038980	Talog - headwaters to confluence with Tyweli	Probably not at risk	>80	>6.54
GB110062039010	Dulas - headwaters to confluence with Cych	Probably not at risk	>80	>6.54
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	Probably at risk	>80	>6.54
GB110062039041	Cych - headwaters to confluence with Teifi	Probably not at risk	>80	>6.54
GB110062039110	Ceri - Dulas to conf Teifi	Probably not at risk	>80	>6.54

Water Body ID	Water Body Name	Acidification risk*	Acid Neutralising Capacity (ANC)	pH
GB110062039140	Cerdin - headwaters to confluence with Teifi	Not at risk	>80	>6.54
GB110062039190	Ceri - headwaters to conf Dulas	Probably not at risk	>80	>6.54
GB110062039220	Clettwr - headwaters to confluence with Teifi	Probably at risk	>80	>6.54
GB110062039230	Grannell - headwaters to confluence with Teifi	Probably not at risk	>80	>6.54
GB110062039240	Dulas - headwaters to conf Teifi	Probably not at risk	>80	>6.54
GB110062039250	Brefi - headwaters to confluence with Teifi	Probably not at risk	>80	>6.54
GB110062043490	Groes - headwaters to confluence with Teifi	Probably not at risk	>80	>6.54
GB110062043501	Teifi - conf Meurig to conf Brennig	Not at risk	>80	>6.54
GB110062043540	Teifi - headwaters to confluence with Meurig	At risk	>80	>6.54
GB110062043563	Teifi - Afon Ceri to estuary	Probably not at risk	>80	>6.54
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	Probably not at risk	>80	>6.54
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	Probably at risk	>80	>6.54
GB110062043566	Teifi - Afon Brennig to Afon Dulas	Probably not at risk	>80	>6.54

Appendix 3. Standards used in the Afon Teifi Review of Consents for flow

The flow target utilises the Habitats Directive Ecological River Flow (HDERF) objective. The maximum permissible percentage reduction from naturalised flow levels is given in Table 1. All reaches within the Afon Teifi SAC are classified as having Very High or High sensitivity to abstraction.

HDERF1 - River flow thresholds (Maximum % reduction from daily naturalised flow) for SAC/SSSI rivers

EW band (sensitivity)	>Qn50	Qn50-95	<Qn95
Very High	10	10	1-5
High	15	10	5-10

For reaches below reservoirs, the effect of abstraction from storage is excluded from the resource assessment, so that the target flow is a 'benchmark' flow, incorporating the reservoir compensation release, rather than a naturalised flow. At times of low flow, compensation releases may increase the flow downstream of the reservoir above natural levels. For the Teifi Pools reservoirs, the benchmark flows used in the assessment include the effect of the reservoir compensation flows which increases low flows slightly; however any reservoir spill is ignored, therefore benchmark mean flow is slightly lower than natural.

RE2	70	4.0	0.6	0.021	6.0-9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500
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Appendix 4. Water Quality Targets for Lake Waterbodies

(as revised in Common Standards Monitoring guidance for Lakes, JNCC 2015)

Some lake SACs designated under the Habitats Regulations 2017 (UK Gov, 2017) overlap lake water bodies designated under Water Framework Directive Regulations (NRW, 2015; UK Gov, 2015). The water quality standards that apply come from the source legislation – i.e. for the water body the WFD Regulations standards and for a SAC the Habitats Regulations standards. Note that the words targets and standards are used under the various documents that sit under these two Regulations. We have interpreted these to mean the same thing and for this document we will use the term standard unless directly quoting from a specific document. Water quality standards for Special Area of Conservation (SAC) lakes are set via agreement at a UK level and presented in the JNCC Common Standards Monitoring (CSM) guidance (JNCC 2015).

However, having two sets of standards for the same water body can lead to confusion as to which apply in a given situation. This Appendix sets out the standards for water quality attributes for lakes in the Afon Teifi SAC. Where they are more stringent, WFD Regulation 2017 standards are adopted as the CSM standards.

The SAC standards in this plan apply to five lakes: Llyn Bach, Llyn Egnant, Llyn Hir, Llyn Teifi and Llyn y Gorlan.

The water quality targets for individual lakes are informed by specific reference variables which are set out in Table A4.0.

Table A4.0. Typological Variables.

Lake	Alk Type	Mean Depth (m)	Depth Type	Colour (Pt Units)	Colour Type	Fish Type
Bach	Low	3.4	Shallow	Unknown	Clear	Salmonid
Egnant	Low	5.7	Shallow	41.8	Humic	Salmonid
Hir	Low	2.8	Very Shallow	24.7	Clear	Salmonid
Teifi	Low	6.3	Shallow	27.9	Clear	Salmonid
Y Gorlan	Low	4	Shallow	Unknown	Clear	Salmonid

A4.1. Dissolved Oxygen (DO)

Table A4.1 provides the values for the physio-chemical attributes to be applied. Standards apply throughout the lake.

The standard for dissolved oxygen is type-specific. Llyn Hir is Very Shallow, whereas other lakes Shallow (Table A4.0). The salmonid standard applies to all five lakes. The High Status standard has been applied.

Table A4.1. Dissolved oxygen standard.

Unit	Unit	Test Statistic	Target
All Lakes	mg L ⁻¹	Mean summer concentration throughout the water column.	≥9.0

A4.2. Acidification

All of the Teifi Pools are low alkalinity and acid sensitive. Consequently, the acidification targets (JNCC 2015) have been applied. Only the Acid Neutralising Capacity (ANC) target is used as this measure has been shown to provide a more reliable means of measuring acidification sensitivity than pH alone. The standard used is the same as the WFD High/Good Boundary.

Table A4.2. Acid Neutralising Capacity standard.

Unit	Unit	Test Statistic	Target
All Lakes	µeq L ⁻¹	Annual mean ANC.	≥40

A4.3. Total Phosphorus (TP)

Changes to the ecology of a lake due to anthropogenic nutrient inputs are often first apparent in the phytoplankton population in the water column. There is a well-established relationship between water column TP and algal biomass, which in turn can have significant impacts on the lake ecosystem (JNCC 2015). It is therefore important to include TP levels in condition assessment.

Phosphorus standards are set either (i) using the WFD Lake Phosphorus Morphoedaphic model where there are existing data on mean lake depth and alkalinity or (ii) if no depth and alkalinity data are available, using the type-specific targets in Table 17 of JNCC (2015). No alignment procedure is required because the WFD standard is used for preference. All of the lakes on this site fall into the 'eutrophic' category.

The WFD phosphorus standard is expressed as the annual geometric mean total phosphorus as P in microgrammes per litre ($\mu\text{g L}^{-1}$). For type-specific values, an annual mean is used.

Table A3.3. Phosphorus standards and typology for oligotrophic lake habitat in the Afon Teifi SAC.

Water Body	Test Statistic	Reason for P standard	TP standard ($\mu\text{g L}^{-1}$)
Bach	Annual geometric mean	Type-specific (oligotrophic) CSM.	≤ 10
Egnant	Annual geometric mean	WFD MEI model, WFD G-M	≤ 8
Hir	Annual mean	WFD MEI model, WFD G-M	≤ 8
Teifi	Annual mean	Type-specific (oligotrophic) CSM.	≤ 10
Y Gorlan	Annual mean	Type-specific (oligotrophic) CSM.	≤ 10

A4.4. Total Nitrogen (TN)

Nitrogen is a key plant nutrient which can also significantly affect algal productivity in lakes. JNCC (2015) recommended that nitrogen targets should be applied to all lakes, but could suggest only a generic standard of 1.5mg L^{-1} , or more stringent targets where appropriate.

Since the publication of that guidance, a WFD standard has been adopted which provides a clear framework for setting nitrogen targets in lakes ([WFD-UKTAG, 2020](#)). This standard is being applied in WFD Cycle 3 and in line with NRW's approach to target setting, is also being applied here.

Nitrogen standards are set using type-specific class boundaries based on lake depth and colour. The targets are expressed as annual mean total nitrogen as N in mg L^{-1} . The High Status boundary is used by default reflecting the approach taken for other parameters, unless there is a need to deviate from this in specific water bodies due to essential permitted infrastructure such as water treatment works.

Table A3.4. Nitrogen standards and typology for lake habitat in the Afon Teifi SAC.

Water Body	Test Statistic	Depth Type	Colour type	TN standard (mg L ⁻¹)
Bach	Annual mean	Shallow	Clear	≤0.48
Egnant	Annual mean	Shallow	Humic	≤0.81
Hir	Annual mean	Very Shallow	Clear	≤0.66
Teifi	Annual mean	Shallow	Clear	≤0.48
Y Gorlan	Annual mean	Shallow	Clear	≤0.48

A4.5. Chlorophyll a

Chlorophyll is a pigment used for photosynthesis by plants. In a water sample from the water column, the chlorophyll concentration measured during the growing season provides a good indication of phytoplankton density and hence of the risk of ecological problems such as algal blooms. Persistent algal blooms would cause the lakes to not meet their quality and typical species conservation objectives.

Chlorophyll targets in CSM are set using the chlorophyll a target that forms part of the lake phytoplankton tool (WFD-UKTAG 2014c), following CSM Guidance to use High Status where possible. A classification of High Status for phytoplankton would also indicate that this target is being met.

Chlorophyll is measured as an annual geometric mean in microgrammes per litre (µg L⁻¹).

Table A3.4. Chlorophyll standards and typology for lake habitat in the Afon Teifi SAC.

Water Body	Test Statistic	Depth Type	Colour type	Chl-a standard ($\mu\text{g L}^{-1}$)
Bach	Annual geometric mean	Shallow	Clear	3
Egnant	Annual geometric mean	Shallow	Humic	3
Hir	Annual geometric mean	Very Shallow	Clear	4
Teifi	Annual geometric mean	Shallow	Clear	3
Y Gorlan	Annual geometric mean	Shallow	Clear	3