CORE MANAGEMENT PLAN INCLUDING CONSERVATION OBJECTIVES

FOR

Afonydd Cleddau / Cleddau Rivers SAC

Version	Date	Summary of changes made	Approved by
Version 3	September 2022	Revision of water quality targets for river features, updated formatting, clarification of the relationship between Conservation Objectives and Performance Indicators.	Caroline Drayton
Version 2	September 2017	Updates to water quality targets	Huw Williams
Version 1	August 20212	Minor map edit	Tracey Lovering

Contents

Preface

This document provides the main elements of Natural Resources Wales' management plan for the site(s) named. It sets out what needs to be achieved on the site(s), 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 the 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 (part 4) 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.

Our vision for the Afonydd Cleddau SAC will be to maintain, or where necessary restore the river to high ecological status, including its largely unmodified and undisturbed physical character, so that all of its special features will be 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 will not only be attractive but will 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. Locally, there will be patches of white-flowered water-crowfoots. In the more shaded reaches, aquatic plants may be scarce, consisting mainly of mosses and liverworts.

The special fish species found in the river, both residents such as the bullhead and brook lamprey, and migratory species such as the sea and river lamprey which swim up river to spawn and go through their juvenile stages in the river, will be present in numbers that reflect a healthy and sustainable population supported by well distributed good-quality habitat. The migratory fish will be able to complete their migrations and

life cycles largely unhindered by artificial barriers such as weirs, pollution, or depleted flows.

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

The presence of the Afonydd Cleddau SAC and its special wildlife will 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 continue to be recognised and promoted through appropriate land management. The river will be a focus for education to promote increased understanding of its biodiversity and the essential life support functions of its ecosystems.

There will be areas of undisturbed yet naturally dynamic alluvial forests throughout the SAC, providing cover and breeding opportunities for the otter. Areas of lowland raised bog, fen and swamp within the river floodplain and SAC will be maintained and where necessary restored.

Site description

Area and designations covered by this plan

Grid reference(s): SM 955 155 Haverfordwest town weir (Western Cleddau), SN 060 144 Blackpool Bridge (Eastern Cleddau)

Unitary authority(ies): Pembrokeshire County Council, Pembrokeshire Coast National Park

Area (hectares): 751 ha

Designations covered:

- Afon Cleddau Dwyreiniol (Eastern Cleddau River) SSSI
- Afon Cleddau Gorllewinol (Western Cleddau River) SSSI
- Esgyrn Bottom SSSI (only unit 1969 is within the SAC)
- Corsydd Llangloffan SSSI
- Wallis Moor SSSI
- Treffgarne Gorge and Tors

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

Outline Description

The River Cleddau is one of the westernmost rivers in Britain and can be broadly divided into the Eastern and Western arms.

A striking feature of this river is that it flows southwards, cutting across the structural orientation in the underlying rocks, which are of Precambrian to Silurian age (650-395 million years ago). In contrast to the orientation of the main channel, its main tributaries follow the orientation of the rocks or are controlled by structural features such as faults and folds.

The catchment is predominantly agricultural land with significant areas of permanent pasture, broadleaved woodland and other semi-natural vegetation. Most of the soils are of clay-rich acidic brown earth type, developed under former and surviving woodland cover, although there are also peaty deposits and peaty soils in some areas.

The Eastern Cleddau River

Starting at an altitude of 225m, approximately 1.5 km from Mynachlog-ddu and at the foot of the Preseli hills of north Pembrokeshire, the river flows for 26 km (74 km including tributaries) south to its tidal limit at Blackpool Bridge, where it discharges into the Milford Haven Waterway SAC.

From its source the river flows south, across an ancient valley wetland. The boundary for the upper reach of the Eastern Cleddau River and Afon Wern abuts the Mynydd Preseli SSSI. The gradient of the river increases producing a turbulent flow during its journey south through narrow wooded valleys. In its lower reaches the river meanders through a wide valley floodplain bordered by low bluffs.

The tributaries included within the Eastern Cleddau are the Afon Wern, Llanycefn, Rhydafallen, Afon Syfynwy, Rhyd-y-Brown Brook, Ty-llosg Brook, Deepford Brook, Cotland Brook, Afon Conin, Pont Shan and Narberth Brook.

The Western Cleddau River

The main channel stretches for 30km between its source at Mathry, which lies at an altitude of 112 m, to the tidal limit of the Daugleddau Estuary at Haverfordwest, flowing over sands and gravels deposited as the ice sheets from the last glaciation retreated.

In its upper course the river flows over soft substrates, across a marshy valley, bounded by the extensive mire of Corsydd Llangloffan NNR/SSSI. As it enters the wooded valley of Priskilly Forest the gradient of the river increases, and this relatively rapid section continues to Wolf's Castle and through the gorges at Treffgarne. In its lower reaches the river meanders through a wide valley floodplain bordered by low bluffs, to its tidal limit at Haverfordwest, where the Western Cleddau discharges into the Pembrokeshire Marine SAC.

The tributaries included within the Western Cleddau are the Afon Cleddau, Nant-y-bugail, Afon Anghof, Nant-y-coy Brook, Spittal Brook, Rudbaxton Water, Camrose Brook and Cartlett Brook.

At the head of the Afon Cleddau is Esgyrn Bottom SSSI, the best example of a raised bog in the county as well as the most south-westerly example of this habitat in the UK. Unit 1969 of the SSSI is within the Cleddau SAC.

Ecological structure and hydromorphological processes in the Cleddau

The ecological structure and functions of the site are dependent on hydrological and geomorphological processes (often referred to as hydromorphological processes), 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 critical 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. Reduction in flows 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 characteristic of the river in order to support the functioning of the river ecosystem.

Geomorphological processes of erosion by water and subsequent deposition of eroded sediments downstream, create the physical structure of the river habitats. Whilst some sections of the river are naturally stable, 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

Riparian habitats, including banksides 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-steam 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 habitats as breeding and resting sites. It is important that appropriate amounts of tree cover, in general at least 50% high canopy 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 setting up stream-side corridors in appropriate locations, managing grazing levels, selective coppicing of riparian trees and restoring adjacent wetlands.

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. 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 need to be designed to allow safe passage. The continuity of riparian habitats enables a wide range of terrestrial species, for example lesser horseshoe bats, 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.

Outline of Past and Current Management

There are many different aspects to the management of this large and complex site. Refer to the Eastern Cleddau River and Western Cleddau River SSSI Site Management Statements for details.

Management Units

The area covered by this plan has been divided into management units to enable practical communication about features, objectives, and management.

Maps showing the management units referred to in this plan are on this site's web page and below. Units can also be viewed on the Welsh Government's website Map Data Cymru. In this plan the management units have been based on the following:

- SSSI boundaries
- Location of key features such as Alluvial woodland and Ranunculion beds
- Differences in the physical character and flow volumes between the reaches
- Differences in land use and management issues between reaches
- Estuaries: the reach below the tidal limit is a separate SAC

Fig. 1a: Map of SAC units in the Eastern arm of the Cleddau SAC. In some cases, many tributaries form one unit. This is clarified with circled unit IDs and dashed lines. Points where units join are indicated by circles. Colour is used as a visual aid alongside the circles to aid telling management units apart. © Natural Resources Wales. All rights reserved.

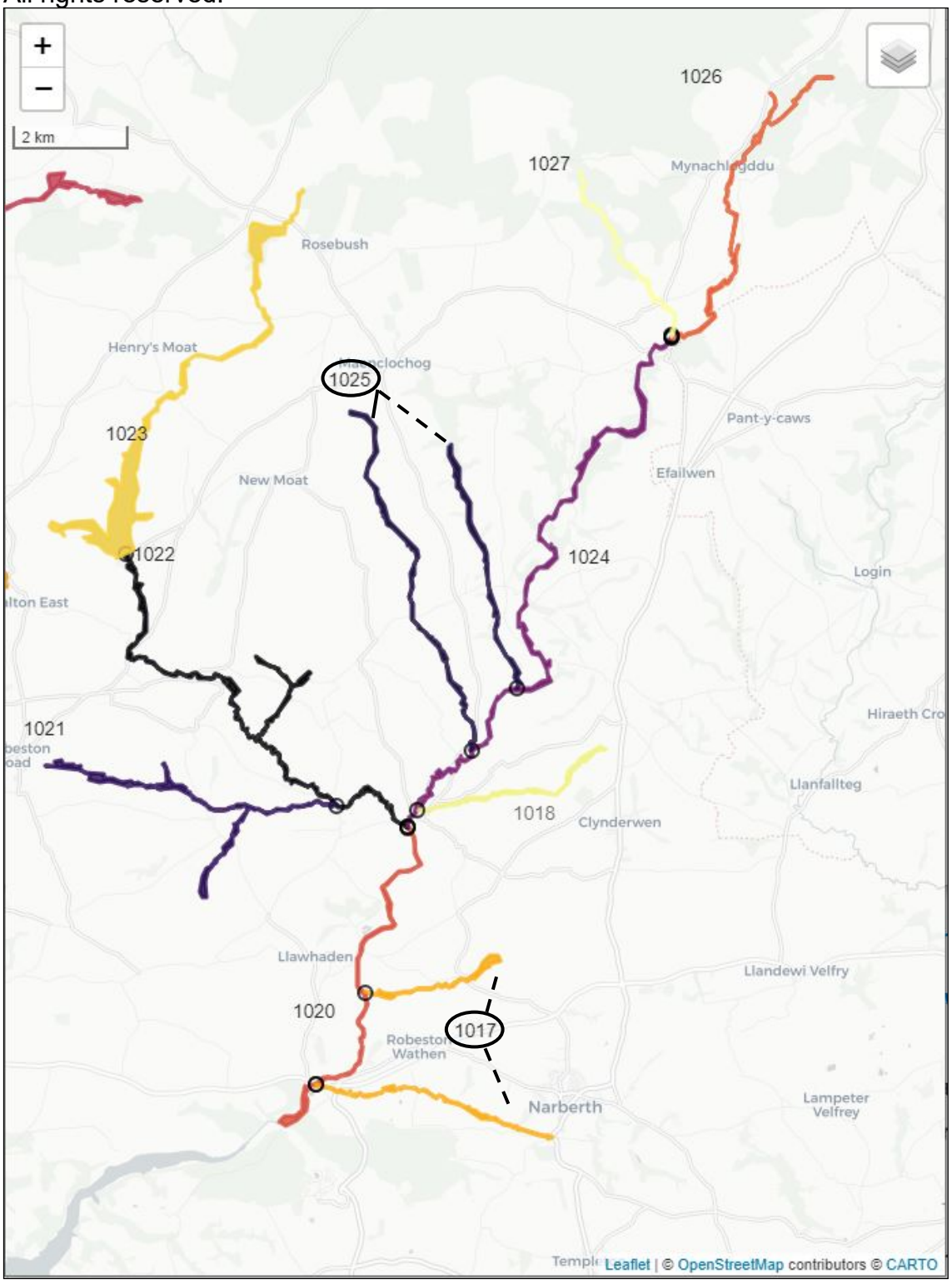


Fig. 1b: Map of SAC units in the Western arm of the Cleddau SAC. In some cases, many tributaries form one unit. This is clarified with circled unit IDs and dashed lines. Points where units join are indicated by circles. Colour is used as a visual aid alongside the circles to aid telling management units apart. The non-SAC part of the Esgyrn Bottom SSSI (which contains SAC unit 1969) is shown with a black boundary around unit 1969. See Fig. 1c for zoomed sections (in boxes) © Natural Resources Wales. All rights reserved.

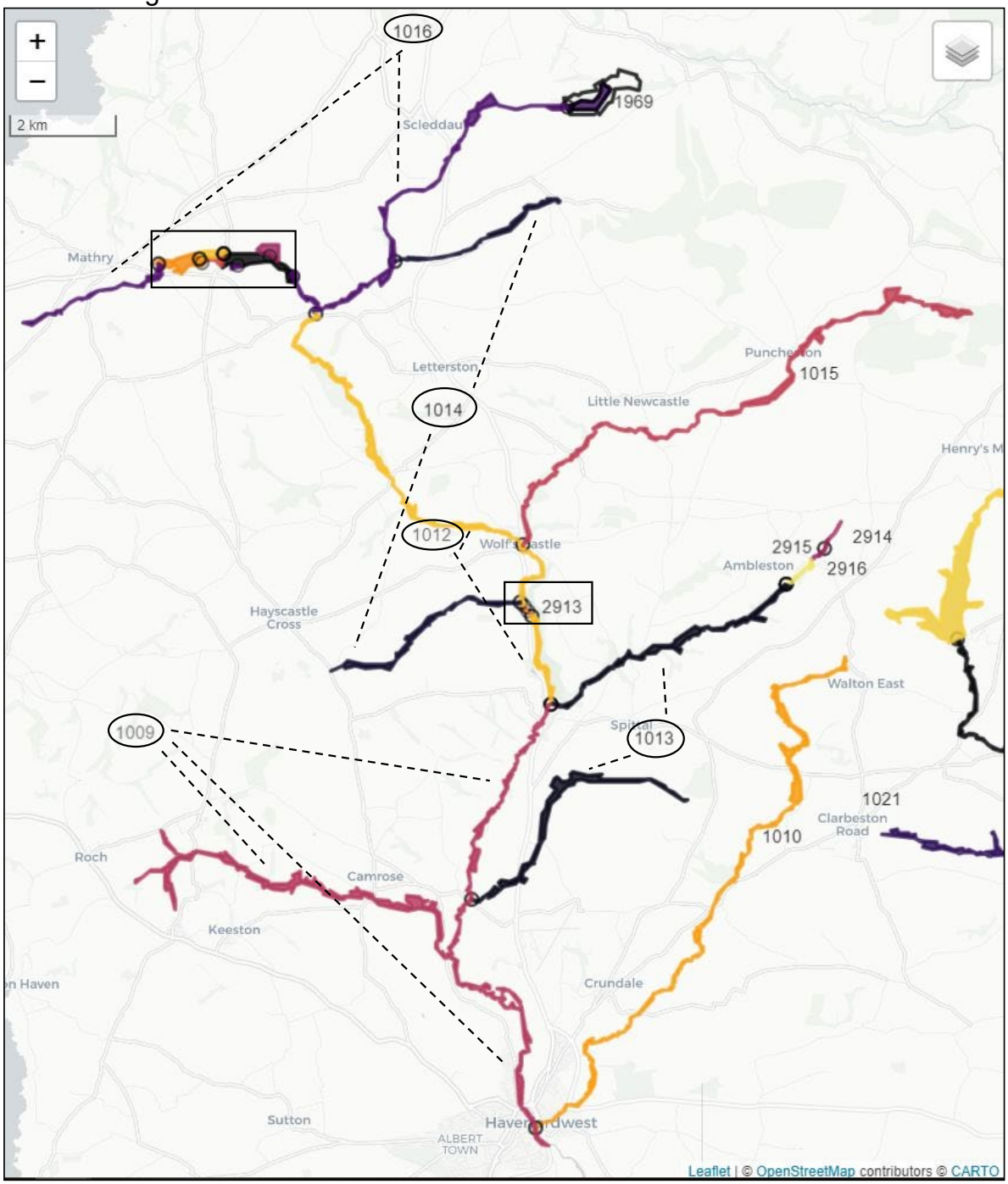
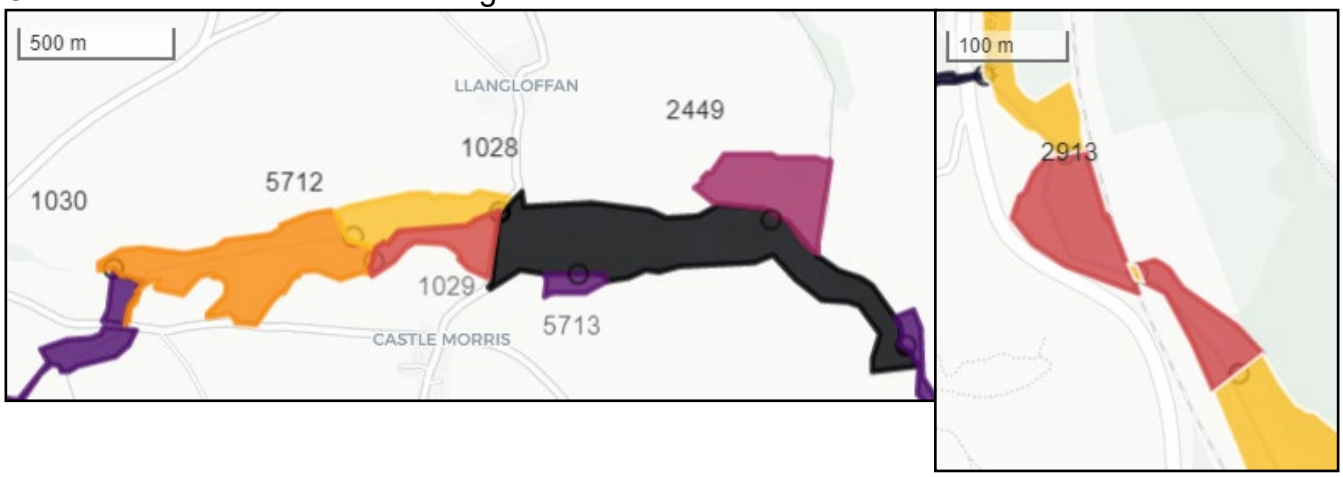


Fig. 1c: Zoomed-in top and middle sections of the Western arm of the Cleddau SAC.



The following table confirms the relationships between the management units and the designations covered:

NRW internal reference	SAC management unit	SSSI	Water body IDs within unit	Other designations / Management
1	1009	Western Cleddau SSSI	GB110061031340, GB110061031160, GB110061031180	
2	1010	Western Cleddau SSSI	GB110061031330	
3	1012	Western Cleddau SSSI	GB110061031340, GB110061038651	
4	1013	Western Cleddau SSSI	GB110061031340, GB110061031190, GB110061031350	
5	1014	Western Cleddau SSSI	GB110061031340, GB110061038660	
6	1015	Western Cleddau SSSI	GB110061031340, GB110061038690	
7	1016	Western Cleddau SSSI	GB110061038670, GB110061038651, GB110061038660, GB110061038680	
8	1017	Western Cleddau SSSI	GB110061030680, GB110061030660, GB110061030670	
9	1018	Western Cleddau SSSI	GB110061038290	
10	1020	Western Cleddau SSSI	GB110061030670	

NRW internal reference	SAC management unit	SSSI	Water body IDs within unit	Other designations / Management
11	1021	Western Cleddau SSSI	GB110061030690, GB110061030700	
12	1022	Western Cleddau SSSI	GB110061030700, GB110061030670	
13	1023	Western Cleddau SSSI	GB110061030700, GB110061038300	
14	1024	Western Cleddau SSSI	GB110061038290, GB110061030670	
15	1025	Western Cleddau SSSI	GB110061038290	
16	1026	Western Cleddau SSSI	GB110061038290, GB110061038320	
17	1027	Western Cleddau SSSI	GB110061038290, GB110061038310	
18	1028	Corsydd Llangloffan	GB110061038670	NNR; NRW owned
19a	1029	Corsydd Llangloffan	GB110061038670	Private ownership
19b	5712	Corsydd Llangloffan	GB110061038670	Private ownership
20	1030	Corsydd Llangloffan	GB110061038670	NNR; Wildlife Trust owned
22	2449	Corsydd Llangloffan	GB110061038670	Private ownership
23	5713	Corsydd Llangloffan	GB110061038670	Private ownership
27	1969	Esgyrn Bottom	GB110061038460, GB110061038680	
28	2913	Treffgarne Gorge & Tors	GB110061031340	Geo SSSI
82	2914	Wallis Moor	GB110061031350	
58	2915	Wallis Moor	GB110061031350	
77	2916	Wallis Moor	GB110061031350	

The Features

Confirmation of Features

SAC features:

SAC feature (Annex I habitats and Annex II species)	Primary reason for site selection?	Relationships, nomenclature etc
Sea lamprey Petromyzon marinus	No	EU Species Code: 1095
Brook lamprey Lampetra planeri	Yes	EU Species Code: 1096
River Lamprey Lampetra fluviatilis	Yes	EU Species Code: 1099
Bullhead Cottus gobio	Yes	EU Species Code:1163
European otter Lutra lutra	Yes	EU Species Code: 1355
Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	No	EU Habitat Code: 3260
Active raised bogs *Priority feature	No	EU Habitat Code: 7110
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) *Priority feature	No	EU Habitat Code: 91E0

Designated feature	Relationships, nomenclature etc
Potamogeton berchtoldii x P. polygonifolius (cf.)	Eastern Cleddau River SSSI
Semi-natural broadleaved woodland and scrub	Cleddau Rivers SSSI
Associated riverside habitats (including marshy grassland, fen, swamp, mire and wet dwarf shrub heath)	Cleddau Rivers SSSI
SSSI features for other SSSIs covered by plan to follow	

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 tables below set out the relationship between the features and management units identified in this plan, for each SSSI concerned.

Table of SAC features for the Western Cleddau River SSSI:

SAC management unit	1009	1010	1012	1013	1014	1015	1016
NRW internal reference	1	2	3	4	5	6	7
Brook lamprey	KS	KS	KS	KS	KS	KS	KS
River lamprey	Sym	Sym	Sym	Sym	Sym	Sym	Sym
Sea lamprey	Sym	Sym	Sym	Sym	Sym	Sym	Sym
Bullhead	Sym	Sym	Sym	Sym	Sym	Sym	Sym
Otter	KS	KS	KS	KS	KS	KS	KS
Alluvial forests	Sym	Sym	Sym	KH	Sym	x	Sym
Ranunculion habitat	KH	KH	KH	Sym	Sym	Sym	KH
Active raised bogs	x	X	x	x	x	x	x

- Otter is present throughout and specific management measures for otter relating to adjacent habitats and disturbance require its selection as a key feature in all units.
- Both good alluvial woodland and Ranunculion habitat occur in units 1012 and 1013, which is why they have been selected as KH/sym in the same unit despite differing management requirements. The units are large enough to allow for both features to occur.
- The feature ‘Rivers with floating vegetation often dominated by water-crowfoot’ is noted in unit 1010, however it is selected as a KH as a driver for improved management
- Brook lamprey are selected as a KS throughout, although where Ranunculion habitat is present, this will be the focus of management, with brook lamprey, sea lamprey and river lamprey and bullhead benefiting from sympathetic management. Where Ranunculion habitat is not present, brook lamprey will be the focus of management with sea lamprey and river lamprey and bullhead benefiting from sympathetic management.
- Bullhead are widespread across the site with particularly high numbers recorded at Pelcombe Brook and Knook Brook, tributaries of the Main channel above Haverfordwest and Camrose Brook respectively. Management for other fish species is likely to be sympathetic for bullhead.
- Local knowledge indicates sea lamprey and river lamprey were not getting past the Town weir in the past.

Table of SAC features for the Esgyrn Bottom SSSI (only unit 27, or SAC management unit 1969, is within the SAC):

SAC management unit				1969
NRW internal reference	24	25	26	27
Brook lamprey	x	x	x	x
River lamprey	x	x	x	x
Sea lamprey	x	x	x	x
Bullhead	x	x	x	x
Otter	Sym	Sym	Sym	Sym
Alluvial forests	x	x	x	x
Ranunculion habitat	x	x	x	x
Active raised bogs	KH	KH	KH	KH

- Esgyrn Bottom lies at the head of the Afonydd Cleddau on the Western Cleddau and is the best example of a raised bog in the county, as well as the most south-westerly example of this habitat in the UK. Only unit 1969 is part of the SAC.

Table of SAC features for the Corsydd Llangloffan SSSI:

Unique unit number	1028	1029	5712	1030	1970
NRW internal reference	18	19a	19b	20	30
Brook lamprey	Sym	Sym	Sym	Sym	Sym
River lamprey	Sym	Sym	Sym	Sym	Sym
Sea lamprey	Sym	Sym	Sym	Sym	Sym
Bullhead	Sym	Sym	Sym	Sym	Sym
Otter	KS	KS	KS	KS	KS
Alluvial forests	KH	x	x	x	x
Ranunculion habitat	x	KH	KH	x	KH
Active raised bogs	x	x	x	x	x

Table of SAC features for Eastern Cleddau River SSSI:

Unique unit number	1017	1018	1020	1021	1022	1023	1024	1025	1026	1027
NRW internal reference	8	9	10	11	12	13	14	15	16	17
Brook lamprey	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS
River lamprey	Sym	Sym	Sym	Sym	Sym	x	Sym	Sym	Sym	Sym
Sea lamprey	Sym	Sym	Sym	Sym	Sym	x	Sym	Sym	Sym	Sym
Bullhead	Sym	Sym	Sym	Sym	Sym	Sym	Sym	Sym	Sym	Sym
Otter	KS	KS	KS	KS	KS	KS	KS	KS	KS	KS
Alluvial forests	Sym	Sym	x	Sym	Sym	x	Sym	KH	Sym	x
Ranunculion habitat	Sym	Sym	KH	Sym	Sym	Sym	Sym	Sym	Sym	Sym
Active raised bogs	x	x	x	x	x	x	x	x	x	x

- Otter is present throughout and specific management measures for otter relating to adjacent habitats and disturbance require its selection as a key feature in all units.
- Significant Alluvial woodland occurs in unit 1025 to justify its selection as a KH and is present in units 1018, 10124 & 1026 where it will benefit from sympathetic management.
- The feature ‘Rivers with floating vegetation often dominated by water-crowfoot’ occurs in unit 1020 and is noted in units 1017, 1021 & 1024. It is therefore selected as KH in unit 1020, and as a sympathetic feature in 1017, 1021 & 1024.
- Brook lamprey are selected as a KS throughout, although where Ranunculion habitat is present, this will be the focus of management, with brook lamprey, sea lamprey and river lamprey and bullhead benefiting from sympathetic management. Where Ranunculion habitat is not present, brook lamprey will be the focus of management with sea lamprey and river lamprey and bullhead benefiting from sympathetic management.
- Local knowledge indicates sea lamprey and river lamprey were not getting past the weir at Canaston in the past.

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. 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 for 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 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. The reservoir dams on the Syfynwy are excluded.
- 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 sea and river lamprey will not be depleted by abstraction to the extent that passage upstream to spawning sites is hindered.
- 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.
- Potential sources of pollution not addressed in the review of consents, such as contaminated land, will be considered in assessing plans and projects.

- Levels of suspended solids will be agreed by NRW for each Water Framework Directive water body in the Afonydd Cleddau 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.

In the Cleddau 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, especially in the head waters of the Eastern Cleddau. 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 NRW 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, including NRW’s Living rivers Scheme will help to achieve the conservation objectives for the SAC. The conservation objectives should be as detailed as they need to be, to fully capture our aspirations for the features on the site. The level of detail will also reflect how much we know about the site and its features.

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. At least 50% high canopy cover to the watercourse/banks should be maintained, where appropriate. Some reaches may naturally have lower tree cover. Cover may also be lower in urban reaches.

Conservation Objective for Feature 1: Sea lamprey *Petromyzon marinus* (EU Species Code: 1095)

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

- The conservation objective for the watercourse as defined above is met.
- The population of the feature in the SAC must be stable or increasing over the long term.
- 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 the Site outline section). Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future.
- Passage of the feature through the SAC is not to be hindered by artificial barriers such as weirs.
- 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.

Conservation Objective for Feature 2 & 3: Brook lamprey *Lampetra planeri* (EU Species Code : 1096); River lamprey *Lampetra fluviatilis* (EU Species Code : 1099)

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

- The conservation objective for the watercourse is met.
- The population of the feature in the SAC must be stable or increasing over the long term.
- 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 the Site outline section). Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future.
- Passage of the feature through the SAC is not to be hindered by artificial barriers such as weirs.

- 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.

Conservation Objective for Feature 4: - Bullhead *Cottus gobio* (EU Species Code : 1163)

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

- The conservation objective for the watercourse is met.
- The population of the feature in the SAC must be stable or increasing over the long term.
- 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 the Site outline section). Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future.
- Passage of the feature through the SAC is not to be hindered by artificial barriers such as weirs.
- 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.

Conservation Objective for Feature 5: - European otter *Lutra lutra* (EU Species Code: 1355)

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

- 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
- The SAC will have sufficient habitat, including riparian trees and vegetation and wetlands, to support the otter population in the long term
- The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.
- The otter must be able to breed and recruit successfully in the SAC. The size of breeding territories may vary depending on prey abundance.
- Otter food sources must be sufficient for maintenance of the population.
- 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.

- 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.

Conservation Objective for Feature 6: - Water-courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (EU Habitat code: 3260)

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

- The conservation objective for the watercourse is 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 the Site outline 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.
- The area covered by the feature within its natural range in the SAC should be stable or increasing.
- The conservation status of the feature's typical species should be favourable condition. 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.

Conservation Objective for Feature 7: Active raised bogs (EU Habitat code 7110)

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

- On the mire expanse there are at least 3 of *Calluna vulgaris, Erica tetralix, Eriophorum angustifolium, E.vaginatum* & *Trichophorum cespitosum* constant, with a combined cover not exceeding 80%
- No single species > 50% cover
- At least one of *Andromeda polifolia, Drosera rotundifolia, Empetrum nigrum, Narthecium ossifragum* and *Vaccinium oxycoccos* occurs at least frequently
- On the mire expanse only there are at least 2 of the following spp. constant, with a combined cover > 20%: *Sphagnum capillifolium, S. magellanicum, S. papillosum, S. tenellum*

- No reduction in extent of microtopographic features (e.g. bog pools).

Conservation Objective for Feature 8: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (EU Habitat code: 91E0)

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

- The canopy is dominated by single stands of alder *Alnus glutinosa* or willow *Salix* spp. In alluvial woods with free draining soils there may be ash or oak in the canopy, but in the wetter alluvial woodlands ash *Fraxinus excelsior* is more likely to be limited to areas of relatively drier ground
- The structure of alluvial woodland is recognised as being dynamic therefore the presence of over mature trees is desirable but not essential
- The river itself should be dynamic to allow for areas of outwash and deposition that trees can regenerate on.
- Lying or standing deadwood (> 20 cm diameter and > 1 m length) is present at all sites
- The feature should support alluvial ground flora including two of the following: meadowsweet *Filipendula ulmaria*, yellow flag *Iris pseudacorus*, nettle *Urtica dioica*, common reed *Phragmities australis*, greater tussock sedge *Carex paniculata*, opposite-leaved golden saxifrage *Chrysosplenium oppositifolium*, rushes *Juncus* spp, tufted hair-grass *Deschampsia cespitosa*, hemlock water-dropwort *Onanthe crocata*, and wild angelica *Angelica sylvestris*.

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: Sea lamprey *Petromyzon marinus*

Status of Feature 1 Unfavourable: Unclassified (2012)

In the first reporting cycle brook & river lamprey populations has failed on three attributes; density, distribution and age structure. The feature also failed to reach the environmental target for flow and it was classed as Unfavourable - unclassified.

In the second reporting cycle brook & river lamprey met all the population attributes but continued to fail on river flow and was assessed as “Unfavourable – recovering”. The ‘recovering’ assessment is made due to the population attributes passing in the target in the second cycle whereas they failed in the first cycle.

In the first reporting cycle sea lamprey population failed on ammocoete density and distribution as no sea lamprey, but spawning activity was not assessed. The feature also failed to meet the river flow target.

In the second reporting cycle the sea lamprey failed on two population attributes (distribution & density as no sea lampreys were found) and spawning activity was not assessed. The feature also failed to meet the environmental target for river flow and the feature was reported as Unfavourable – unclassified.

A low level of confidence is reported for the water quality attributes as over half the units in the sites do not have any monitoring survey sites. In addition there are concerns regarding the water quality of the Eastern and Western Cleddau. Pollution events in the catchment are thought to be an issue. This is reflected partly by Milford Haven Waterway and the catchment (Eastern and Western Cleddau) are on 'Amber alert' status for a NVZ. However, this is part of a separate assessment which is not considered in the condition assessment. Hence the results of the assessment of the water quality attributes does not reflect on any NVZ assessment.

Management Requirements of Feature 1

The impacts of barriers to migration have been largely overcome since installation of the fish passes at Haverfordwest and Canaston Bridge. Smaller weirs remain, on the Anghof, upper Eastern Cleddau, Vicars Mill on the Eastern Cleddau and the Llys y Fran Dam on the Syfynwy, but these barriers are higher in the catchment, leaving much of the river accessible.

The impact of acoustic (i.e. noise/vibration) and sediment/chemical barriers arising from plans or projects should also be assessed. When arising from construction or other development related activities it may be necessary to restrict timing of such activities.

The impact of flow depletion downstream of a number of abstractions was assessed in the Review of Consents process. Abstractions which may have an impact on the features of the SAC have passed to stage 4 for options appraisal. The outcome of these assessments is in progress.

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. Improvements have recently been made to the screening of the abstractions at Canaston and Crow Hill.

The impact of lowered temperatures from the hypolimnial release at Llys y Fran on the Cleddau also has the potential to impact upon lamprey. The anadromous sea lamprey is temperature dependent at critical freshwater life stages. Migration of sea lamprey into estuaries usually occurs from April onwards at temperatures of between 10-18 ºC, and spawning occurs when water temperatures increase above a threshold of 15 ºC, usually between May and June. The critical spawning temperature range for sea lamprey is considered to be 11-25 ºC, and eggs require temperatures of 15-25 ºC to hatch. Distribution of lamprey within the Cleddau catchment is therefore also likely to be limited by the current river temperature regime.

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 40cm depth generally in shallow (<0.5 m) slack-water channel margins with some shade.

The 2005 APEM report describes optimal habitat [nursery areas] as areas identified with:

- Several square metres of stable, fine sediment at least 150mm deep
- Low water velocity
- Shallow water depth
- Organic detritus
- Presence of shade

The APEM report also describes sub-optimal habitat [nursery areas] as patchy, shallow sediment interspersed among coarser substrate with comparatively high velocity flow, more typically described as salmonid fry and parr habitat. All the sub-optimal habitat sites contained a few square centimetres of silt or fine sand.

In the Afonydd Cleddau 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.

If appropriate, land bordering the SAC can be entered into a Living Rivers Agreement for improvements such as stock exclusion and buffer strips, especially on reaches adjacent to intensively managed livestock grazing or arable land.

Other 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.

A project looking at Catchment Sensitive Farming on the Deepford brook began in 2006/07 running through until the end of the 07/08 financial years. Deepford brook was chosen as a pilot to work on a predominantly dairy/intensive livestock catchment. The primary aim of the work was to investigate methods for reducing diffuse pollution coming from agricultural practice, and the response of the farming community to these methods and the interventions needed to undertake them. The way the project aimed to achieve these reductions was through provision of advice, support and financial grants to farmers/landowners to allow them to change aspects of their farm infrastructure or management in ways that will reduce run off and the potential of that run off to be loaded with pollutants such as soil, phosphorus, ammonia, sheep dip and organic material.

More recently projects targeting all farms in the catchments of the Cartlett, Anghof and Syfynwy tributaries have been undertaken. All farms were offered advice on best land management practice and free soil testing to determine correct levels of fertiliser application. If appropriate, land bordering the SAC was entered into a Living Rivers Agreement.

Management for all sea, river and brook lamprey is likely to be sympathetic.

Status and Management Requirements of Features 2 & 3: Brook lamprey *Lampetra planeri* & River lamprey *Lampetra fluviatilis*

Status of Features 2 and 3 Unfavourable: Recovering (2012)

In the first reporting cycle brook & river lamprey populations has failed on three attributes; density, distribution and age structure. The feature also failed to reach the environmental target for flow and it was classed as Unfavourable - unclassified.

In the second reporting cycle brook & river lamprey met all the population attributes but continued to fail on river flow and was assessed as "Unfavourable – recovering". The 'recovering' assessment is made due to the population attributes passing in the target in the second cycle whereas they failed in the first cycle.

In the first reporting cycle sea lamprey population failed on ammocoete density and distribution as no sea lamprey, but spawning activity was not assessed. The feature also failed to meet the river flow target.

In the second reporting cycle the sea lamprey failed on two population attributes (distribution & density as no sea lampreys were found) and spawning activity was not assessed. The feature also failed to meet the environmental target for river flow and the feature was reported as Unfavourable – unclassified.

A low level of confidence is reported for the water quality attributes as over half the units in the sites do not have any monitoring survey sites. In addition, there are concerns regarding the water quality of the Eastern and Western Cleddau. Pollution events in the catchment is thought to be an issue. This is reflected partly by Milford Haven Waterway and the catchment (Eastern and Western Cleddau) are on 'Amber alert' status for a NVZ. However, this is part of a separate assessment which is not considered in the condition assessment. Hence the results of the assessment of the water quality attributes does not reflect on any NVZ assessment.

Management Requirements of Features 2 and 3

The impacts of barriers to migration have been largely over come since installation of the fish passes at Haverfordwest and Canaston Bridge, although further assessment of the efficacy of these passes would be useful. Smaller weirs remain, on the Anghof, upper Eastern Cleddau, Vicars Mill on the Eastern Cleddau and there is also the Llys y Fran Dam on the Syfynwy, but these barriers are higher up the catchment, leaving much of the river accessible.

The extent and quality of suitable habitat for brook and river lamprey must be maintained. Elevated levels of fines (particles <0.83mm) within spawning substrates can interfere with egg survival. Spawning habitat consists of well-oxygenated gravel/pebble substrate of >10cm depth in a range of water depths (0.2 to 1.5m). 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 (<0.5m) slack-water channel margins.

The 2005 APEM report describes optimal habitat [nursery areas] as areas identified with:

- Several square metres of stable, fine sediment at least 150mm deep
- Low water velocity
- Shallow water depth
- Organic detritus
- Presence of shade

The APEM report also describes sub-optimal habitat [nursery areas] as patchy, shallow sediment interspersed among coarser substrate with comparatively high velocity flow, more typically described as salmonid fry and parr habitat. All of the sub-optimal habitat sites contained at few square centimetres of silt or fine sand.

The impact of flow depletion downstream of a number of abstractions was assessed in the Review of Consents process. Abstractions that may have an impact on the features of the SAC have passed to stage 4 for options appraisal. The outcome of these assessments is in progress.

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. Improvements have recently been made to the screening of the abstractions at Canaston and Crow Hill

The impact of lowered temperatures from the hypolimnial release at Llys y Fran on the Cleddau also has the potential to impact upon lamprey. The freshwater brook lamprey and anadromous river lamprey are temperature dependent at critical freshwater life stages. River and brook lamprey start to spawn in British rivers when water temperatures reach 10-11ºC, usually between March and April for river lamprey and March and May for brook lamprey. Distribution of lamprey within the Cleddau catchment is therefore also likely to be limited by the current river temperature regime.

In the Afonydd Cleddau 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.

If appropriate, land bordering the SAC can be entered into a Living Rivers Agreement for improvements such as stock exclusion and buffer strips, especially on reaches adjacent to intensively managed livestock grazing or arable land.

Other 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.

A project looking at Catchment Sensitive Farming on the Deepford brook began in 2006/07 running through until the end of the 07/08 financial years. Deepford brook was chosen as a pilot in order to work on a predominantly dairy/intensive livestock catchment. The primary aim of the work was to investigate methods for reducing diffuse pollution coming from agricultural practice, and the response of the farming community to these methods and the interventions needed to undertake them. The way the project aimed to achieve these reductions was through provision of advice, support and financial grants to farmers/landowners in order to allow them to change aspects of their farm infrastructure or management in ways that will reduce run off and the potential of that run off to be loaded with pollutants such as soil, phosphorus, ammonia, sheep dip and organic material.

More recently, projects targeting all farms in the catchments of the Cartlett, Anghof and Syfynwy tributaries has been undertaken. All farms were offered advice on best land management practice and free soil testing to determine correct levels of fertiliser

application. If appropriate land bordering the SAC was entered into a Living Rivers Agreement.

Management for all sea, river and brook lamprey is likely to be sympathetic.

Status and Management Requirements of Feature 4: Bullhead *Cottus gobio*

Status of Feature 4 Unfavourable: Unclassified (2012)

In the first reporting cycle bullhead feature failed to meet the target for flow but river morphology, population density and age structure were not assessed. In the second reporting cycle water quality attributes passed but the flow attribute failed. The population attribute and river morphology were not assessed. Hence the overall assessment was Unfavourable – unclassified. A low level of confidence is reported for the water quality attributes as over half the units in the sites do not have any monitoring survey sites. In addition, there are concerns regarding the water quality of the Eastern and Western Cleddau. Pollution events in the catchment is thought to be an issue. This is reflected partly by Milford Haven Waterway and the catchment (Eastern and Western Cleddau) are on 'Amber alert' status for a NVZ. However, this is part of a separate assessment which is not considered in the condition assessment. Hence the results of the assessment of the water quality attributes does not reflect on any NVZ assessment.

Management Requirements of Feature 4

Vertical drops of >18-20 cm are sufficient to prevent upstream movement of adult bullheads. 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. At least 50% high canopy cover to the watercourse/banks should be maintained, where appropriate. Some reaches may naturally have lower tree cover. Cover may also be lower in urban reaches.

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 5: European otter *Lutra lutra*

Status of Feature 5 Favourable: Maintained

The conservation status of otters in the Afonydd Cleddau SAC is based on records of otter distribution, general riparian habitat quality, breeding records and current breeding habitat quality as outlined in the Performance Indicators.

Management Requirements of Feature 5

The catchment is capable of supporting 11 breeding females on the Western Cleddau, and 8 breeding females on the Eastern Cleddau. This is determined by the number of existing breeding territories as identified by Jones, (2004).

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. Involvement of river users and land managers will be important in improving potential breeding habitat near to the river. Living Rivers Agreements and agri-environment schemes provide possible mechanisms for maintaining suitable sites, such as lightly grazed woodlands, areas of dense scrub, and tussocky fens with purple moor-grass.

There is the opportunity to increase the number of breeding sites through targeted management under the Living Rivers Scheme. Of an initial 78 breeding sites identified through a desk top study in 2004, 37 were considered sub-optimal. It was noted

that this would not necessarily preclude breeding activity. A survey of these sites is required with an assessment of the potential for improvement to ‘optimal’ condition.

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.

Measures to ensure the safe movement of otters around the catchment will be promoted, in particular the ongoing 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.

Status and Management Requirements of Feature 6: Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Status of Feature 6 Unfavourable: Unclassified (2012)

In the first reporting cycle the assessment was based on a Mean Trophic Rank assessment and the feature failed to meet the flow target and also possibly the SRP one. The feature was reported as “Unfavourable – unclassified” with low confidence.

In second reporting cycle the macrophyte population was not assessed and feature failed to meet the targets for flow and river habitat structure targets for channel and banks. The feature is reported as “Unfavourable - unclassified”. A low level of confidence is reported for the water quality attributes as over half the units in the sites do not have any monitoring survey sites. In addition, there are concerns regarding the water quality of the Eastern and Western Cleddau. Pollution events in the catchment is thought to be an issue. This is reflected partly by Milford Haven Waterway and the catchment (Eastern and Western Cleddau) are on 'Amber alert' status for a NVZ. However, this is part of a separate assessment which is not considered in the condition assessment. Hence the results of the assessment of the water quality attributes does not reflect on any NVZ assessment.

Management Requirements of Feature 6

Important stands of the habitat have been identified in the lower reaches of the Western Cleddau main river below Welsh Hook, at Wolf’s Castle and at Pont Llangwarren.

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. 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.

The level of shading is a determining factor to the presence of this feature in many reaches. The Afon Rhyd Afallen and the Conin are two such stretches where communities are bryophyte dominated. On reaches where the feature is identified, some coppicing of bank side trees may be required.

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. Measures should be targeted initially at those reaches identified as holding important stands of this vegetation, units 1009,1012,1016 & 1020 and as a mechanism to improve the overall quality of the river, unit 1016.

In the Afonydd Cleddau 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.

If appropriate, land bordering the SAC can be entered into a Living Rivers Agreement for improvements such as stock exclusion and buffer strips, especially on reaches adjacent to intensively managed livestock grazing or arable land.

Other 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.

A project looking at Catchment Sensitive Farming on the Deepford brook began in 2006/07 running through until the end of the 07/08 financial years. Deepford brook was chosen as a pilot in order to work on a predominantly dairy/intensive livestock catchment. The primary aim of the work was to investigate methods for reducing diffuse pollution coming from agricultural practice, and the response of the farming community to these methods and the interventions needed to undertake them. The way the project aimed to achieve these reductions was through provision of advice, support and financial grants to farmers/landowners in order to allow them to change aspects of their farm infrastructure or management in ways that will reduce run off and the potential of that run off to be loaded with pollutants such as soil, phosphorus, ammonia, sheep dip and organic material.

More recently, projects targeting all farms in the catchments of the Cartlett, Anghof and Syfynwy tributaries was undertaken. All farms will be offered advice on best land management practice and free soil testing to determine correct levels of fertiliser application. If appropriate, land bordering the SAC can be entered into a Living Rivers Agreement.

More information is required on the natural range and distribution of this feature in the Afonydd Cleddau. Important examples of the feature may be present outside currently known locations. Sympathetic management will be promoted wherever the feature is present, if possible through the use of Living Rivers Agreements with land owners.

Status and Management Requirements of Feature 7: Active raised bogs

Status of Feature 7 Unfavourable: declining

Primary (i.e. un-cut) mire occupies a limited area of the site, and appears to have been truncated by past drainage and peat cutting operations (Baird and Money, 1998). The primary mire edges display damage in the form of slumping and cracking, particularly along the northeast and northwest margins

of the area. There is a general predominance of *Calluna vulgaris* and under-representation of *Sphagna* across the bog surface, which may be symptomatic of progressive dehydration, but long-term trends are still unclear. As such the overall condition of the primary raised mire should provisionally be considered to be unfavourable, declining.

Raised mires are dependent upon a high and seasonally stable water table, together with an acidic water chemistry and low levels of plant nutrient availability, for both their development and maintenance. The chief factor affecting the raised bog vegetation is its hydrology. The construction of sluices on outflow ditches has been postulated as a means of countering the effects of peat cutting and drainage.

Raised mires are termed ombrotrophic, meaning that they are entirely dependent on atmospheric precipitation alone for both their water and nutrient inputs. Any nutrient enrichment by for example drift of agricultural inputs such as lime and herbicide/pesticide sprays may have a detrimental impact on the vegetation. Esgyrn Bottom is surrounded by steep wooded slopes which provide a suitable buffer against such occurrences. More insidious impacts could occur through pollution of groundwater, for example through intensification of agriculture. This threat should be addressed through maintenance of semi-natural vegetation and encouragement of good agricultural practice within the catchment area of the valley.

Fire, particularly if affecting extensive areas of the mire, may damage the hydrology of the site by destroying the microclimate amelioration and water holding capacity of the mire vegetation. As such, whilst loss of the vegetation cover may be short-lived, recovery to an active peat-forming state is likely to take a number of years or even decades. Fire episodes also increase the opportunity for the establishment of tree/shrub species and encourage the spread of fire tolerant competitive species notably *Molinia*. Measures should be taken to prevent fires.

Scrub encroachment is not currently thought to be a problem. Examination of aerial photographs suggests that there was some localised scrub expansion between 1971 and 1983, but further expansion was very limited between 1983 and 1992 (Baird & Money, 1998). Scrub largely comprises *Salix cinerea* and *Alnus glutinosa* aligned

along ditch lines and other wet depressions, suggesting that current scrub distribution is influenced more by base-rich conditions than dehydration.

Grazing does not currently occur on the raised bog, but introduction of stock on to areas of secondary raised mire would help to control *Molinia* and scrub.

Management Requirements of Feature 7

Grazing should not be necessary to keep the primary raised bog in good condition, but very light grazing may be of value on sites impacted by drainage. The secondary raised bog has been grazed in the past, and grazing by larger animals such as cattle, ponies or deer would have positive effects if reintroduced. Grazing here should aim to keep the purple moor-grass tussocks in check and create a mixture of moor-grass and other plants varying between ankle-height and knee-height.

Although **burning** is sometimes used as a traditional method of rejuvenating areas of purple moorgrass, the bog here should not be burnt. The layer of Sphagnum moss and underlying peat would be damaged, and the growth of purple moor-grass encouraged. Accidental summer burns are particularly damaging, and an effort should be made to prevent these from occurring.

Scrub appears to be spreading across the secondary raised bog. The non-native rhododendron is a particular concern. Occasional **cutting** may be necessary to stop this from spreading further and shading out the native bog plants. Treatment of stumps with a suitable herbicide would be necessary to prevent re-growth.

Pollution: Activities that could affect water draining on to the bog should be carried out carefully. Where possible, use of fertilisers or other chemical inputs on fields adjoining the bog should be limited. This will ensure a clean supply of water draining on to the bog margins. Any felling in the woodland should avoid causing silt problems. Aerial pollution has a damaging impact on sensitive bog plants, and originates from both local sources and further afield.

The raised bog is dependent on the maintenance of a natural **drainage** pattern. No new drainage systems should be put in place, and no pools should be created. A programme of ditch blocking and hydrological restoration is urgently required within and immediately adjacent to the raised bog and this will be progressed by NRW and relevant partners.

Status and Management Requirements of Feature 8: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

Status of Feature 8 Unfavourable: Unclassified

A survey to map the complete distribution of the feature and collect summary condition data of the entire series of alluvial forest (>1 ha in area) within the Afonydd

Cleddau SAC was undertaken in 2003-2004 by the Wildlife Trust of South and West Wales (Jones, 2004). The aim of the survey was to provide a clear overview of the many areas of alluvial woodland present within the SAC; not to provide a condition assessment of the feature. The survey data would then allow NRW condition monitoring effort to be efficiently directed toward a small set of woodlands representative of the series.

Some of the sites did not meet the criteria of alluvial forest since ash formed the dominant canopy species rather than appearing as a component of the community. Other sites occupied elevated ground above the river system, which would not be subject to alluvial flooding.

Subsequent targeted monitoring provided SAC condition assessment based on site-specific performance indicators developed by Tracey Lovering (SAC Monitoring Team). Condition assessment of the Alluvial woodland feature across the SAC required 3 out of 4 sites on each arm to pass individual condition assessments. Three sites failed: 2 from the Eastern Cleddau and 1 from the Western.

Therefore, the condition assessment is **Unfavourable: Unclassified**. The sub-category of Unclassified is provided since there was no previous data available for these sites with which a trend could be assessed.

In future years of monitoring NRW is likely to monitor a new set of 8 sites in the series of alluvial woodlands on the Cleddau. This will provide greater information on individual sites and highlight site-specific management issues to bring the series into favourable condition. We will continue to assess the condition of the sites based on the same attributes/sub-attributes, with site-specific amendments. In this way we will gradually build up a database on all of the sites on the Cleddau, we will gain the actual extent of the feature and will be in a position to prioritise management decisions.

Selected sites with Condition Assessment Summary (P=Pass; F= Fail):

- Eastern Cleddau: Henry's Moat (P)
- Cotland Mill, Deepford Brook (P)
- Southfield Villa, Pont Crwca (F)
- Abystree (F)
- Western Cleddau: Esgyrn Bottom (P)
- Brimaston, Nant y Coy Brook (P)
- Wiston Mill, Cartlett Brook (P)
- Cuffern Bridge (F)

Site-specific management issues that led to assessment of site as Unfavourable:

- Southfield Villa: Limited associated ground flora, sparse ground cover; dense thickets of bramble 30-80% (Target: Dense thickets of bramble <10%; confined to drier margins of habitat).
- Abystree: Canopy gap occupied by dense bramble with no evidence of saplings (Target: At least 2 saplings established in canopy gap (2-5m trees) (advance regeneration) but only alder, ash, willow i.e. no beech or sycamore)

- Cuffern Bridge: Dense thickets of bramble c. 7% in places (along woodland edge) (Target: Dense thickets of bramble <10% and confined to drier margins of habitat). Sycamore dominating canopy with rhododendron understorey (Targets: 50-90% of the canopy forming trees are alder; <5% of the canopy forming trees across the woodland are non-native; Exotics <5%).

Management Requirements of Feature 8

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) comprises woods dominated by alder *Alnus glutinosa* and willow *Salix* spp. on flood plains in a range of situations from islands in river channels to low-lying wetlands alongside the channels. The habitat typically occurs on moderately base-rich, eutrophic soils subject to periodic inundation.

Many such woods are dynamic, being part of a successional series of habitats. Their structure and function are best maintained within a larger unit that includes the open communities, mainly fen and swamp, of earlier successional stages. On the drier margins of these areas other tree species, notably ash *Fraxinus excelsior* and elm *Ulmus* spp., may become abundant. In other situations the alder woods occur as a stable component within transitions to surrounding dry-ground forest, sometimes including other Annex I woodland types. These transitions from wet to drier woodland and from open to more closed communities provide an important facet of ecological variation. The ground flora is correspondingly varied. Some stands are dominated by tall herbs, reeds and sedges, for example common nettle *Urtica dioica*, common reed *Phragmites australis*, greater tussock-sedge *Carex paniculata*, and meadowsweet *Filipendula ulmaria*, while others have lower-growing communities with creeping buttercup *Ranunculus repens*, common marsh bedstraw *Galium palustre*, alternate-leaved golden-saxifrage *Chrysosplenium oppositifolium* and marsh-marigold *Caltha palustris*.

In the UK this Annex I habitat falls mainly within the following NVC types:

- W5 *Alnus glutinosa – Carex paniculata* woodland
- W6 *Alnus glutinosa – Urtica dioica* woodland
- W7 *Alnus glutinosa – Fraxinus excelsior* – Lysimachia nemorum woodland
- W2a *Salix cinerea – Betula pubescens – Phragmites australis* woodland, *Alnus glutinosa – Filipendula ulmaria* sub-community

Alder requires high light levels to regenerate from seed and will not, therefore, regenerate under a canopy. However, it readily self-coppices from the base as trunks fall. This ‘coppice’ re-growth is counted as regeneration in the performance indicators. At present, natural processes of trees falling and re-growing appear to be maintaining the required structural diversity across most of the site, but some coppicing might be required in areas where trees have not been falling down.

Excessive grazing can have a negative effect on natural regeneration and the ground flora of the sites, where livestock have access, fencing may be needed to control or preferably exclude livestock.

Some sites have non-native species present, namely Rhododendron, Himalayan Balsam and Japanese Knotweed, and control of these will be required.

Where works are required a Living Rivers Agreement can be offered to the land-owner.

Areas of new alluvial woodland are being established in areas of previous wet grass-lands. This is a natural progression within the wetland communities.

Further survey work is required to assess the condition of the alluvial forests and management requirements on a site by site basis.

Alder root disease can have a devastating impact on alluvial forests. Coppicing the affected trees has been shown to prolong their life and this course of action will be taken when alder root disease is found in survey sites or on ad hoc site visits.

Alluvial woodlands don’t necessarily have to be wet and can occur on free draining soils. In these circumstances ash and oak can form a component of the canopy. However, most alluvial woodlands are also wet simply because these tend to be the areas that haven’t been cleared for other land uses. Wet Alluvial woodlands are at risk of drying out where artificial drains have been dug in the past which will allow species of drier habitats, notably bramble and ash, to take over. There is a risk of drier woodland communities taking over from the alluvial woodland in these areas. There may exist the possibility of blocking drains on some sites and new drains should not be created without first seeking advice from NRW.

Action plan

This section takes the management requirements a stage further, assessing the specific management interventions required on each management unit. It 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

SAC management unit	Summary of Conservation Management Issues	Action needed?
1009	The currently unfavourable condition assessment of river lamprey and seal lamprey suggests that there may be adverse factors influencing these species and further survey work is required to gain a clearer picture of sea lamprey population. Investigation is required firstly at the weir in Haverfordwest to assess migration passage upriver.	Yes
1010	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality - NRW have identified this reach as having particularly poor water quality with no fish recorded during the latest round of monitoring. Invasive species, notably Himalayan balsam and isolated stands of rhododendron are present in the unit and lead to a reduction in local biodiversity and in the case of Himalayan balsam, bank instability. Otters are present throughout the reach with two areas identified as potential breeding sites. There have been occasional accidental discharges and pollution events recorded in the unit.	No
1012	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality.	Yes

SAC management unit	Summary of Conservation Management Issues	Action needed?
	Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Otters are present throughout the reach with an identified as potential breeding site at Priskilly forest. There have been occasional accidental discharges and pollution events recorded in the unit.	
1013	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Otters are present throughout the reach with identified potential breeding sites throughout the entire unit.	Yes
1014	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Otters are present throughout the reach with 2 identified potential breeding sites on the Nant Y Coy and one on the Nant y Bugail.	Yes
1015	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality. the reach has been recognised as having particularly poor water quality and is to be targeted by NRW under a CSF scheme. Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Otters are present throughout the reach with 2 identified potential breeding sites.	Yes

SAC management unit	Summary of Conservation Management Issues	Action needed?
	there have been occasional pollution incidents, farming related reported on this reach.	
1016	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality. Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Otters are present throughout the reach with potential breeding sites at Llangloffan Fen and Esgyrn Bottom.	Yes
1017	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality. Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Otters are present throughout the reach but no potential breeding sites have been identified.	No
1018	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality. Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Otters are present throughout the reach but no potential breeding sites have been identified.	No
1020	The currently unfavourable condition assessment of both sea and river lamprey suggests that there may be adverse factors influencing these species and further survey work is required to gain a clearer picture of sea lamprey population.	Yes
1021	Diffuse pollution and sediment inputs from agricultural land management have negative impacts upon water quality. The Deepford brook catchment sensitive farming	Yes

SAC management unit	Summary of Conservation Management Issues	Action needed?
	scheme has been in operation but there has been limited uptake of streamside corridor fencing. Otters are present throughout the reach.	
1022	Otters are present throughout the reach with identified potential breeding sites immediately below the reservoir and on the Rhyd y Brown. There has been one road death reported at Walton Mill. Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. Reductions in flows downstream of Llys y Fran may lead to drying out of lamprey spawning areas The Abstraction at Walton Mill has the potential to reduce levels and wetted perimeter within a 250m reach between the points of abstraction and discharge. This may impact upon lamprey habitat and may also hinder the migration of sea and river lamprey through this section. there is one further abstraction identified under the RoC process - a fish farm immediately below the reservoir - this has passed through to a stage 4 options appraisal. Invasive species, including Japanese knotweed are present throughout the reach. they supress local biodiversity and can lead to bank instability.	Yes
1023	Otters are present throughout the reach with an identified potential breeding site on the reach and further potential breeding habitat throughout. Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. The abstractions on the Rosebush and Llys-y-Fran reservoirs have the potential to entrain juvenile brook lamprey. Reductions in flows downstream of Rosebush may lead to drying out of brook lamprey spawning areas	Yes

SAC management unit	Summary of Conservation Management Issues	Action needed?
	The reservoirs act as a barrier to migration of fish species, populations of bullhead would not be able to recolonise if wiped out by a pollution event. Some Japanese knotweed present in the top of the reach	
1024	Otters are widespread and present throughout the reach with an identified potential breeding site at Rydwilym Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. There is an abstraction at Pont Hywel which may have an impact - this is progressing to stage 4 options appraisal with NRW	Yes
1025	Otters are widespread and present throughout the reach with an identified potential breeding sites located on both the Afon Rhyd Afallen and the Llanycefn. Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability.	Yes
1026	Otters are widespread and present throughout the reach with an identified potential breeding sites located at Glandy Bridge and Waunlwyd Diffuse pollution and siltation: Agricultural and forestry land management affects run-off from land and has negative impacts on water quality. Invasive species, including Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability. Also present are stands of cherry laurel and rhododendron at Penrallt Fach Gerddi	Yes
1027	Otters are widespread and present throughout the reach although no potential breeding sites have been identified.	Yes

SAC management unit	Summary of Conservation Management Issues	Action needed?
	Invasive species, notably Himalayan balsam are present in the unit and lead to a reduction in local biodiversity and bank instability.	
1028	Otters are present throughout the unit with good identified breeding habitat in the undisturbed and dense woodland / scrub areas. Diffuse pollution and siltation: Agricultural land management affects run-off from land, especially to the north and has negative impacts on water quality. the channel has been straightened and deepened in the past, management works have been undertaken to limit the drying of the terrestrial habitats and pools excavated in the location of historical meanders. There is excellent public access through the unit via a recently installed boardwalk. The unit is also an NNR and is managed according to a NRW management plan.	Yes
1029	This unit is privately owned and a management agreement with the landowner is in place.	No
5712		No
1030	Otters are present in the unit with good identified breeding habitat throughout. Diffuse pollution and siltation: Agricultural land management affects run-off from land and has negative impacts on water quality. The channel has been straightened and deepened in the past, the Wildlife Trust are proposing works to reintroduce meanders and water control measures to help stop the terrestrial habitats from further drying out. The Wildlife Trust are building a carpark on-site but outside the boundary of the SAC. Proposals are under development to introduce public access.	Yes

SAC management unit	Summary of Conservation Management Issues	Action needed?
	The unit is also an NNR and is managed within the suite of WTSWW nature reserves. Tighter control over grazing is required to prevent banks from collapsing and associated sediment inputs, also to ensure more effective management of marshy grassland components of unit	
2449	There is a NRW management agreement in force on this unit	No
5713		No
1969	Hydrological investigations have revealed that the northern margin of the raised bog is being impacted by an old drainage ditch. Remediation work is planned here. Any grazing management proposals would require new fencing with attendent landscape issues. Grazing (with guanacas) only takes place on a small section on the northern edge of the bog - provided the hydrology of the bog functions naturally, growth of competitive species such as *Molinia* and *Ulex* species should remain limited and no grazing management of the primary raised mire should be required. Rhododendron is present around the margins of the primary raised mire, and should be eradicated. Past pollution from a dairy yard at Gelli has affected the western end of the raised mire, but the catchment is otherwise well buffered against run-off. Air pollution has the potential to impact on the low nutrient status of the mire surface. The site has not been burnt since the 1980s, but fire has the potential to damage the habitat.	Yes
2915	Otters are present throughout the reach with identified potential breeding sites throughout the entire unit. There are issues concerning the SSSI management to be addressed later.	No
2916	Otters are present throughout the reach with identified potential breeding sites throughout the entire unit. there are issues concerning the SSSI management to be addressed later.	No

SAC management unit	Summary of Conservation Management Issues	Action needed?
2914	Otters are present throughout the reach with identified potential breeding sites throughout the entire unit. There are issues concerning the SSSI management to be addressed later.	No

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 above.
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.

Performance indicators for Feature 1: Sea lamprey *Petromyzon marinus* (EU Species Code: 1095)

Performance indicators for feature condition:

Attribute	Attribute rationale and other comments	Specified limits
a) Distribution within catchment	This attribute provides evidence of successful spawning and distribution trends. There is currently a lack of data regarding current and historical sea lamprey spawning sites. Spawning locations may move within and between sites due to natural processes or new sites may be discovered over time. Silt beds downstream of all 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	Lower limit: not Determined Upper limit: none set Any silt beds adjacent to or downstream of suitable spawning sites should contain *Petromyzon* ammocoetes.
b) Ammocoete density	This standard CSM attribute establishes a minimum occupied spawning range within any sampling period of 15 km.	Ammocoetes should be present in at least four sampling sites each not less than 5 km apart.

Performance indicators for Feature 2 & 3: Brook lamprey *Lampetra planeri* (EU Species Code : 1096); River lamprey *Lampetra fluviatilis* (EU Species Code : 1099)

Performance indicators for feature condition:

Attribute	Attribute rationale and other comments	Specified limits
a) Age/size structure of ammocoete population	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	Samples < 50 ammocoetes 2 size classes Samples > 50 ammocoetes at least 3 size classes
b) Distribution of ammocoetes within catchment	The natural range of this species in terms of ammocoete distribution includes all units. A minimum of 30 sample sites will be monitored at 6 yearly intervals when presence at less than 2/3 will lead to an unfavourable condition assessment	Present at not less that 2/3 of sites surveyed within natural range
	Reduction in distribution will be defined as absence of ammocoetes from all samples within a single unit, and will lead to an unfavourable condition assessment	No reduction in distribution of ammocoetes
c) Ammocoete density	Optimal habitat is defined as stable fine sediment or sand ≥15cm deep, low water velocity and the presence of organic detritus. Sub-optimal habitat is defined as shallow sediment, often patchy and interspersed among coarser substrate	Optimal habitat: > $10m^{-2}$ Overall catchment mean: >$5m^{-2}$

Performance indicators for Feature 4: Bullhead *Cottus* gobio (EU Species Code : 1163)

Performance indicators for feature condition:

Attribute	Attribute rationale and other comments	Specified limits
a) Adult densities	CSM guidance states that there should be no reduction in densities from existing levels, and in any case no less than 0.2 m^{-2} in upland rivers (source altitude >100m) and 0.5 m^{-2} in lowland rivers (source altitude ≤100m)	No less than 0.2 m^{-2} in sampled reaches

Attribute	Attribute rationale and other comments	Specified limits
b) Distribution	Absence of bullheads from reaches identified as suitable or previously occupied, revealed by ongoing monitoring will result in an unfavourable condition assessment	Bullheads should be present in all suitable reaches. As a minimum, no decline in distribution from current
c) Reproduction / age structure	This gives an indication of successful recruitment and a healthy population structure	Young-of-year fish should occur at densities at least equal to adults

Performance indicators for Feature 5: European otter *Lutra lutra* (EU Species Code: 1355)

Performance indicators for feature condition.

Attribute	Attribute rationale and other comments	Specified limits
a) Distribution	Results from the Otter Survey of Wales 2002 show that otter signs (spraints or footprints) were found at 97% of the sites searched throughout the Cleddau catchment. The figure for the lower limit is set at 85% to allow for a small number of sites to be negative as a result of factors such as weather conditions or surveyor error.	Lower Limit: Otter signs found at 85% of Otter Survey of Wales full survey sites (current level: 97%) within the Eastern and Western Cleddau. Upper Limit: None set.
b) Breeding activity	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.)	Lower Limit: 2 reports (within the catchment) of otter cub/family sightings or 2 reports of cubs, lactating females or pregnant females from otter road casualties are recorded for at least 1 year in any three year period. Upper Limit: None set.

Attribute	Attribute rationale and other comments	Specified limits
c) Actual and potential breeding sites	21 actual or potential sites have been identified on the Western Cleddau, and 20 sites identified on the Eastern Cleddau. 78 sites were identified during an initial desk top study (35 on the Western and 43 on the Eastern). Of these 21 sites on the Western and 20 sites on the Eastern were classified in categories A-C, as defined below: 1. Good habitat, "Confirmed" sites from corroborative evidence such as Road deaths of lactating bitches or cubs, sightings of cubs or family groups and an assessment of age from description. 2. Habitat good for breeding but no historical supportive evidence but field signs suggest breeding 3. Good habitat but no corroborative evidence. Jones (2004) states that the of the original 78 sites, those not included in the above categories, and therefore discarded as breeding sites are not necessarily never used by otters as breeding sites, however they do not compare in habitat terms with these listed sites.	Lower Limit: There should be no reduction or decline in the number or quality of identified actual or potential breeding sites. Upper Limit: None set.

Performance indicators for factors affecting the feature:

Factor	Factor rationale and other comments	Operational Limits
Water quality		See Appendix 2
Ecosystem structure and function:	Studies have indicated that the viability of an otter population partially relates to the viability of its food sources	Fish biomass stays within expected natural fluctuations

Factor	Factor rationale and other comments	Operational Limits
Food availability	Otters depend on food that comes from a range of aquatic environments, such as small streams and marshes (Chanin 2003a). Fish make up the majority of the otter diet (often >75%), though amphibians and crustaceans are also constituents. Eels are particularly favoured. At times, an alternative prey, such as frogs, can assume a greater importance than fish. Data on fish stocks from NRW.	
Ecosystem structure and function: Riparian habitat	Certain areas of the SAC are critical to the movement of otters both within the system and to adjacent sites.	No overall permanent decrease and no overall loss in sensitive areas.
Negative indicators: Anthropogenic mortality	Road deaths have been clearly noted as a primary threat to the otters conservation status across Wales. Liles and Colley (2000) identified numerous road death black spots in the Cleddau catchment, and mitigation has taken place. Future mitigation should be focused on sites identified adjacent to potential breeding areas.	No increase in numbers of recorded Road Deaths.
Negative indicators: Disturbance	Otters are sensitive to human disturbance and especially to sudden changes in activity. They are particularly sensitive to disturbance by dogs. The female otter is particularly sensitive to disturbance when she has cubs.	No significant change to bank side usage, no significant development, particularly in sensitive areas.

Performance indicators for Feature 6: Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (EU Habitat code: 3260)

Performance indicators for feature condition:

Attribute	Attribute rationale and other comments	Specified limits
a) Distribution within catchment	*Ranunculus* spp. will be present with an MTR species cover score of at least 50 in: Any three representative 100m stretches of suitable habitat in units 1009, 1012, 1016 & 1020. The feature should also be present in one representative sample 100m stretch of suitable habitat in unit 2, although failure of this unit alone will not make the feature fail as a whole.	Distribution within management units 1009, 1012, 1016 & 1020
b) Typical species	Should conform to appropriate JNCC type: *Ranunculion fluitantis* and *Callitricho-Batrachion* Vegetation communities: CB5: Atlantic bryophyte *Callitriche hamulata*/ *Ranunculus penicillatus* spp. *penicillatus* rivers. Typical species also include *Potamogeton crispus*, *Myriophyllum alternifolium*, *Fontinalis antipyretica*, *F. squamosa, Hygrohypnum ochraceum, Amblystegium fluviatile, Amblystegium riparium, Brachythecium plumosum, Racomitrium aciculare, Rhyncostegium riparoides* and *Scapania* spp.	Characteristic plant species should dominate the assemblage

Performance indicators for factors affecting the feature:

Factor	Factor rationale and other comments	Operational Limits
Negative indicators: Native species	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 Afonyd Cleddau SAC: Algae indicative of eutrophication (*Enteromorpha* spp., *Cladophora* spp. And *Vaucheria* spp.) should not have an MTR cover value of greater than 5 (ie.10%) in 3 consecutive years in: Any three representative sample 100m stretches of suitable habitat in units 1009, 1012, 1016 & 1020 **AND** In one representative sample 100m stretch of suitable habitat in unit 1010, although failure of this unit alone will not make the feature fail as a whole.	Cover of indicators of eutrophication maintained below threshold over the medium to long term
Negative indicators: Alien / introduced species	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 Afonydd Cleddau SAC, therefore assessment of this attribute relies on locally defined thresholds and expert judgement. Details to be confirmed	No impact on native biota from alien or introduced species

Performance indicators for Feature 7: Active raised bogs (EU Habitat code 7110)

Performance indicators for feature condition:

Attribute	Attribute rationale and other comments	Specified limits
a) Extent	There should be no reduction in the total extent (area) of bog, including any associated pools and lagg fen as mapped by Phase II Lowland Peatland Survey (August 2005): The extent of the Active raised bog : NVC communities M2a:<0.1 ha; M17: 1.3 ha, M18: 1.0 ha; M21: <0.1 ha) Total extent: c. 2.3 ha. And lagg fen communities: NVC communities M6: c. 1.0 ha; M23: 1.8 ha: M25: 7.1 ha; M27: 0.3 ha; S4: 0.1 ha; W4: 0.1 ha) Total extent: 10.4 ha and degraded bog communities: NVC communities: M15: 3.2 ha; M25: 7.1 ha (as in lagg above) or dry heath types H4: 1.5 Total extent: 11.8 ha.)	Lower Limit: No reduction in extent. Upper Limit: Not set
b) Habitat composition	Site Specific definitions: Bog is taken here to be the peat deposit together with typical bog vegetation, irrespective of the precise nature and Condition of that vegetation. Lagg fen comprises both peat deposit and vegetation, irrespective of nature and condition.	Lower limit: mire expanse (2.3 ha): M2a: at least 0.1 ha i.e. 10% of M17-M18 in I & L, M18 at least 1.0 ha and, M17 upper limit 1.3 ha. lagg fen (10.4 ha): M6: c. 1.0 ha M23: 1.8 ha: M25: 7.1 ha; M27: 0.3 ha; S4: 0.1 ha; W4: 0.1 ha Upper Limit: Not set

Performance indicators for factors affecting the feature:

Attribute	Attribute rationale and other comments	Specified limits
a) Indicators of negative change non-woody vascular plant species	This target applies to the whole bog, not just the mire expanse. The plants listed are indicators of enrichment or of drying out of the bog. *Phragmites* is acceptable around upwellings or their equivalent on ditched bogs. Invasive non-native plant species should be absent or no more than rare (if present at baseline)	**Lower limit:** none set **Upper limit:** No more than 1% cover of the following on the bog surface (subject to exceptions in comments column): *Phragmites australis, Phalaris arundinacea, Glyceria maxima, Epilobium hirsutum, Urtica dioica, Pteridium aquilinum, Rubus fruticosus, Juncus effusus, Deschampsia cespitosa, Cirsium spp.*
b) Development of scrub	Invasion by woody species and their development to healthy maturity may indicate drying out and/or enrichment. Trees and shrubs will exacerbate drying out. *Salix* spp. and *Myrica gale* can occur on raised bogs, but scrub generally constrains itself to areas where it receives a source of nutrients (e.g. near water that has passed through or over a mineral soil). As a result, it often is found close to or on the 'rand' of the raised bog, where it is more acceptable.	**Lower limit:** not set **Upper limit:** On the mire expanse, trees and shrubs (*Betula, Salix, Rhododendron, Pinus* species, other gymnosperms no more than rare and < 5% cover. On the bog margin (rand) woody species < 10% cover
c) Drainage	Raised bogs need a high and relatively constant water table level. Artificial drainage has had a major impact at this site; this results in water table drawdown, oxidation and wastage of peat, and the release of nutrients into the peat, and dissolved organic	**Limits:** Water table depths should not exceed 20 cm below ground level in an average summer. Flooding should be confined to natural hollows

Attribute	Attribute rationale and other comments	Specified limits
	carbon into dependent watercourses. The effects of drainage at this site need to be countered through a programme of hydrological restoration using peat dams and bunds.	only and result from rainfall and not overbank flooding.
d) Atmospheric deposition	Rainfall constitutes the sole supply of water and nutrients to raised bog habitats. This results in characteristically nutrient-poor and acidic soil chemistry. This characteristic also renders raised bogs highly sensitive to atmospheric pollution. Nitrogen is of particular concern, and N deposition in the area has been estimated at 21.6 kg N/ha/yr (source: UK Air Pollution Information Service – www.apis.ac.uk), well in excess of the published Critical Load for this habitat of between 5 and 10 kg N/ha/yr. Improvements in air quality require concerted policy measures at a UK level, as well as local development control to eliminate or reduce proximal sources of nitrogen.	**Upper limit:** 10 kg N/ha/yr **Lower limit.** None set.

Performance indicators for Feature 8: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (EU Habitat code: 91E0)

Performance indicators for feature condition:

Attribute	Attribute rationale and other comments	Specified limits
a) Extent	To be defined following further survey, as original estimate of 132.66 ha was based on a contract survey (Jones, 2004); the accuracy of which is questioned following limited field testing. Loss of woodland cover should only occur through natural processes e.g. river movement creating natural re-channelling, silt deposits; and storm damage. The feature was considered to be present on 44 sites on the Western Cleddau and 28 sites on the Eastern Cleddau, however the accuracy of the data requires field-testing (See Appendix 5)	Lower Limit: To be defined following further survey. Upper Limit: None set. AND No reduction in the total number of sites: Lower Limit: 72 sites supporting alluvial woodland Upper Limit: Not required
b) Quality	The site-specific definition of good condition alluvial woodland provided below is based on Common Standards Monitoring Guidance For Woodland Habitats (JNCC, 2004) and NRW SAC monitoring in 2004. (See Lovering, 2005).	*Upper Limit:* none set *Lower Limit:* 3 out of 4 sample woodlands on each arm of the Cleddaus to meet site-specific assessment of good condition alluvial woodland.

Attribute	Attribute rationale and other comments
Structure and processes	The canopy is dominated by alder Alnus glutinosa or willow *Salix* spp. In alluvial woods with free draining soils there may be ash or oak in the canopy, but in the wetter alluvial woodlands ash *Fraxinus excelsior* will be limited to areas of relatively drier ground. 50% - 90% of the canopy forming trees are alder. At least one example of each age component present (sapling if the survey site has a gap or woodland edge, mature, over mature, dead-wood) The under-storey covers between 5-30% in at least 80% of survey sites Gaps large enough to cause a noticeable growth response from ground vegetation in >40% of survey sites. Dense thickets of bramble cover <10% of individual sites and are confined to drier margins of habitat. Deadwood, lying or standing > 20 cm diameter and > 1 m length present at 80% of survey sites. Alluvial woodland is a dynamic habitat and lying deadwood can be flushed away or deposited seasonally through a series of sites. Therefore failure in this quality indicator alone will not result in the site failing No evidence of alder disease.
Regeneration	Regeneration occurring and 90% alder and willow. There is very little (if any) regeneration from seed within alluvial woodland, this is to be expected as *Alnus*, *Salix* and *Betula* generally seed along edges or into open areas of successionally younger vegetation, where there is less competition for light. Therefore, it is accepted that there is unlikely to be any seedling establishment within the woodland itself. In order to ensure continuation of the woodland it is expected that regeneration will be vegetative from the base of stems and from vertical growth from fallen branches.
Non-native species	<5% of the canopy forming trees across the woodland Non-native species are non-native.
	Exotics cover < 10% ground

Attribute	Attribute rationale and other comments
Ground flora	60% of the survey sites should support alluvial ground flora including two of the following: meadowsweet *Filipendula ulmaria*, yellow flag Iris pseudacorus, nettle *Urtica dioica*, common reed *Phragmities australis*, greater tussock sedge *Carex paniculata*, opposite-leaved golden saxifrage *Chrysosplenium oppositifolium*, rushes J*uncus* spp, tufted hair-grass *Deschampsia cespitosa*, hemlock water-dropwort *Onanthe crocata*, and wild angelica *Angelica sylvestris*.

Performance indicators for factors affecting the feature:

Attribute	Attribute rationale and other comments	Specified limits
Hydrology	Extensive bramble cover is an indicator that the site maybe drying out. However, it is worth noting that dense bramble cover offers potential for otter natal holts if other conditions pertaining to otters are satisfied. (area >0.5 ha, one or more natal dens, free from flood risk and close to a good food supply)	Dense thickets of bramble cover <10% of individual sites and are confined to drier margins of habitat.
Grazing	Grazing pressure will have an influence on the ground layer and regeneration. Light, controlled grazing is permitted, stock exclusion is preferable	No impact on regeneration and ground flora criteria satisfied

Appendix 2: Water Quality Targets

(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. 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) rivers are set via agreement at a UK level and presented in the JNCC Common Standards Monitoring (CSM) guidance (JNCC 2015, 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 Afonydd Cleddau SAC. Where they are more stringent, WFD Regulation 2017 standards are adopted as the CSM standards.

Organic pollution

The following table (Table 1a) provides the values for the physio-chemical attributes to be applied across all river types. Standards apply throughout the assessment unit, 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 1a). For the 90%ile total ammonia the CSM target 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 each waterbody are given in Table 1b.

Table 1a. Organic pollution standards for SAC rivers

Organic pollution attribute	Unit	Test Statistic	Target
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 1b.
95%ile un-ionised ammonia	mg l^{-1}	95%ile	≤0.025

Table 1b. Total Ammonia standards for water bodies in the Afonydd Cleddau 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*
GB110061038690	Anghof - headwaters to conf with Western Cleddau	0.2	WFD (high)
GB110061031180	Camrose Brook - headwaters to conf with W. Cleddau	0.2	WFD (high)
GB110061031330	Cartlett Brook - HW to conf with W. Cleddau	0.25	CSM
GB110061038680	Cleddau North - H'waters to conf with W. Cled	0.2	WFD (high)
GB110061030690	Deepford Brook - headwaters to conf with Syfynwy	0.2	WFD (high)
GB110061038290	E. Cleddau - conf with Wern to conf with Syfynwy	0.2	WFD (high)
GB110061030670	Eastern Cleddau - conf with Syfynwy to tidal limit	0.2	WFD (high)
GB110061038320	Eastern Cleddau - headwaters to conf with Wern	0.2	WFD (high)
GB110061030680	Longford Brook - HW to conf with E. Cleddau	0.2	WFD (high)
GB110061038660	Nant y Bugail - headwaters to conf with Cleddau N.	0.2	WFD (high)
GB110061030660	Narbeth Brook - headwaters to conf with E. Cleddau	0.25	CSM
GB110061031190	Rudbaxton Water - HW to conf with W. Cleddau	0.2	WFD (high)
GB110061031350	Spittal Brook - headwaters to conf with W. Cleddau	0.25	CSM
GB110061038300	Syfynwy - headwaters to Llys-y-fran	0.2	WFD (high)
GB110061030700	Syfynwy - Llys-y-fran to conf with E Cleddau	0.2	WFD (high)

Water Body ID	Water Body Name	Total Ammonia (90%ile, mg l^{-1})	Reason for total ammonia standard*
GB110061031340	W Cleddau - Anghof conf to Cartlett Brook conf	0.2	WFD (high)
GB110061038670	W Cleddau - headwaters to conf with Cleddau North	0.2	WFD (high)
GB110061038310	Wern - headwaters to conf with Eastern Cleddau	0.2	WFD (high)
GB110061038651	Western Cleddau - Cleddau North to Anghof conf	0.2	WFD (high)

Reactive phosphorus

Phosphorous 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). River Habitat Survey (EA, 2003) river flow categories are used to determine river size.

The process also includes an alignment procedure to ensure that standards are never less stringent than the Water Framework Directive (WFD) phosphorus standard for the same water body. If the WFD standard is more stringent than the CSM standard then the WFD standard applies.

Individual phosphorus standards for all waterbodies in the Afonydd Cleddau SAC are given in Table 2. As explained previously, the WFD phosphate standard has been applied where it is more stringent than CSM targets.

Table 2. Phosphorus standards and typology for all waterbodies in the Afonydd Cleddau SAC. * Phosphorus standard to be applied to annual and growing season means. Standards calculated from annual mean expressed in µg 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* (µg l^{-1})	Reason for phosphorus standard**	CSM_ Alt type	CSM_ Alk type	River size
GB11006 1038690	Anghof - headwaters to conf with Western Cleddau	1015	37	WFD (good)	low Alt <80m	low Alk <50mgl	river
GB11006 1031180	Camrose Brook - headwaters to conf with W. Cleddau	1009	30	CSM (max allowable)	low Alt <80m	low Alk <50mgl	headwater
GB11006 1031330	Cartlett Brook - HW to conf with W. Cleddau	1010	30	CSM (max allowable)	low Alt <80m	low Alk <50mgl	headwater
GB11006 1038680	Cleddau North - H'waters to conf with W. Cled	1016, 1969	40	CSM (max allowable)	low Alt <80m	low Alk <50mgl	river
GB11006 1030690	Deepford Brook - headwaters to conf with Syfynwy	1021	39	WFD (good)	low Alt <80m	low Alk <50mgl	river
GB11006 1038290	E. Cleddau - conf with Wern to conf with Syfynwy	1018, 1024, 1025, 1026, 1027	15	CSM (near natural)	high Alt >80m	low Alk <50mgl	river
GB11006 1030670	Eastern Cleddau - conf with Syfynwy to tidal limit	1017, 1020, 1022, 1024	20	CSM (near natural)	low Alt <80m	low Alk <50mgl	river
GB11006 1038320	Eastern Cleddau - headwaters to conf with Wern	1026	10	CSM (max allowable)	high Alt >80m	low Alk <50mgl	headwater
GB11006 1030680	Longford Brook - HW to conf with E. Cleddau	1017	20	CSM (near natural)	low Alt <80m	low Alk <50mgl	river
GB11006 1038660	Nant y Bugail - headwaters to conf with Cleddau N.	1014, 1016	40	CSM (max allowable)	low Alt <80m	low Alk <50mgl	river

Water Body ID	Water Body Name	SAC Manage-ment Unit(s)	Phosph-orus standard* (µg l^{-1})	Reason for phosphorus standard**	CSM_ Alt type	CSM_ Alk type	River size
GB11006 1030660	Narbeth Brook - headwaters to conf with E. Cleddau	1017	34	WFD (high)	low Alt <80m	high Alk >50mg/l	headwater
GB11006 1031190	Rudbaxton Wa-ter - HW to conf with W. Cleddau	1013	30	CSM (max allowable)	low Alt <80m	low Alk <50mgl	headwater
GB11006 1031350	Spittal Brook - headwaters to conf with W. Cleddau	1013, 2914, 2915, 2916	30	CSM (max allowable)	low Alt <80m	low Alk <50mgl	headwater
GB11006 1038300	Syfynwy - head-waters to Llys-y-fran	1023	10	CSM (near natural)	high Alt >80m	low Alk <50mgl	river
GB11006 1030700	Syfynwy - Llys-y-fran to conf with E Cleddau	1021, 1022, 1023	39	WFD (good)	low Alt <80m	low Alk <50mgl	river
GB11006 1031340	W Cleddau - Anghof conf to Cartlett Brook conf	1009, 1012, 1013, 1014, 1015, 2913	40	CSM (max allowable)	low Alt <80m	low Alk <50mgl	river
GB11006 1038670	W Cleddau - headwaters to conf with Cleddau North	1016, 1028, 1029, 5712, 1030, 2449, 5713	15	CSM (near natural)	low Alt <80m	low Alk <50mgl	headwater
GB11006 1038310	Wern - headwa-ters to conf with Eastern Cleddau	1027	10	CSM (max allowable)	high Alt >80m	low Alk <50mgl	headwater
GB11006 1038651	Western Cleddau - Cleddau North to Anghof conf	1012, 1016	40	CSM (max allowable)	low Alt <80m	low Alk <50mgl	river

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 devel-oped to measure increases in nutrient concentrations through assessing degree of change in floristic composition in benthic diatoms (algae) in streams and rivers.

Acidification

This standard only applies to assessment units 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 3a and 3b for standards for all water bodies in the Afonydd Cleddau SAC.

Most water bodies in the Cleddau are classified as siliceous, but are not acid sensitive (Hankin *et al*. 2014). The only areas where acidification risk is a significant consideration are the Wern and Upper Eastern Cleddau. However, to comply with CSM guidance, acid targets have been applied for all relevant water bodies in the catchment. **Note that monitoring and reporting will only be carried out for water bodies classified as either 'at risk' or 'probably at risk'.** If ANC data is available then water bodies should be assessed against the ANC standard but if ANC data is not available then pH should be used.

Table 3a. Acidification standards for SAC rivers.

*Acid Neutralising Capacity; ** Dissolved Organic Carbon

Targets 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 3b. Acidification targets for all waterbodies in the Afonydd Cleddau SAC.
*Acidification risk categories taken from Hankin *et al*. 2014.

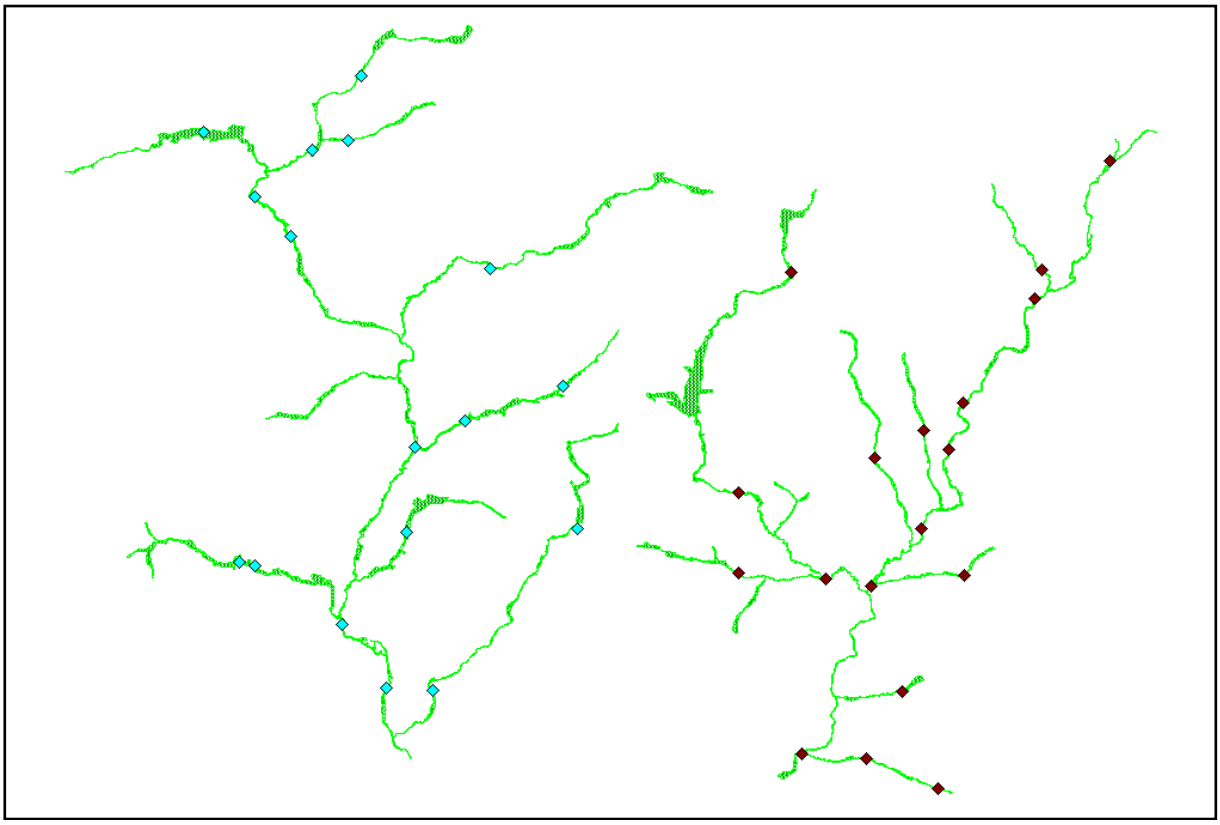
Water Body ID	Water Body Name	Acidification risk	Acid Neutralising Capacity (ANC)	pH
GB110061038690	Anghof - headwaters to conf with Western Cleddau	Probably not at risk	>80	>6.54
GB110061031180	Camrose Brook - headwaters to conf with W. Cleddau	Probably not at risk	>80	>6.54
GB110061031330	Cartlett Brook - HW to conf with W. Cleddau	Probably not at risk	>80	>6.54
GB110061038680	Cleddau North - H'waters to conf with W. Cled	Probably not at risk	>80	>6.54

GB110061030690	Deepford Brook - headwaters to conf with Syfynwy	Probably not at risk	>80	>6.54
GB110061038290	E. Cleddau - conf with Wern to conf with Syfynwy	Probably not at risk	>80	>6.54
GB110061030670	Eastern Cleddau - conf with Syfynwy to tidal limit	Probably not at risk	>80	>6.54
GB110061038320	Eastern Cleddau - headwaters to conf with Wern	At risk	>80	>6.54
GB110061030680	Longford Brook - HW to conf with E. Cleddau	Probably not at risk	>80	>6.54
GB110061038660	Nant y Bugail - head-waters to conf with Cleddau N.	Probably not at risk	>80	>6.54
GB110061030660	Narbeth Brook - headwaters to conf with E. Cleddau	Probably not at risk	n/a	>6.54
GB110061031190	Rudbaxton Water - HW to conf with W. Cleddau	Probably not at risk	>80	>6.54
GB110061031350	Spittal Brook - head-waters to conf with W. Cleddau	Not at risk	>80	>6.54
GB110061038300	Syfynwy - headwa-ters to Llys-y-fran	At risk	>80	>6.54
GB110061030700	Syfynwy - Llys-y-fran to conf with E Cleddau	Probably at risk	>80	>6.54
GB110061031340	W Cleddau - Anghof conf to Cartlett Brook conf	Probably not at risk	>80	>6.54
GB110061038670	W Cleddau - head-waters to conf with Cleddau North	Probably not at risk	>80	>6.54
GB110061038310	Wern - headwaters to conf with Eastern Cleddau	Probably at risk	>80	>6.54
GB110061038651	Western Cleddau - Cleddau North to Anghof conf	Not at risk	>80	>6.54

Appendix 3: Lamprey Survey Sites

Site No.	Site Name
W1	W.Cleddau, Upstream of road bridge
W2	Cartlett Brook, Shoalshook Lane
W3	Cartlett Brook, U/S of Penty Park Lodge
W4	W.Cleddau, D/S of Camrose Brook
W5	Camrose Brook, U/S Camrose Mill Bridge
W6	Camrose Brook, D/S Camrose Mill Bridge
W7	Rudbaxton Water, U/S of road bridge
W8	W.Cleddau, U/S Treffgarne Bridge
W9	Spittal Brook, Wood End, Spittal
W10	Spittal Brook, Scollock Bill
W11	Anghof, Beulah Bridge
W12	W.Cleddau, Coed Ty-Newydd Grug
W13	W.Cleddau, Priskilly Forest Footbridge
W14	W.Cleddau, Pont Llangloffan
W15	Cleddau, Pont Llanwarren
W16	Bugail, New Bridge
W17	Cleddau, Dolau Cottage
W35	Millin Brook, Cooks Bridge

Site No.	Site Name
E1	E.Cleddau, Narberth Brook confluence
E2	Narberth Brook, Ford by East Atheston
E3	Narberth Brook, Sewage Works
E4	E.Cleddau, Pont Shan
E5	E.Cleddau, Conin confluence
E6	Syfynwy, Deepford Brook confluence
E7	Deepford Brook, Road bridge
E8	Syfynwy, Stepaside Bridge
E9	Syfynwy, Rhyd Fawr Bridge
E10	E.Cleddau, Glancleddau
E11	Rhyd-a-fallen, Rhyd-a-fallen Bridge
E12	E.Cleddau, Llwyn-dwfr Bridge
E13	Llancefyn, Llancefyn Mill
E14	E.Cleddau, Gors
E15	E.Cleddau, Pont Hywel Bridge
E16	Wern, Pont Mynachlogddu
E17	E.Cleddau, Caermeini Ganol
E18	Conin, Crug y deri



Appendix 4: 2001 Macrophyte Survey Sites

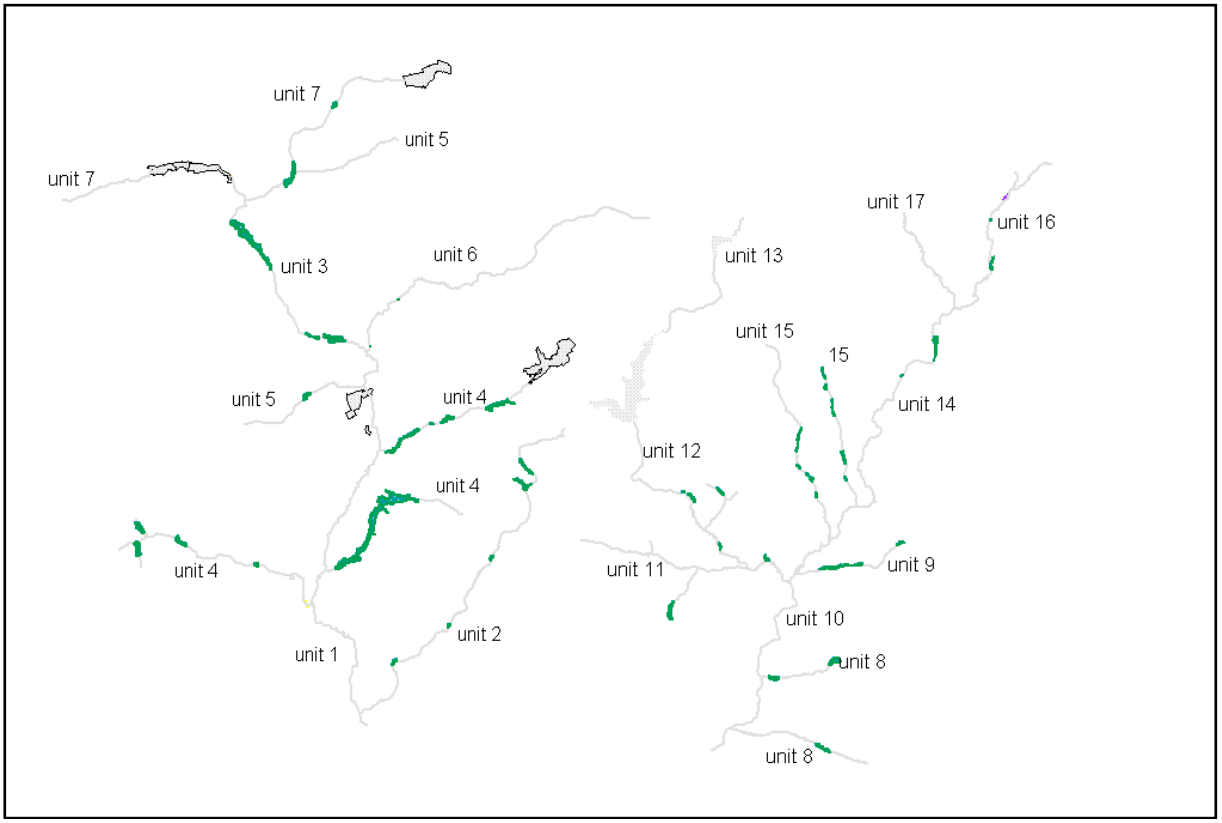
(GRs are located at midpoint of survey stretch)

Site	Name	GR
WC1	Western Cleddau at Pont Llangloffan	SM904319
WC2	Afon Cleddau: Trecoed to Nant y Bugail confluence	SM935319
WC3	Western Cleddau at Welsh Hook	SM934277
WC4	Afon Anghof at Puncheston	SN008294
WC5	Afon Anghof at Sealyham	SM968280
WC6	Western Cleddau at Wolfscastle	SM957264
WC7	Spittal Brook upstream of Golden Hill	SM986245
WC8	Western Cleddau at Treffgarne	SM959229
WC9	WC9 Camrose Brook at Stock Park Farm SM908203	SM908203
WC10	Knock Brook at Keeston Bridge SITE REJECTED – UNSUITABLE	SM911188
WC11	Western Cleddau at Cutty Bridge	SM941188
WC12	Carlett Brook upstream of Crundale level crossing	SM981180
EC13	Afon Wern tributary	SN122298
EC14	Eastern Cleddau at Waun Isaf	SN144300
EC15	Eastern Cleddau downstream of Llangloman	SN127262
EC16	Llanycefn tributary	SN098244
EC17	Eastern Cleddau at Rhyd-y-Bil confluence	SN106234

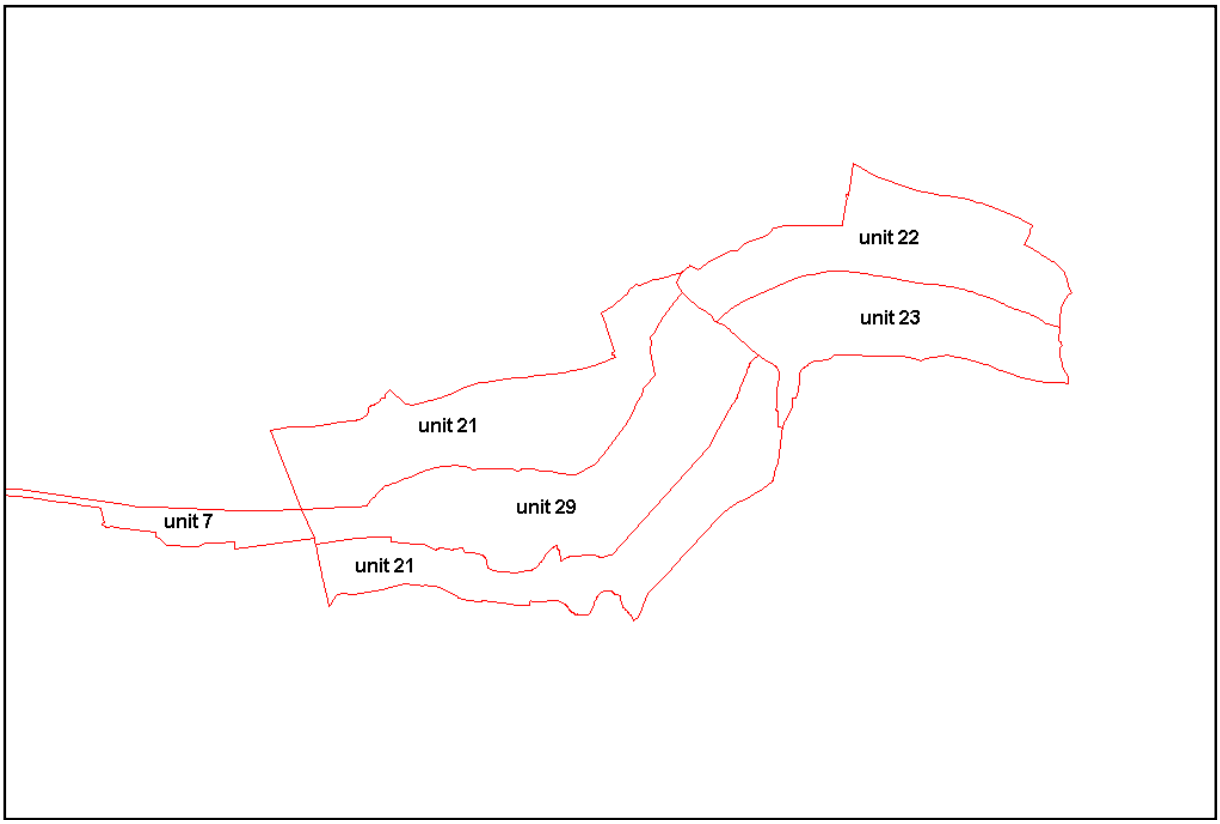
Site	Name	GR
EC18	Rhyd Afallen tributary SITE REJECTED – UNSUITABLE	SN086235
EC19	Rhyd y Brown / Ty Llosg tributary. (Relocated)	SN063216
EC20	Syfynwy downstream of Southfield Villa	SN043223
EC21	Syfynwy at Deepford Brook confluence	SN075200
EC22	Eastern Cleddau at Llandre Bridge	SN091204
EC23	Eastern Cleddau at Abystree	SN075163
WC25	Treffgarne Gorge	

EC19: Site was relocated slightly downstream of that originally chosen, which was outside the suggested SSSI / SAC boundary and located in a wooded area where shading may reduce aquatic macrophyte cover. New location is below wooded area and also below confluence with small trib entering from west on right bank.

Appendix 5: Map of Alluvial Woodland Locations (Jones, 2004)



Appendix 6: Details of Esgyrn Bottom Units



Appendix 7: Summary of the Living Rivers Scheme

Objectives of the Rivers scheme

As nutrient and sediment levels increase, deterioration of the SSSIs may occur in terms of changes in plant and animal communities, growth of harmful weed and algae and a decline in the species of interest. Agricultural sources may be one source for increased levels of nitrates and phosphates within the rivers, and may also increase the levels of sediment within the river system. Pesticides and herbicides that leach into the river can also cause pollution problems. A reduction in pollution from agricultural sources is therefore an objective for the scheme.

In summary, the scheme will:

- Create appropriate buffer zones/riverside corridors in order to safeguard and improve water quality and provide a sheltered corridor to benefit invertebrates, birds and mammals including otters.
- Maintain and enhance natural habitats and features of the river by tree planting, pollarding, fencing and cutting of vegetation.
- Safeguard and improve the habitat for populations of bullhead, brook, sea and river lamprey species, otters and water crowfoot beds.
- Maintain and enhance existing wetland habitats, in particular wet woodlands and raised bog.
- Promote the advantages to both wildlife and agriculture of sympathetic management practices.
- Undertake a monitoring programme of the special features of the site.

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