Teifi Demonstrator Project Evidence Review

Report No: 813

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Bwriad yr adolygiad tystiolaeth hwn yw cefnogi cynnydd Prosiect Dalgylch Arddangos Teifi. Mae Prosiect Dalgylch Arddangos Teifi yn bartneriaeth aml-sefydliadol, traws-sector sy'n anelu at wella ansawdd dŵr a'r amgylchedd dŵr ehangach yn nalgylch afon Teifi, trwy gydweithio a gweithio ystwyth. Bydd llwyddiannau'n cael eu casglu a'u datblygu ar raddfa fwy i'w defnyddio mewn dalgylchoedd afonydd eraill yng Nghymru.

Mae gan ddalgylch afon Teifi dirwedd amrywiol yn cynnwys ardaloedd o ucheldir ac iseldir. Ardal wledig ydyw yn bennaf, ac mae cyfran fawr o'r boblogaeth yn cael ei chyflogi ym maes amaeth, sef y prif ddefnydd tir hefyd. Mae rhywfaint o berygl llifogydd yn y dalgylch. Mae ychydig goedwigaeth yn bresennol yn yr ardaloedd ucheldirol ac mae rhywfaint o goetir llydanddail yn y dalgylch isaf yn bennaf, yn ffinio â'r afon a'i llednentydd.

Mae yna nifer o weithgareddau sy'n effeithio ar ansawdd dŵr yn nalgylch afon Teifi, gan gynnwys gollyngiadau dŵr, tynnu dŵr, llygredd amaethyddol a thaenu deunyddiau ar y tir. Mae Cyfoeth Naturiol Cymru (CNC) yn rheoleiddio'r gweithgareddau hyn i raddau amrywiol o fewn dalgylch afon Teifi. Mae yna hefyd fecanweithiau statudol ar waith i warchod a gwella amgylchedd dŵr dalgylch afon Teifi, sef Rheoliadau'r Gyfarwyddeb Fframwaith Dŵr 2017 a Rheoliadau Cadwraeth Cynefinoedd a Rhywogaethau 2017.

Mae Dalgylch Arddangos Teifi yn cynnwys 37 o gyrff dŵr y Gyfarwyddeb Fframwaith Dŵr sy'n afonydd, pedwar corff dŵr y Gyfarwyddeb Fframwaith Dŵr sy'n llynnoedd, un corff dŵr y Gyfarwyddeb Fframwaith Dŵr sy'n drosiannol, aber afon Teifi, ac un corff dŵr y Gyfarwyddeb Fframwaith Dŵr sy'n ddŵr daear. Mae'r newid a welwyd rhwng dosbarthiad llawn Rheoliadau Cyfarwyddeb Fframwaith Dŵr 2021 a dosbarthiad interim Rheoliadau Cyfarwyddeb Fframwaith Dŵr 2024 yn cyflwyno darlun cymysg ar gyfer dalgylch afon Teifi. Cynyddodd nifer y cyrff dŵr a gyflawnodd statws ecolegol da cyffredinol o 37% i 42%, a gostyngodd y nifer a gyflawnodd statws ecolegol cymedrol. Fodd bynnag, cynyddodd y nifer a gyflawnodd statws ecolegol gwael hefyd o 14% i 16%.

Mae 18 o gyrff dŵr afonol wedi'u dynodi'n ardaloedd cadwraeth arbennig (ACA). Cynhelir asesiadau o nodweddion ACA ac asesiadau ansawdd dŵr. Mae eog Iwerydd, llysywen bendoll y môr, y dyfrgi Ewropeaidd, a chrafanc y dŵr yn methu asesiad cyflwr dangosol 2020. Ar gyfer ansawdd dŵr, mae'r asesiad diweddaraf yn dangos gwelliant ar gyfer tri pharamedr ansawdd dŵr, gan gynnwys ffosfforws. Mae un paramedr ansawdd dŵr, mynegai diatom troffig, wedi dirywio.

Aseswyd 12 o baramedrau ansawdd dŵr ar gyfer ACA a'r Gyfarwyddeb Fframwaith Dŵr yn 2021 a 2024 sydd wedi achosi methiannau corff dŵr. Mae materion ansawdd dŵr yn amrywio ar hyd dalgylch afon Teifi.

Llygredd metel gwenwynig yw'r broblem fwyaf yn y dalgylch uchaf, tra bod llygredd ffosfforws yn broblem yn bennaf yn y dalgylch canol ac isaf. Gwellodd methiannau ffosfforws rhwng 2021 a 2024. Mae trefn hydrolegol yn achosi problem yn un o'r llynnoedd yn y dalgylch uchaf, ond mae trefn llif y brif afon yn bennaf naturiol. Mae

nitrogen anorganig tawdd yn broblem yn aber afon Teifi, sydd hefyd yn agored i lygredd tymor byr o ddeunydd ysgarthol yn ystod glawiad uchel. Mae'r cemegyn Cypermethrin wedi achosi problem mewn un o'r cyrff dŵr dalgylch uchaf yn 2021, ac mewn un corff dŵr dalgylch isaf yn 2024. Disgwylir i waddod fod yn broblem yn y dalgylch er mai cyfyngedig yw'r dystiolaeth ar hyn o bryd. Mae rhywogaethau estron goresgynnol yn broblem ar draws y dalgylch er nad yw'r union ddosbarthiad ac effaith yn hysbys.

Mae cyflwr infertebratau yn broblem yn y cyrff dŵr sy'n llynnoedd yn y dalgylch uchaf, ac mae'n anhysbys i raddau helaeth o fewn y cyrff dŵr afonol. Mae cyflwr macroffytau a diatomau yn broblem yn y dalgylchoedd canol ac isaf. Pysgod yw'r prif baramedr sy'n effeithio ar statws ecolegol corff dŵr y Gyfarwyddeb Fframwaith Dŵr ar draws y dalgylch, ac er bod nifer y cyrff dŵr sy'n methu o ran pysgod yn gostwng o 2021 i 2024, mae difrifoldeb y methiant yn cynyddu mewn dau gorff dŵr. Mae'r galw biocemegol am ocsigen wedi bod yn broblem yn y dalgylch isaf yn flaenorol. Mae hyn wedi gwella yn 2024 heb unrhyw fethiannau o ran y galw biocemegol am ocsigen yn y dalgylch. Bu mân welliant mewn ocsigen tawdd.

Mae gwaith modelu dosraniad ffynhonnell ffosfforws (SAGIS) ac ymchwiliadau rhesymau dros beidio â chyflawni statws da CNC yn dangos mai llygredd o ddŵr gwastraff a defnydd tir gwledig yw'r achosion mwyaf o fethiant ansawdd dŵr ar draws dalgylch afon Teifi. Mae'r effeithiau'n amrywio fesul corff dŵr ac yn dibynnu ar y dull ymchwilio.

Mae llawer o gamau gweithredu eisoes yn cael eu cymryd gan randdeiliaid o fewn y dalgylch i wella ansawdd dŵr a'r amgylchedd dŵr. Ar wahân i ddyletswyddau statudol CNC a Dŵr Cymru, mae'r gweithgareddau hyn yn cynnwys: cael gwared ar rywogaethau estron goresgynnol ac ailddolennu afonydd gan y prosiect Pedair Afon LIFE; cynlluniau i leihau llygredd metel trwy brosiectau adfer mwyngloddiau metel; arolygon cerdded dros afonydd i nodi rhwystrau i fudo pysgod; cynllun rheoli maetholion a nifer o weithgareddau ymgysylltu cymunedol.

Mae'r dulliau ymyrryd i Brosiect Dalgylch Arddangos Teifi eu datblygu, er mwyn cynorthwyo'r gweithgareddau parhaus y manylir arnynt uchod, yn cynnwys y canlynol:

- Dull rheoli dalgylch sy'n defnyddio technegau adfer afonydd a rheoli llifogydd naturiol
- Dulliau wedi'u hanelu at addasu rheolaeth tir
- Ystyried dulliau rheoleiddio hyblyg lle gellir nodi manteision
- Dull cydweithredol o ailgysylltu pobl â byd natur i gyflawni adferiad diwylliannol ac amgylcheddol
- Mae modelau a mapiau ar gael i helpu i dargedu rhai ymyriadau, ochr yn ochr â'r ffynonellau tystiolaeth a gwybodaeth a ddarperir yn yr adroddiad hwn.

Bwriedir i'r argymhellion yn yr adroddiad hwn lywio'r gwaith o ddatblygu a chyflawni prosiectau yn y dyfodol drwy'r bartneriaeth. Bydd cyflawni'r argymhellion hyn yn dibynnu ar sicrhau cyllid prosiect digonol ac ymdrech ar y cyd. I grynhoi, argymhellir:

- Ystyried ansicrwydd asesu ansawdd dŵr ac oedi
- Ceisio llenwi bylchau tystiolaeth megis gwybodaeth am systemau carthffosiaeth preifat ac effeithiau gwaddod
- Defnyddio cyfuniad o ddulliau i wella'r amgylchedd dŵr a fydd yn cryfhau cysylltiadau diwylliannol a chydweithio tra'n ystyried ardaloedd dynodedig, ymyrraeth yn unol â'r anghenion, rhwydweithiau cynefinoedd a thargedu cyrff dŵr penodol a amlinellir yn yr adroddiad
- Canolbwyntio ar gynyddu manylion gronynnog yn y sylfaen dystiolaeth bresennol a modelau presennol, yn lle creu modelu ychwanegol ar raddfa dalgylch.

Executive summary

This evidence review is intended to support the progress of the Teifi Demonstrator Project (TDP). The TDP is a multi-organisational, cross-sector partnership aiming to deliver improvements to water quality and the wider water environment in the Teifi catchment, through collaboration and agile working. Successes will be captured and scaled up to use in other river catchments in Wales.

The Teifi catchment has a diverse landscape including both upland and lowland areas. It is mainly rural, and a large proportion of the population is employed in farming, which is also the predominant land-use. There is some flood risk in the catchment. A small amount of forestry is present in the upland areas and there is some broadleaved woodland mainly in the lower catchment, bordering the river and its tributaries.

There are numerous activities which impact water quality in the Teifi catchment including: water discharges, water abstraction, agricultural pollution, and materials to land application. Natural Resources Wales (NRW) regulates these activities to varying extents within the Teifi catchment. There are also statutory mechanisms in place to protect and enhance the water environment of the Teifi catchment, namely the Water Framework Directive (WFD) Regulations 2017 and the Conservation of Habitat and Species Regulations 2017.

The Teifi Catchment contains 37 river WFD water bodies, four WFD lake water bodies, one WFD transitional water body, the Teifi Estuary, and one WFD groundwater body. The change seen between the 2021 WFD Regulations full classification and a 2024 WFD Regulations interim classification presents a mixed picture for the Teifi catchment. The number of water bodies achieving overall Good ecological status increased from 37% to 42% and the number achieving Moderate ecological status decreased, however the number achieving Poor ecological status also increased from 14% to 16%.

18 river water bodies are designated as a Special Area of Conservation (SAC). SAC features assessments and water quality assessments are carried out. Atlantic salmon, sea lamprey, European otter, and river water-crowfoot are failing the 2020 indicative condition assessment. For water quality, the most recent assessment

shows an improvement for three water quality parameters including Phosphorus. One water quality parameter, Trophic Diatom Index (TDI), has declined.

There are 12 water quality parameters assessed for SAC and WFD in 2021 and 2024 which have caused water body failures. The water quality issues vary along the length of the Teifi catchment.

Toxic metal pollution is the biggest issue in the upper catchment, whilst phosphorus pollution is mainly an issue in the middle and lower catchment. Phosphorus failures improved from 2021 to 2024. Hydrological regime is causing an issue in one of the lakes in the upper catchment, but the flow regime of the main river is mainly natural. Dissolved inorganic nitrogen (DIN) is an issue in the Teifi Estuary, which is also subject to short term pollution from faecal material during high rainfall events. The chemical Cypermethrin has caused an issue in one upper catchment water body in 2021, and one lower catchment water body in 2024. Sediment is expected to be an issue in the catchment although evidence is currently limited. Invasive Non Native Species (INNS) are an issue across the catchment although their exact distribution and impact is unknown.

The condition of invertebrates is an issue in the lake water bodies in the upper catchment and is largely unknown within the river water bodies. The condition of macrophytes and diatoms are an issue in the middle and lower catchment. Fish are the principal parameter which impact WFD water body ecological status across the catchment, and although the number of water bodies failing for fish decreases from 2021 to 2024, the severity of the failure increases in two water bodies. Biochemical Oxygen Demand (BOD) has previously been an issue in the lower catchment, this has improved in 2024 with no BOD failures in the catchment. There has been a minor improvement in Dissolved Oxygen (DO).

Phosphorus source apportionment modelling (SAGIS) and NRW's Reasons for Not Achieving Good (RNAG) investigations show that pollution from waste water and rural land use are the greatest causes of water quality failure across the Teifi catchment. The impacts differ per water body and depending on the investigation approach.

There are many actions already being undertaken by stakeholders within the catchment to improve water quality and the water environment. Aside from the statutory duties of NRW and Dŵr Cymru Welsh Water (DCWW), these activities include: INNS removal and river re-meandering carried out by the Four Rivers for LIFE project; plans to reduce metal pollution through metal mine remediation projects; river walk-over surveys to identify barriers to fish migration; a Nutrient Management Plan (NMP) and numerous community engagement activities.

Intervention approaches for the TDP to take forward, to support the ongoing activities detailed above, include:

- A catchment management approach which applies river restoration and natural flood management techniques.
- Approaches aimed at adapting land management.
- Consideration of flexible regulatory approaches where benefits can be identified

- A collaborative approach reconnecting people with nature to achieve both cultural and environmental restoration.
- Models and maps are available to help target certain interventions, alongside the evidence and information sources provided in this report.

The recommendations in this report are intended to inform future project development and delivery via the partnership. The delivery of these recommendations will be dependent on securing adequate project funding and collaborative effort. In summary, it is recommended to:

- Consider water quality assessment uncertainty and time lag.
- Look to fill evidence gaps such as knowledge of private sewage systems and the effects of sediment.
- Use a combination of approaches to improving the water environment that will strengthen cultural connections and collaboration whilst considering designated areas, intervention scalability, habitat networks and the targeting of specific water bodies outlined in the report.
- Focus on increasing granular detail in the existing evidence base and existing models, instead of creating additional catchment scale modelling.

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1. What are the characteristics of the Teifi catchment?

1.1. Project Background

The aim of this report is to provide an overview of readily available evidence to support the Teifi Demonstrator Project (TDP). The TDP is an NRW led project which emerged from the Quad meetings (Chairs of Ofwat, Natural Resources Wales (NRW), Dŵr Cymru Welsh Water (DCWW) and Hafren Dyfrdwy) and was supported at the First Minister's Summit on River Pollution, which aims to:

1. Improve water quality in the Teifi catchment, whilst encouraging climate resilience and enhanced biodiversity in line with the Sustainable Management of Natural Resources (SMNR) principles.

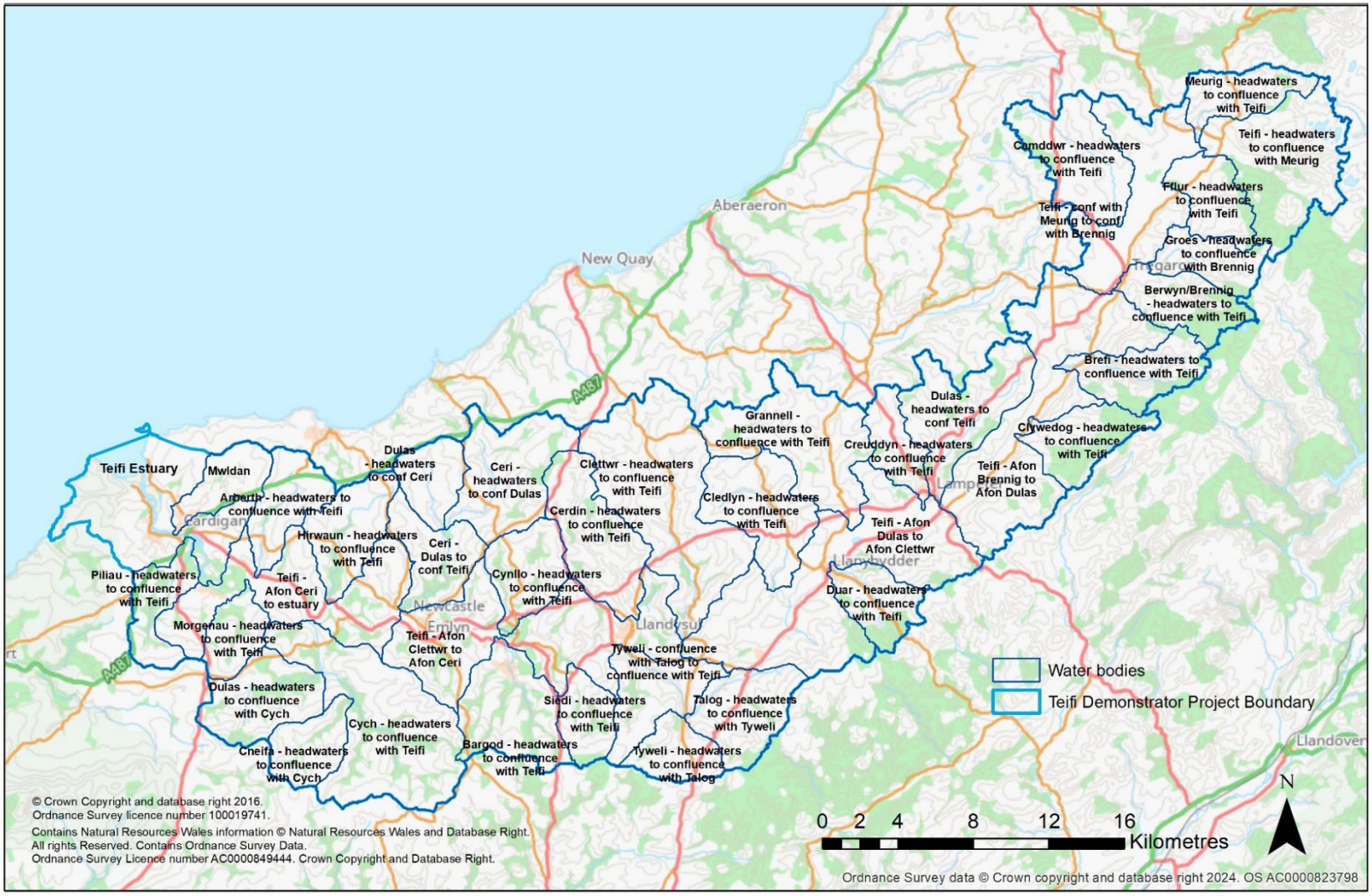
2. Collaboratively adopt innovative and agile regulatory and evidence communication approaches to support a range of interventions.

3. Capture the learning and manage it in an agile way so it can be scaled up bringing multiple benefits to other river systems.

A partnership of 20 key organisations has been established to co-develop and co-deliver these aims. Engagement activities to date have included a 'hackathon' workshop event involving over 40 stakeholders, where several cross-cutting ideas/solutions were identified for potential inclusion in the Teifi Demonstrator project. This report is intended to inform the actions which are taken forward as project proposals and to support applications for project funding.

As such, this report has a wide remit, and whilst it attempts to highlight and summarise the most significant pieces of evidence relating to water quality in the Teifi catchment, there may be other evidence that requires consideration, particularly from organisations other than NRW. This report should therefore be seen as the first iteration, which has taken place over a 12-month period from February 2024 to February 2025 in evidence retrieval and synthesis to support the Teifi Demonstrator Project. Revisions will most likely be made as more evidence is collected through the course of the project, this will likely be made accessible through a 'live' platform, instead of a static report.

Figure 1. The Teifi catchment boundary used for the TDP, with river and transitional water body names. The names are those used for WFD Regulations. SAC water body names may differ.



The boundary used for the Teifi Demonstrator Project (TDP) is shown in Figure 1, this area is referred to as the Teifi catchment in this report. This is also the boundary of the Teifi Opportunity Catchment which is included in the Western Wales River Basin Management Plan (2021-2027). Being an Opportunity Catchment means that the Teifi is recognised as a catchment where there is greatest opportunity to address the objectives of the Water Framework Directive (WFD) Regulations 2017 (See section 2.1), deliver sustainable management for water and contribute to the well-being goals (Natural Resources Wales, 2023a). This potential for positive change in the catchment contributed to its selection as the demonstrator catchment for Wales. Other reasons include: the size of the catchment, its location being wholly within Wales, the presence of a bathing water, the diversity of the landscape and its rich cultural heritage. These reasons are explored further in this section.

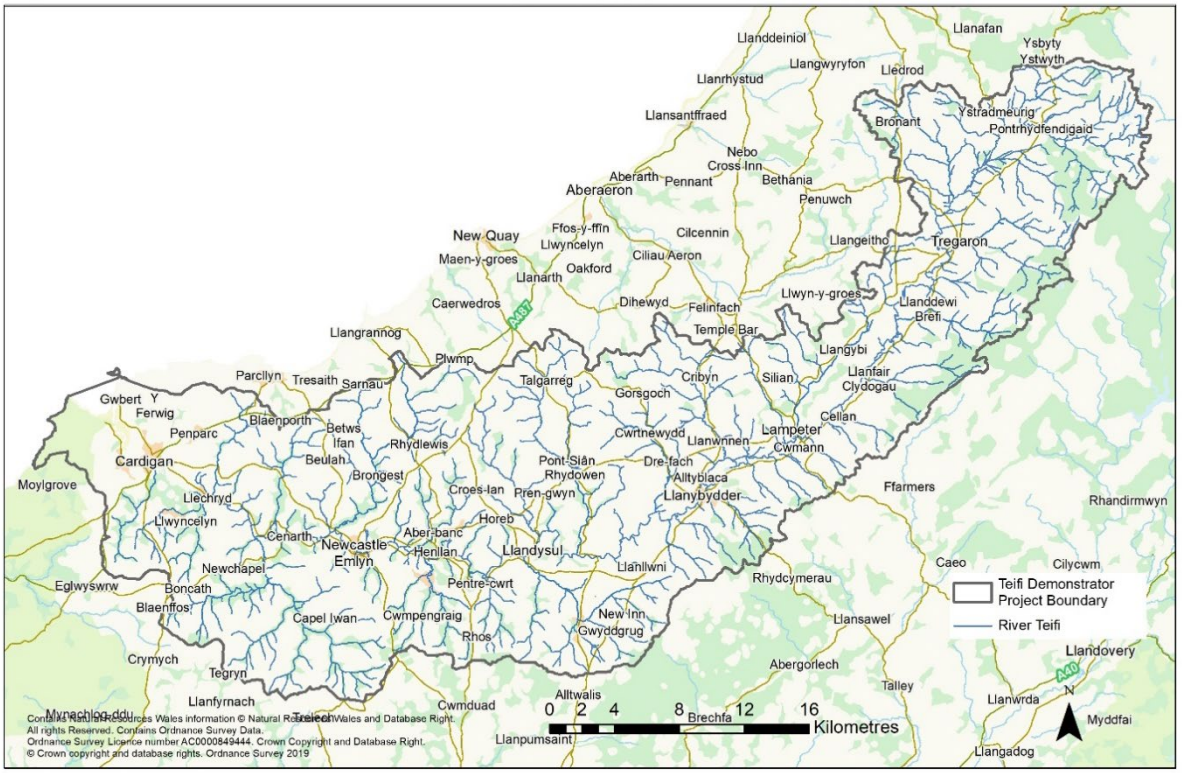
The Teifi catchment includes both the estuary and the Teifi Pools as well as the main River Teifi and its tributaries. The Teifi catchment also contains the Afon Teifi/River Teifi Special Area of Conservation (SAC), discussed in section 2.2. (Natural Resources Wales, 2022a). The boundary of the project follows part of the coastline of Cardigan Bay, but the coastline is not included in this project.

The Teifi catchment boundary provides a focus for the project; however, it is important to consider how the catchment influences and is influenced by the wider area. Ensuring resilient ecosystems is one of the long term aims of SMNR, and connectivity is a key attribute of resilient ecosystems (Natural Resources Wales, 2022a; Natural Resources Wales, 2020a). This is discussed throughout this report.

1.2 Catchment Summary

At 122 km in length, the River Teifi is one of the longest rivers in Wales, its source originating from the Teifi Pools, a group of lakes on the edge of the Cambrian Mountains. The river descends steeply through moorland and forestry until it reaches Cors Caron, one of the most ecologically important raised bog landscapes in the UK. From here it meanders gently through the small towns of Tregaron, Lampeter, Llanybydder, Llandysul and Newcastle Emlyn – these are seen in Figure 2 (Natural Resources Wales, 2014; Natural Resources Wales, 2022a). Many of these towns were formed as defensive or bridging points, with the castles built on the banks of the River Teifi still serving as focal points for these settlements today.

Figure 2. The Teifi catchment, with the Teifi river and towns.



The spectacular Cenarth Falls, one of the many famous attractions found along the river, draws visitors with hopes of spotting leaping salmon (Natural Resources Wales, 2015; Figure 3). The river is one of only three Welsh rivers where the art of coracle making and fishing is still practiced, a tradition which goes back centuries and forms part of the area's rich heritage, which has the Teifi at its heart.

In the wider valley, several river tributaries flow through agricultural land which varies from small, thickly hedged fields to larger, open, and improved fields, before they join the main River Teifi. The river becomes more incised and eventually forms the densely wooded, and steep sided, Cilgerran Gorge. The river then widens into an estuary at the larger town of Cardigan with a mosaic of marshland, reed beds and saltmarsh before joining the sea in Cardigan Bay, flanked by rocky headlands and the popular bathing area of Poppit West (Natural Resources Wales, 2014).

Figure 3. Images of the Teifi River. Top to bottom: Swans at Cors Caron; Cenarth Falls; the Teifi River at Newcastle Emlyn

1.3 Population and culture

The Teifi catchment falls within the boundaries of three local authorities: Ceredigion, Carmarthenshire, and Pembrokeshire. Much of the Teifi catchment is within Ceredigion, with the river itself acting as a boundary between Ceredigion and the other two counties. The Teifi catchment is a rural and sparsely populated area, with a population density roughly three times lower than that of Wales as a whole (ONS, 2021; Welsh Government 2023a).

The towns within the Teifi catchment play an important role in serving this wider rural community. The local authorities have developed regeneration plans for the Teifi's towns, for example, Ceredigion County Council have developed regeneration plans for Cardigan, Lampeter, Llandysul and Tregaron. These plans showcase the importance of the River Teifi in supporting urban regeneration. Lampeter's regeneration plan includes plans for increasing the towns connectivity to the river through river walks (Rural Office, 2023).

Mining and its legacy have been a part of the area since the 12th century, when it's believed that the Cistercian Monks at Strata Florida Abbey began mining lead and zinc at Abbey Consols Mine (Natural Resources Wales, 2016). In the 1800s, during the industrial revolution, the Teifi catchment was the centre of the woollen industry, one of Wales's most important and widespread industries (National Wool Museum, 2024), with the river and its tributaries powering mills which employed thousands of people (Rock Mill Wales, 2018). Both the mining and woollen mill industries declined at the beginning of the 20th century (Natural Resources Wales, 2016).

The River Teifi and estuary also once supported a fishing industry and community which continues today in the form of a small-scale commercial net fishery, comprising traditional seine and coracle nets, which is licensed to catch sea trout in the Teifi Estuary. The river remains an internationally renowned destination for angling, and is famous for its salmon, sea trout and trout fishing (Llandysul Angling Association, 2020). Both the net and rod fisheries have been subject to mandatory catch-and-release regulations to protect the increasingly vulnerable salmon stocks, and there are additional restrictions in place to provide protection of sea trout (NRW All Wales Byelaws).

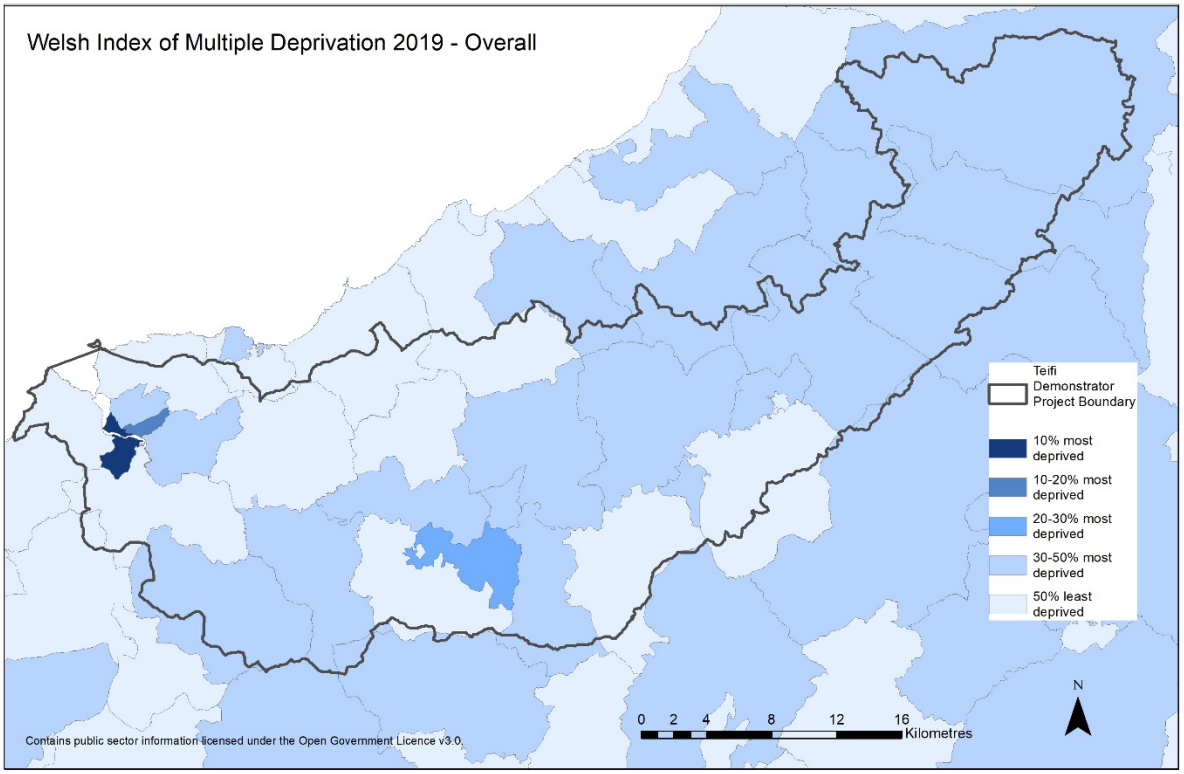
Today, there is wider use of the river for recreation, with not only fishing but also water sports, such as kayaking and paddleboarding, taking place on the river, these activities also contribute to the tourism industry in the area. In all three counties which constitute the Teifi catchment, the main areas of employment are: farming; sales and retail; and care working (Welsh Government, 2023a).

The Welsh language is spoken to a varying extent across the Teifi catchment and whilst the exact number of people that speak Welsh within the catchment is unknown, the local authorities which make up the Teifi catchment have 45.3%, 39.9% and 17.2% Welsh speakers respectively for Ceredigion, Carmarthenshire and Pembrokeshire (Wesh Language Commissioner, 2021). Across the whole of Wales,

the agriculture, forestry, and fishing sector have the highest percentage of Welsh speakers (43%) (Welsh Government, 2019a).

The Welsh Index of Multiple Deprivation (WIMD) is Welsh Government's official measure of relative deprivation. It uses 'small areas' also called 'Lower Super Output Areas' (LSOAs) to identify the areas with the highest concentration of combined deprivation for aspects including health, education, and employment.[1] 32 LSOAs are within the Teifi Demonstrator Catchment Boundary. The most recent WIMD analysis was completed for 2019, with 21 (over 66%) being within the 50% most deprived areas in the country. Figure 4 shows that 18 (56%) of the LSOAs in the Teifi catchment are classified as being within the 30-50% of the most deprived areas (Welsh Government, 2019b).

Figure 4. Map showing Welsh Government's Index of Multiple Deprivation split up by LSOA's.



It is the understanding of the Teifi Demonstrator Project that, there have been a number of projects in the area linking communities and local heritage such as 'The Spirit of the Miners' project, and the culture and heritage of the Teifi catchments has been addressed for individual towns in the Local Authority Place Plans (Ceredigion County Council, 2025). However, there is currently no published evidence available which encompasses all of the cultural narratives of the Teifi catchment. The role of culture and community in understanding how individuals within the catchment engage with the river is important, however, the scope of this report is to present

[1] LSOAs are a formal statistical spatial unit comprising of between 400 and 1,200 households for which a range of national statistics are produced. There are 1,917 in Wales (Statistical geographies - Office for National Statistics (ons.gov.uk))

evidence directly relating to the water environment within the Teifi catchment and so no further evidence gathering to understand the cultural landscape of the catchment has been carried out, beyond what is presented in the above section.

1.4 Flood risk

As the Teifi catchment is mostly rural in nature, communities are dispersed. Many of the communities close to the river Teifi are at risk of flooding with Lampeter, Llanybydder and Cardigan most at risk. There have been notable storms affecting the catchment in recent years with the most significant being Storm Callum in 2018 which caused flooding of 220 commercial and residential properties in Llandysul, Newcastle Emlyn, Llechryd, Llanybydder and Lampeter (Natural Resources Wales, 2023b).

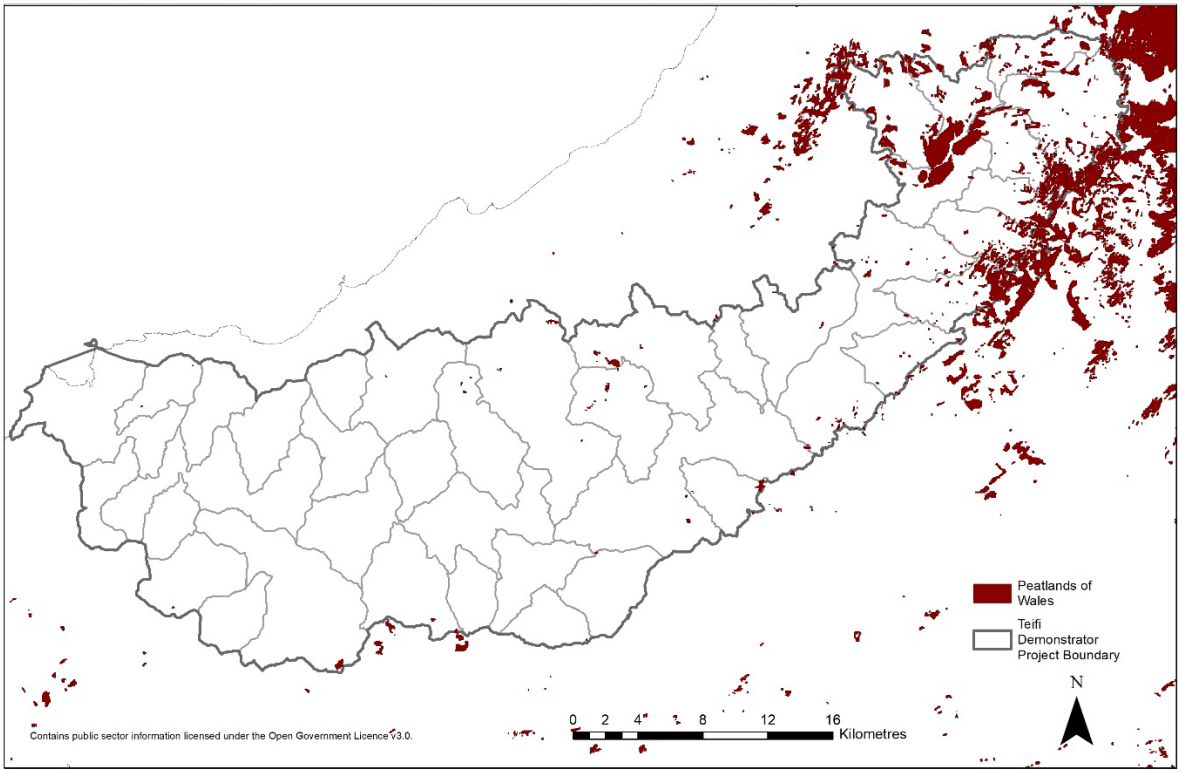
Climate projections indicate that there will be an increase in the frequency and intensity of extreme weather events, including storm events in the Summer and prolonged wet periods during the Winter period. This will increase peak flows in rivers, which is expected to increase the risk of flooding events. It is predicted that more properties will be at risk of flooding in the future in the Teifi catchment with Cardigan expected to have the greatest change in risk from sea flooding and Tregaron the greatest change in risk from river flooding (Natural Resources Wales, 2023b).

1.5 Geology and soils

The underlying geology of the Teifi catchment produces a low to moderate nutrient status. The Teifi catchment is primarily composed of medium to heavy textured, low permeability soils of loam and clay. This creates higher run off in comparison to sandy, light textured soils. These primary features also make large parts of the river characteristically flashy, although Cors Caron (see section 2.2.3) and the Teifi pools both reduce the flashiness of the river. The Teifi River is also prone to acidification in the upper catchment due to the soils poor buffering capacity (Natural Resources Wales, 2015). ‘The run-off characteristics and nutrient status are significantly modified by land use in the catchment, which is predominantly pastoral with some woodland and commercial forestry in the headwaters and a limited amount of arable in the lower catchment’ (Natural Resources Wales, 2022a, p.8).

The Teifi catchment contains areas of peat soils and peatland, primarily in the upper catchment, see Figure 5, the most significant of which is the raised bog Cors Caron through which the River Teifi flows (See section 2.2.3).

Figure 5. Map showing the areas of peatland that overlap with the Teifi Catchment.



1.6 Forestry and woodland

Figure 6 shows the areas of broadleaf woodland and conifer forest mapped by the National Forest Inventory. The catchment has very few large areas of woodland but contains scattered wooded areas and is bordered to the south by two large forestry blocks, Tywi North Forest, and Brechfa East Forest, both managed by NRW.

There are seven NRW forest blocks in total within or overlapping with the Teifi Demonstrator Catchment. Forests have the potential to negatively and positively affect freshwater ecosystems. If managed and designed well, forests can ‘reduce the effects of acid deposition, avoid eutrophication, decrease sediment delivery and help manage local food risk’ (Forest Research, 2023, p. 110). They can also have a positive effect on drinking water catchments by reducing water treatment costs. The low usage of pesticides can also help to offset more intensive land use practices.

However, certain forestry practices such as planting and harvesting, or a poorly managed forest, can result in increased soil disturbance and erosion which in turn causes increased sedimentation into rivers. The effects of sedimentation are discussed in Section 3. The UK Forestry Standard (UKFS) provides guidance and outlines on reducing the impacts of sedimentation, including using broadleaved

woodland buffer strips and avoiding harvesting systems such as short rotation clear-fell. Forestry practice also includes the use of chemicals, mainly for the control of pests. For example, cypermethrin (see Section 3) is used for the control of pine weevil, however its use is tightly controlled and only encouraged as a last resort when other forms of management are not possible (Forest Stewardship Council, 2024). Coniferous forest also has the potential to increase acidification in water bodies as pollutants in cloud, mist and rain are more easily captured in high canopy forests – especially at high elevations. The UKFS provides guidance on mitigating this, including changing forest structure (Forest Research, 2023).

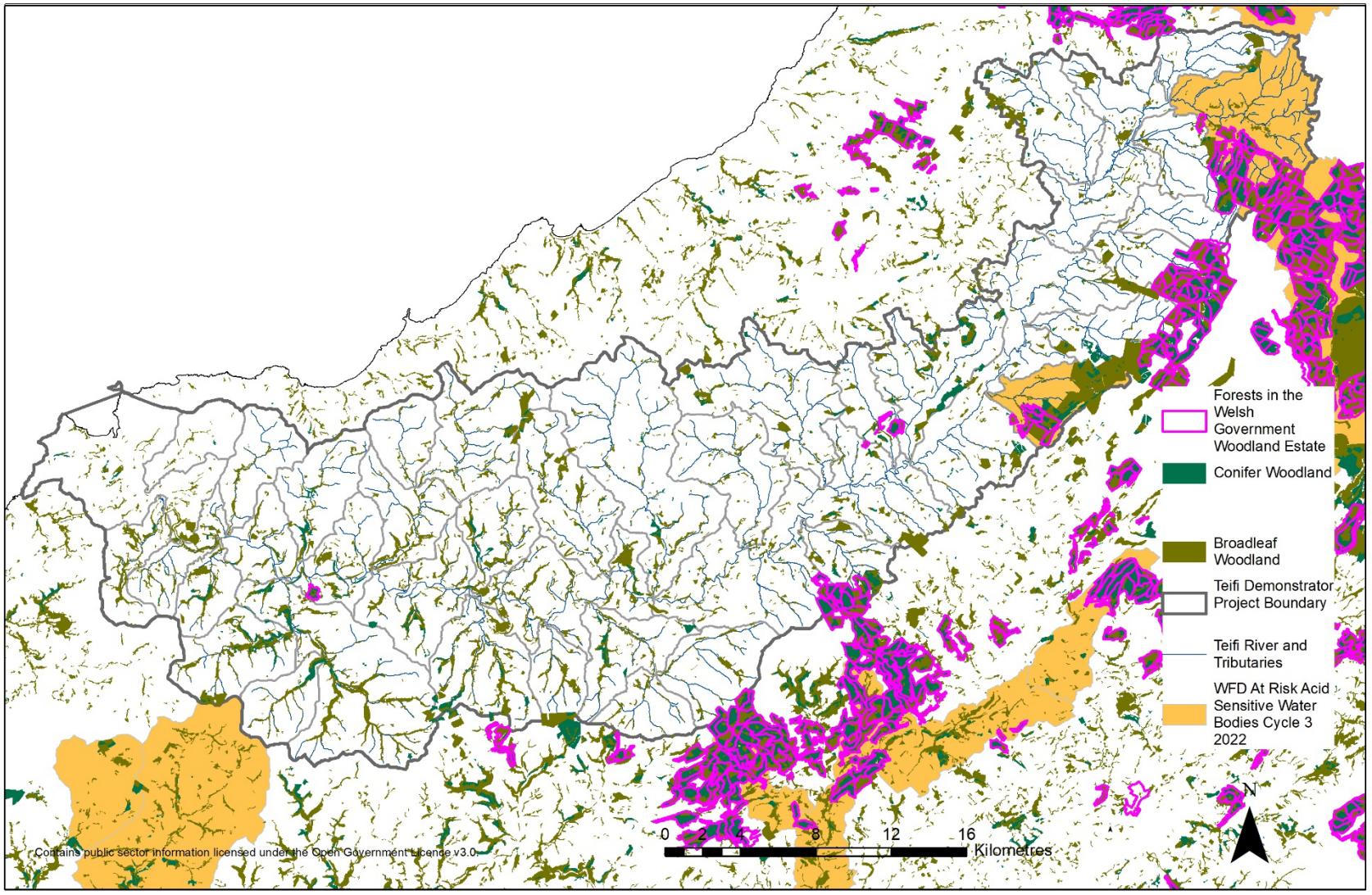
On the Teifi, which is a predominantly lowland catchment, a key influence is woodland cover along the river banks. Woody material (including leaves, twigs branches and entire trees) is critical both for the ecological and hydrological functioning of river, providing food, habitat structure, flow variability, sediment sorting, and modulating erosion, deposition and connectivity with the floodplain (Gurnell *et al.* 1995; Politti *et al.* 2018; Wilkes *et al.* 2018; Grabowski *et al.* 2019). Boulders also play an important function in this regard and can also help to trap wood.

Trees provide important material and nutrient inputs to river ecosystems. These inputs comprises about 50% of the diet of river animals, fungi and bacteria in the catchment (Allen *et al.* 2024). Woody material in rivers is particularly important for increasing fish abundance (Halley *et al*. 2009; Anlanger *et al*. 2022) and is also important for the diet of pearl mussels (Brauns *et al.* 2021).

Riparian woodland contributes in other ways to the health of river ecosystems. It provides shade during hot spells, thereby preventing water temperatures exceeding critical maxima for sensitive species such as salmonids (Broadmeadow *et al.* 2011; Kail *et al.* 2020; Ogilvy *et al.* 2022), and suppresses algal growth. More generally, intact riparian habitat is important for semi-aquatic species such as invertebrate's dependant on river shingle habitat, terrestrial phases of aquatic insects, and river-dependant vertebrates such as kingfisher, otter, and water vole.

Maintaining a habitat mosaic in a river catchment is essential for a healthy river. Whilst some evidence of this can be seen in the areas of broadleaved woodland along the Teifi and its tributaries in Figure 6, improving and expanding this habitat should be explored as part of habitat restoration along water courses in the Teifi catchment.

Figure 6. Map showing wooded areas within and adjacent to the Teifi catchment, taken from the National Forest Inventory 2021.



1.7 Agriculture

Agriculture is one of three main livelihoods within the Teifi catchment and is the predominant land-use in the catchment. Large dairy units are found in the lower reaches of the Teifi, with mixed dairy and livestock rearing more prevalent in the middle of the Teifi catchment. In the upper Teifi catchment, poorer soil conditions restrict agriculture to low intensity livestock rearing (sheep and beef) on rough grazing (Natural Resources Wales, 2015). There are 1440 farm businesses within the Teifi, and over 60% are below 50 hectares (See Appendix A). Appendix B provides a breakdown of farm business number per water body, with an estimated area coverage per water body. The water body 'Clettwr - headwaters to confluence with Teifi' (GB110062039220) has the largest estimated farm business area coverage, at over 5000 hectares. Fertiliser run-off, livestock manure, silage effluent, sheep dip and soil erosion from ploughed land all have the potential to discharge into the Teifi (Natural Resources Wales, 2022a). In Section 4 of this report, there is information available on agriculture's contribution to water pollution in the Teifi catchment.

Agriculture has a significant role in the landscape, community, and economy of the Teifi catchment, and as such the catchment may be significantly affected by the Welsh Government's proposed new agricultural policy: the Sustainable Farming Scheme (SFS). The new scheme will reward farmers for delivering actions based on Sustainable Land Management objectives of the Agriculture (Wales) Act 2023. It is a change from the current system's direct payments, with more emphasis on reward for public goods, particularly environmental actions. This scheme is still in development and due to be introduced in 2026.

1.8 Section summary

This section summarises the population characteristics, flood risk, and land uses of the Teifi catchment. Historically, the culture and development of the Teifi catchment has been inextricably linked to the landscape and the Teifi river through the woollen and mining industries, and through agriculture: the surviving industry which continues today within the catchment and is an important livelihood for local people.

2. How does NRW regulate/manage the Teifi catchment?

2.1 Water Framework Directive Regulations 2017 (WFD Regulations 2017)

WFD Regulations 2017 provide the framework for the protection and improvement of water in Wales. The WFD Regulations 2017 require that River Basin Management Plans (RBMPs) are published and updated every six years. The assessment of all water bodies in Wales is also undertaken. The latest full classification was published in 2021, and an interim classification was published in March 2025 (and is referred to in this report at the 2024 WFD interim assessment).

The Teifi Catchment contains 43 water bodies in total (Table A). Smaller lakes and ponds under 50 hectares in area (or five hectares when they are designated as SACs) are not classed as water bodies under WFD Regulations. Each water body is given a status of either Bad, Poor, Moderate, Good, or High. This is achieved by first classifying the status of multiple chemical and biological elements, the element with the lowest status determines the overall waterbody status.

Table A shows the overall water body classifications for 2021 and 2024 for each water body type in the Teifi catchment. Between 2021 and 2024 the number of Good and Poor water bodies has increased, and the number of Moderate water bodies has not changed. Figures 7 and 8 show these mapped to the Teifi catchment.

Table A. Count of water bodies in the Teifi catchment per overall WFD Regulations classification for 2021 and 2024

Water body type	**No. of water bodies**	**No. Good 2021**	**No. Moderate 2021**	**No. Poor 2021**	**No. Good 2024**	**No. Moderate 2024**	**No. Poor 2024**
Lake	4	0	2	2	0	2	2
River	37	16	18	3	18	15	4
Transitional (Estuary)	1	0	1	0	0	1	0
Groundwater	1	0	0	1	0	0	1
Total No. **(%)**	43	16 (37%)	21 (49%)	6 (14%)	18 (42%)	18 (42%)	7 (16%)

Figure 7. The Teifi catchment, showing the 2021 WFD Regulations classification for overall water body status.

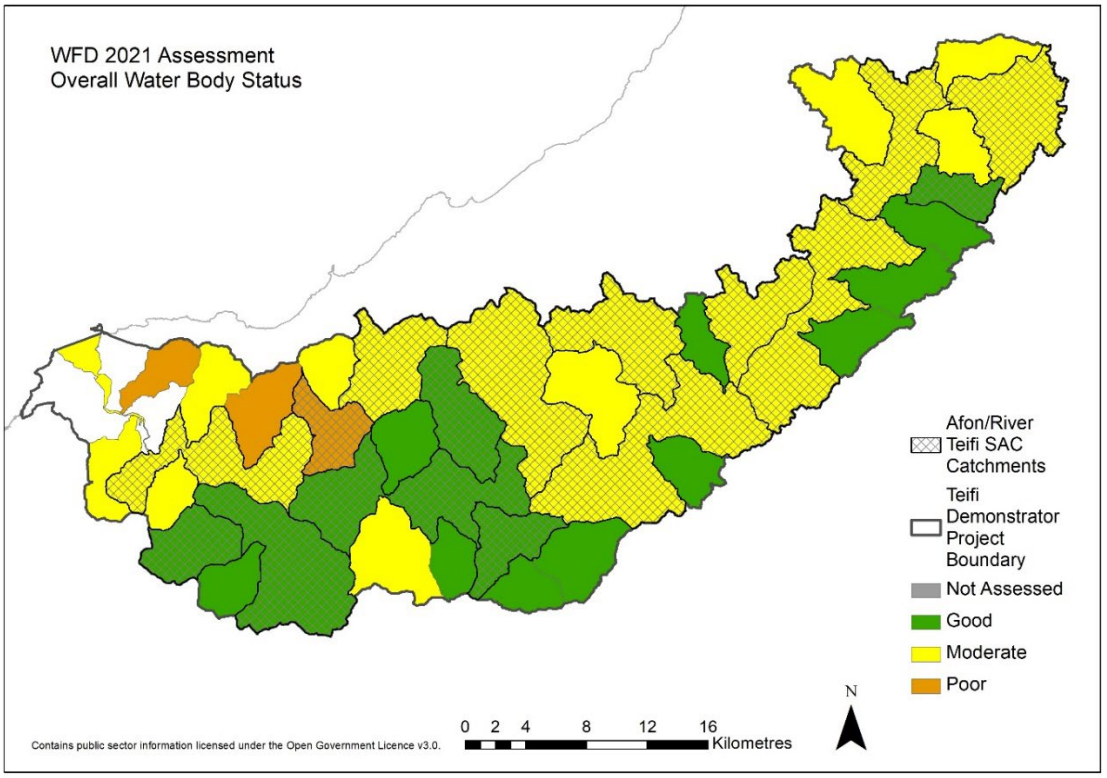
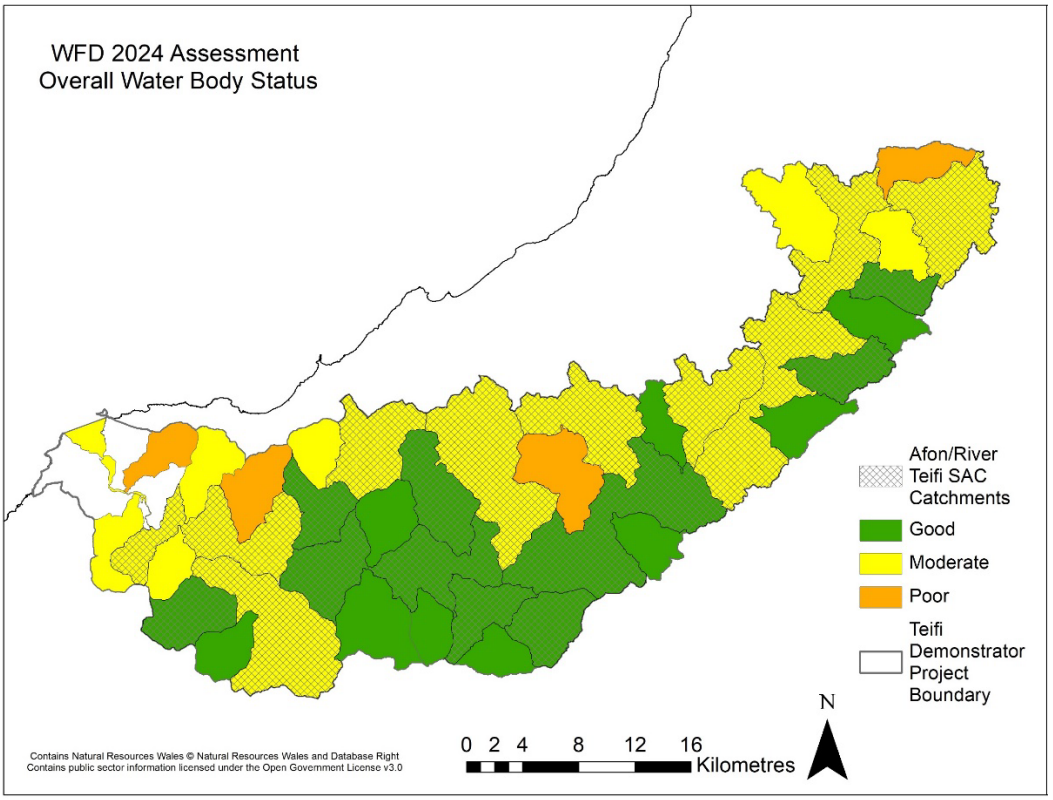


Figure 8. The Teifi catchment, showing the 2024 WFD Regulations interim classification for overall water body status.



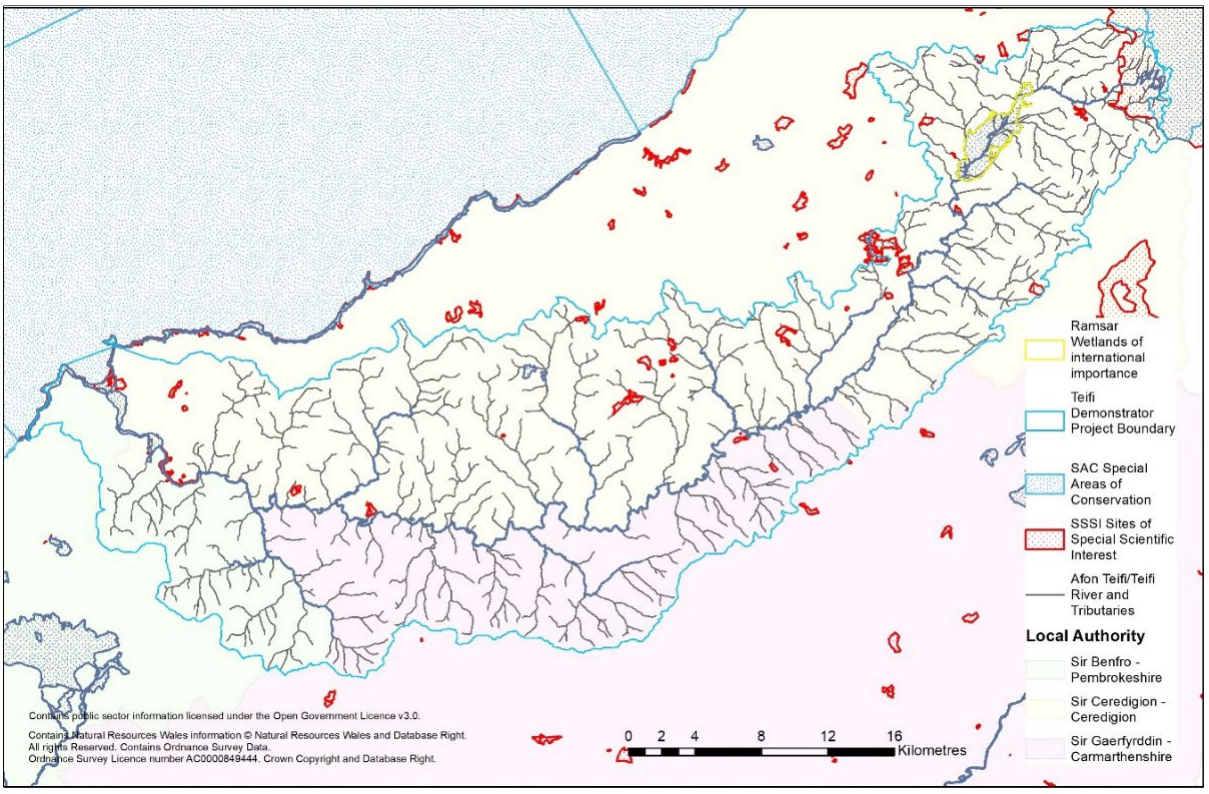
Each water body is not necessarily assessed for every element, a risk-based decision is made as to which elements will be assessed. River water bodies are often displayed as river water body catchments, the term river water body is used to identify both the water body and river water body catchment in this report. Each river water body has a name, and a number used in both WFD Regulations assessments and SAC assessments.

Section 3 provides an overview of the WFD Regulations classification for 2021 and 2024, including greater detail on the water quality parameters that have driven failures for both of the WFD Regulations cycles, and the SAC assessments. The WFD Regulations assessment results for all parameters classified in the Teifi catchment can be found on Water Watch Wales.

2.2 Protected Areas

2.2.1 Afon Teifi / River Teifi Special Area of Conservation (SAC)

Figure 9. Teifi catchment with local authority boundaries and designations in the wider area.



The Teifi is a SAC under the Conservation of Habitat and Species Regulations 2017. The length of the main river is included in the SAC, as are ten tributaries, the extent

of this can be seen in Figure 9, where the Teifi SAC appears as a dark blue line. For the Teifi catchment, 18 river water bodies are included within the SAC boundary designation. The SAC is designated due to eight Annex I (habitats) and Annex II (species) features (See Table B). Conservation objectives are required to be set for SACs (Natural Resources Wales, 2022a). An important aspect of the SAC conservation objectives is the maintenance and restoration of the water quality and physical characteristics of the water environment to maintain stable or increasing populations of each feature.

The most recent SAC features assessments were carried out in 2013. A baseline assessment was also carried out in 2020 which produced an indicative condition assessment for each feature, but did not include any new monitoring data for site features beyond that which was available in 2013. Both assessments, alongside the condition assessment carried out for the first SAC reporting cycle can be seen in Table B.

Table B. River Teifi SAC features and condition assessments (Natural Resources Wales, 2013; Natural Resources Wales, 2020b; Natural Resources Wales, 2022a)

SAC Feature Name (Annex I habitats and Annex II species)	Condition	Assessment Year	Condition	Assessment Year	Indicative Condition	Assessment Year
Atlantic Salmon - *Salmo salar*	Unfavourable	2007	Unfavourable	2013	Unfavourable	2020
Bullhead - *Cottus gobio*	Unfavourable	2006	Unknown	N/A	Unknown	2020
Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	Favourable	2007	Unknown	N/A	Favourable	2020
Floating Water-plantain - *Luronium natans*	Favourable	2004	Unknown	N/A	Favourable	2020
European Otter - *Lutra lutra*	Favourable	2004	Unknown	N/A	Unfavourable	2020
River Lamprey - *Lampetra fluviatilis* and Brook Lamprey - *Lampetra planeri*	Unfavourable	2005	Favourable	2013	Favourable	2020
Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Favourable	2006	Unfavourable	2013	Unfavourable	2020
Sea Lamprey - *Petromyzon marinus*	Unfavourable	2005	Unfavourable	2013	Unfavourable	2020

Water quality is used as part of the condition assessment with targets being adopted from guidance published by the Joint Nature Conservation Committee (JNCC). Targets include Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total (T-NH3) and unionised ammonia (U-NH3), Phosphorus, Trophic Diatom Index (TDI), pH and Acid Neutralising Capacity (ANC). Water quality targets for SAC are often more stringent than those set by the WFD Regulations 2017.

Two SAC water quality assessments were published by NRW using water quality data collected over a three-year period from 2017 to 2019. These are the Compliance Assessment of Welsh River SACs against Phosphorus Targets report and the Compliance Assessment of Welsh River SACs Against Water Quality Targets (Hatton-Ellis and Jones, 2021; Foster et al., 2024). These assessments are referred to in this report as the 'previous' assessments. A SAC water quality assessment has been published in 2025, using water quality data collected over a three-year period from 2020 to 2023. This assessment is referred to in this report as the 'recent' assessment. The full assessment can be found at Water Watch Wales. The results on these assessments can be seen in Table C, more information on these assessments per water body is available alongside the WFD assessments in Section 3.

Table C. Assessment count of water bodies in the Teifi catchment per water quality attribute for previous and recent SAC water quality assessments

SAC Water Quality Parameter	No. Pass – Previous	No. Fail - Previous	No. Not assessed - Previous	No. Pass - Recent	No. Fail - Recent	No. Not assessed - Recent
Phosphorus	8 (44.5%)	8 (44.5%)	2 (11%)	12 (67%)	4 (22%)	2 (11%)
DO	13 (72%)	2 (11%)	3 (17%)	14 (78%)	2 (11%)	2 (11%)
BOD	7 (39%)	6 (33%)	5 (28%)	14 (78%)	0	4 (22%)
T-NH3	14 (78%)	0	4 (22%)	15 (83%)	0	3 (17%)
U-NH3	14 (78%)	0	4 (22%)	15 (83%)	0	3 (17%)
pH	15 (83%)	0	3 (17%)	16 (89%)	0	2 (11%)
ANC	3 (17%)	0	15 (83%)	9 (50%)	0	9 (50%)
TDI	16 (89%)	2 (11%)	0	0	5 (28%)	13 (72%)

There are also freshwater-dependent SACs within the Teifi Catchment. These include the raised bog Cors Caron, discussed in Section 2.2.3, and Rhos Llawr Cwrt

SAC with the latter designated for Marsh Fritillary Butterfly. The distribution of these throughout the Teifi catchment can be seen in Figure 9, more detail on the individual protected areas within the Teifi catchment can be found on the Wales Environmental Information Portal and the NRW website.

2.2.2 Sites of Special Scientific Interest (SSSIs)

The entire Afon Teifi/River Teifi SAC is designated as an SSSI, which is a UK level designation. The River Teifi SSSI is designated due to the features listed in Table D. Managing the SSSI so that its features are in favourable condition is also a conservation objective for the SAC (Natural Resources Wales, 2022a).

Table D SSSI features and indicative condition assessment (Natural Resources Wales, 2020b)

Feature name	Indicative Condition	Year
a blackfly - Simulium morsitans	Favourable	2020
Afon Teifi at Cenarth - Fluvial geomorphology of Wales	Favourable	2020
Afon Teifi at Cors Caron - Fluvial geomorphology of Wales	Favourable	2020
Assemblage of RDB and/or Nationally Scarce and/or Atlantic-Western British bryophytes	Unknown	2020
Atlantic Salmon - Salmo salar	Unfavourable	2020
Breeding bird assemblage of lowland open waters and their margins	Favourable	2020
Brook Lamprey - Lampetra planeri	Favourable	2020
Brown Hairstreak - Thecla betulae	Unknown	2020
Bullhead - Cottus gobio	Unknown	2020
Cetti's Warbler - Cettia cetti - Breeding	Unknown	2020
Club-tailed Dragonfly - Gomphus vulgatissimus	Unfavourable	2020
Cornish Moneywort - Sibthorpia europaea	Unfavourable	2020
Floating Water-plantain - Luronium natans	Favourable	2020
Hybrid Pondweed - Potamogeton x olivaceus	Unknown	2020
Marshy grassland	Unknown	2020
Multi-fruited River Moss - Cryphaea lamyana	Unknown	2020
Other: Marginal/inundation	Unknown	2020

Feature name	Indicative Condition	Year
Otter - Lutra lutra	Unfavourable	2020
River Lamprey - Lampetra fluviatilis	Favourable	2020
Running water	Unfavourable	2020
Sea Lamprey - Petromyzon marinus	Unfavourable	2020
Semi-natural woodland	Unknown	2020
Spotted Sedge - Carex punctata	Unknown	2020
Standing water	Favourable	2020
Swamp	Unknown	2020
Toadflax Leaf Beetle - Chrysolina sanguinolenta	Unfavourable	2020
Water Sedge - Carex aquatilis	Unknown	2020

2.2.3 Cors Caron

Cors Caron is an extensive raised mire system within the Teifi catchment which is designated as a Ramsar Site, SSSI, SAC and National Nature Reserve. Ramsar Sites are wetlands of international importance designated under the Convention of Wetlands (JNCC, 2025; Natural Resources Wales, 2025a).

In 2020, NRW released a five-year action programme for restoring and protecting peatland in Wales due to its significance as a habitat, the regulatory ecosystem services that it provides. These include reducing greenhouse gas related climate change through carbon capture and mitigating peak flows via increased soil water storage. The environmental benefits of peatlands have a direct link to the River Teifi and to water quality, as healthy peatlands can support good water quality through filtration and water and nutrient retention (IUCN, 2024). Cors Caron is one of seven key raised bogs identified in Wales as part of the 'LIFE for Welsh Raised Bogs' project, through which its condition is being improved (Natural Resources Wales, 2018a).

2.3 Flood Alleviation Schemes

In recent years, NRW has undertaken flood risk management work in the catchment that includes the maintenance of flood defences and updating of flood risk models. A planned tidal flood alleviation scheme will reduce the risk of flooding to around 90 homes and businesses in Cardigan. The proposed scheme consisting of flood defence walls and flood gates, costing in the region of £8 million, begins construction this year (2025).

Natural Flood Management (NFM) is a nature based solution to help reduce flood risk and complement other flood risk management approaches. The Welsh Government National Strategy for Flood and Coastal Erosion Risk Management in Wales promotes NFM. NRW aims to integrate NFM where possible and are currently

developing their approach (Natural Resources Wales, 2022b). Section 5.3 contains more detail on how and where NFM could be used in the Teifi catchment.

2.4 Pollution Incidents

From 01/03/2016 to 30/09/2024 there were 222 substantiated pollution incidents recorded by NRW in the Teifi catchment, where the water environment was listed as the primary impact (Natural Resources Wales, 2024a). There were five 'High – Significant' or 'High – Major' pollution incidents in this period, three were on agriculture premises, one was on a manufacturing site and one where the premises was not identified. 21 river water bodies in the Teifi catchment have recorded incidents, three water bodies have over 30 incidents each in this time period, these are: 'Hirwaun - headwaters to confluence with Teifi' (GB110062039130), 'Teifi - Afon Ceri to estuary' (GB110062043563), and 'Teifi - Afon Clettwr to Afon Ceri' (GB110062043564) (Figure 10). Agriculture accounts for 42% of water related substantiated pollution incidents in this time period (Figure 11). Across the whole of Wales, for this same time period, Agriculture accounts for 15% of water related substantiated pollution incidents (Natural Resources Wales, 2024a).

Figure 10. Water related pollution incidents in the Teifi catchment, by water body, 01/03/2016 - 30/09/2024 (Natural Resources Wales, 2024a).

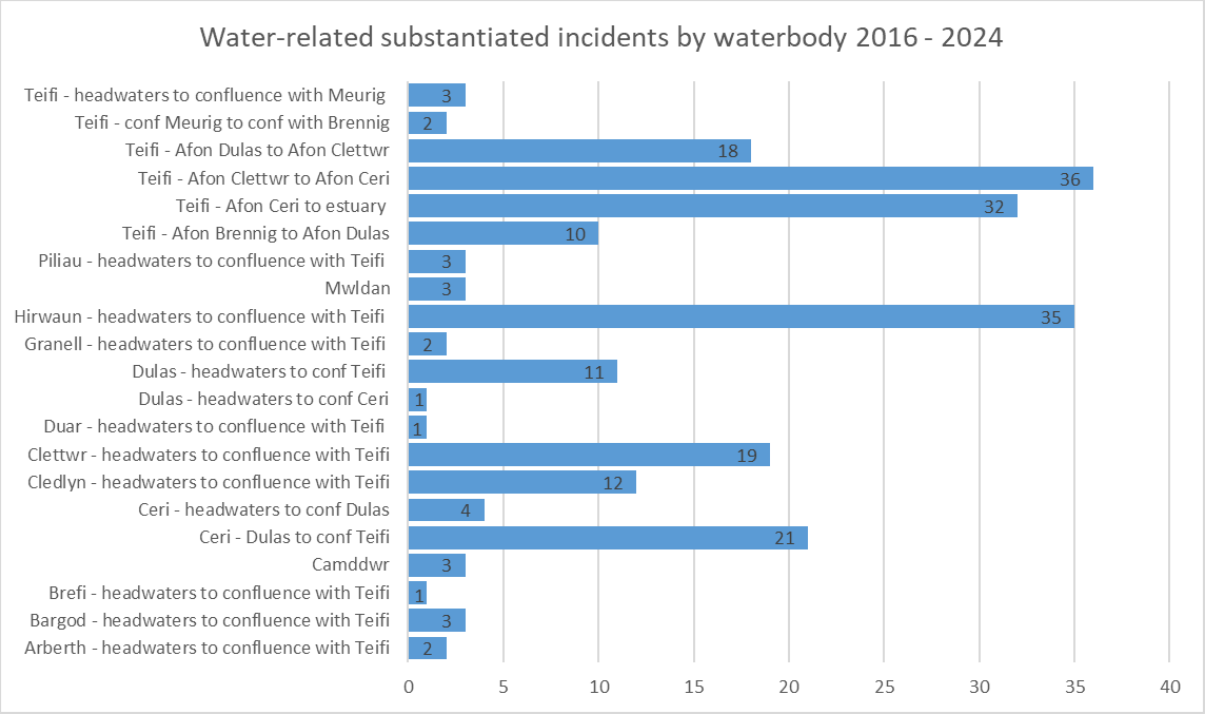
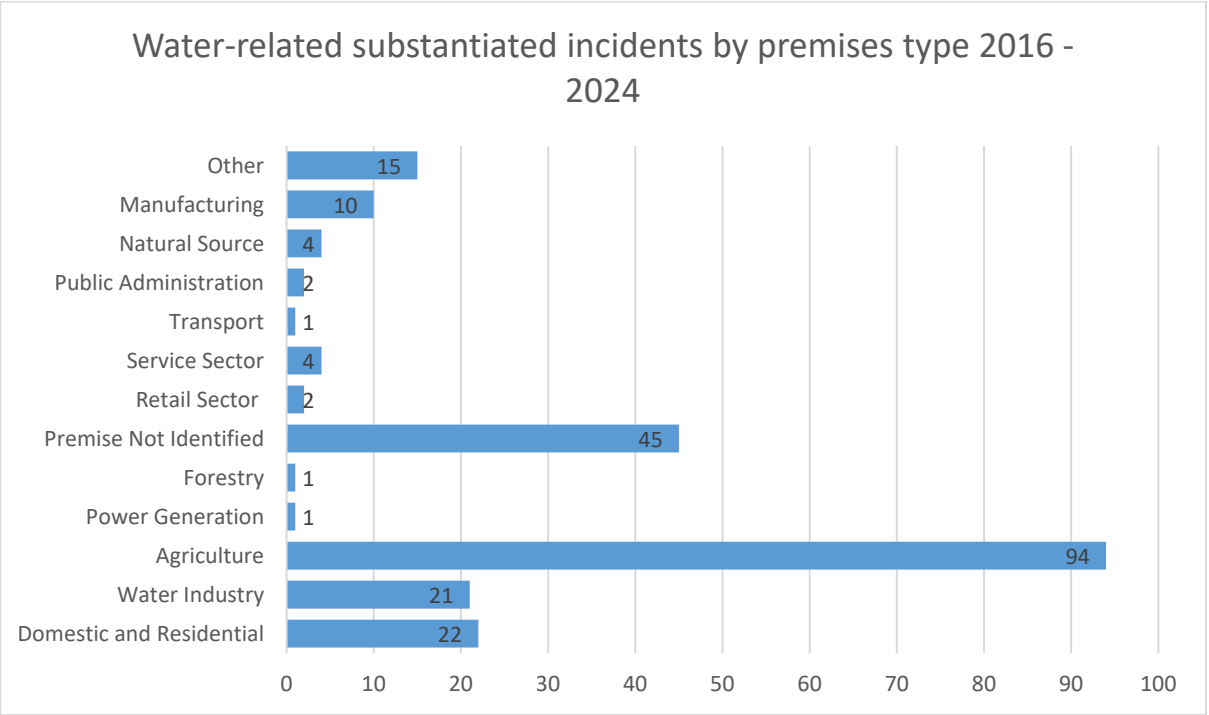


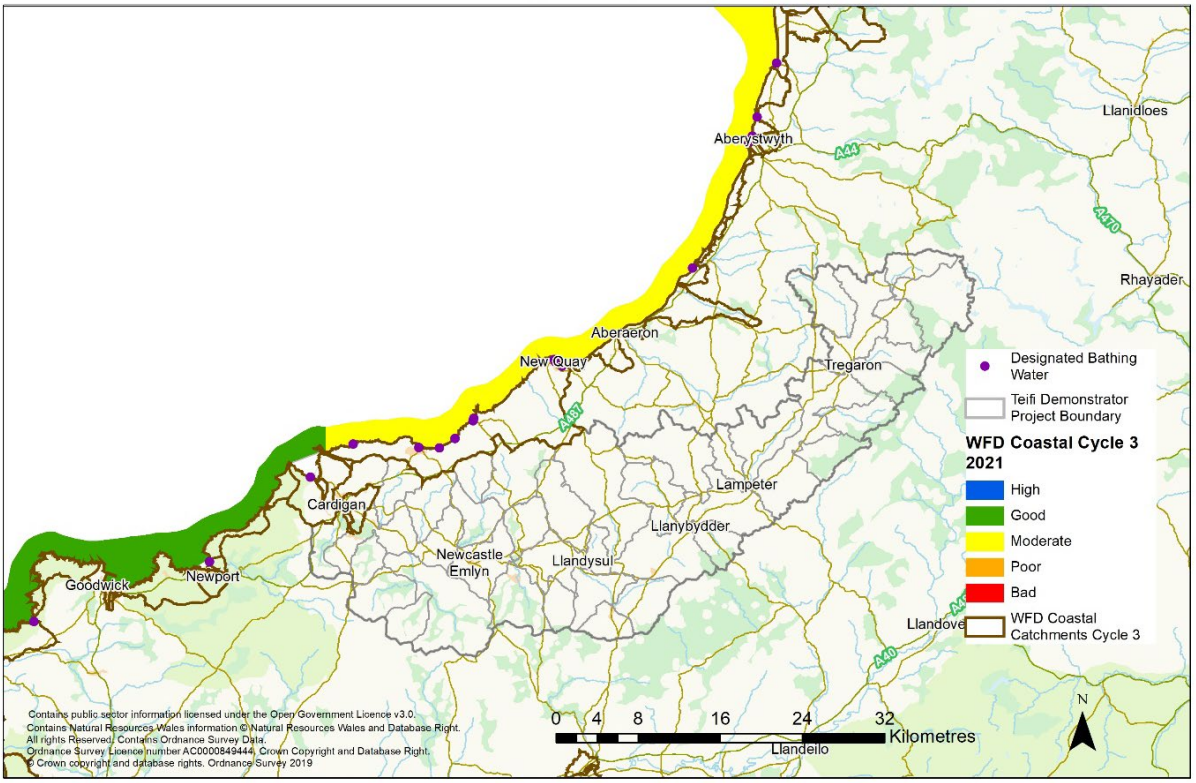
Figure 11. Water related pollution incidents in the Teifi catchment, by premises type, 01/03/2016 - 30/09/2024 (Natural Resources Wales, 2024a).



This data has been used to create maps of pollution incidents across Wales for the Wales Environmental Information Portal, these maps are in the process of being updated by NRW with the more recent data shown above. Information on incidents classed as high is also available on DataMapWales.

2.2.4 Marine areas

Figure 12. Marine protected areas connected to the Teifi catchment.



The River Teifi and its catchment is connected to the Irish Sea and the marine environment of Cardigan Bay (Figure 12). Changes to the river or its catchment could impact these areas, and vice versa. There is one designated Bathing Water in the Teifi catchment: Poppit West (designated under the Bathing Water Regulations 2013); the entire Teifi catchment is considered as an area affecting the Bathing Water. Poppit West is also designated as a nutrient sensitive area under the Urban Waste Water Treatment (England and Wales) Regulations (1994).

The River Teifi flows into the Cardigan Bay marine SAC. The condition of this SAC in the 2018 indicative condition assessment can be seen in Table E.

Table E. Indicative condition of Cardigan Bay SAC Features from the 2018 assessment (Natural Resources Wales, 2018b)

Designated Features	**Indicative condition assessment**
Bottlenose dolphin (*Tursiops truncatus*)	Favourable
Grey seal (Halichoerus grypus)	Favourable
River lamprey (Lampetra fluviatilis)	Favourable

Designated Features	Indicative condition assessment
Sea lamprey (Petromyzon marinus	Unknown
Reefs	Favourable
Sandbanks which are slightly covered by seawater all the time	Unfavourable
Submerged or partially submerged sea caves	Unknown

There are two WFD Regulations coastal water bodies, 'Cardigan Bay South' (GB621009580000) and 'Cardigan Bay Central' (GB651009030000), which the Teifi also discharges to (Figure 12). They were assessed as Good and Moderate respectively in the 2021 WFD assessment.

2.5 Permitting activities

2.5.1 Water discharge and groundwater activity permits

Direct discharges of sewage and wastewater are regulated by NRW to control their impact on water quality. Permits detail the volume that can be discharged and limits substances within the effluent that can be released for any discharge which is not classed as exempt (Natural Resources Wales, 2024b; Natural Resources Wales, 2023c). The largest discharges are the Wastewater Treatment Works (WwTW) managed by DCWW.

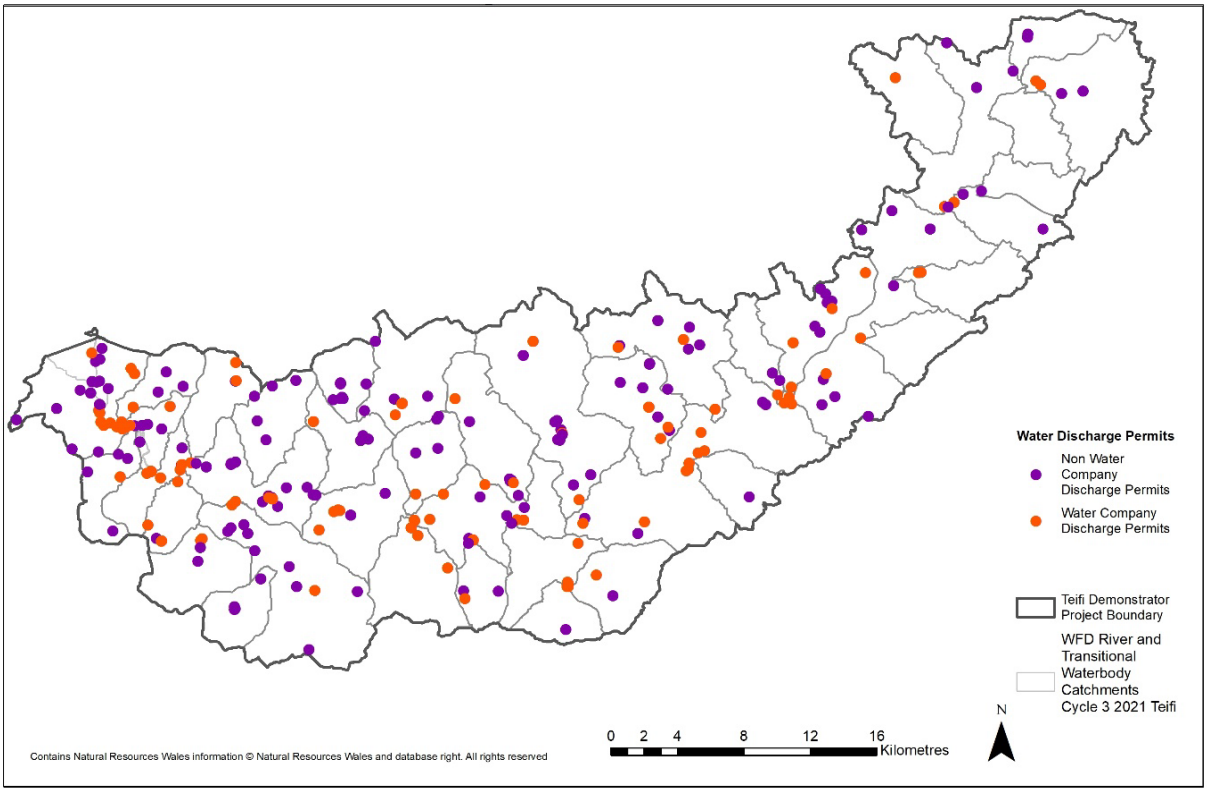
On the 14/03/2024 in the Teifi Catchment, there were 278 sites with permits for water discharge and groundwater activities, discharging to either surface water (rivers and streams) or groundwater (into land). The breakdown of these permits by site description is shown in Table F. 114 of these site permits are held by DCWW, including permits for two Water Treatment Works at Strata Florida and Llechryd, and 28 WwTWs (Natural Resources Wales, 2024b). The remaining 84 DCWW site permits are mainly for storm overflows and sewage pumping stations, which may be required to discharge at periods of high flow. The spatial distribution of these permits is seen in Figure 13.

Table F. Water Discharge permits by site description (Natural Resources Wales, 2024b).

Site Description	No. of Permits	% of Total	DCWW?
Education, hospitals, recreational centres, offices, schools, and short-stay accommodation	33	12%	No
Domestic properties (multiple and single)	94	34%	Yes (2)
Sewerage network - including WwTW, pumping stations and storm overflows	118	42%	Yes (110)

Site Description	No. of Permits	% of Total	DCWW?
Water Treatment Works	2	1%	Yes (2)
Fish Farm	1	0%	No
No. Site Description	30	11%	No
Total	**278**		**114**

Figure 13. Permitted discharges in the Teifi catchment, with data downloaded on 14/03/2024 (Natural Resources Wales, 2024b).

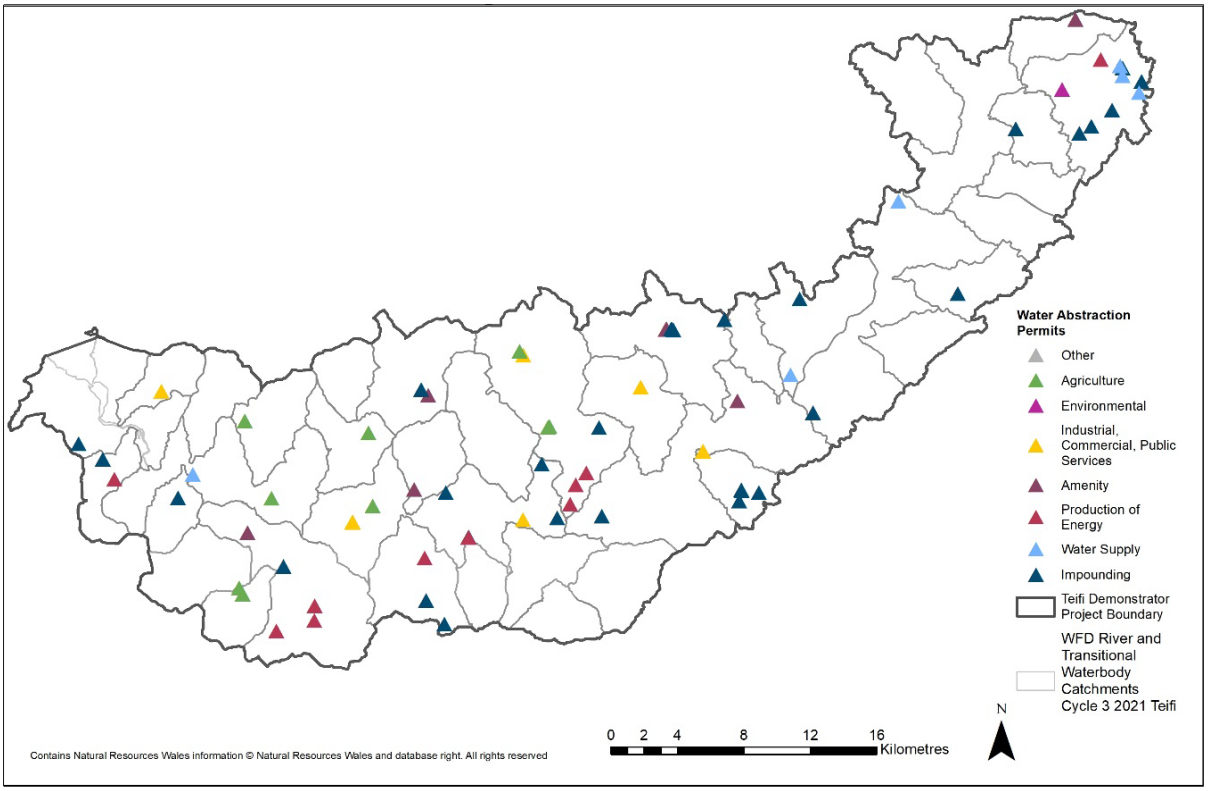


2.5.2 Water abstraction licences

As of 29/08/2024 there are 88 abstraction licences in the Teifi catchment. Under the Water Act 2003 all abstraction of 20 cubic metres per day or more require a licence (Natural Resources Wales 2024c). Each licence has a maximum abstraction quantity that the holder must adhere to. Abstraction licences can be seen in Figure 14 categorised by primary purpose.

An extensive review (Habitats Directive Review of Consents) of abstraction and impoundment licences within riverine SAC catchments has already been undertaken based on the evidence available. The flow targets in the Teifi Core Management Plan remain the same and have not altered since NRW produced the following summary, as still deemed protective and all new licences are assessed to comply with those targets. The flow assessment concluded that the Teifi passes its flow targets with confidence (Carpenter, 2012).

Figure 14. Permits for water abstraction in the Teifi catchment, with data downloaded on 29/08/2024 (Natural Resources Wales, 2024c).



2.5.3 Water discharge and groundwater activity exemptions

Many discharges do not require a permit, in which case they should be registered as an exemption with NRW (Natural Resources Wales, 2024d). Exemptions cover smaller (often single household) discharges of treated domestic sewage to surface water (under 5 cubic metres) or groundwater (under 2 cubic metres), managing vegetation near/on water, substances released into the ground for scientific purposes and discharges from open loop cooling and heating systems.

As of 12/06/2024 there were 4461 registered water quality permit exemptions within the Teifi Catchment. 4196 of these are within the WFD Regulations river water bodies and the remaining 265 are found at the mouth of the estuary. 4183 of these discharges are to groundwater, 241 are to surface water and 37 are unknown. Of the 4196 water quality exemptions in the river water body catchments, only 35 of these are not classified as sewage discharges (Natural Resources Wales, 2024e). A break-down of exemptions by water body can be seen in Appendix C. Unfortunately, it is suspected that the total number of these exemptions, especially single household discharges of domestic sewage (Septic tank users) is an underestimate, as registration of these is conducted on a voluntary basis.

2.5.4 Waste sheep dip disposal permits

Sheep dip is a liquid insecticide and fungicide used to protect sheep from pests. Cypermethrin based sheep dips were previously authorised for use in the UK, as of 2010 they have been banned (Environment Agency, 2019). The active ingredient in current sheep dips is diazinon. Sheep dips are hazardous substances that can pollute groundwater and surface water and have a devastating effect on aquatic invertebrate populations, which in turn can deprive fish of food for large stretches of the river. This negative effect on invertebrate populations in the upper Teifi has been observed through investigations conducted in 2003 and 2004 (Rutt, 2004; Environment Agency Wales, 2003).

As of 14/06/2024 there are 29 effective permits within the Teifi catchment. Sixteen permits were in use before April 1999, the remaining 13 permits were issued and became effective between 2004 and 2021 (Natural Resources Wales, 2024f).

Historically farmers have been able to apply for an environmental permit to dispose of waste sheep dip to land. After a recent review, NRW has stopped issuing new permits that allow farmers to dispose of waste sheep dip to land. Instead, farms will need to have the waste dip removed by a registered waste carrier and disposed of in a suitable waste facility.

2.5.5 Review of permits

In response to the 2021 phosphorus compliance assessment report (Hatton-Ellis and Jones, 2021) NRW undertook a Review of Permits under Article 6(2) of the Habitats Directive and associated Regulations to take appropriate measures to avoid the deterioration of SACs. The review included Dŵr Cymru/Welsh Water (DCWW) WwTW permits with a Dry Weather Flow of 20m^3/day or more into the catchment area of all SAC rivers and included the addition of phosphorus onto permits where required. In addition, if amendments were also required to other limits on the permit for Biochemical Oxygen Demand, Suspended Solids, and/or Ammonia these were also varied.

For the Teifi, 27 WwTW permits were included in the review and details of the phosphorus limits are summarised in Table G below. Limits were based on the assumptions in and outputs from the Source Apportionment Geographic Information System (SAGIS) water quality modelling undertaken by DCWW and independently quality assured by NRW. Many permits have a future date for implementation of a tighter limit which will be delivered as part of the Water Company Asset Management Plan (AMP) programme. The phosphorus limits are set as annual average of 12 monthly samples for Total Phosphorus (TP). NRW has published details of the permits which have been varied - Natural Resources Wales / Phosphorus limits on environmental permits for waste water treatment work discharges.

The agreed PR24 investment will enable DCWW to carry out improvements at their WwTWs to comply with the RoP standards. This will be delivered through Asset Management Programme (AMP) period 8 2025-2030 or AMP 9 (to 2032) (See Section 5).

Table G Revised list of water discharge permits for the Teifi catchment, correct as of 20/09/2024. In this table, 'P' refers to phosphorus and the effective date limits for (1) (2) are the dates from which the WwTWs are required to meet the 'P' limit.

WwTW Name	Permit Number	P limit (1) mg/l	Effective date P limit (1)	P limit (2) mg/l	Effective date P limit (2)
LAMPETER	BP0045001	5mg/l	12/12/2023	0.5mg/l	31/12/2025
ADPAR CEREDIGION	BN0112801	5mg/l	20/12/2023		
CILGERRAN	BP0217801	5mg/l	22/12/2023		
LLANYBYDDER CEREDIGION	BJ0091401	5mg/l	29/11/2023		
LLANDYSUL	BG0010201	5mg/l	12/12/2023		
TREGARON	BH0057801	5mg/l	29/11/2023	2mg/l	31/03/2030
PONTRHYDFENDIGAID	BN0040202	5mg/l	27/12023	1.8mg/l	31/03/2030
HENLLAN	BN0013701	5mg/l	26/01/2024		
LLECHRYD	BG0024901	5mg/l	21/02/2024		
DREFACH/VELINDRE	BH0060601	5mg/l	01/12/2023		
PENCADER	BG0007801	5mg/l	30/04/2024	3.5mg/l	31/03/2032
ABERCYCH	BG0034501	5mg/l	12/12/2023		
CWRTNEWYDD	BN0005601	5mg/l	11/04/2024		
CAPEL IWAN	BN0054901	5mg/l	10/01/2024	1.8mg/l	31/03/2030
CELLAN	BN0008101	5mg/l	19/12/2023		
CENARTH CEREDIGION	BP0101201	5mg/l	22/02/2025		
CRIBYN	BG0027001	5mg/l	24/06/2024	3.5mg/l	31/03/2032
FFOSTRASOL	BH0072801	5mg/l	26/06/2024	4.5	31/03/2032
GORSGOCH	BG0043501	5mg/l	02/07/2024	3mg/l	31/03/2032
LLANFIHANGEL-AR-ARTH	BN0020802	5mg/l	13/11/2023	2mg/l	31/12/2025
NEWCHAPEL	BP0219501	5mg/l	27/06/2024	3.2mg/l	31/03/2030
PENTRECWRT	BG0036101	5mg/l	08/03/2024		
RHYDLEWIS LLANDYSUL	BP0013501	5mg/l	12/03/2024	4.5mg/l	31/03/2030
LLANGYBI LAMPETER	BG0021501	5mg/l	19/12/2023		
BONCATH	BG0001201	5mg/l	22/01/2024		
LLANDEWI BREFI	BG0023501	1.5mg/l	12/07/2023	1.5mg/l	31/03/2030
BEULAH CERED'N	BN0015801	5mgl	26/01/2024	2mg/l	31/03/2030

2.6 Price Review 2024 National Environment Programme (NEP)

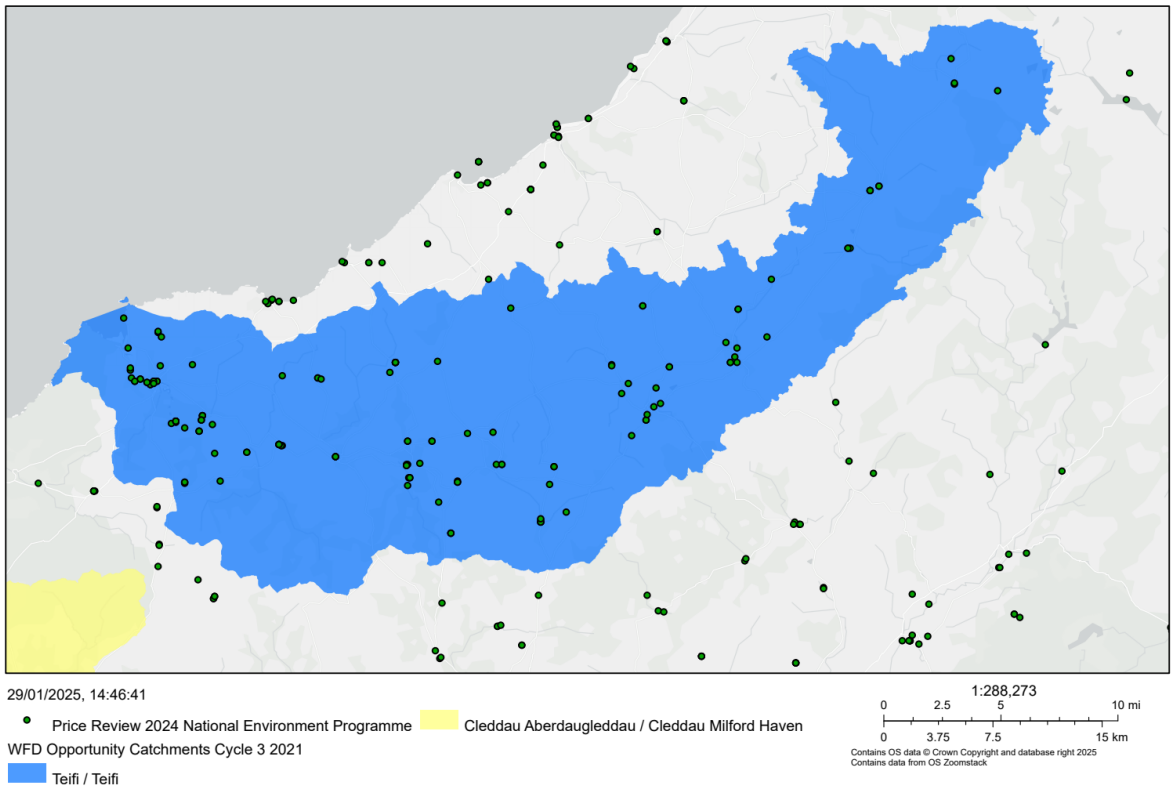
The Price Review 2024 (PR24) Final Determination (FD) National Environment Programme (NEP) dataset is a Wales-wide spatial point dataset that identifies the environmental legislative obligations on water companies operating in or benefitting from Wales's natural resources (see

Figure 15 for spatial points in the Teifi Catchment). The dataset can be accessed via the Wales Environmental Information Portal under the Water Framework Directive tab. In the Teifi catchment, the operating water company is DCWW. Delivery of the identified actions occurs in the Asset Management Plan (AMP) period. The PR24 NEP will be delivered via the 8th edition of the AMP (AMP8) from 1 April 2025 to 31 March 2030. These actions are intended to ensure compliance with new and changed environmental obligations relevant to the water companies.

This dataset is published reflecting the version of the NEP used in Ofwat's FD for PR24. It does not reflect additional funding by Ofwat at FD for specific actions by DCWW and HD for extra storm overflow improvements.

During its delivery in AMP8 the NEP actions may be subject to change.

Figure 15. Price Review (2024) Final Determination (FD) National Environment Programme (NEP) dataset mapped to the Teifi catchment.



2.7 Fisheries regulation

NRW's responsibilities include maintaining, improving, and developing fisheries, and enhancing their contribution to the economy (Natural Resources, Wales 2022d). NRW regulates freshwater and migratory fisheries in Wales in a number of ways, including:

- Byelaws: NRW sets national and local byelaws that govern where, when, and how people can fish for different species in all waters in Wales. These byelaws apply to all waters, regardless of ownership. Some species of fish in Wales are protected because they are rare or vulnerable. For example, all salmon must be released unharmed, and worm fishing for salmon is prohibited.
- Licences: NRW sells annual rod licences to control, support and manage fish stocks. Migratory rod licence holders are required to complete annual catch returns to help assess stocks of salmon and sea trout. NRW typically receives catch returns from the Teifi from over 200 rod licensees. NRW also licences commercial net fisheries in some river estuaries, including up to 15 licences on the Teifi for coracle and seine netting. The number of commercial licences available is controlled via a Net Limitation Order, which is reviewed every ten years.
- Free passage: NRW regulates and facilitates the free passage of migratory fish and eels.
- Fish movement: NRW, along with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), controls the movement and introduction of fish into inland waters.
- NRW annually assesses the status of salmon and sea trout stocks, which informs the informs the management and regulation of fisheries. The Teifi catchment assessment for fish is discussed in Section 3.2.

2.8 Control of Agricultural Pollution Regulations

Welsh Government introduced The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 (CoAPR) on the 1 April 2021 with some measures implemented over a phased timetable with the final measures being introduced on 1 August 2024.

CoAPR consolidate the Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (Wales) Regulations 2010 (as amended) and the Nitrate Pollution Prevention Regulations after public consultation. CoAPR harmonised definitions and calculation methodologies. CoAPR are subject to a statutory 4-year review which should be completed by 1 April 2025.

CoAPR requirements includes:

- Definitions for certain materials, activities, and structures, for example nitrogen fertiliser, organic manure, and slurry.
- Containment of all slurry (as defined) and silage effluent.
- Require minimum capacity and construction standards for the structures used for storage of organic manures (plant animal and human sources) and silage.
- Sets requirements and duration for the use of temporary field heaps for solid organic manures.
- Set conditions when nitrogen fertiliser (any fertilising material containing N) may be spread – wet waterlogged, buffers against water courses etc.

- Set controls for applications from organic and inorganic fertilising materials.
- Sets limits for total nitrogen loading at farm (livestock manures) and field level (organic manures).
- Requirement of a written nitrogen plan (annually before and spreading takes place) and record of spreading activities.

NRW have recruited staff to undertake compliance and enforcement inspections with respect to CoAPR. CoAPR is included within the requirements of Cross Compliance as Statutory Management Requirement 1. All farmers and land managers in Wales applying for Welsh Governments Basic Payment Scheme (BPS) and/or certain land-based Rural investment schemes, are responsible for meeting the Cross Compliance requirements. In a 12-month period from December 2023 to December 2024 47 farm visits were undertaken in the Teifi and Ceredigion North operational catchment, 20 of these farms were compliant and 27 were non-compliant.

2.9 Materials to land

The recovery (not disposal) of waste and livestock manures to agricultural land for agricultural (provision of the required nutrients for crop growth) or ecological benefit is commonly referred to as landspreading. In practice this may be surface applications or shallow injection of the organic material. The inappropriate storage and landspreading of these organic manures have the potential to pollute surface and groundwaters. This can include lack of adequate storage capacity and spreading in inappropriate soil /weather conditions or application rates. The regulatory frameworks controlling the application of organic manures to land are complex. They include:

- Environment Permitting Regulations (EPR) 2016,
- The Sludge (Use in Agriculture) Regulations 1989 (SUiAR),
- The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 (CoAPR) (See Section 2.8)
- Definition of Waste - The Waste (England and Wales) Regulations 2011/ The Waste (Circular Economy) (Amendment) Regulations 2020

These frameworks cover the storage and application of organic materials applied to land by multiple sectors including agriculture, the water industry, the waste industry and the food and drink industry.

The CoAPR require Welsh Government (WG) to carry out a review of the effectiveness of the measures which is due to be published by 1 April 2025. WG also announced a review of the regulatory framework related to organic manure in July 2024.

2.10 Section summary

WFD Regulations 2017 provide a framework for protecting and improving the Teifi catchment. Between 2021 and 2024 the WFD classifications show a mixed picture for the Teifi catchment, as whilst the number of Good water bodies increased from 37% to 44%, and the number of Moderate water bodies has decreased, the number of Poor water bodies has also increased (Table A).

The Teifi river and 10 tributaries (18 river water bodies) are also designated as a Special Area of Conservation (SAC), under this designation the river receives special protection from development to ensure the conservation of the SAC. The Afon Teifi/ River Teifi SAC is also a Site of Special Scientific Interest (SSSI) and restoring the SSSI features is an objective of the River Teifi SAC. The most recent assessment shows an improvement for three water quality parameters including Phosphorus. One water quality parameter, Trophic Diatom Index (TDI), declines.

The rest of this section details the information NRW records on activities which impact water quality, this includes water abstraction and discharge, control of agricultural pollution and fisheries regulation.

Recommendations:

- To consider the current management (such as designations) of the Teifi catchment when undertaking interventions to ensure that work has synergistic benefits where possible.
- To consider how this evidence review, and subsequent research may inform future river basin management planning, and land use planning and development.
- Evidence gaps which require further investigation are the limited of understanding of:
  - The number, type, and impact of private sewage systems in the Teifi catchment.
  - The quantity and type of material to land application in the Teifi catchment.

3. What are the problems with the water environment in the Teifi catchment?

As described in section 2 there are several water quality datasets that provide information on the status of water bodies within the Teifi catchment. Table H provides a water body overview of the 2021 and 2024 WFD Regulations assessments and Table I provides a water body overview of the previous and recent SAC assessments (See section 2.2.1 and explanation of the terms previous and recent). Figure 1 shows the names of the water bodies, as seen in Table H and Table I, on a map. The water bodies in Table H and Table I are also ordered from upper to lower catchment to allow for spatial inference.

In this section each water quality parameter which has caused one or more water body failures is explored. Under the WFD Regulations these are referred to as elements and under SAC condition assessments as attributes. The below section also explores other pressures on water quality identified within the Teifi catchment through conversations with stakeholders and by the Western Wales River Basin Management Plan, the current RBMP for the Teifi.

Table H. 2021 and 2024 WFD Regulations Assessments overall water body classification including failing elements. Driving elements are in bold for Poor water bodies with two or more failing elements (Natural Resources Wales, 2025b).

Water Body ID	Water Body Name	Water body Type	Overall Water body Status (2021)	Failing Elements (2021)	Overall Water body Status (2024)	Failing Elements (2024)	Change (Element or Overall) between 2021 and 2024
GB31038398	Pond y Gwaith	Lake	Moderate	Littoral Inverts	Moderate	Littoral Inverts	No change
GB31038390	Llyn Teifi	Lake	Moderate	Littoral Inverts	Moderate	Littoral Inverts	No change
GB31038394	Llyn Hir	Lake	Poor	**Littoral Inverts**	Poor	**Littoral Inverts**; Total Phosphate	Change
GB31038409	Llyn Egnant	Lake	Poor	**Littoral Inverts**; Hydrological Regime	Poor	**Littoral Inverts**; Hydrological Regime	No change
GB110062043540	Teifi - headwaters to confluence with Meurig	River	Moderate	Zinc	Moderate	Zinc	No change
GB110062043550	Meurig - headwaters to confluence with Teifi	River	Moderate	Zinc; Cadmium; Lead	Poor	**Fish**; Cadmium; Lead; Zinc	Change
GB110062043530	Camddwr - headwaters to confluence with Teifi	River	Moderate	Fish	Moderate	Fish	No change
GB110062043501	Teifi - conf with Meurig to conf with Brennig	River	Moderate	Fish; Inverts; Cypermethrin	Moderate	Fish; Zinc	Change
GB110062043510	Fflur - headwaters to confluence with Teifi	River	Moderate	Fish	Moderate	Fish	No change
GB110062043490	Groes - headwaters to confluence with Brennig	River	Good	N/A	Good	N/A	No change
GB110062043470	Berwyn/Brennig - headwaters to confluence with Teifi	River	Good	N/A	Good	N/A	No change
GB110062039250	Brefi - headwaters to confluence with Teifi	River	Good	N/A	Good	N/A	No change
GB110062039200	Clywedog - headwaters to confluence with Teifi	River	Good	N/A	Good	N/A	No change
GB110062043566	Teifi - Afon Brennig to Afon Dulas	River	Moderate	Fish	Moderate	N/A	No change
GB110062039240	Dulas - headwaters to conf Teifi	River	Moderate	Fish	Moderate	Fish	No change

Water Body ID	Water Body Name	Water body Type	Overall Water body Status (2021)	Failing Elements (2021)	Overall Water body Status (2024)	Failing Elements (2024)	Change (Element or Overall) between 2021 and 2024
GB110062039210	Creuddyn - headwaters to confluence with Teifi		Good	N/A	Good	N/A	No change
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	River	Moderate	Fish	Good	N/A	Change
GB110062039230	Grannell - headwaters to confluence with Teifi	River	Moderate	Macrophytes and Diatoms	Moderate	Macrophytes and Diatoms	No change
GB110062039150	Cledlyn - headwaters to confluence with Teifi	River	Moderate	Fish; Macrophytes and Diatoms; Phosphate	Poor	**Fish**; Macrophytes and Diatoms; Phosphate	Change
GB110062039060	Duar - headwaters to confluence with Teifi	River	Good	N/A	Good	N/A	No change
GB110062039220	Clettwr - headwaters to confluence with Teifi	River	Moderate	Phosphate; Macrophytes and Diatoms	Moderate	Phosphate; Fish	Change
GB110062039140	Cerdin - headwaters to confluence with Teifi	River	Good	N/A	Good	N/A	No change
GB110062038980	Talog - headwaters to confluence with Tyweli	River	Good	N/A	Good	N/A	No change
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	River	Good	N/A	Good	N/A	No change
GB110062038950	Tyweli - headwaters to confluence with Talog	River	Good	N/A	Good	N/A	No change
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	River	Good	N/A	Good	N/A	No change
GB110062039190	Ceri - headwaters to conf Dulas	River	Moderate	Fish; Phosphate	Moderate	Fish; Phosphate	No change
GB110062039090	Cynllo - headwaters to confluence with Teifi	River	Good	N/A	Good	N/A	No change
GB110062039000	Siedi - headwaters to confluence with Teifi	River	Good	N/A	Good	N/A	No change

Water Body ID	Water Body Name	Water body Type	Overall Water body Status (2021)	Failing Elements (2021)	Overall Water body Status (2024)	Failing Elements (2024)	Change (Element or Overall) between 2021 and 2024
GB110062039180	Dulas - headwaters to conf Ceri	River	Moderate	Fish; Phosphate; Macrophytes and Diatoms; BOD	Moderate	Macrophytes and Diatoms	Change
GB110062039030	Bargod - headwaters to confluence with Teifi	River	Moderate	Phosphate	Good	N/A	Change
GB110062039110	Ceri - Dulas to conf Teifi	River	Poor	Fish; Phosphate; **Macrophytes and Diatoms;** BOD	Good	N/A	Change
GB110062039130	Hirwaun - headwaters to confluence with Teifi	River	Poor	**Fish**; Phosphate	Poor	**Fish**; Macrophytes and Diatoms; Phosphate	Change
GB110062039041	Cych - headwaters to confluence with Teifi	River	Good	N/A	Moderate	Macrophytes and Diatoms	Change
GB110062038960	Cneifa - headwaters to confluence with Cych	River	Good	N/A	Good	N/A	No change
GB110062039010	Dulas – confluence with Cych	River	Good	BOD	Good	N/A	
GB110062039050	Morgenau - headwaters to confluence with Teifi	River	Moderate	Fish; Phosphate; Macrophytes and Diatoms	Moderate	Fish; Macrophytes and Diatoms	No change
GB110062039170	Arberth - headwaters to confluence with Teifi	River	Moderate	Phosphate; Macrophytes and Diatoms	Moderate	Phosphate; Macrophytes and Diatoms;	No change
GB110062039070	Piliau - headwaters to confluence with Teifi	River	Moderate	Fish; Phosphate	Moderate	Phosphate; Fish; Macrophytes and Diatoms	Change
GB110062039160	Mwldan	River	Poor	**Fish**; Phosphate	Poor	**Fish**; Phosphate	No change

Water Body ID	Water Body Name	Water body Type	Overall Water body Status (2021)	Failing Elements (2021)	Overall Water body Status (2024)	Failing Elements (2024)	Change (Element or Overall) between 2021 and 2024
GB110062043563	Teifi - Afon Ceri to estuary	River	Moderate	Macrophytes and Diatoms	Moderate	Cypermethrin	Change
GB11006206900	Teifi Estuary	Transitional	Moderate	DIN	Moderate	DIN	No change

Table I. Previous (Hatton-Ellis and Jones, 2021; Foster et al., 2024) and recent (Water Watch Wales, 2025) SAC water quality assessments per SAC water body of the seven water quality parameters.

Water body Number	Water body Name	Parameter Pass (Previous)	Parameter Fail (Previous)	Parameter Not Assessed (Previous)	Parameter Pass (Recent)	Parameter Fail (Recent)	Parameter Not Assessed (Recent)
GB110062043540	Teifi - headwaters to confluence with Meurig	Phosphorus; DO; BOD; T-NH3; U-NH3; pH; ANC		TDI	Phosphorus; DO; BOD; T-NH3; U-NH3; pH; ANC		TDI
GB110062043501	Teifi - conf Fflur to conf Brennig	Phosphorus; T-NH3; U-NH3; pH; ANC	DO; BOD	TDI	Phosphorus; BOD; T-NH3; U-NH3; pH; ANC	DO	TDI
GB110062043566	Teifi - Afon Brennig to Afon Dulas	Phosphorus		DO; BOD; T-NH3; U-NH3; pH; ANC; TDI	Phosphorus; T-NH3; U-NH3; pH; ANC	DO	BOD; TDI
GB110062043490	Groes - headwaters to confluence with Teifi	DO; BOD; T-NH3; U-NH3; pH	Phosphorus	ANC; TDI	DO; BOD; T-NH3; U-NH3; pH	Phosphorus	ANC; TDI
GB110062039250	Brefi - headwaters to confluence with Teifi	DO; pH		Phosphorus; BOD; T-NH3; U-NH3; ANC ; TDI	DO; pH		Phosphorus; BOD; T-NH3; U-NH3; ANC; TDI
GB110062039240	Dulas - headwaters to conf Teifi	Phosphorus; DO; BOD; T-NH3; U-NH3; pH		ANC; TDI	Phosphorus; DO; BOD; T-NH3; U-NH3; pH		ANC; TDI

Water body Number	Water body Name	Parameter Pass (Previous)	Parameter Fail (Previous)	Parameter Not Assessed (Previous)	Parameter Pass (Recent)	Parameter Fail (Recent)	Parameter Not Assessed (Recent)
GB110062039230	Grannell - headwaters to confluence with Teifi	Phosphorus; T-NH3; U-NH3; pH	DO; TDI	BOD; ANC; TDI	Phosphorus; DO; T-NH3; U-NH3; pH	TDI	BOD; ANC
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	Phosphorus		DO; BOD; T-NH3; U-NH3; pH; ANC; TDI	Phosphorus	TDI	DO; BOD; T-NH3; U-NH3; pH; ANC
GB110062039220	Clettwr - headwaters to confluence with Teifi	DO; BOD; T-NH3; U-NH3; pH; ANC	Phosphorus	TDI	DO; BOD; T-NH3; U-NH3; pH; ANC	Phosphorus; TDI	
GB110062038980	Talog - headwaters to confluence with Tyweli			Phosphorus; DO; BOD; T-NH3; U-NH3; pH; ANC; TDI			Phosphorus; DO; BOD; T-NH3; U-NH3; pH; ANC; TDI
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	Phosphorus; DO; BOD; T-NH3; U-NH3; pH		ANC; TDI	Phosphorus; DO; BOD; T-NH3; U-NH3; pH		ANC; TDI
GB110062039140	Cerdin - headwaters to confluence with Teifi	Phosphorus; DO; BOD; T-NH3; U-NH3; pH		ANC; TDI	Phosphorus; DO; BOD; T-NH3; U-NH3; pH		ANC; TDI
GB110062039010	Dulas - headwaters to confluence with Cych	DO; T-NH3; U-NH3; pH	Phosphorus; BOD;	ANC : TDI	Phosphorus; DO; BOD; T-NH3; U-NH3; pH; ANC		TDI
GB110062039041	Cych - headwaters to confluence with Teifi	DO; T-NH3; U-NH3; pH	Phosphorus; BOD	ANC; TDI	Phosphorus; DO; BOD; T-NH3; U-NH3; pH; ANC	TDI	
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	DO; T-NH3; U-NH3; pH	Phosphorus; BOD	ANC ; TDI	Phosphorus; DO; BOD; T-NH3; U-NH3; pH; ANC		TDI
GB110062039190	Ceri - headwaters to conf Dulas	DO; BOD; T-NH3; U-NH3; pH	Phosphorus; TDI	ANC; TDI	DO; BOD; T-NH3; U-NH3; pH; ANC	Phosphorus; TDI	

Water body Number	Water body Name	Parameter Pass (Previous)	Parameter Fail (Previous)	Parameter Not Assessed (Previous)	Parameter Pass (Recent)	Parameter Fail (Recent)	Parameter Not Assessed (Recent)
GB110062039110	Ceri - Dulas to conf Teifi	DO; T-NH3; U-NH3; pH	Phosphorus; BOD	ANC; TDI	Phosphorus; DO; BOD; U-NH3; pH		ANC; TDI
GB110062043563	Teifi - Afon Ceri to estuary	DO; T-NH3; U-NH3; pH	Phosphorus; BOD	ANC; TDI	DO; BOD; T-NH3; U-NH3; pH; ANC		Phosphorus; TDI

3.1 Pressures affecting the water environment

Metals (zinc, cadmium, lead)

Run off and leachate contaminated with toxic metals entering watercourses has an adverse effect on ecosystems and is particularly harmful to aquatic organisms such as fish. The failures of water bodies in the upper reaches of the Teifi catchment are due to leachate of zinc, cadmium and lead entering the watercourse from historic metal mines, causing localised pollution. The impacts of these are being investigated through the Metal Mine Programme led by NRW (See Section 5.2).

WFD Regulations Assessments

Figure 16. 2021 WFD Regulations assessment of metal elements for the river and transitional water bodies within the Teifi Catchment.

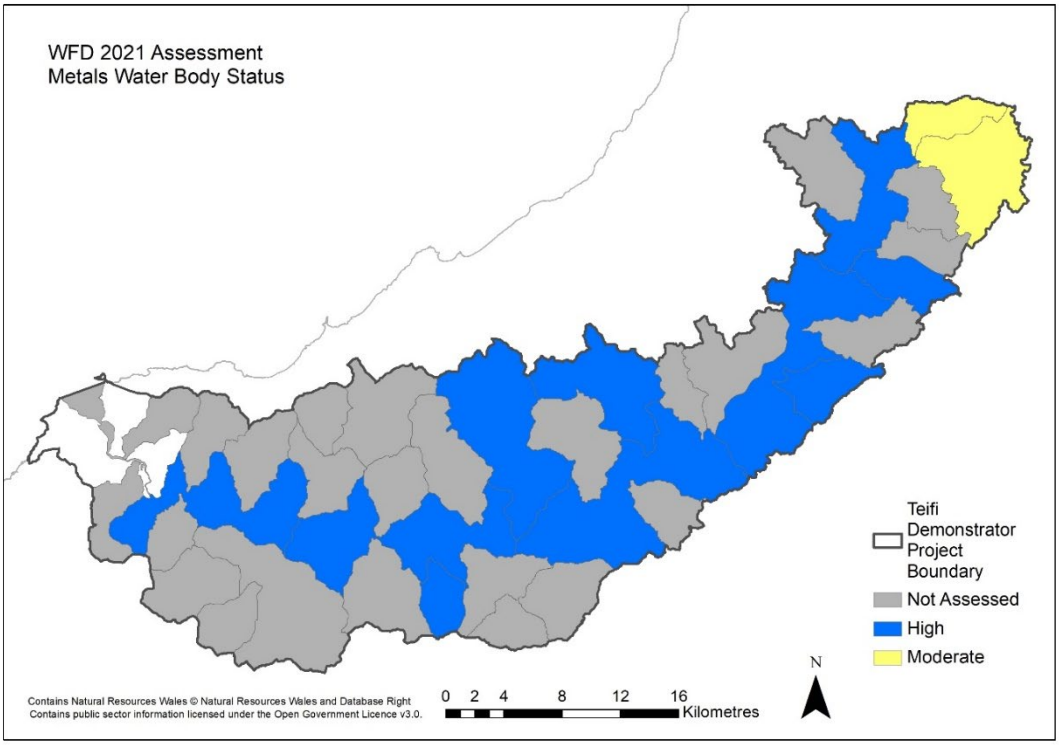
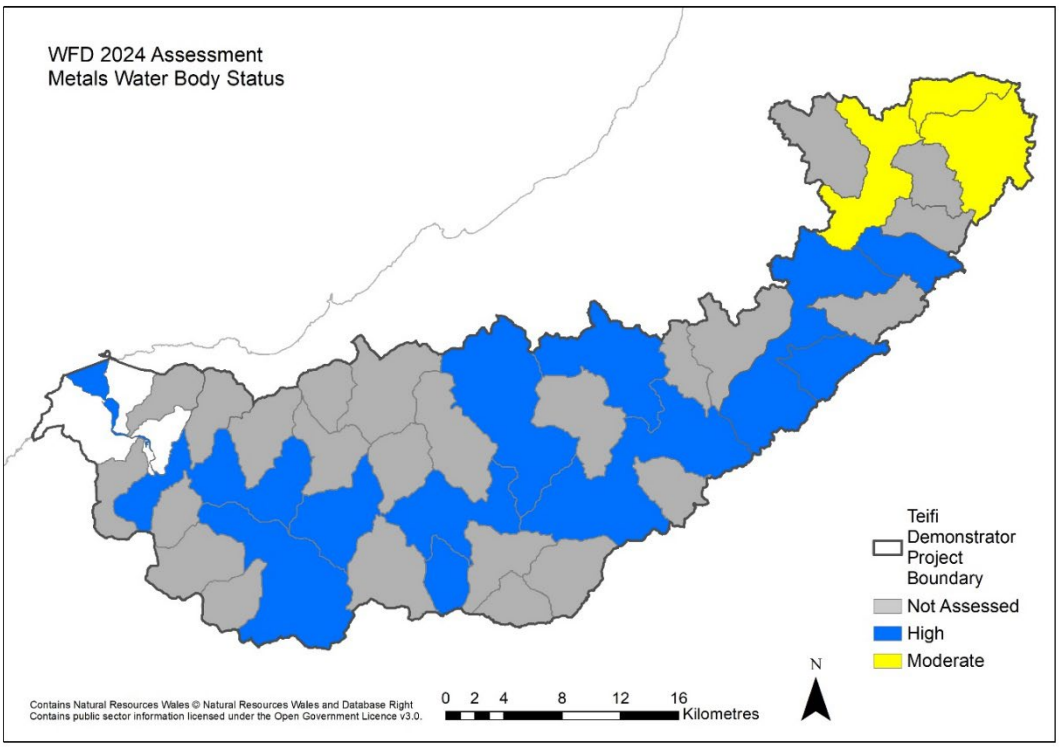


Figure 17. 2024 WFD Regulations assessment of metal elements for the river and transitional water bodies within the Teifi Catchment.



Two water bodies failed due to metal elements in 2021, ‘Teifi - headwaters to confluence with Meurig’ (GB110062043540) and ‘Meurig - headwaters to confluence with Teifi’ (GB110062043550) (See Figure 16 and Table H). The leachate also caused the failure of the groundwater body (Teifi and Coastal Ceredigion - GB41002G203300) within which the Teifi catchment lies.

Three water bodies failed due to metal elements in the 2024 WFD Regulations assessment (See Figure 17 and Table H). The two water bodies which failed in 2021 failed again. ‘Meurig - headwaters to confluence with Teifi’ (GB110062043550) also having a new failure for fish. ‘Teifi - conf with Meurig to conf with Brennig’ (GB110062043501) is a new failure for 2024. The groundwater body was not reassessed in the 2024 assessment, as groundwater is assessed every 6 years.

Cypermethrin

Cypermethrin is a synthetic insecticide which is highly toxic to aquatic life. It binds to soil and sediment and is less soluble in water. It has a fast degradation rate. Sources of cypermethrin include arable farming, forestry, landfill, wastewater treatment works and gardening. Its use has decreased in recent years in both forestry and agriculture, with its use in farming halving between 2000 and 2016, with chemicals such as Diazinon now considered to be of a higher concern across Wales as a whole (Environment Agency, 2019).

WFD Regulations Assessments

Figure 18. 2021 WFD Regulations assessment of cypermethrin for the river and transitional water bodies within the Teifi Catchment.

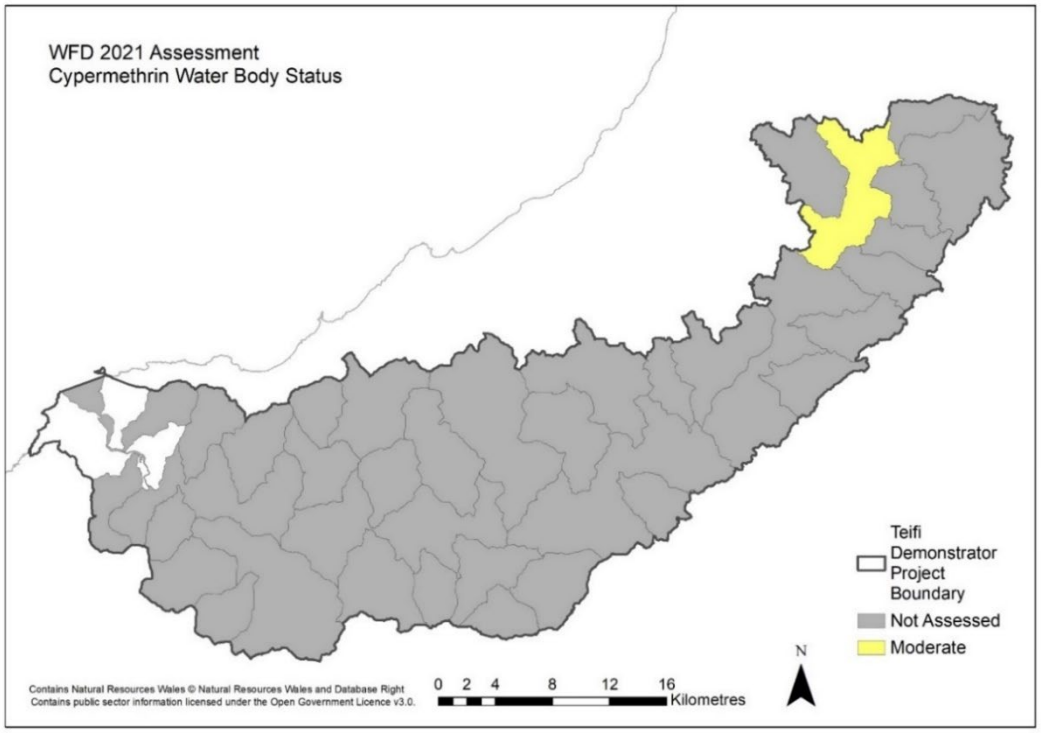
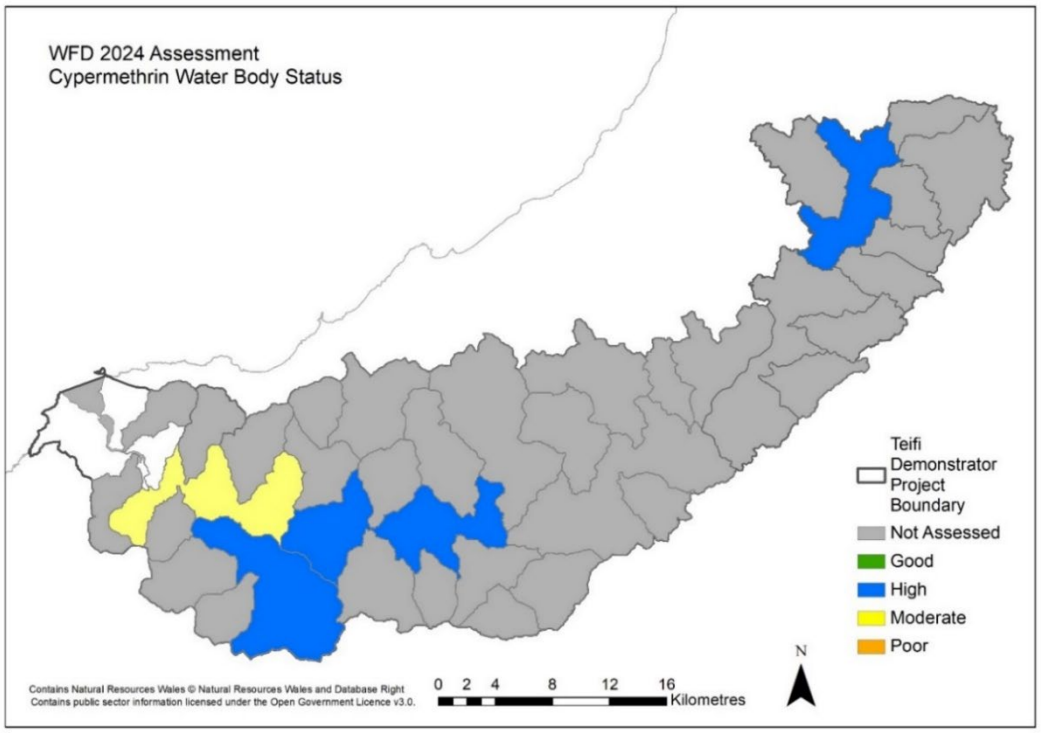


Figure 19. 2024 WFD Regulations assessment of cypermethrin for the river and transitional water bodies within the Teifi Catchment.



One water body within the Teifi catchment, ‘Teifi - confluence with Meurig to confluence with Brennig’ (GB110062043501), which also failed for fish and invertebrates, is classified as failing for cypermethrin in the 2021 WFD assessment (Figure 18 and Table H).

The WFD Regulations standard for cypermethrin classifies any water body that has an average sample concentration of higher than 0.0006 µg/l, or short-term peaks (95th percentile – MAC-EQS) above 0.00006 µg/l, as failing (The EU, 2013). The acceptable drinking water level for all pesticides is classed at 0.1 µg/l per individual pesticide, and 0.5 µg/l combined (Drinking Water Inspectorate, 2024).

In 2021, a large water quality dataset from DCWW was used to complement the WFD Regulations classification, but for cypermethrin, the limit of detection of 0.0038 µg/l in that dataset was higher than the Environmental Quality Standard (EQS) and could not be used for the WFD Regulations classification. There was, however, a small number of detections – six out of over 3,000 samples across Wales in six different locations, each with a single positive result. As all of those were considerably above the EQS, they would likely lead to a breach of the EQS if an average or percentile could be calculated, hence those six water bodies were defaulted to fail. One of them was in the Teifi catchment, leading to the ‘Teifi - confluence with Meurig to confluence with Brennig’ (GB110062043501), failing based off a single sample result, rather than an average sample, this concentration amount was: 0.0061 µg/l and was sampled on 9th May 2019.

The 2024 WFD Regulations assessment sampled four water bodies within the Teifi catchment, and sample technology is now able to detect cypermethrin at lower concentrations to allow for more detailed classification. One water body failed the assessment, ‘Teifi - Afon Ceri to Estuary’ (GB110062043563) (See Figure 19 and Table H).

Phosphorus

Phosphorus is a key nutrient for growth in plants, the availability of which is a limiting factor for their growth in freshwater. Increasing levels of phosphorus, primarily from sewage effluent and agricultural land, result in nutrient enrichment and eutrophication (excessive growth of simple plant life like algae) (Mainstone, 2010). Changes in the composition of river ecosystems have adverse impacts on other species within the river such as fish and invertebrates as well as drinking water quality. As a result, phosphorus levels within rivers are a key indicator for river health, with standards set both under the WFD Regulations and as management targets for SAC rivers (Hatton-Ellis & Jones, 2021). Orthophosphate is the standard determinant used to assess phosphorus as it is the oxidised and bioavailable form of phosphorus within the river.

WFD Regulations Assessments

Figure 20. 2021 WFD Regulations assessment of Phosphorus for the river and transitional water bodies within the Teifi Catchment.

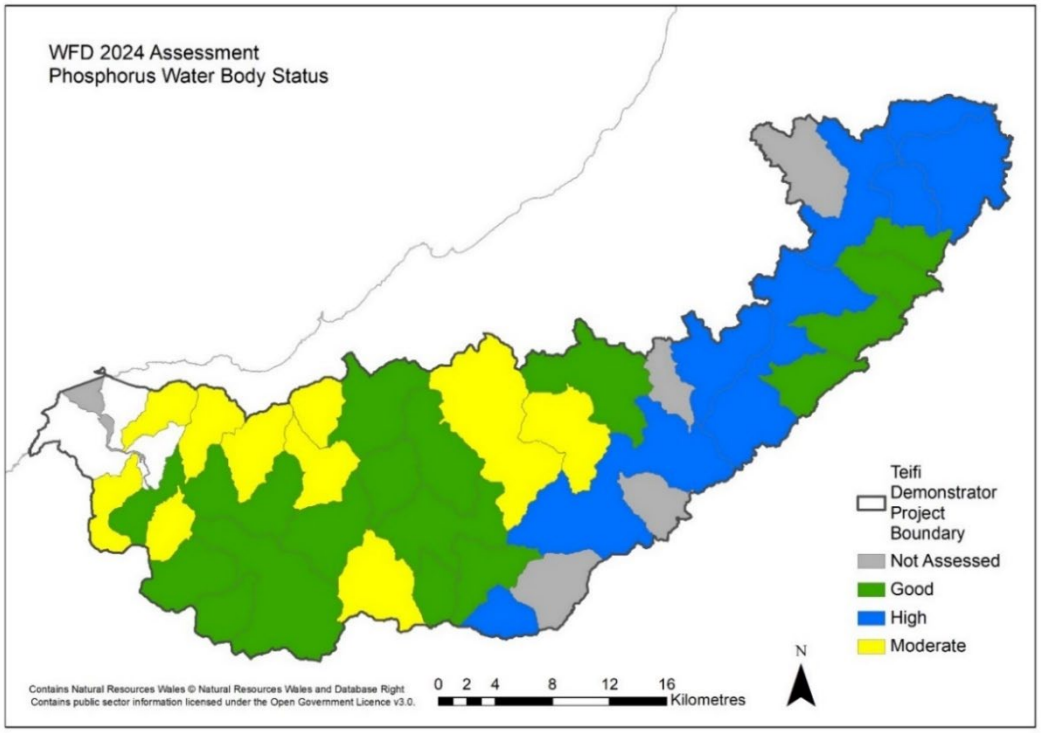
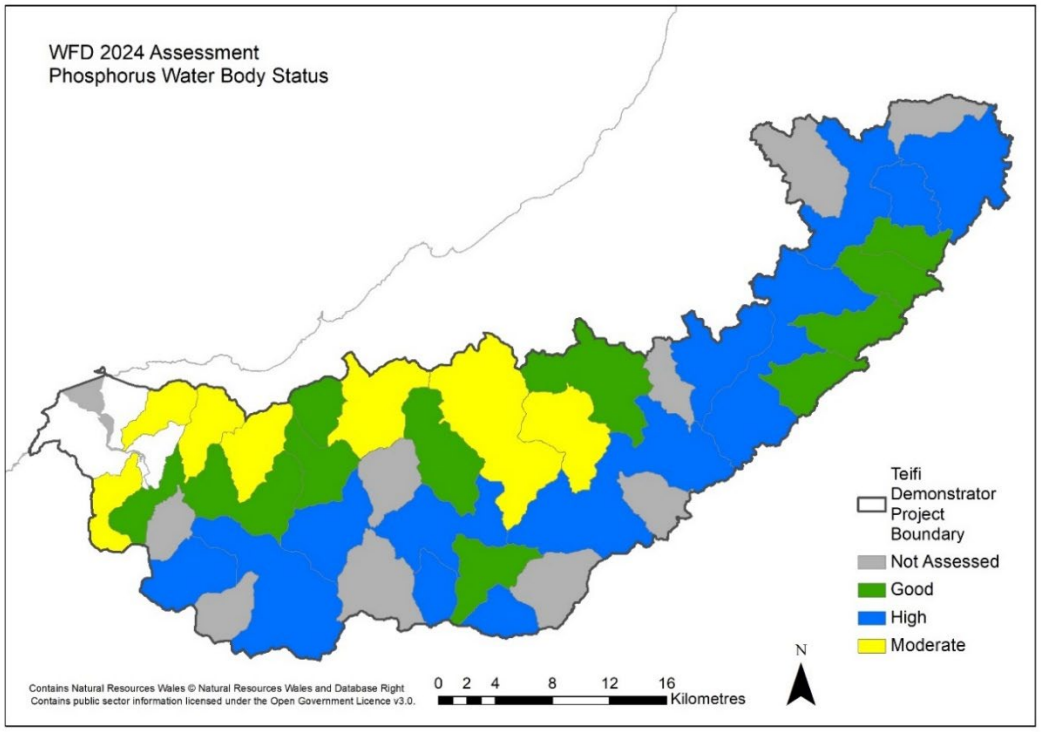


Figure 21. 2024 WFD Regulations assessment of Phosphorus for the river and transitional water bodies within the Teifi Catchment.



Ten water bodies failed to achieve Good status for phosphorus in the 2021 WFD Regulations assessment (Figure 20 and Table H). Seven river water bodies failed for phosphorus in the 2024 WFD assessment (Figure 21 and Table H). The failing water bodies in both assessments are in the mid and lower reaches of the Teifi. One lake water body also failed for phosphorus in 2024, 'Llyn Hir' (GB31038394).

One water body, 'Ceri - Dulas to conf Teifi' (GB110062039110), failed in 2021 and achieves Good in 2024.

Four river water bodies were not assessed in 2021, and nine river water bodies were not assessed in 2024. Two water bodies, 'Bargod - headwaters to confluence with Teifi' (GB110062039030), and 'Morgenau - headwaters to confluence with Teifi' (GB110062039050) failed in 2021 and were not assessed in 2024. The 'Bargod' is now classed as Good, whereas the 'Morgenau' has declined for Fish and has a new failure for Macrophytes and Diatoms.

SAC Assessments

8/18 water bodies (44.5%) passed the 2021 SAC phosphorus compliance assessment (Table I). For the 2024 SAC assessment, 12/18 water bodies (67%) passed (Table I). Two water bodies failed both SAC and WFD 2024 assessment: 'Ceri - headwaters to conf Dulas' (GB110062039190) and 'Clettwr - headwaters to confluence with Teifi' (GB110062039220). Two water bodies failed the SAC assessment but did not fail the WFD assessment: 'Groes - headwaters to confluence with Teifi' (GB110062043490) and 'Teifi - Afon Ceri to estuary' (GB110062043563). Four water bodies which failed in 2021 have passed in 2024. In 2021 and 2024 two water bodies were unassessed.

Combined Assessments

In 2021, 16 water bodies failed to meet their objectives for phosphorus (Figure 22). In 2024, 9 water bodies failed to meet their objectives for phosphorus, meaning there is an improvement in phosphorus compliance across the catchment (Figure 23). There is also an increase in unassessed water bodies in 2024. The general picture that emerges is of increasing incidence of phosphorus non-compliance moving down the catchment, however this trend was more pronounced in the 2021 results than in 2024.

Figure 22. Combined phosphorus failures within the Teifi catchment for the 2021 SAC and 2021 WFD Regulations phosphorus assessments.

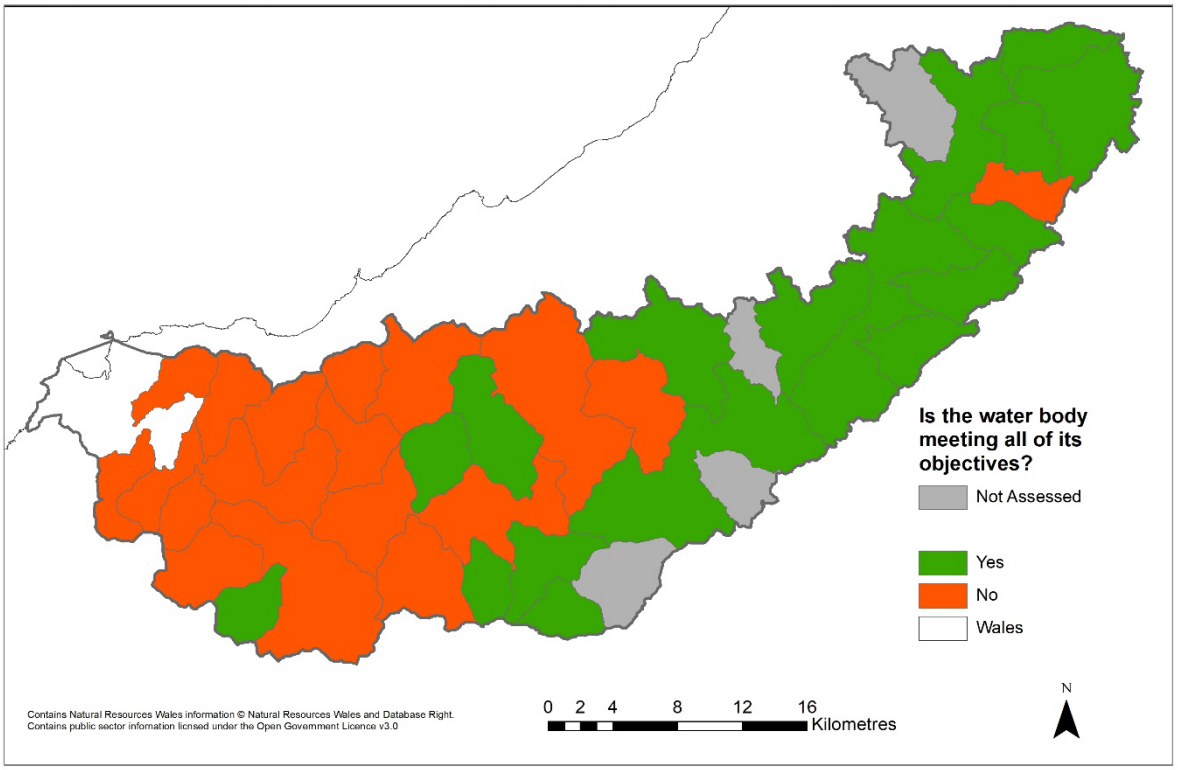


Figure 23. Combined phosphorus failures within the Teifi catchment for the most recent 2024 SAC and WFD Regulations assessments

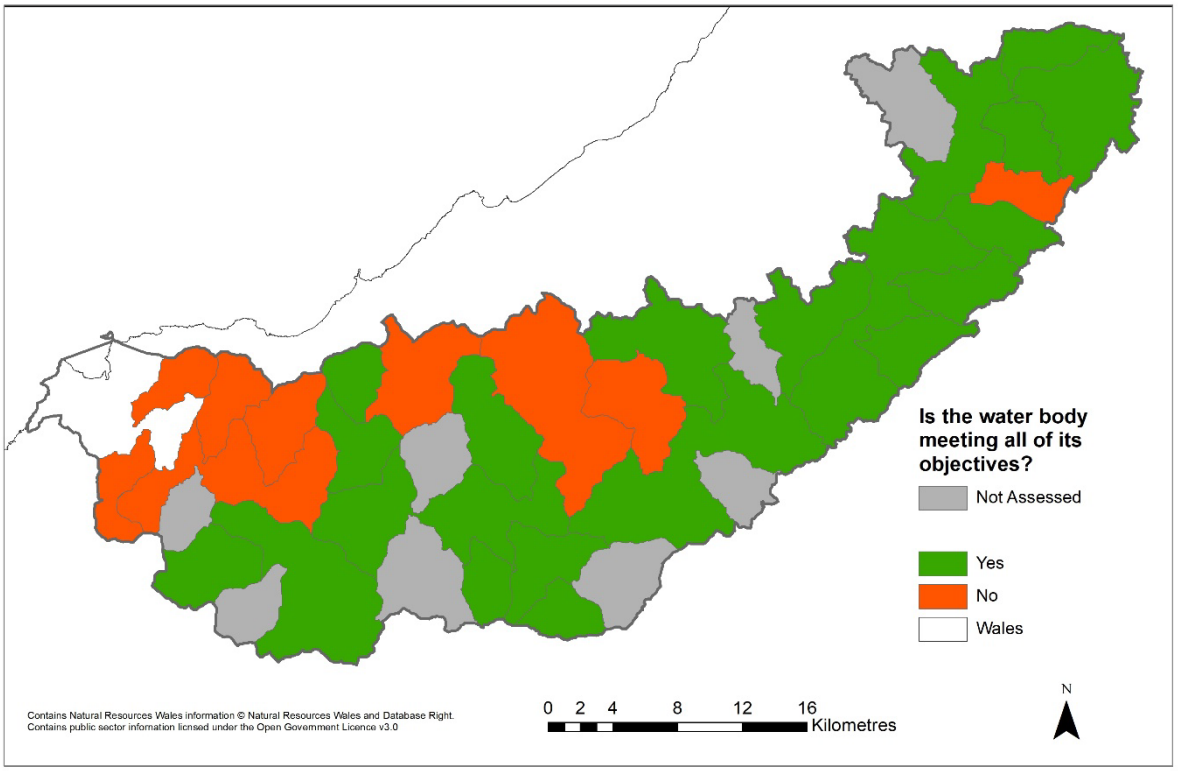
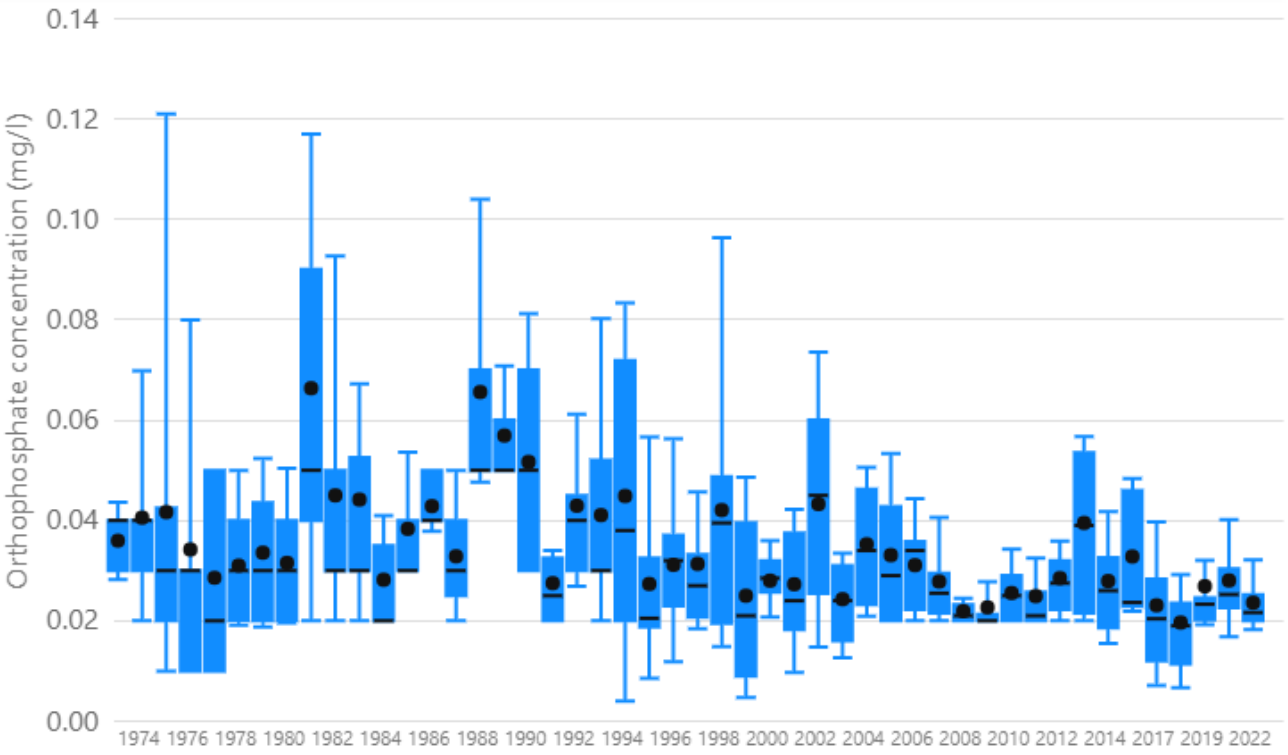


Figure 24 is a summary of longer-term data collected for orthophosphate at Llechryd Bridge, in the water body Teifi – Afon Ceri to estuary (GB110062043563). It is shown here as it is one of the last sampling points measured by NRW in the main river before it meets the Teifi Estuary and has a long-term dataset. Figure 24 shows how the mean orthophosphate concentrations have fluctuated over time and overall have slightly decreased from when Llechryd Bridge was sampled in 1974. The variation between yearly samples has decreased over time also, resulting in greater confidence in the mean result.

Figure 24. Teifi at Llechryd Bridge Orthophosphate mgl-1 P. Annual means 1974 – 2022. Mean (dot), Median (line), Quartiles (box), 95% confidence intervals (whiskers).



Dissolved inorganic nitrogen (DIN) – Teifi Estuary

DIN is used as an indicator of nutrient enrichment in transitional and coastal waters, as it is usually the limiting nutrient for algal growth in sea waters (Scottish Government, 2024).

WFD Assessments

DIN is failing to achieve Good status in the Teifi Estuary for the 2021 and 2024 WFD Regulations assessments and causing the overall failure of the Teifi Estuary.

Bacterial contamination – Teifi Estuary (Poppit West)

NRW undertake annual water quality assessments of designated bathing waters under the Bathing Water Directive. Poppit West, located on the edge of the Teifi Estuary, has an excellent status, the highest status a bathing water can receive. However, the bathing water is subject to 'short term pollution' when high rainfall events cause faecal material to wash into the sea from livestock, sewage, and urban drainage from the Teifi catchment. There is a pollution risk forecast model associated with Poppit West to enable warnings to be given about entering the water during these high rainfall events – in 2023 there was a total of three warnings given (Natural Resources Wales, 2024h).

Sediment and turbidity

Sediment flow and movement is a natural river process that varies through the course of a river, however physical modifications and pollution can cause sediment build up and increased turbidity in the river – affecting the natural environment of the river including dissolved oxygen levels and wildlife populations. If it is confined within the river by flood defences, suspended sediment also clogs gravels and sands in river habitat, killing invertebrates (including juveniles of the critically endangered freshwater pearl mussel) and fish eggs.

Increased sediment is caused by soil erosion, which is increased through certain activities such as livestock being allowed onto riverbanks (Natural Resources Wales, 2022a). It is expected that increased sediment into the Teifi from activities such as agriculture have an adverse effect on water quality within the Teifi, however whilst suspended solids data is collected by NRW as a part of water quality analysis, the extent of this effect undetermined.

Water quantity

One lake water body (Llyn Egnant, GB31038409) is failing for hydrological regime in the 2021 and 2024 WFD Regulations assessment.

'Changes to natural flow and levels of water' is classed as a Significant Water Management Issue (SWMI) in the Western Wales 2021 – 2027 RBMP. The flow of the river can change when water is removed, both from the river itself and from lakes and groundwater areas within the catchment (Natural Resources Wales, 2022c, p.36). These abstractions for the Teifi catchment are presented in section 2.5.2. Flow is also affected by physical modifications to the river such as weirs (Natural Resources Wales, 2022a). Where these are present in the Teifi and have been mapped by the West Wales Rivers Trust as part of a fisheries project for NRW, this work is recorded in Section 5 of this report.

Flow data is collected by NRW, and the UK Centre for Ecology and Hydrology (UKCEH) store the UK's official record of river flow data. UKCEH has records for three flow stations along the main River Teifi. These are:

- Station 62001: Teifi at Glan Teifi. In the lower catchment.
- Station 62002: Teifi at Llanfair. In the mid-catchment.
- Station 62003: Teifi at Pont Llanio. In the upper catchment.

A mainly natural regime is recorded for all three stations, with Cors Caron having a significant attenuation effect on flow especially during flood events and public water supply impounding reservoirs and minor agricultural abstractions also having a partial effect on reducing flow (UKCEH, 2024a). Data on tributary flow is not available.

Invasive non-native species

'Invasive Non-Native Species' (INNS) are classed as a Significant Water Management Issue (SWMI) in the Western Wales 2021 – 2027 RBMP (Natural Resources Wales, 2022c, p.36). INNS can impact freshwater ecosystems by reducing biodiversity, disrupting nutrient levels, and increasing sedimentation and run off (Natural Resources Wales, 2024i).

The exact distribution of and number of INNS within the Teifi catchment is unknown, though some mapping of control of INNS is being undertaken as part of the NRW led Four Rivers for Life Project (See Table H). Also, the National Biodiversity Network (NBN) Atlas Wales records species occurrence includes INNS and provides an indicator of their distribution. For example, the NBN Atlas Wales has accepted recordings of INNS such as Japanese Knotweed, Himalayan Balsam, American Mink, Giant Hogweed and American Skunk Cabbage within the Teifi Catchment (NBN Atlas, 2024). This data has been used to create hot spot maps of INNS across Wales for the Wales Environmental Information Portal, these hot spot maps are in the process of being updated by NRW with more recent data.

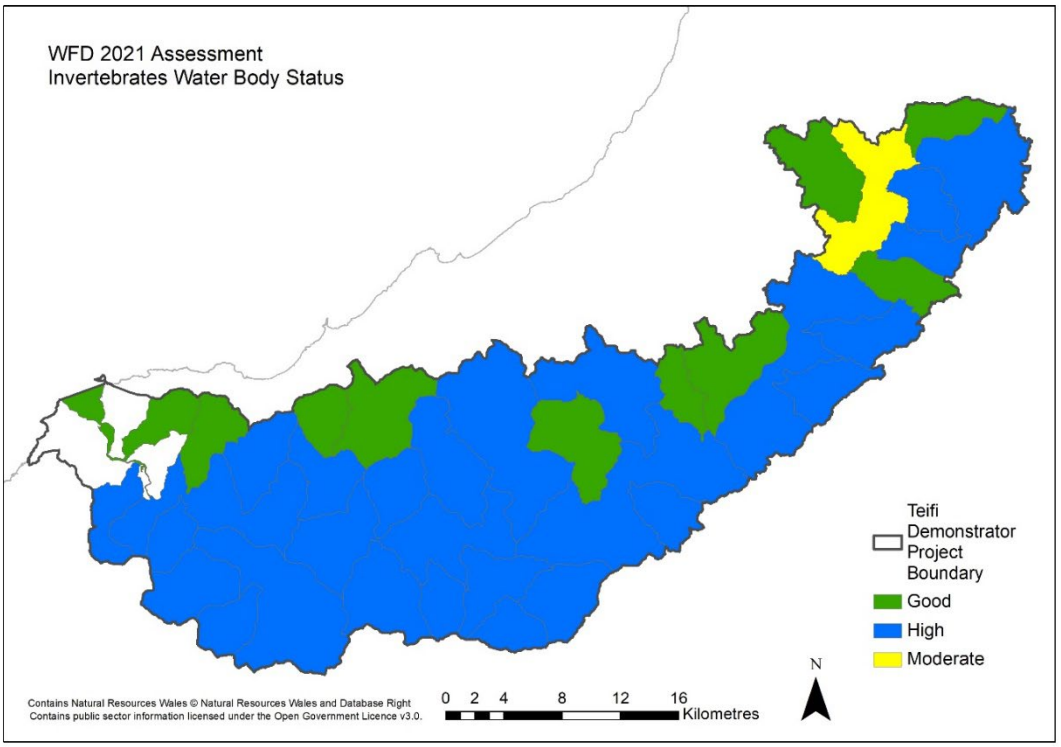
3.2 Factors affected by the water environment

Invertebrates

Invertebrates are aquatic animals without backbones that live on or in riverbed and lake sediment. These communities are good indicators of acidification and organic pollution (WFD-UKTAG, 2008). Rivers and lakes are assessed using the standard RIVPACS (River Invertebrate Prediction and Classification System) model which predicts macroinvertebrate population in 'pristine' conditions at each sampling site and uses the difference between this and the observe fauna to classify sites (WFD-UKTAG, 2023a; UKCEH, 2024b).

WFD Regulations Assessments – Rivers

Figure 25. 2021 WFD assessment of Invertebrates for the river and transitional water bodies within the Teifi Catchment.



One river water body failed for invertebrates with a Moderate status in the 2021 classification: 'Teifi - conf with Meurig to conf with Brennig' (GB110062043501). The data used to classify in 2021 was rolled forward from the 2015 and 2018 classification periods. This waterbody is in the upper catchment (Figure 25 and Table H). It also failed for Cypermethrin in 2021. No river water bodies failed for invertebrates in the 2024 WFD assessment. Unlike the 2021 assessment, 12/37 received a classification for invertebrates in 2024, and no classification was produced for 'Teifi - conf with Meurig to conf with Brennig' (GB110062043501) which failed in 2021.

WFD Regulations Assessments - Lakes (Littoral invertebrates)

When assessing lakes, invertebrates are sampled from the shoreline of lakes (littoral). All four of the Teifi Pools failed to achieve Good status for Littoral Invertebrates in the 2021 and 2024 WFD assessments. The reasons for this failure are discussed in Section 4.

Dissolved Oxygen

Dissolved oxygen (DO) is a measure of the amount of oxygen dissolved in water. Low DO can indicate organic pollution, it can also be caused by other factors such as higher temperatures and river morphology (Foster et al. 2024).

However, DO measurements are taken as spot samples during the day when DO concentrations are at their highest due to photosynthesis, so the results of this determinant are unlikely to be representative of DO pressures. For this reason, BOD is a better measurement of the pressures affecting DO, as a spot sample series of BOD measurements will be more reflective of actual BOD in the watercourse in comparison to measured versus actual DO.

WFD Regulations Assessments

No water bodies in the Teifi catchment fail the 2021 or 2024 WFD assessment for DO.

SAC Assessments

The previous SAC assessment of dissolved oxygen found that 13/18 water bodies passed for DO (Table I and Appendix D). Three water bodies were not assessed and two water bodies failed, these were: 'Teifi - conf Fflur to conf Brennig' (GB110062043501), failed with high confidence, and the 'Grannell - headwaters to confluence with Teifi' (GB110062039230), failed with Low confidence.

In the recent SAC assessment, 14/18 water bodies passed for dissolved oxygen, two were unassessed and two failed (Table I). 'Teifi - conf Fflur to conf Brennig' (GB110062043501), continues to fail and 'Teifi – Afon Brenning to Afon Dulas' also failed (GB110062043566). Both water bodies were assessed using the same sample point.

Macrophytes and phytobenthos (diatoms)

Macrophytes are larger freshwater plants, readily distinguished by the naked eye (UWMN, 2024). Macrophytes play an important role in river functioning, especially in slower moving, lowland sections of the Teifi, by providing habitat diversity for macroinvertebrates and fish and through regulating the transport of both water and sediment (Willby et al., 2012; Gurnell *et al.* 2010; O'Hare *et al.* 2011; Wilkes *et al.* 2018). Macrophytes are assessed by cover, species richness and diversity to give an overall score for the water body using the River LEAFPACS 2 method, which responds to phosphorus concentrations. The River Teifi has extensive macrophyte beds that are important internationally, reflected in its SAC designation for - 'Rivers with floating vegetation often dominated by water-crowfoot' habitat.

Phytobenthos are a group of mainly microscopic algae that are found attached to submerged surfaces such as stones and plant stems (Wilkinson, 2022). Phytobenthos are sensitive to changes in the water environment and therefore are good indicators of nutrient enrichment, with diatoms being the subgroup assessed for the WFD Regulations (WFD-UKTAG, 2023b).

WFD Regulations Assessments

Despite being different elements, the results from macrophytes and phytobenthos monitoring are combined for WFD assessments.

Figure 26. 2021 WFD assessment classification of macrophytes and diatoms for the river and transitional water bodies within the Teifi Catchment.

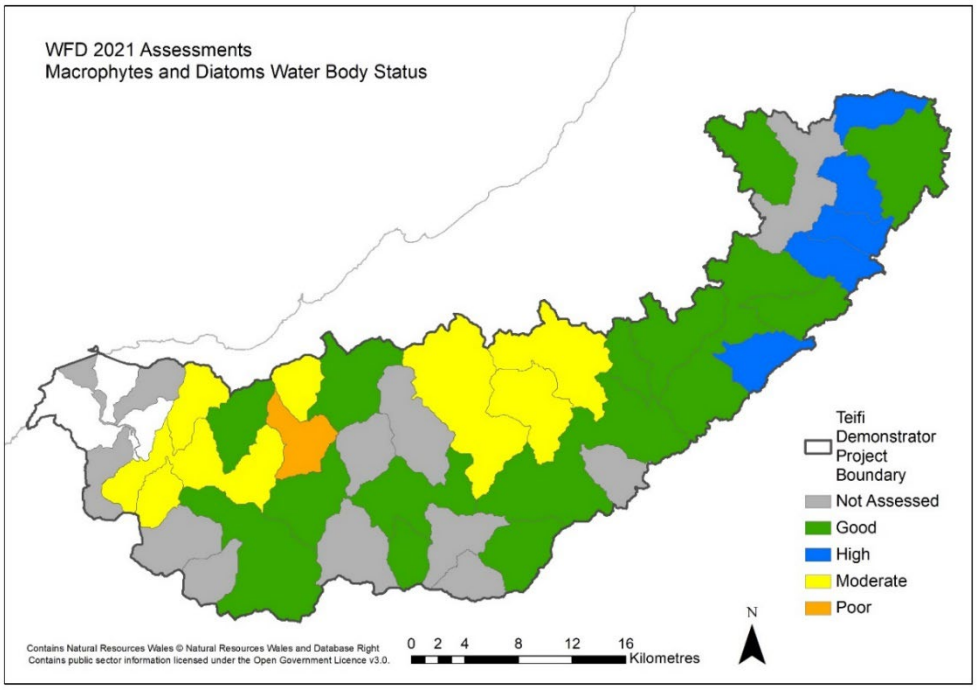
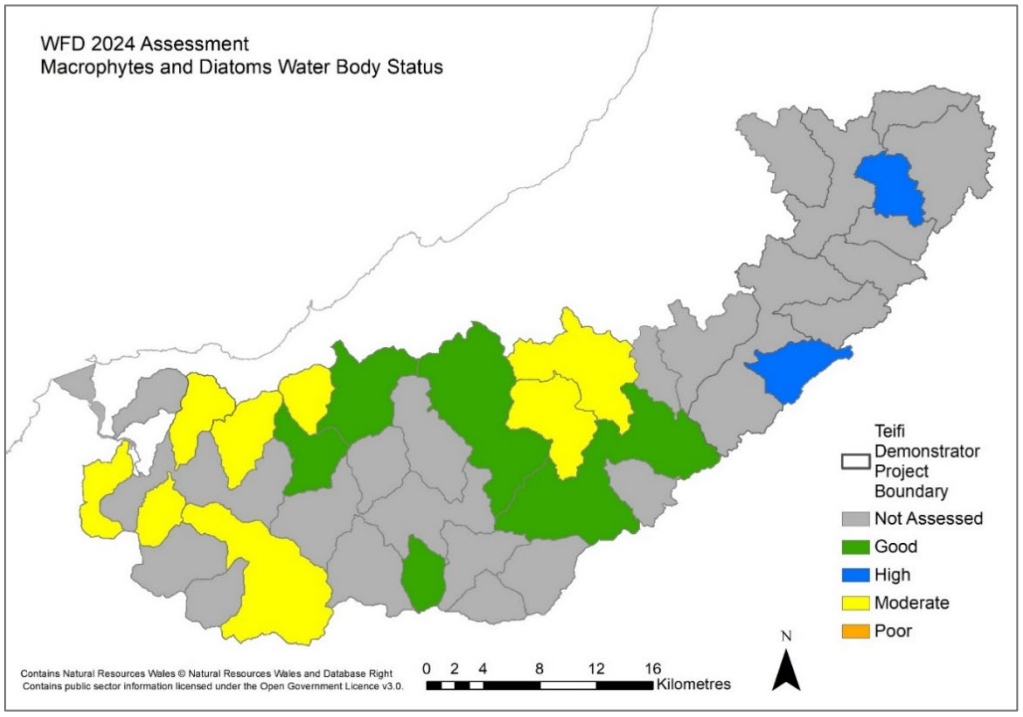


Figure 27. 2024 WFD assessment classification of macrophytes and diatoms for the river and transitional water bodies within the Teifi Catchment.



The condition of macrophytes and diatoms are an issue in the middle and lower catchment. Eight water bodies failed in the 2021 and 2024 WFD assessment (Figures 26 and 27). Some failures in 2024 were new: ‘Cych - headwaters to confluence with Teifi’ (GB110062039041),‘Piliau - headwaters to confluence with Teifi’ (GB110062039070) and ‘Hirwaun - headwaters to confluence with Teifi’ (GB110062039130), with other water bodies that had previously failed seeing improvement (Table H). Overall, the 2024 assessment showed a slight increase in the macrophyte and diatom failures in the lower catchment and a slight decrease in failures in the middle catchment.

New data collected for the 2021 WFD classification was available for seven water bodies, six water bodies failed based on data collected from previous classification periods. For the 2024 WFD assessment all assessed water bodies were classified using new data.

SAC Assessments

Macrophytes are not assessed as part of the SAC assessments, but Diatoms are. Two SAC water bodies were assessed for Trophic Diatom Index (TDI) in the previous 2024 SAC assessment (Table I and Appendix D): **‘**Ceri - headwaters to conf Dulas’ (GB110062039190) and ‘Grannell - headwaters to conf Teifi’ (GB110062039230). Both water bodies failed.

For the most recent 2024 SAC assessment of TDI, three water bodies were assessed. All three water bodies failed. The failures for **‘**Ceri - headwaters to conf Dulas’ (GB110062039190) and ‘Grannell - headwaters to conf Teifi’ (GB110062039230) were also rolled forward from the previous assessment meaning that overall, five water bodies failed.

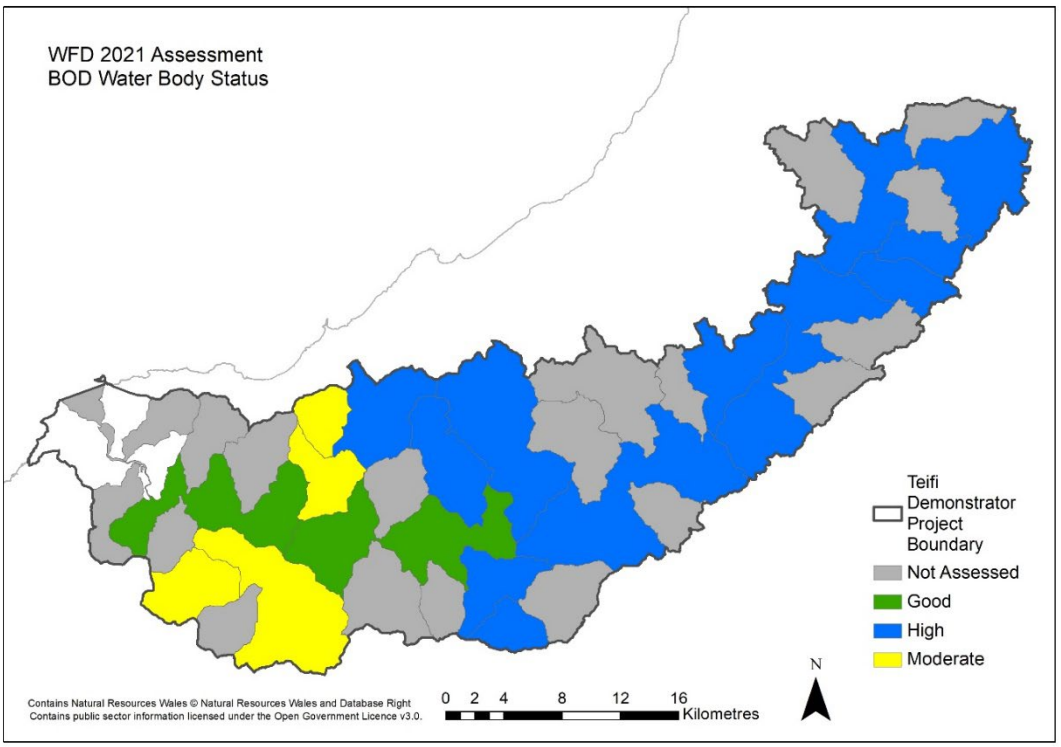
Biochemical oxygen demand (BOD)

BOD is a measure of the dissolved oxygen needed by aerobic organisms to break down organic material. High BOD values are caused by organic pollution such as from manures or sewage and mean that fish and aquatic invertebrates may lack oxygen and are at risk of stress (Foster et al., 2024).

WFD Regulations Assessments

Whilst BOD does not directly affect overall water body status in WFD assessments, it is an important measure of organic pollution and river health and is therefore included in WFD Assessments.

Figure 28. 2021 WFD assessment classification of BOD for the river and transitional water bodies within the Teifi Catchment.



Four water bodies failed to achieve Good for BOD in the 2021 WFD assessment (See Figure 28 and Table H). No water bodies failed in the 2024 WFD assessment, all failing water bodies were reassessed with new data.

SAC Assessments

Six water bodies failed in the previous SAC water quality assessment for BOD (Table I and Appendix D). No water bodies failed in the recent SAC assessment; all failing water bodies were re-assessed with new data.

Combined Assessments

Combining SAC and WFD assessments means that seven waterbodies within the Teifi catchment failed for BOD based on previous assessments. No water bodies failed in the most recent assessments.

Fish

The issues affecting fish populations in the Teifi catchment are numerous and many are not unique to the Teifi. The complexity of these issues is covered in reports such as NRW's Salmon and sea trout plan of action for Wales 2020 and the multi-agency report, Assessment of Salmon Stocks and Fisheries in England and Wales.

In summary, there has been a dramatic and rapid decline in both salmon and sea trout populations across Wales, but there has been a particularly marked decline on the River Teifi. There is no one single cause for this decline, with different

environmental factors affecting the river such as flow, temperature, physical river modifications and a general decline in river habitat and water quality. In addition to the factors affecting fish within rivers, both sea trout and salmon are facing increased mortality at sea leading to reductions in the number of fish returning to our rivers to spawn. Consequently, pressures at sea, including climate change, contribute to falling populations of both salmon and sea trout in Welsh rivers (Malcom et al., 2012, Natural Resources Wales, 2020c).

Most individual species monitoring data available in the Teifi is for salmon and trout populations - iconic, native species that provide an indication of the environmental health and quality of the river. Salmon is a protected SAC feature for the River Teifi and is one of the primary reasons for its selection as a SAC (Natural Resources Wales, 2022a). Sea trout is recognised in the national Biodiversity Action Plan (Natural Resources Wales, 2020c). Sea, river, and brook lamprey are also present in the River Teifi, all three are SAC features and Sea Lamprey are in unfavourable condition. The distribution of both sea and river lamprey is poorly understood within the river, although it is thought that sea lamprey are unable to negotiate Cenarth Falls and so are restricted to the lower river (Natural Resources Wales, 2022a).

Salmon and sea trout stock status are individually assessed using ‘Conservation Limits’. Conservation Limits (CLs) are based on estimates of the salmon / sea trout production capacity of individual catchments. They are expressed in terms of egg deposition levels and are set to help ensure that adequate numbers of fish go on to spawn.

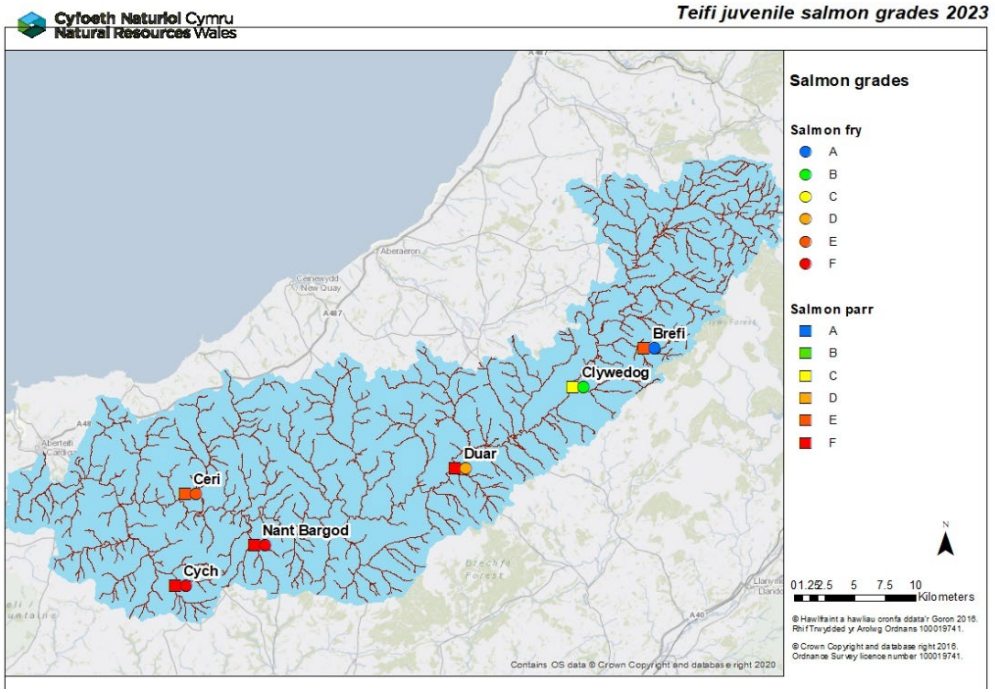
Compliance assessment involves:

- Estimating the numbers of salmon or sea trout returning each year and their likely egg contribution. On most rivers these estimates are based on rod catches – except where the operation of fish traps or counters allows more direct enumeration of the returning stock.
- Applying a formal (trend-based) statistical compliance method to assess the status of individual river stocks against their CLs. The latter process is designed to test whether the ‘Management Objective’ has been achieved; i.e. that stocks meet or exceed their CL four years out of five, in the long-term.

This data shows that salmon stocks in the Teifi are “At Risk” and are projected to be “At Risk” in 5 years’ time. Sea trout stocks are also assessed to be currently ‘At Risk’ and are projected to be ‘At Risk’ in risk in 5 years' time (Cefas et al., 2024).

Figure 29 shows the juvenile grades for sea trout and salmon respectively at different locations based on the 2023 juvenile monitoring programme. Salmon data shows poor grades of D and lower in the lower catchment, in water bodies such as the Duar, where the WFD 2021 assessment classification for fish is High. For trout, grades across the catchment are generally higher. However out of the 6 data points, three score a D or lower for trout parr (Natural Resources Wales, 2024g). Figure 30 shows how the density estimates for both sea trout and salmon have changed over time. Juvenile salmon have shown a downward trend, brown trout has shown variation in trend with reduced numbers in 2023 (Natural Resources Wales 2024g).

Figure 29. Juvenile salmon and trout grades and locations of sampling sites in the Teifi catchment 2023. ‘A’ grades are classed as best through to F grade as worst (Natural Resources Wales, 2024g).



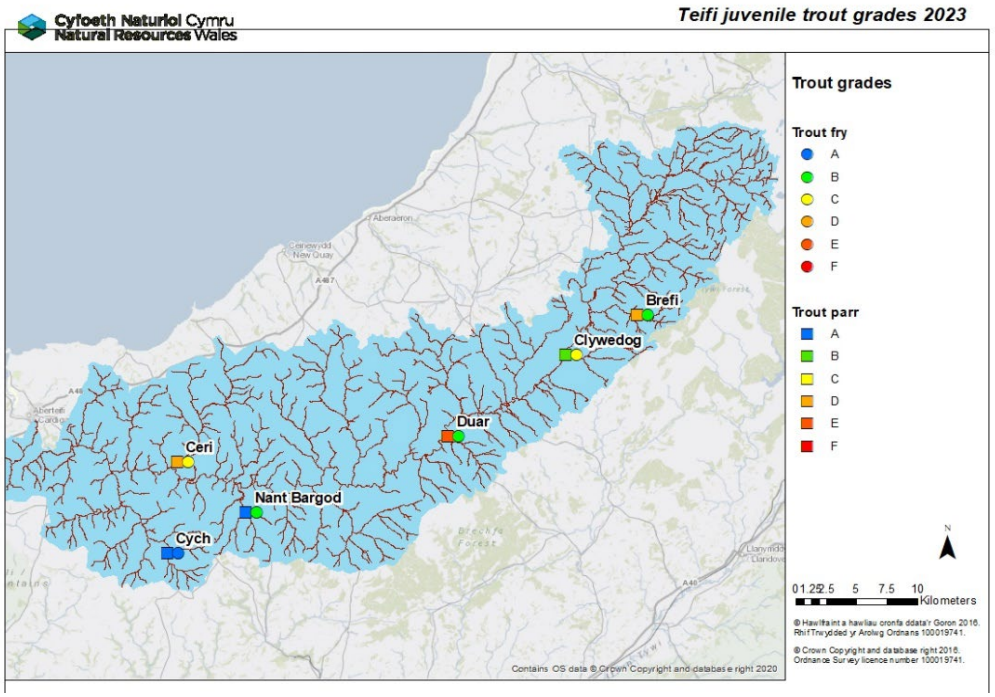
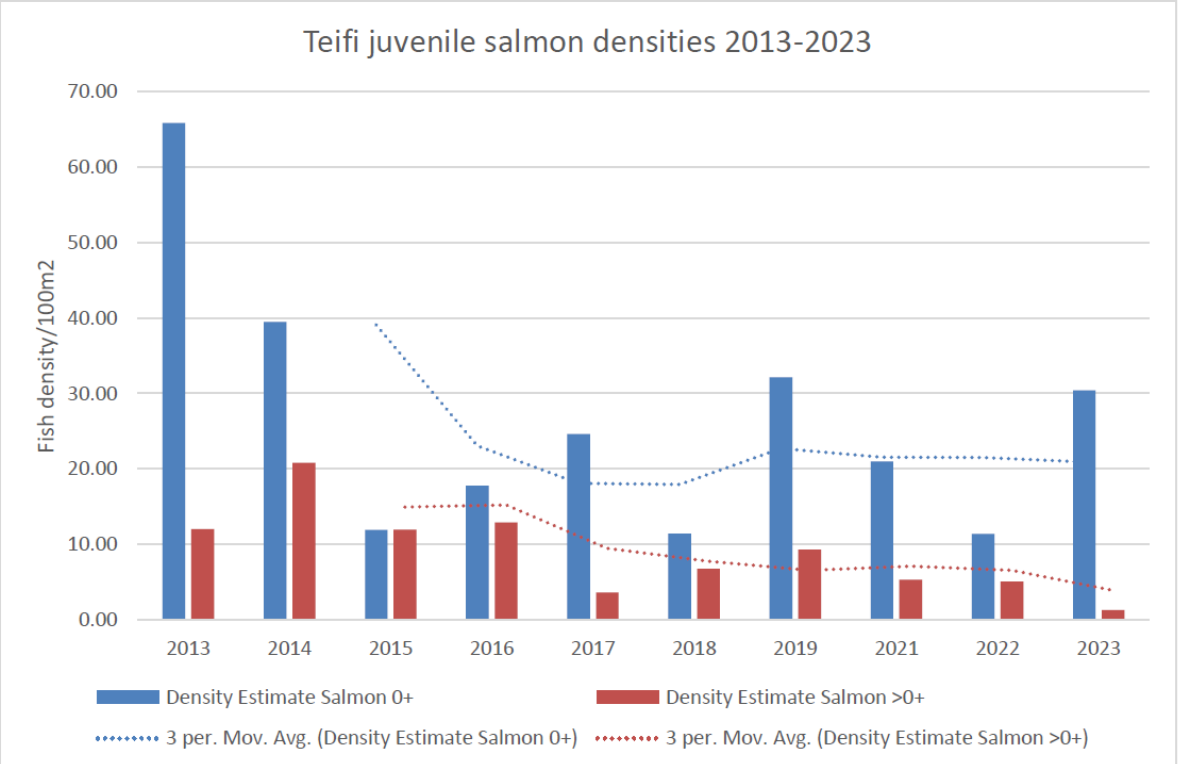
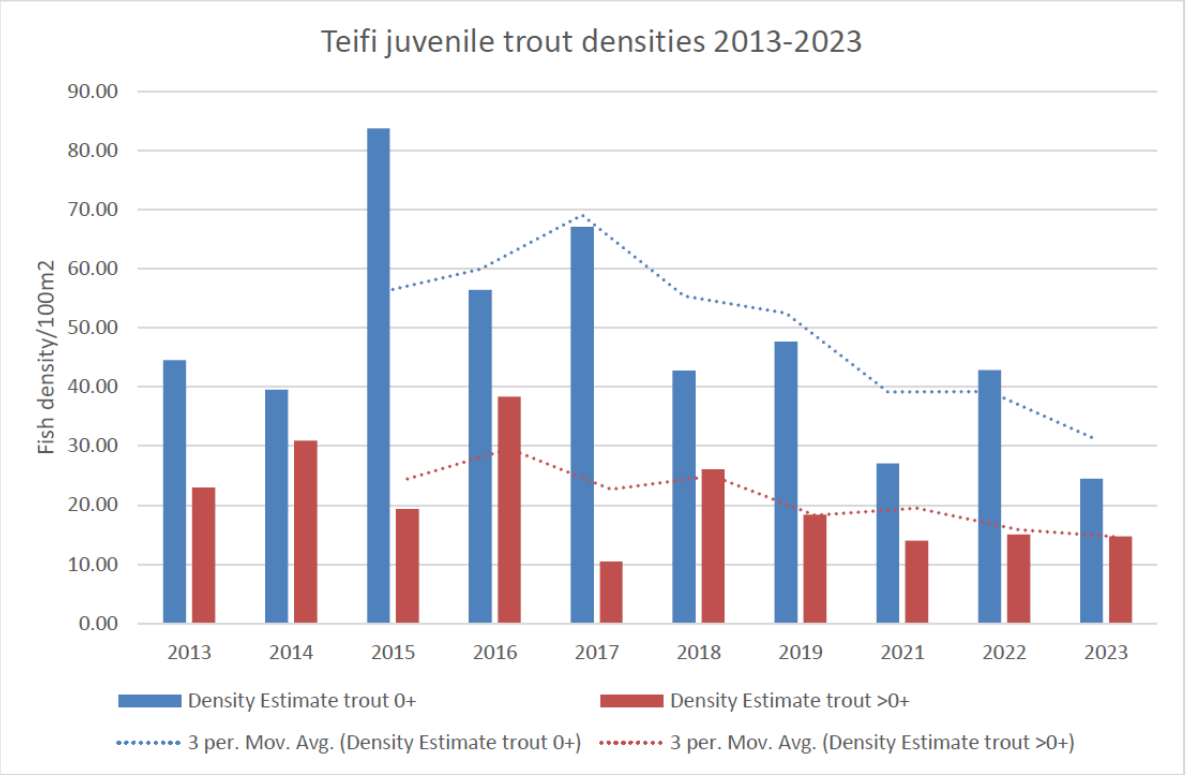


Figure 30. Stock densities for salmon and brown trout fry and parr on the Teifi catchment with 3-year rolling average trendlines 2013-2023 (Natural Resources Wales, 2024g, pp. 13-14*)*





WFD Assessments

In addition to individual species assessments, fish are also assessed as part of WFD Regulations. Assessments for fish are based on NRW's juvenile monitoring programme:

Figure 31. 2021 WFD assessment classification of fish for the river water bodies within the Teifi catchment.

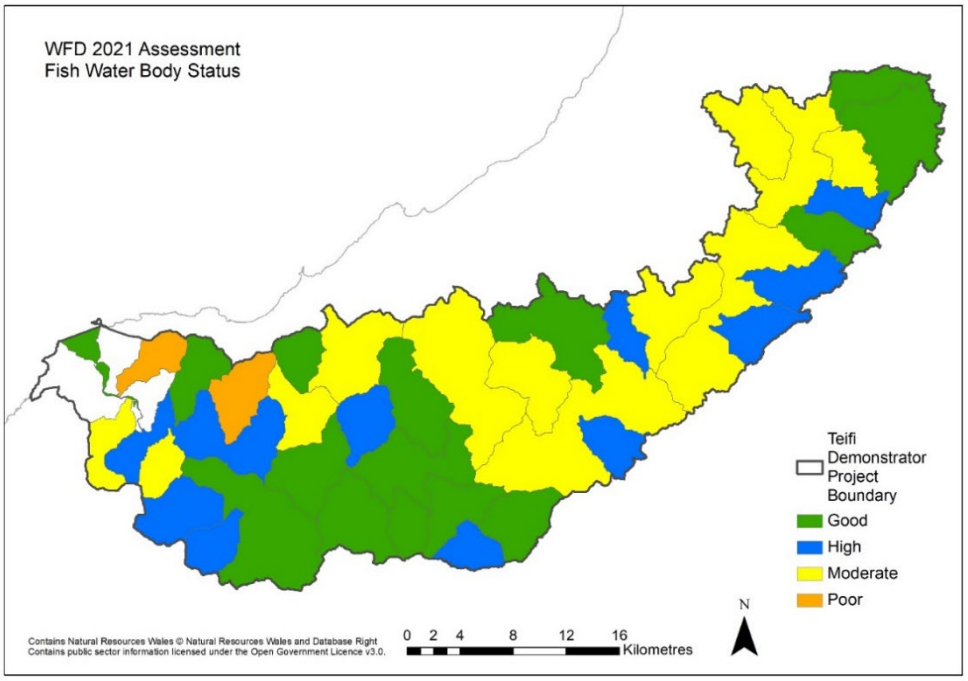
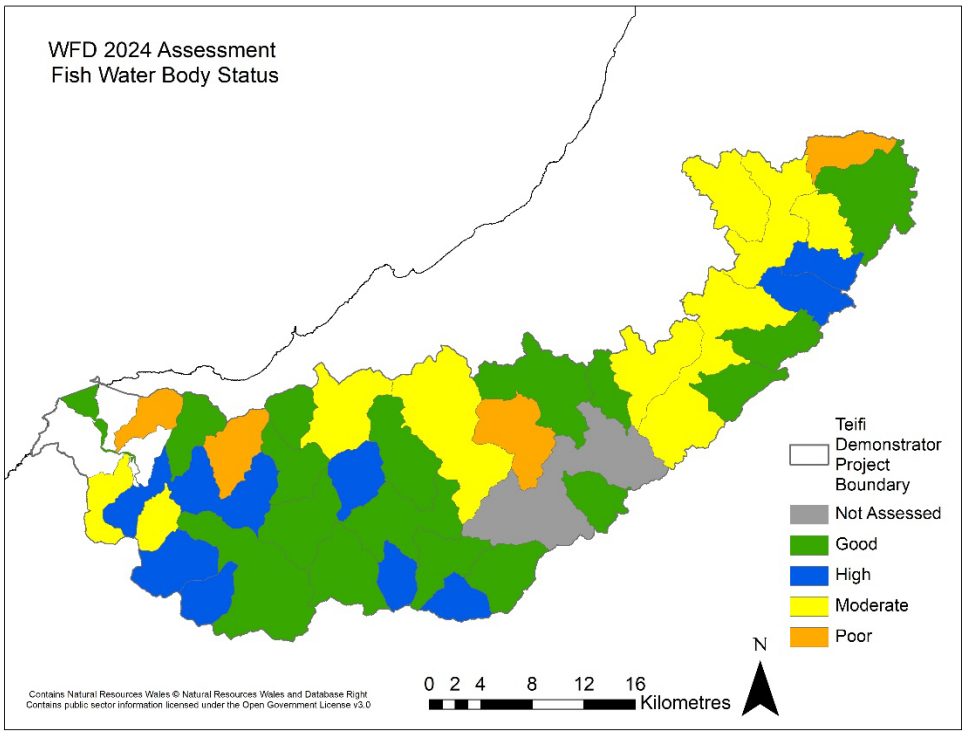


Figure 32. 2024 WFD assessment classification of fish for the river water bodies within the Teifi Catchment



In the 2021 WFD assessment, 14 water bodies are failing for fish in the Teifi catchment: three are classified as Poor and 11 are classified as moderate (Figure 31 and Table H). In the 2024 WFD assessment, 13 water bodies are failing for fish in the Teifi catchment: four of these are Poor and eight are Moderate (Figure 32 and Table H).

One failure is new in 2024: ‘Meurig - headwaters to confluence with Teifi’ (GB110062043550).

The ‘Cledlyn - headwaters to confluence with Teifi’ was Moderate and has declined to Poor.

One water body improved between 2021 and 2024 from Poor to Good: ‘Ceri - Dulas to conf Teifi’ (GB110062039110).

One water body, ‘Teifi - Afon Dulas to Afon Clettwr’ (GB110062043565) failed for fish in 2021, was not assessed in 2024 and is now classed as achieving Good overall. However, this failure in 2021 was found to be due to statistical process (See section 4.1.1). One water body improved for fish but is failing overall: ‘Dulas - headwaters to conf Ceri’ (GB110062039180).

For both assessments there is a cluster of 12 water bodies in the lower catchment which are achieving High or Good, suggesting healthy fish populations and good quality habitat in these areas. This contrasts with the more detailed assessment of salmon and sea trout stocks by NRW’s fisheries teams which is discussed above. This is because the WFD status for fish includes consideration of all fish species expected to be present. Some of these species are less sensitive to habitat or water quality issues than salmon and in some cases Good status can be achieved despite very low salmon numbers being observed.

Otters

In 2021, the Otter Survey Wales 2015-2018 was published by NRW, detailing the conditions of Otter populations across Wales based on surveys conducted by individuals of varying experience, from newly trained volunteers to highly experienced professionals. The report found the Teifi to be an area of concern as it has had a statistically significant decline in otter populations of 20% between the survey periods of 2009-10 and 2015-18 (Kean and Chadwick, 2021).

The Teifi was resurveyed by a highly experienced surveyor in December 2019 and January 2020, who found 74% of sites positive for otter signs, 18 more sites than the volunteers in the 2015-18 survey period (See Table J). However, the surveyor noted that ‘in his opinion, the results do not indicate an otter population at or near carrying capacity and this is extremely worrying’ (Kean and Chadwick, 2021, p.56).

Table J Results of the Teifi Otter surveys.

	1977 - 78	1984	1991	2002	2009-10	2015-17	2019-20
Positive sites (positive/total)	28/73	29/75	44/75	72/74	71/74	37/74	55/74
% positive	38%	39%	59%	97%	96%	50%	74%

Beavers

Beavers, which reinstate natural processes by improving habitat structure, heterogeneity, and connection to the floodplain, have been shown to significantly increase diversity of multiple riverine taxonomic groups (Stringer & Gaywood 2016; Law *et al*. 2016, 2018). The Teifi was thought to be the last river in southern Britain to support a beaver population before it was hunted to extinction around 1200 (Halley *et al*. 2009). However, although beavers can provide substantial ecological benefits to both rivers and fish populations (Stringer & Gaywood 2016; Puttock *et al*. 2017, Needham *et al*. 2021), they are not the single solution for river management (Law *et al*. 2019).

Following a recent evidence review conducted by NRW on the state of beavers in Wales, Welsh Government have set out their policy position (September 2024) supporting a move towards the managed reintroduction of European beavers (*Castor fiber*) in Wales.

Freshwater Pearl Mussels

A key species that has almost been lost from the Teifi is the freshwater pearl mussel (*Margaritifera margaritifera*), though it is understood that a substantial population once existed (Hatton-Ellis, 2018). Pearl mussels are a large and long-lived freshwater bivalve, formerly widespread across Wales but now Critically Endangered across Europe (Moorkens, 2024) due predominantly to clogging of river gravels by fine sediments, causing mortality of juveniles. Healthy pearl mussel populations both require good water quality and help to maintain it, as they can occur in large aggregations that filter feed from the water column. An ambition of the TDP could be the reinstatement of healthy river gravels that can support pearl mussels, in support of NRW's Pearl Mussel Strategy.

3.3 Water quality assessments: confidence and uncertainty

Water quality assessments allow judgements to be made on the quality of large areas of water and for the status of water bodies to be directly compared. Monitoring

samples taken on a monthly, quarterly, or sometimes yearly basis at often one sampling point within a water body are reduced to a single value per element. There is also often a time lag between the data used, especially with regards to rolled forward classifications, and the assessment release date.

For WFD classifications this is either an ecological quality ratio (EQR), mean or percentile, which is then judged against classification thresholds to produce a classification of Bad, Poor, Moderate, Good, or High. Appendix E illustrates the variation which is present between water bodies that are classified in the same bracket for three 2021 WFD classifications, it is also important to understand that the classifications themselves vary in confidence for each element in each water body.

As part of the WFD assessment process, a value between 0 and 1 is assigned to each of the class categories to indicate the level of confidence that the true result falls within the boundaries of each class (confidence of class). A categorical certainty value (either Uncertain, Quite Certain or Very Certain) is then applied to the result depending on the size of the confidence of class value for the class assigned to the result. They are also shared publicly via Water Watch Wales. The confidence value for whether the element would fall into a different classification bracket is also calculated.

Uncertainty should be considered when attempting to use assessments to drive interventions and assess the success of these interventions based on changes to those assessments. WFD is discussed here, but methods vary across SAC (e.g. High and Low) and other assessments and so uncertainty should be considered on an individual assessment basis. In classifications where certainty is low, more information beyond available monitoring data might be needed to better understand what is going on with the river and how to improve it.

3.4 Section summary

Section 3.1 provides an overview of factors affecting water quality in the Teifi catchment and causing WFD and SAC assessment failures:

- Toxic metals are the biggest pressure in the upper catchment, and this does not change between the 2021 and 2024 assessments.
- Phosphorus failures improved from 2021 to 2024. In 2021, the failures were largely in the lower catchment, this improved in 2024 however most failures still occur in the middle and lower catchment. The number of water bodies that were unassessed for phosphorus increased in 2024, making it difficult to ascertain the true extent of the improvement.
- Dissolved Inorganic Nitrogen (DIN) is causing the WFD failure of the one transitional water body in the catchment, the Teifi Estuary, in 2021 and 2024. The estuary is also subject to short term pollution from faecal material during high rainfall events.
- Hydrological regime is affecting one lake water body. The main river has a largely natural regime.

- There is one cypermethrin failure in the upper catchment in 2021 and one in the lower catchment in 2024.
- Sediment is expected to be having an impact in the catchment although evidence is currently limited.

Section 3.2 provides an overview of factors affected by water quality in the Teifi catchment and causing assessment failures:

- The condition of invertebrates is largely unknown within the river water bodies. The lake water bodies are all failing for invertebrates in 2021 and 2024.
- The lower catchment struggled with higher numbers of failures for BOD in the previous assessments, and this has improved in 2024 assessments with no BOD failures in the catchment. A minor improvement in the SAC assessment of DO can also be seen in 2024.
- The condition of macrophytes and diatoms are an issue in the middle and lower catchment. Eight water bodies failed in the 2021 and 2024 WFD assessment. Some failures in 2024 were new, with other water bodies that had previously failed seeing improvement.
- Fish continue to fail across the catchment, as although the number of water bodies failing for fish in the WFD assessments decreases from 14 in 2021 to 13 in 2024, the severity of the failure increases in two water bodies.
- Certain issues effect the whole catchment, including INNS and an unstable population of Otters.

Sub-section 3.3, focuses on the uncertainty surrounding scientific measurement, using WFD assessments as an example.

Recommendations:

- The water quality assessments discussed in this section should be used to understand water quality at a water body level in the Teifi catchment. Further monitoring to support specific interventions on a more local scale should be developed if necessary. In cases where monitoring external to NRW is available or a collaborative monitoring approach is possible, this should be considered in line with NRW's acceptability of use policy.
- The uncertainty and time lag of the classifications within water quality assessments should be considered when attempting to use them to assess the success of interventions.
- The Teifi Demonstrator Project should explore if it can fill some of the evidence gaps identified in this section, either through established monitoring techniques or via other methods:
    - Pesticides and other chemicals
    - Macrophytes
    - Phytobenthos (diatoms)
    - Sediment pressure

- Flow (tributaries)
- INNS

4. What is causing water pollution in the Teifi Catchment?

This section provides an overview of the investigations and models available for understanding what might be causing the water quality failures in Section 3, which are not always related to regulated activities. The models discussed in this section have different methods (see sub-sections for links to sources and methodologies) and different use purposes and should not therefore be directly compared.

4.1 Reasons for Not Achieving Good (RNAGs)

Investigations are conducted by NRW to ascertain the reasons for not achieving Good classification status, for each element that fails to do so in a WFD assessment, per water body. NRW also conducts investigations for significant deteriorations between WFD Regulations cycles, even if they do not result in a water body failure e.g., if a water body deteriorates from High to Good. These investigations may include conducting site visits, analysing monitoring data and using modelling. NRW's operational teams conduct work in catchments and water bodies based on the outcomes of the RNAGs, to try to improve water quality and reduce failures. RNAG data for all water bodies across Wales are available at Water Watch Wales. The RNAG investigations discussed in this section do not yet include the most recent 2024 WFD interim assessment and are based on the 2021 WFD assessment.

These investigations are carried out as part of the WFD Regulations process. For water bodies marked as Good under WFD assessment that are failing their Habitats Regulations (SAC) objectives, further work is being undertaken for investigations into Habitats Regulations failures and to identify reasons for failure.

4.1.1. River

Figure 33. The number of water bodies affected by each RNAG category in the Teifi catchment. Data is only for ‘probable’ and ‘confirmed’ certainty RNAGs.

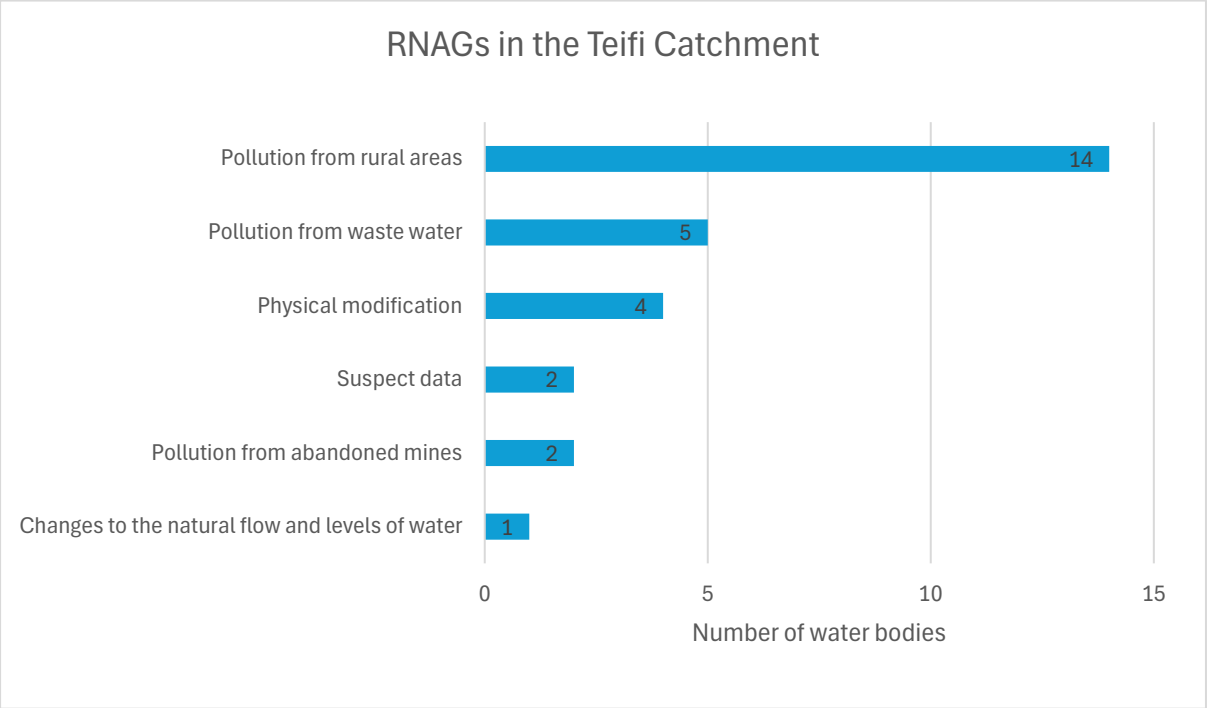
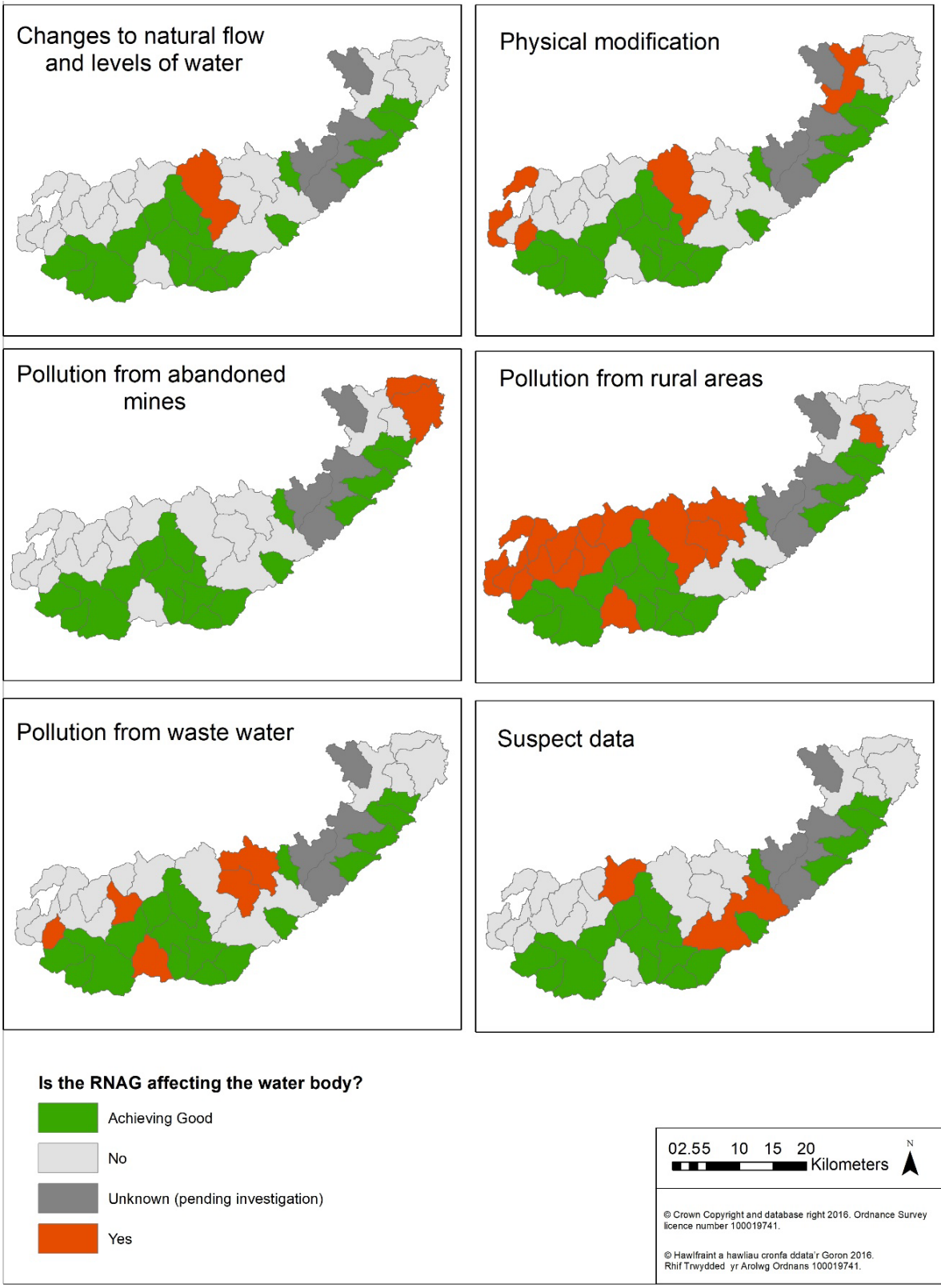


Figure 34. RNAG categories and their effect on the water bodies of the catchment. Data is only for ‘probable’ and ‘confirmed’ certainty RNAGs.



Figures 33 and 34 show the Reasons for Not Achieving Good (RNAGs) split into six categories and the number of waterbodies being affected by each RNAG. The RNAG categories seen in Figures 33 and 34 are derived using a matrix that maps combinations of all three RNAG tiers (Tier 1: Significant Water Management Issue (SWMI), Tier 2: activity, Tier 3: business category), to help summarise the data from the thousands of possible combinations into a more manageable list but offers more detail than just summarising by SWMI alone. This included normalising the data, by grouping reasons against water bodies, to reduce duplication for when one reason may be the cause of multiple failures which can otherwise artificially inflate the data. One water body may have multiple Reasons for Not Achieving Good.

Figure 34 maps the six categories to the water body and Appendix F shows this dataset as a table and includes the water body names. ‘Pollution from rural areas’ is most prevalent in the mid and lower catchment, whilst ‘pollution from abandoned mines’ is only occurring in the upper catchment. ‘Suspect Data’ is given as a RNAG if investigations find that the element failure may not be correct, for example, ‘Teifi - Afon Dulas to Afon Clettwr’ (GB110062043565) was found to have been classified because of ‘statistical process’ as failing for fish when in fact, the data suggests that the water body is not failing. Three water bodies have fish failures for which RNAGs are yet to be assigned, these appear as Unknown (pending investigation) in Figure 34. Investigations are either programmed or already in process and will report in due course.

4.1.2 Lakes

The failures based on littoral invertebrates in the Teifi Pools (WFD Regulations Lake Water bodies) are attributed to air pollution (acid deposition) and natural causes by RNAG investigations, these have not yet been confirmed. The Teifi Pools are within the water body catchment, ‘Teifi – headwaters to confluence with Meurig’(GB110062043540), which is an acid sensitive catchment.

In common with many Welsh upland lakes, the Teifi Pools have a history of acidification dating back to the 19th century because of acid deposition from burning of fossil fuels for transport, energy, and industry (Fritz et al. 1989). Following the closing of most coal fired power stations in Britain, acid deposition has greatly reduced, and the Teifi Pools and other lakes are showing chemical recovery, but biological recovery is slower (Burgess et al. 2006; Battarbee et al. 2014).

Several lakes not included as water bodies in WFD classification are also present in the Teifi catchment. Llyn Berwyn is a 13ha oligotrophic (low nutrient) lake in the headwaters of the Brennig, managed as a trout fishery. It has suffered from acidification in the past and is regularly limed by Tregaron Angling Association. Maes-llyn is a small (2ha) kettle-hole lake which forms part of Cors Caron SSSI. It has not been monitored recently, but risk assessment found it to be at significant risk of nutrient enrichment (Carvalho et al. 2005). Another lake, Llyn Pencarreg, in the floodplain of the main river near the village of Pencarreg, is also designated as SSSI but is in Unfavourable Condition due to nutrient enrichment from agricultural pollution (Goldsmith et al., 2014; Hatton-Ellis, 2016; Goldsmith et al., 2019).

4.1.3 Estuary

RNAG investigations for the DIN failure in the Teifi Estuary suggest agriculture, commercial and domestic sewage are all partially responsible, with agriculture being the ‘major’ contributor.

4.2 Source apportionment - SAGIS

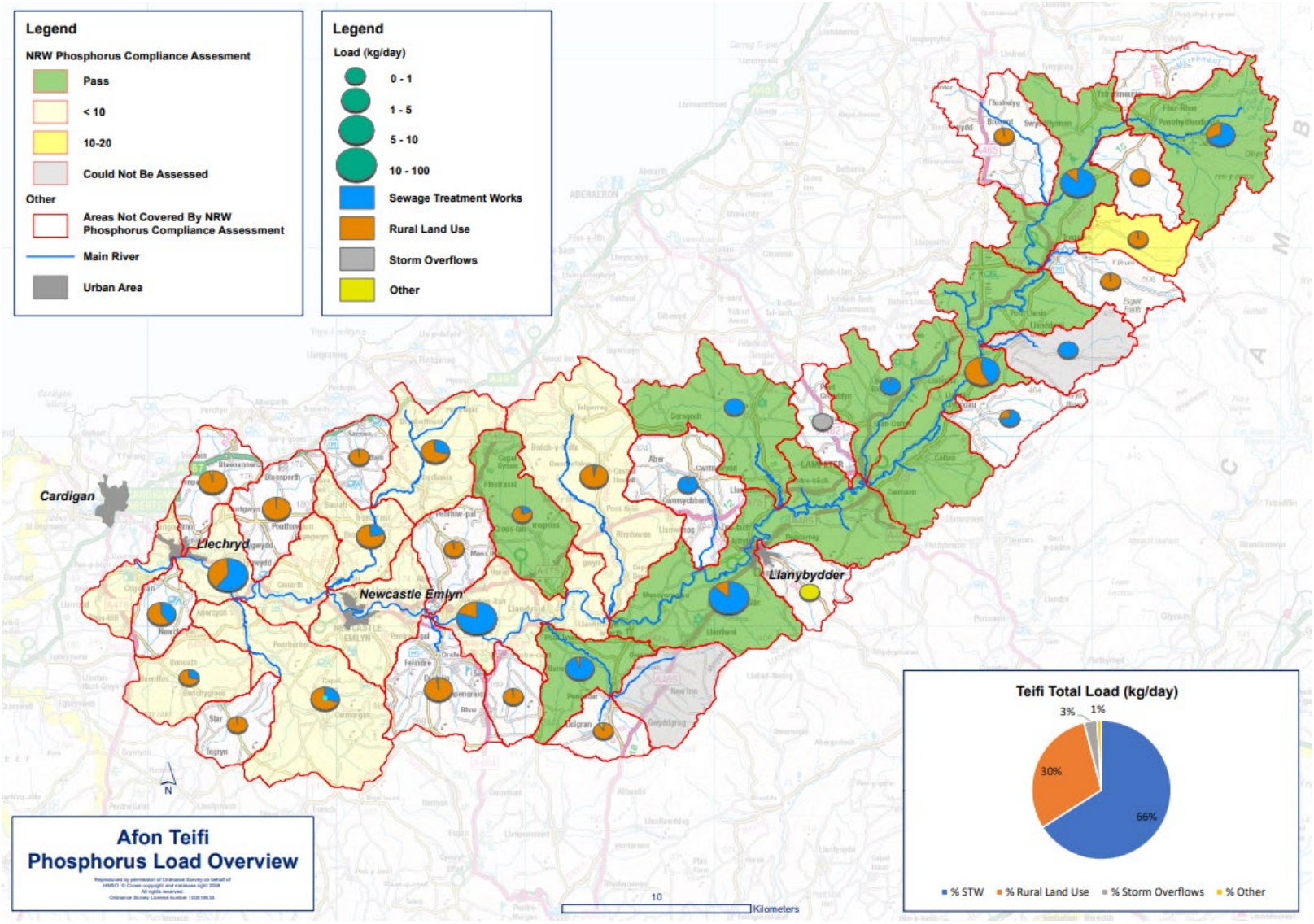
Source Apportionment Graphical Information System (SAGIS) is a model developed by DCWW to measure phosphorus levels and estimate the apportionment of phosphorus outputs (DCWW, 2022). Figure 35 shows the latest outcomes of this model, independently quality assured by NRW. This model contributes to the understanding of the RNAG investigations, as outlined in Section 4.1.

The SAGIS model predicts a 45 kg per day orthophosphate discharge from the Teifi catchment into the Teifi Estuary and Cardigan Bay, the load varies per water body in the Teifi catchment. In terms of source apportionment 66% is attributed to Sewage Treatment Works (WwTWs), 30% to rural land use, 3% to intermittents and 1% to other.

Apportioning for the SAGIS model is currently split between Sewage Treatment Works (WwTWs), Rural Land Use, Storm Overflows and Other. There are number of important considerations to be aware of when viewing the model outputs:

- The SAGIS model has been calibrated to be as accurate as possible in the apportionment of Sewage Treatment Works for use in regulating DCWW’s water discharge permits. The apportioning of phosphorus load between the other categories provides a useful indication of which category is a significant pollution source.
- Rural Land Use apportionment in the SAGIS model is based on the Phosphorus and Sediment Yield Characterisation In Catchment (PSYCHIC) model which estimates phosphorus losses at a 1km grid scale. The modelled transfer pathways include soil phosphorus, phosphorus from sediment loss and incidental losses from manure and fertiliser applications (See Section 2.9 for more information on material to land application) (DCWW, 2022).
- Intermittent sources of orthophosphate, such as Storm Overflows, are more difficult to apportion in the model.
- Other is a category encompassing any pollution source that cannot be accounted for by the other three categories, this includes private sewage systems.

Figure 35. The outputs of the SAGIS model for the Teifi catchment (DCWW, 2024)



According to the SAGIS model there are 11 water bodies where Sewage Treatment Works are the main source of orthophosphate. The three water bodies with the largest output of 10 – 100 kg a day of phosphate where Sewage Treatment Works cause the most pollution are:

Lower catchment:

1. Teifi - Afon Ceri to estuary (GB110062043563)

- WFD assessment failures: macrophytes and diatoms (2021), cypermethrin (2024).
- SAC assessment failures: phosphorus; BOD (previous).
- RNAG category (Figure 34): pollution from rural areas.

2. Teifi - Afon Clettwr to Afon Ceri (GB110062043564)

- WFD assessment failures: none.
- SAC assessment failures (previous): phosphorus; BOD.
- RNAG category (Figure 32): none.

Middle catchment:

3. Teifi - Afon Dulas to Afon Clettwr (GB110062043565)

- WFD assessment failures: fish (2021)
- SAC assessment failures: TDI (recent)
- RNAG category (Figure 34): suspect data.

According to the SAGIS model there are 20 water bodies where Rural Land Use is the main cause of orthophosphate pollution. There are no water bodies with the largest load of 10 – 100 kg/day that rural land use is majority contributor for. The one water body with the next largest load of 5-10 kg/day that Rural Land Use is majority contributor for is:

1. Teifi - Afon Brennig to Afon Dulas (GB110062043566)

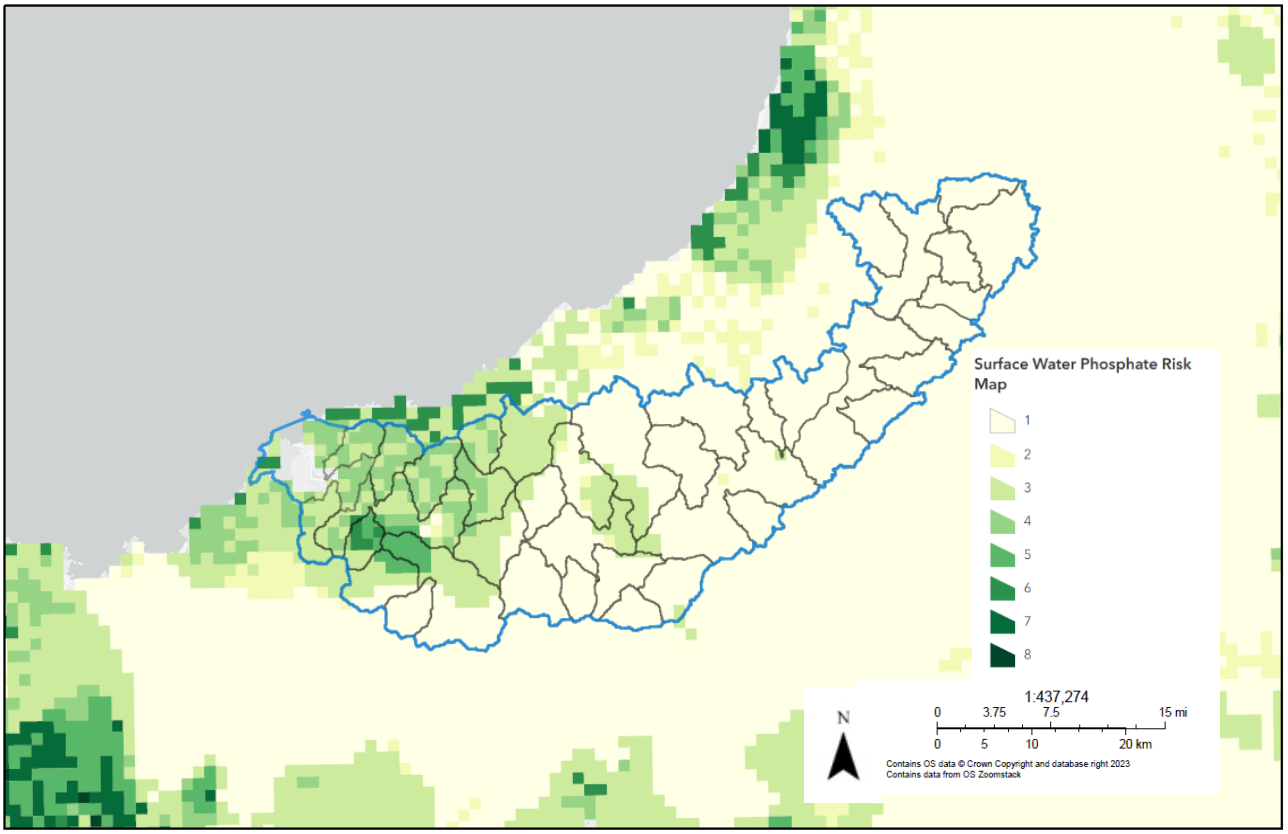
- WFD assessment failures: fish (2021)
- SAC assessment failures : DO (recent)
- RNAG category (Figure 34): Unknown (pending investigation)

The SAGIS model also shows one water body whose phosphorus input is not affected by Rural Land Use or Sewage Treatment Works, the Duar, where the source of phosphorus is assigned ‘other’ in Figure 35.

4.3 NRW Nutrient Review 2023 – nitrogen and phosphorus

Modelling was also undertaken for the Nutrient Review which was conducted by the consultancy Arup on behalf of NRW. This review was conducted in response to the introduction of the Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021. The review is a whole Wales assessment of nutrient risks, and it modelled diffuse sources of phosphorus and nitrogen entering watercourses and produced risk maps to show the potential hot spots for pollution from land use sources (Figure 36). Point source modelling is not included in this review, the model factors in diffuse leaking from sewers but not point source discharges from private or public or septic tanks. The modelling also provides a breakdown per water body of which types of land use are contributing the most to nutrient pollution. This is available, along with the rest of the resources produced by the Nutrient Review, on the Wales Environmental Information Portal.

Figure 36. Surface Water Phosphate Risk Map produced as part of the Nutrient Review.



In Figure 36, each 1km grid square is scored on a scale from 1 - 8 for phosphate risk from diffuse sources. Scores of 1 - 3 suggest a low risk that surface water phosphate concentration will exceed 0.1mg/l and diffuse sources are considered unlikely to be a significant source, scores 4 - 6 suggest a medium risk and scores 7 - 8 suggest a high risk that diffuse sources are a significant source of pollution. Although there are no high-risk grid squares within the Teifi catchment, Figure 36 shows that there is the

greatest risk of diffuse phosphate pollution in the lower catchment. This is generally in line with the outcomes of SAGIS modelling and RNAG investigations.

Water bodies where some or all the water body has a medium risk are:

1. Teifi Estuary (GB11006206900)
2. Morgenau - headwaters to confluence with Teifi (GB110062039050)
3. Cych - headwaters to confluence with Teifi (GB110062039041)
4. Dulas - headwaters to confluence with Cych (GB110062039010)
5. Teifi - Afon Ceri to estuary (GB110062043563)
6. Mwldan (GB110062039160)
7. Piliau - headwaters to confluence with Teifi (GB110062039070)
8. Arberth - headwaters to confluence with Teifi (GB110062039170)
9. Hirwaun - headwaters to confluence with Teifi (GB110062039130)
10. Ceri - Dulas to confluence Teifi (GB110062039110)
11. Dulas - headwaters to confluence Ceri (GB110062039180)
12. Teifi - Afon Clettwr to Afon Ceri (GB110062043564)

4.4 Other models

SEPARATE

The SEPARATE (SEctor Pollutant AppoRtionment for the AquaTic Environment) model was developed as part of Defra project WQ0223 (UK CEH, 2014). It was produced in 2014 and provides apportionment between 'both diffuse (agriculture, urban, river channel banks, atmospheric deposition, groundwater) and point (sewage treatment works, septic tanks, combined sewer overflows, storm tanks) sources' of pollution for total phosphorus, nitrogen, and fine-grained sediment (UK CEH, 2014).

These loadings for the Teifi catchment are available to download on the UKCEH website, however these outputs are not included for discussion here as the framework is based on UK wide modelling and its accuracy and validity for use in Wales, and therefore in the Teifi catchment, has not been tested by NRW.

SCIMAP

SCIMAP is a framework for modelling environmental pressures for the water environment: sediment, nutrients, microbial pollution, and flood hazards. It has been used to effectively identify sediment sources at a catchment level on the River Esk in North Yorkshire (Reaney et al., 2011). It has also been used on the River Eden to assess the impact of different types of land use on salmon fry abundance (Perks et al., 2011). SCIMAP has been used by West Wales Rivers Trust (WWRT) to produce a sediment model of the Teifi Catchment for the West Wales Nutrient Management Board (NMB).

4.5 Section summary

This section details the causes of water pollution in the Teifi catchment.

Reasons for Not Achieving Good (RNAG) investigations are NRW's method for determining the cause of a WFD assessment water body failure.

SAGIS, developed by DCWW, is a model for phosphorus output and apportionment. NRW's Nutrient Review 2023 is a model for diffuse nitrate and phosphorus pollution.

The models discussed in this section have different methods (see section for links to sources and methodologies) and different use purposes and should not therefore be directly compared. That being said, when viewed alongside the RNAGs, the similarities between them can help with drawing conclusions regarding how best to focus interventions within the Teifi catchment i.e., whether a water body could benefit more from either a sewage discharge or an agricultural intervention.

For example, the RNAG analysis, the SAGIS model, and the Nutrient Review all indicate that the following water bodies are most at risk of pollution from rural land use in the Teifi catchment. These are all in the lower catchment:

1. Arberth – headwaters to confluence with Teifi (GB110062039170)
2. Morgenau - headwaters to confluence with Teifi (GB110062039050)
3. Hirwaun – headwaters to confluence with Teifi (GB110062039130)
4. Ceri – Dulas to confluence with Teifi (GB110062039110)
5. Dulas - headwaters to conf Ceri (GB110062039180)
6. Teifi - Afon Ceri to estuary (GB11006206900)

The RNAG analysis and SAGIS both indicate that the following water bodies are at risk of pollution from sewage discharge:

1. Grannell – headwaters to confluence with Teifi (GB110062039230)
2. Cledlyn - headwaters to confluence with Teifi (GB110062039150)

For some water bodies, such as, 'Teifi - Afon Ceri to estuary' (GB110062043563), the RNAG analysis suggest they are more at risk of pollution from rural land use whilst the SAGIS model suggests they are at more at risk of pollution from sewage discharge. Therefore, these waterbodies could most likely benefit from both rural land use and sewage discharge interventions.

The models also help to highlight gaps or limits in our understanding of the Teifi catchment.

Recommendations:

- The information provided in this section should be used to help target and prioritise appropriate interventions at a water body level, to achieve an overall improvement in water quality.

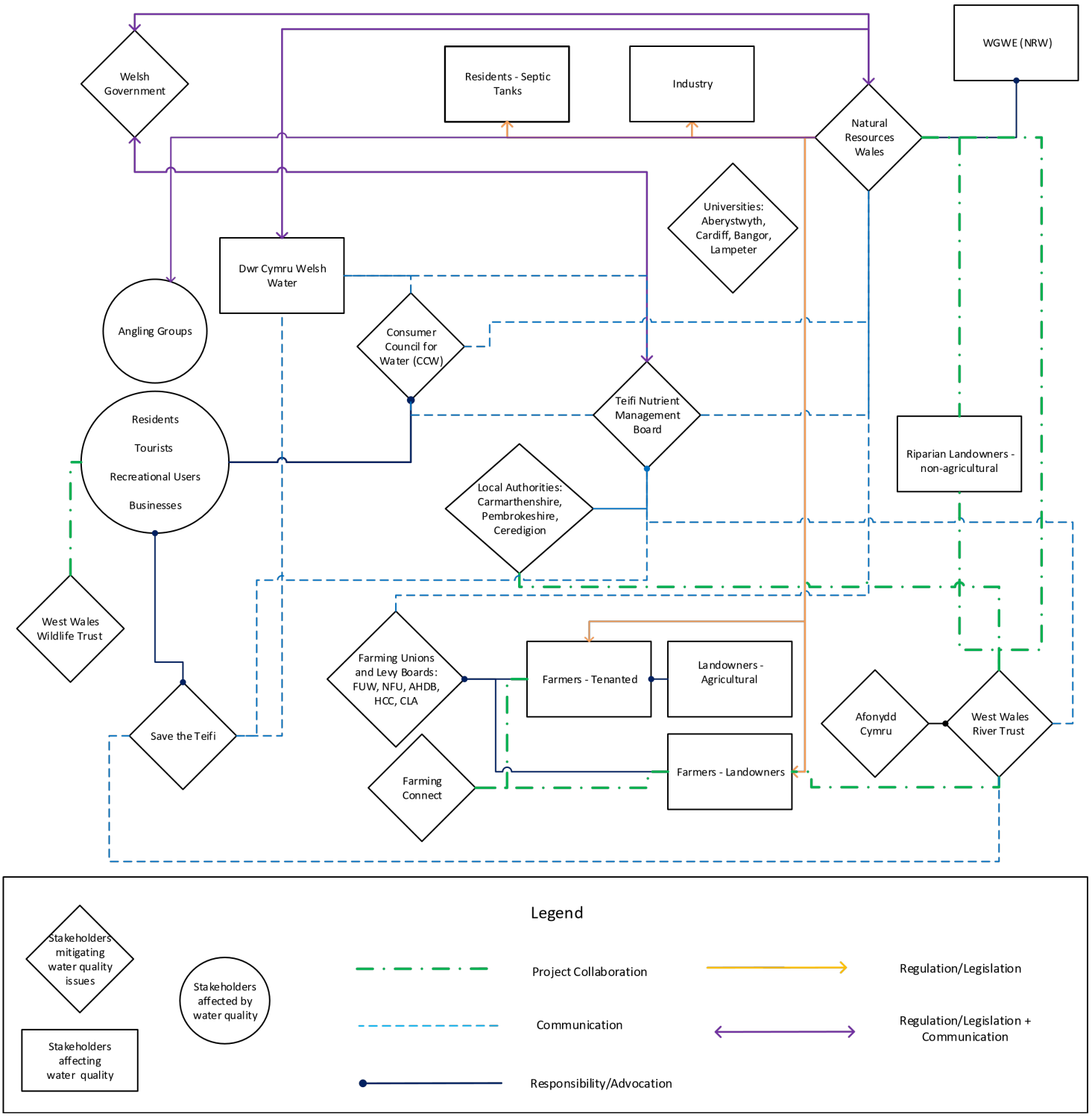
- There should be an ambition to more clearly represent local factors affecting rural land use, including landspreading practice, in the SAGIS model.
- Other models such as those available for nitrogen, and groundwater as a part of the Nutrient Review, and the SCIMAP sediment model for the Teifi produced by WWRT, should be explored for use in targeting interventions.

5. How do we improve the water environment in the Teifi catchment?

5.1 Stakeholders

There are many organisations and individuals within the Teifi catchment that are affecting water quality and working to improve it. Everybody who lives in and interacts with the Teifi catchment has the potential to impact and be impacted by the Teifi River and its environmental condition. The known relationships between the river stakeholders are mapped in Figure 37. Each stakeholder within the catchment is represented by a shape which changes depending on how the stakeholder interacts with water quality, and the lines of connection between the stakeholders differ depending on the perceived strength of these connections. The second aim of the TDP requires a collaborative approach to interventions. To achieve this by strengthening working relationships within the Teifi catchment, and therefore more effectively improve water quality, communication connections seen in Figure 37 should aim to change into collaboration and regulation/legislation connections should be strengthened with communication. In this manner we can ensure that everyone is included in the restoration of the Teifi Catchment.

Figure 37. The known stakeholders involved with freshwater management in the Teifi catchment and their connections to one another.



5.2 Stakeholder activities improving water quality

There are already many activities happening within the Teifi catchment to improve water quality. Understanding the extent and impact of this activity is important to avoid duplication within this project, but also to create connection between existing activities to strengthen them and also to build on, and learn from, the work of projects that have ended. Table K shows the plans available for managing water quality mitigation activities within the Teifi catchment, Table L shows the known activities for water quality improvement and monitoring within the catchment, per stakeholder.

Table K Water Management Plans for the Teifi Catchment

Organisation	**Plan**
Natural Resources Wales	Western Wales River Basin Management Plan 2021 – 2027 Summary
Natural Resources Wales	Core Management Plan including Conservation Objectives for Afon Teifi/River Teifi SAC (2022)
West Wales Rivers Trust for Natural Resources Wales	Fisheries Habitat Restoration Plan: Teifi Catchment (2018)
West Wales Rivers Trust for Natural Resources Wales	Afon Teifi Fisheries Habitat Restoration Report – Phase 2
Afon Teifi Nutrient Management Board	Afon Teifi Nutrient Management Plan (Draft)

Table L Known activities in the Teifi catchment per organisation. Statutory activities are in italics.

Principal Organisation	**Partner Organisation/s**	**Activity / Project Name and Sources**	**Summary**
NRW	-	*WFD Regulations Assessments and Investigations (See Section 2)*	*Conducted by monitoring and environment teams.*
NRW	-	*SAC Rivers Project - water quality assessment and features condition assessment (See Section 2)*	*Supported by NRW's monitoring programme.*
NRW	-	*Permitting and Regulation (See Section 2)*	*Activities that affect pollution are regulated.*
NRW	-	Incident Response (See Section 2)	NRW responds to, enforces, and regulates water pollution, illegal fishing, illegal abstraction, and suspected water course alteration incidents

Principal Organisation	Partner Organisation/s	Activity / Project Name and Sources	Summary
NRW	NRW / WG / DCWW / National Park Authority / Brecon Beacons National Park Authority / Agricultural Research Centre Coleg Sir Gar / Woodland Trust	Four Rivers for LIFE - Teifi (River Restoration Programmes)	River restoration project on the Teifi River. Works include river habitat improvement and re-meandering of Cors Caron. Also include INNS management, with removal of Himalayan Balsam and American Skunk Cabbage in the Teifi catchment (Natural Resources Wales, 2024j). 5,566m of riparian fencing has been completed on the main Teifi River and some tributaries. Two failing culverts have been replaced. 707ha of agricultural land have been directly influenced by these works and a further 4,108ha influenced through advice and guidance on improving agricultural practices.

Principal Organisation	Partner Organisation/s	Activity / Project Name and Sources	Summary
NRW	Welsh Government, the Mining Remediation Authority & Strata Florida Trust	Metal mine remediation projects – Abbey Consols and Esgair Mwyn	The two primary sources of metals pollution in the Teifi catchment, Abbey Consols (biggest source of zinc) and Esgair Mwyn (biggest source of lead) are sites subject to remediation projects as part of the joint Wales Metal Mine Programme between NRW and the Mining Remediation Authority. The two projects are at the detailed design stage with construction planned for future financial years. The other mine in the catchment, Cwm Mawr, is not believed to be a significant source of pollution and is not currently included in the Metal Mine Programme.
NRW	Welsh Government	Dairy Project	A project running from 2018 to 2023, delivering a programme of agricultural pollution prevention visits to dairy farms in Wales to reduce the number, frequency, and severity of agricultural pollution incidents.

Principal Organisation	Partner Organisation/s	Activity / Project Name and Sources	Summary
Afonydd Cymru / West Wales Rivers Trust	NRW	Fisheries Habitat Restoration Project	Walk-over surveys conducted by West Wales Rivers Trust to identify barriers to fish migration with recommended actions for mitigating these.
Afonydd Cymru / West Wales Rivers Trust	Afon Teifi Nutrient Management Board	Sediment Pathways Project	Mapping of diffuse pollution using the SCIMAP fine sediment risk model in the Teifi catchment.
Afonydd Cymru/ West Wales Rivers Trust	Ceredigion County Council	'Adopt a Tributary' Scheme	Scheme to mobilise groups of volunteers and support them in improving individual tributaries.19 of the Teifi's tributaries have been adopted.
Afonydd Cymru / West Wales Rivers Trust	Small World Esmée Fairbairn Foundation	People's Plan for the Teifi	Survey to gather individuals' perspectives on the River Teifi. Currently underway and reporting in April 2025.
Afon Teifi Nutrient Management Board	NRW, West Wales Rivers Trust, Dŵr Cymru Welsh Water, Save the Teifi	Monitoring Programme - Phosphate and multi-parameter sensors	A two-phase monitoring programme to monitor phosphate and other water quality parameters on the main river and tributaries - a mixture of real time monitoring, citizen science and other methods.

Principal Organisation	Partner Organisation/s	Activity / Project Name and Sources	Summary
Afon Teifi Nutrient Management Board	NRW, West Wales Rivers Trust, Dŵr Cymru Welsh Water, Save the Teifi	Phosphate Reduction and Mitigation (PRAM) Project - Teifi	Phosphate reduction project funded by HLF and delivered in 2023 – Initiatives included working with individual farms to reduce run off, riparian fencing, incentives to use septic tank servicing.
Ceredigion County Council	Arcadis	Strategic Mitigation	Proposed strategic mitigation opportunities along the Teifi River which includes two integrated constructed wetland and one wet woodland.
Ceredigion County Council	Unknown at present – out for tender	County Farms Net Benefit Assessment	To holistically consider the net benefit of CCC agricultural land holdings and qualitatively and quantitatively assess the before and after analysis of strategic changes to increase economic, environmental, and social impacts including biodiversity, carbon capture and nutrient mitigation.
Dŵr Cymru Welsh Water	-	*WTW (2) and WwTW (28) (30 Sites in Total)*	*Maintenance and monitoring of major abstraction and discharge points on the river.*

Principal Organisation	Partner Organisation/s	Activity / Project Name and Sources	Summary
Dŵr Cymru Welsh Water	-	*PR-24 Business Plan 2025 - 30*	*DCWW are committed to a reduction in total load of phosphorus across Wales of 30% 2035 based on 2020 levels. This will be covered by Asset Management Programme (AMP) 8 and 9. Details of reductions on the Teifi can be found in Section 2.5.5. and 2.6.*
Dŵr Cymru Welsh Water	University of Leeds	Pesticide pollution intervention programme - 'Weed wiper trial'	Programme to reduce pesticide use by increasing awareness and providing support to land managers to follow best management practice (Okumah, 2021).
Farming Connect	Welsh Government, Multiple Farms	On-farm projects	Soil mapping at a site in the Teifi catchment. From 2019 to 2022.
Farming Connect	Welsh Government, Multiple Farms	Welsh soil project	The project objectives are to - carry out a soil carbon audit on a proportion of the farm's fields (fields that vary in their soil type/properties and use/management); assess soil microbial activity by burying cotton material and evaluating its decomposition over time.

5.3 Driving further improvement in the Teifi Catchment

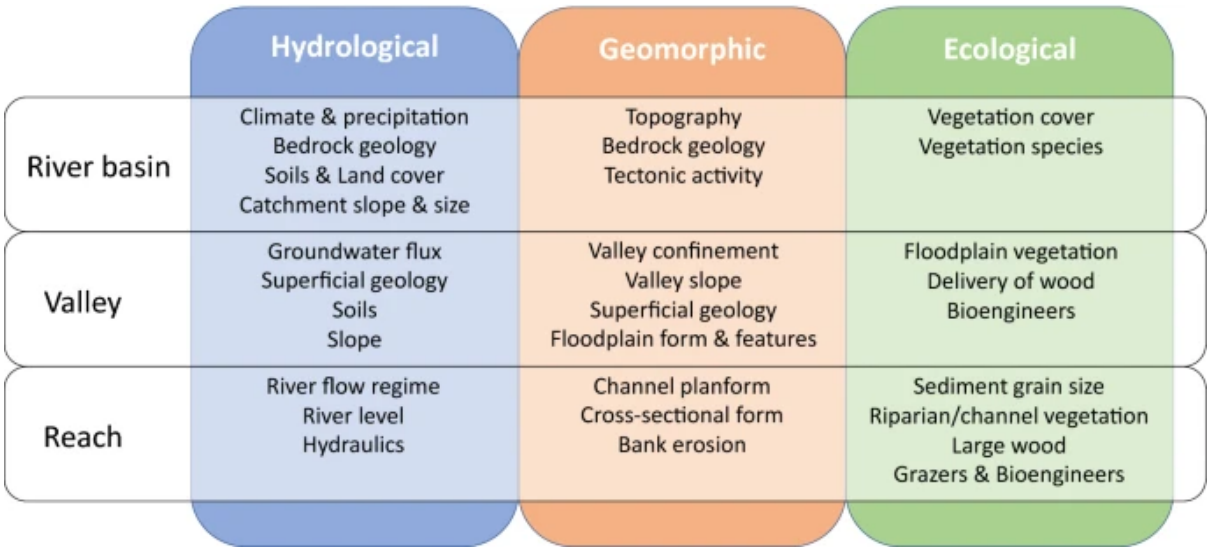
Once water bodies have been identified for targeted intervention, deciding what, where, and by whom interventions should take place within the water body is the next step. For point source pollution (WwTWs, or storm overflows), this is simpler as the source is usually known and so interventions, such as DCWW's plans to reduce phosphorus output at their treatment works (Table L), can be more easily focused. In the case of rural land use pollution (a term which covers a wide variety of different types of pollution from bank erosion, to slurry, to pesticide run off) defining the interventions, and securing agreement on the responsibilities and the resources to act, becomes more complex.

5.3.1 Integrated catchment management

In terms of *what* to do to mitigate the effects of pollution within the Teifi catchment, aligning interventions with the SMNR principles is the first aim of the TDP and these principles, which include ensuring resilient ecosystems that provide multiple benefits in the long term through participatory action, provide a guide to ensuring interventions deliver the best possible outcomes.

One principle of the SMNR approach is to ensure appropriate scale and Grabowski *et al*. (2022) provide a conceptual model for visualising catchment management using the Ecosystem Approach. They identify hydromorphic, geomorphic, and ecological factors that influence riverine processes at different spatial scales that reflect the natural and anthropogenic character of the landscape (Figure 38). This type of approach provides a framework for managing rivers and aligns with the WFD Regulations, the Habitats Regulations, the Freshwater SSSI Designation Guidelines (Mainstone *et al*. 2018), and with the JNCC Rivers Common Standards Monitoring Guidance (JNCC 2016).

Figure 38. Conceptual Framework of River Processes at different scales. From Grabowski et al. (2022).



Natural Flood Management (NFM) is another type of ecosystem approach that can follow SMNR principles, and it can be combined with techniques for river restoration to deliver the improvements to habitat structure which are required to improve the water environment. NFM involves working across the landscape to protect, restore or mimic natural hydrological processes. This includes increasing infiltration of water, slowing the flow of water across the landscape, storing water, and holding back sediment. In addition to flood risk alleviation for vulnerable communities, this approach can provide many SMNR co-benefits when delivered correctly, such as habitat creation, carbon storage and water quality improvement (The Flood Hub, 2024). River restoration is a concept encompassing a wide variety of intervention approaches that are all designed to support the return of natural river ecosystem function (River Restoration Centre, 2024a). Interventions can include riparian planting to create an intact riparian corridor, in stream interventions, re-meandering and woodland buffer strip planting (River Restoration Centre, 2024b). Figure 39 shows how rural land use management could be changed to support the ecosystem approach.

Under the SMNR approach, NFM and river restoration techniques are compatible and can be combined and used concurrently for maximum benefit. Their primary benefit is on water flow management and habitat creation but can also realise water quality improvements. For example, in the management of floodplains and wetlands (e.g. marshes and bogs) within a catchment. These ecosystems can be restored to store water and, as the transitional area between aquatic and terrestrial systems, act as a buffer zone (River Restoration Centre, 2024b). After these habitats have been restored, processes such as nutrient cycling can then be managed to improve water quality, for example, by hay

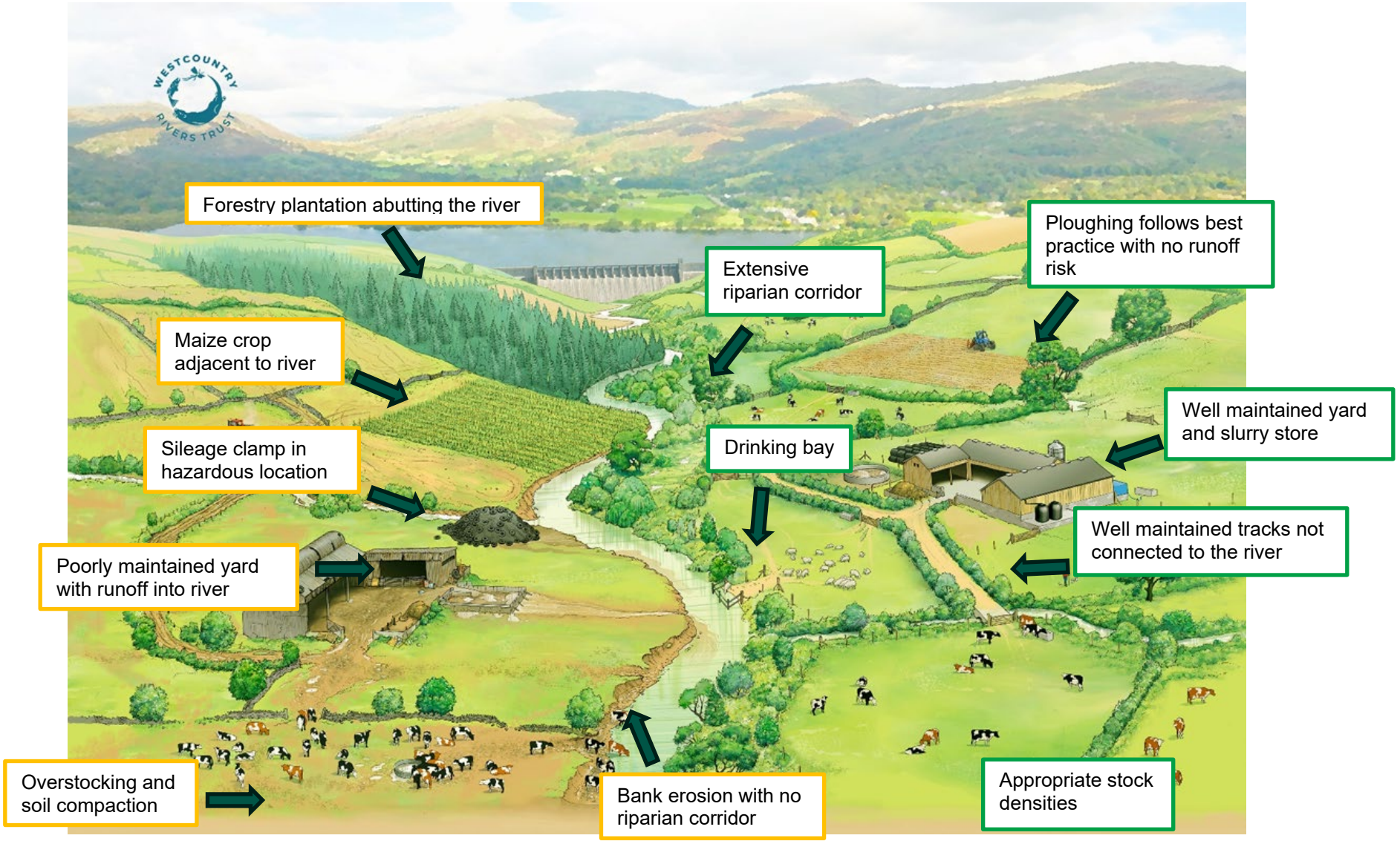
making from floodplain meadows to remove nutrients deposited by river sediment from the floodplain (Floodplain Meadows Partnership, 2024).

A number of the interventions supported by nature-based solutions are happening in the Teifi catchment already, for example, as part of the Four Rivers for Life project and the Fisheries Habitat Restoration Project (Table L). In addition to supporting water environment improvement for the Teifi catchment itself, expanding and trialling different SMNR approaches within the catchment may provide wider opportunities. For example, it can help to inform the SFS by providing learning on the benefits associated with different interventions. It could also provide learning on how these approaches may be used to alleviate the pressure on the water environment created by development planning proposals.

Approaches to rural land use pollution also need to include the reduction of pollution at its source. This may require changes in land use practices and a better understanding of the land use itself and its interaction with the environment. The RePhoKUs project, which took place in three UK catchments including the River Wye, was a research project looking at phosphorus inputs and outputs into a catchment. The project considered how phosphorus 'use in the UK food system could become more efficient, sustainable, and resilient at catchment, regional and national scales' (Withers et al., 2022, p. 4). One of the key messages of the project is a need for 'greater regulatory, training, incentive, technical and infrastructure support' in order to create the transformative exchange needed to improve water quality (Withers et al., 2022, p. 18). The TDP could be a mechanism for delivering these types of support.

Another key message of the RePhoKUs project is the need of soil analysis surveys to help with land and nutrient management. This type of work is being carried out by other initiatives such as the Soil Nutrient Health Scheme in Northern Ireland which aims to reduce rural land use pollution by supporting farmers to optimise crop nutrient application. Run off risk maps are produced for this project at a farm level using LiDAR (a remote sensing method) (AFBI, 2023). Soil mapping using soil sampling has also been undertaken by one farm in the Teifi catchment with the help of Farming Connect (See Table L). Remote sensing data is currently captured for Wales as part of the Living Wales project. Investigations are currently underway within NRW to consider whether this data, or other available models, can be made useful for farmers and landowners as run off risk maps at a farm level, or if further remote sensing could be needed (Living Wales, 2024).

Figure 39 Bad (left) and Good (right) practice in rural land use management (c) Westcountry Rivers Trust



5.3.2 Locations for intervention

In terms of *where* to apply the interventions within the Teifi catchments' water bodies, the walkover surveys (Table L) conducted by West Wales Rivers Trust cover 25 water body catchments, and the subsequent Fisheries Habitat Restoration Plans (Table K) detail habitat issues and opportunities for restoration. To complement these plans, or in places where they are not available, GIS map layers which model potential locations for different interventions can be used as a starting point. Three of these models are discussed below.

Priority Ecological Networks (PEN) have been produced by NRW to show areas of connectivity between protected sites and provide a framework for action such as habitat creation or improvement either within the PEN or at its margins in order to extend the current PEN or link to others (Natural Resources Wales, 2023d). Figure 40 shows the Marine, Fen, Native Woodland, Sand Dune, Semi-natural grassland, Heathland and Bog Pens and where they overlap with the Teifi catchment. A hotspot map layer is also available, which shows the count per 1km square of networks within that square, it can be accessed via Data Map Wales.

Figure 40. Priority Ecological Networks within the Teifi Catchment

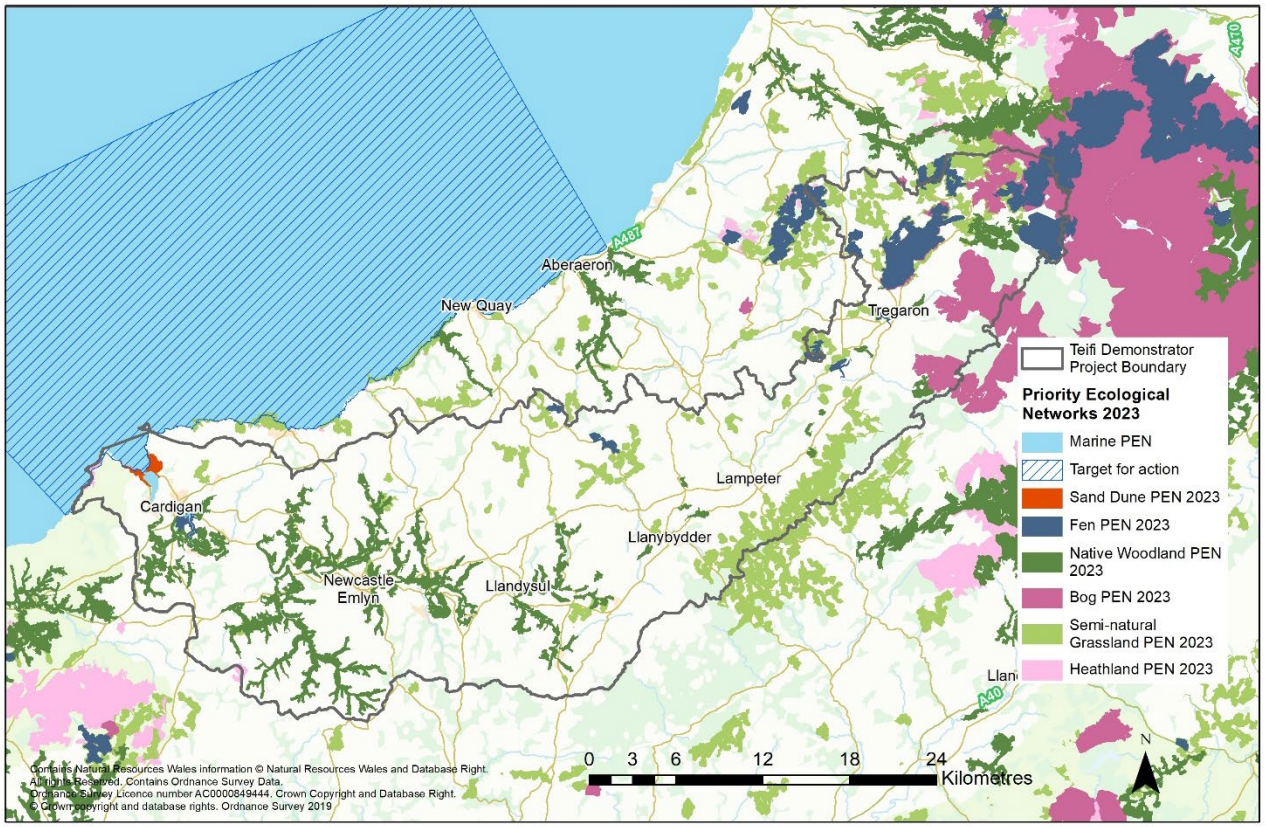


Figure 41 shows the second model discussed in this sub-section. It was produced by NRW as part of the Welsh Information for Nature-based Solutions (WINS) map series. The map

series uses the national Phase 1 Habitat Survey dataset which is derived from a programme of field recording undertaken in the late 20th century. Figure 41 shows opportunities for where interventions which would help reduce nutrient enrichment could, for example, be placed within one of the Teifi catchment's water body's, the Hirwaun (GB110062039130). The WINS modelling is available for the whole of Wales, including the whole of the Teifi catchment. The four interventions modelled are: channel belts (wooded shelterbelts along drainage channels), habitat restoration, hedgerow planting and riparian woodland planting (Natural Resources Wales, 2022e). The WINS map series also includes potential opportunities for reducing sedimentation and faecal coliforms entering the river, as well as their constraints.

Figure 41. WINS opportunity layer for reducing nutrient enrichment in the Hirwaun water body catchment.

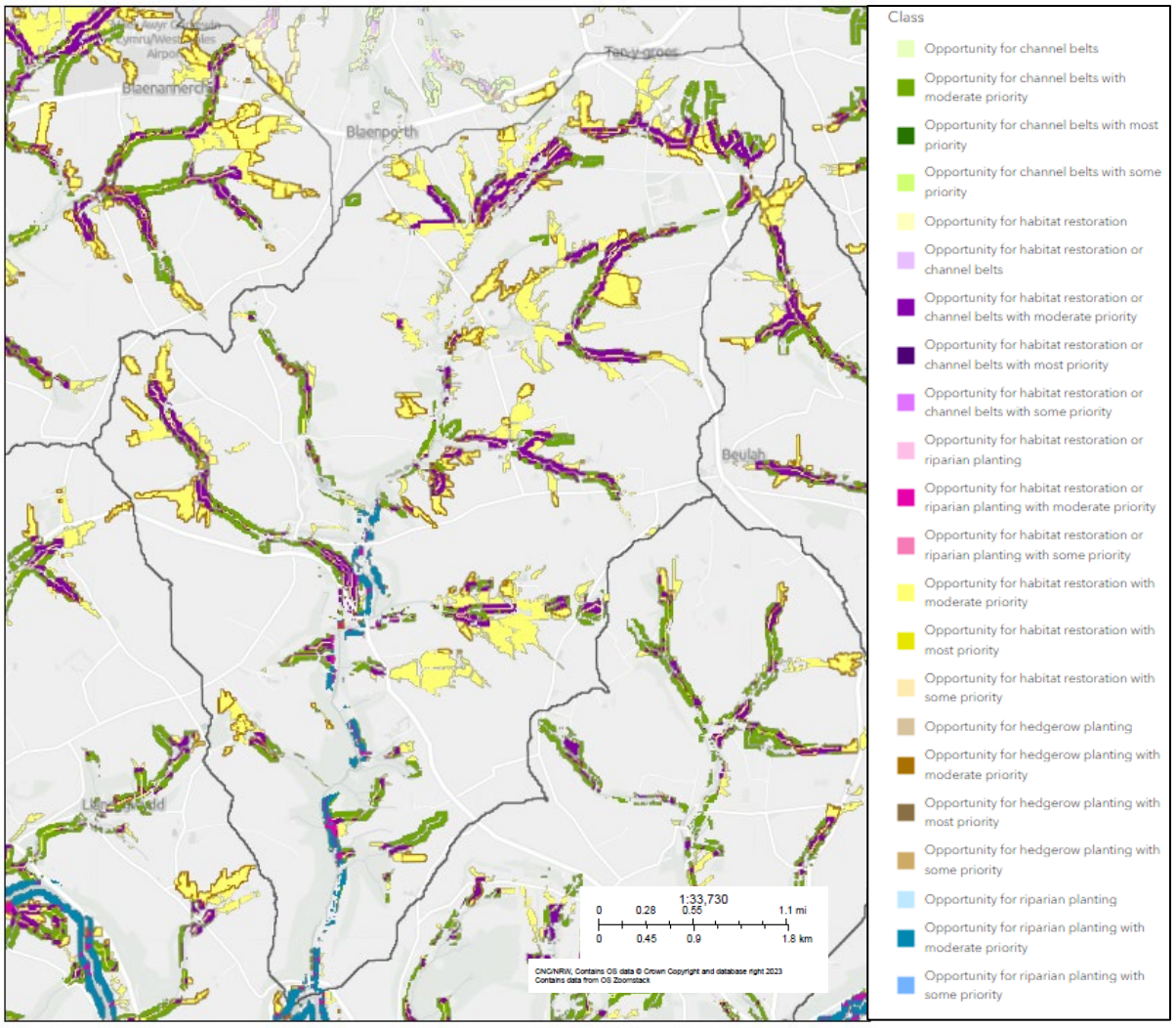
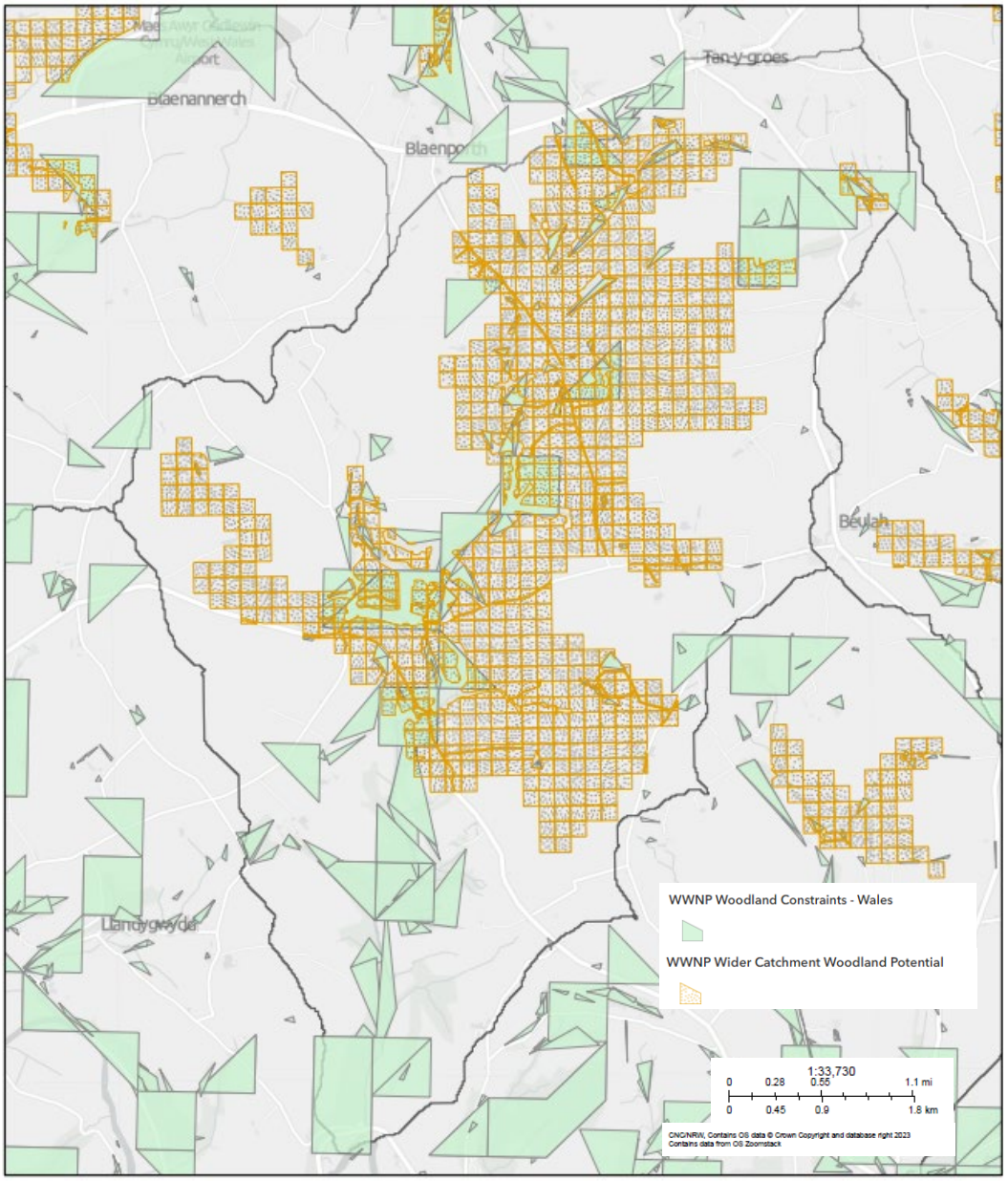


Figure 42 shows one of the modelling outputs produced by Natural Resources Wales and the Environment Agency as part of the Working with Natural Processes (WWNP) project. The WWNP modelling outputs are available for the whole of Wales, including the whole of

the Teifi catchment. Figure 42 shows opportunities for planting and constraints for areas in the Hirwaun catchment where planting woodland would have the highest potential for increasing infiltration due to slowly permeable soils. The WWNP also includes map layers showing riparian and floodplain woodland planting potential more specifically (Natural Resources Wales, 2018c).

Figure 42 WWNP layers showing constraints and opportunities for planting woodland in the wider catchment (outside of floodplains and riparian areas).



5.3.3 Collaborative and transformative change

In terms of *who* should be involved in an integrated catchment management approach, the benefits of socially and culturally inclusive approaches to improving our rivers has been recognised (United Nations, 2023). Reconnecting people to their rich cultural and natural heritage within the Teifi catchment (see Section 1) by undertaking collaborative restoration measures would mean that communities, stakeholders, land managers, businesses and visitors could all benefit from, and be empowered to maintain, an improved river environment.

This inclusion of all individuals in the improvement process is intended to bring about transformative change, something that the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) states is required to respond to global environmental challenges and crises. The recently published 'Transformative Change Assessment', highlights five key strategies that the TDP should consider pursuing to effect the changes required:

1. Conserve, restore and regenerate places of value to people and nature that exemplify biocultural diversity;

2. Drive systematic change and mainstreaming biodiversity in the sectors most responsible for nature's decline;

3. Transform economic systems for nature and equity;

4. Transform governance systems to be inclusive, accountable, and adaptive;

5. Shift views and values to recognize human-nature interconnectedness.

5.5 Section summary

The first part of this section focuses on the people of the Teifi Catchment and the many activities already taking place to improve the riverine environment and water quality. Aside from the statutory duties of NRW and DCWW, these activities include: INNS removal and river meandering carried out by the Four Rivers for LIFE project; plans to reduce metal pollution through metal mine remediation projects; river walk-over surveys to identify barriers to fish migration; a Nutrient Management Plan (NMP) and numerous community engagement activities.

The last part of this section outlines some of the resources and approaches which are available for mitigating, and deciding how to mitigate, pollution within the Teifi catchment. Intervention approaches for the TDP to take forward, to support the ongoing activities detailed above, include a catchment management approach which applies river restoration and natural flood management techniques; approaches aimed at adapting land management; flexible regulatory approaches and a collaborative approach which ensures cultural restoration alongside environmental restoration; models and maps are available to help target certain interventions, alongside the evidence and information sources provided in this report.

Recommendations:

- In order to improve the water environment within the Teifi catchment, especially with regards to diffuse pollution, a collaborative approach should be taken which includes all stakeholders affecting and affected by water quality, to more comprehensively understand the agricultural inputs such as those from materials to land.
- The TDP should realise the connection with cultural heritage by working with communities to foster pro-environmental attitudes and change behaviours. Seek funding opportunities which allow this connection to be fostered.
- Interventions to improve water quality and improve habitat resilience should seek to use a combination of community involvement, nature-based solutions, river and flood plain restoration, more sustainable farming practice and adaptive regulation.
- The TDP should consider piloting the delivery of rural land use related SMNR interventions and capturing learning, so they inform future land use policy in Wales, in particular optional and collaborative action within the new SFS scheme.
- Based on the intervention modelling discussed in sub-section 5.3, it is unlikely that more catchment-scale data is needed to carry out tree planting or habitat restoration projects. However, scoping of individual sites is required should these types of interventions form part of the TDP.
- The information presented in this report should be added to, improved, and updated over the course of the TDP as an evolving resource to support water environment restoration and improvement in the Teifi catchment. This may include:
    - Water body specific data and evidence to support local action.
    - The stakeholder map (Figure 37) and stakeholder activity table (Table L). This could also be improved with a map of activities and/or an inventory of actions in the catchment to support collaboration.
    - Evidence collected by the activities included in Table L, and any other activities within the Teifi catchment that become relevant to the TDP.
    - Evidence relevant to catchment management and the ecosystem approach as it applies to freshwaters published in the scientific literature and the Citizen Science sector both from within the Teifi catchment and elsewhere.
- The evidence detailed in the above recommendation should, where possible, be made publicly available through a single open platform which is maintainable for the long term and prioritises data visualisation and aids evidence interpretation.
- The delivery of specific interventions should be flexible, and continually evaluated, with support from the evidence base detailed in the above two recommendations, to ensure they have their intended impact on the watercourse and its surrounding areas, including habitat networks.

6. All recommendations

As stated in the executive summary, the recommendations in this report are intended to inform future project development and delivery via the partnership. The delivery of these recommendations will be dependent on securing adequate project funding and effective collaboration with project partners and other stakeholders. The following recommendations are made throughout this report and reiterated here for ease of reference:

Section 2 – How does NRW regulate/manage the Teifi catchment?

- To consider the current management (such as designations) of the Teifi catchment when undertaking interventions to ensure that work has synergistic benefits where possible.
- To consider how this evidence review, and subsequent research may inform future river basin management planning, and land use planning and development.
- Evidence gaps which require further investigation are the limited of understanding of:
    - The number, type, and impact of private sewage systems in the Teifi catchment.
    - The quantity and type of material to land application in the Teifi catchment.

Section 3 – What are the problems with the water environment in the Teifi catchment?

- The water quality assessments discussed in this section should be used to understand water quality at a water body level in the Teifi catchment. Further monitoring to support specific interventions on a more local scale should be developed if necessary. In cases where monitoring external to NRW is available or a collaborative monitoring approach is possible, this should be considered in line with NRW's acceptability of use policy.
- The uncertainty and time lag of the classifications within water quality assessments should be considered when attempting to use them to assess the success of interventions.
- The Teifi Demonstrator Project should explore if it can fill some of the evidence gaps identified in this section, either through established monitoring techniques or via other methods:
    - Pesticides and other chemicals
    - Macrophytes
    - Phytobenthos (diatoms)

- Sediment pressure
- Flow (tributaries)
- INNS

Section 4 – What is causing water pollution in the Teifi catchment?

- The information provided in this section should be used to help target and prioritise appropriate interventions at a water body level, to achieve an overall improvement in water quality.
- There should be an ambition to more clearly represent local factors affecting rural land use, including landspreading practice, in the SAGIS model.
- Other models such as those available for nitrogen, and groundwater as a part of the Nutrient Review, and the SCIMAP sediment model for the Teifi produced by WWRT, should be explored for use in targeting interventions.

Section 5 – How do we improve the water environment in the Teifi catchment?

- In order to improve the water environment within the Teifi catchment, especially with regards to diffuse pollution, a collaborative approach should be taken which includes all stakeholders affecting and affected by water quality.
- The TDP should realise the connection with cultural heritage by working with communities to foster pro-environmental attitudes and change behaviours. Seek funding opportunities which allow this connection to be fostered.
- Interventions to improve water quality and improve habitat resilience should seek to use a combination of community involvement, nature-based solutions, river and flood plain restoration, more sustainable farming practice and adaptive regulation.
- The TDP should consider piloting the delivery of rural land use related SMNR interventions and capturing learning, so they inform future land use policy in Wales, in particular optional and collaborative action within the new SFS scheme.
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    - The stakeholder map (Figure 37) and stakeholder activity table (Table L). This could also be improved with a map of activities and/or an inventory of actions in the catchment to support collaboration.

    - Evidence collected by the activities included in Table L, and any other activities within the Teifi catchment that become relevant to the TDP.
    - Evidence relevant to catchment management and the ecosystem approach as it applies to freshwaters published in the scientific literature and the Citizen Science sector both from within the Teifi catchment and elsewhere.
- The evidence detailed in the above recommendation should, where possible, be made publicly available through a single open platform which is maintainable for the long term and prioritises data visualisation and aids evidence interpretation.
- The delivery of specific interventions should be flexible, and continually evaluated, with support from the evidence base detailed in the above two recommendations, to ensure they have their intended impact on the watercourse and its surrounding areas, including habitat networks.

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Appendices

Appendix A Farm business size in the Teifi catchment

Number of farm businesses by hectarage and overall, in the Teifi catchment, as well as the percentage of farms within the Teifi catchment found in each hectare category (Natural Resources Wales, 2023b).

Farm Business Size (Hectares)	**Count**	**%**
0 - 25	561	39.0%
26 - 50	317	22.0%
51 - 100	362	25.1%
101 - 200	155	10.8%
201 - 300	28	1.9%
301 - 400	11	0.8%
401 - 710	6	0.4%
Total	1440	100%

Appendix B Farm business area per water body

Table showing the count of farm businesses per water body with an approximate figure for area of water body which is part of a farm business (Welsh Government, 2023b). This Table is based on the Land Parcel Information System (LPIS) dataset and therefore only includes farm businesses which are in receipt of subsidy.

Water body	Water body Name	Water body catchment Area (Hectares)	Count of Farm Business with Central Point within Water body	Farm Business Area per Water body (Hectares)*
GB110062043540	Teifi - headwaters to confluence with Meurig	4021	17	3719
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	7301	110	5117
GB110062038950	Tyweli - headwaters to confluence with Talog	1230	23	766
GB110062039000	Siedi - headwaters to confluence with Teifi	1192	23	862
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	1933	36	1928
GB110062039050	Morgenau - headwaters to confluence with Teifi	1128	10	609
GB110062039070	Piliau - headwaters to confluence with Teifi	1391	32	1076
GB110062039130	Hirwaun - headwaters to confluence with Teifi	1947	26	1472
GB110062039150	Cledlyn - headwaters to confluence with Teifi	2729	46	2323
GB110062039180	Dulas - headwaters to conf Ceri	1270	26	752
GB110062039200	Clywedog - headwaters to confluence with Teifi	1710	13	860

Water body	Water body Name	Water body catchment Area (Hectares)	Count of Farm Business with Central Point within Water body	Farm Business Area per Water body (Hectares)*
GB110062039230	Grannell - headwaters to confluence with Teifi	3782	62	3269
GB110062039250	Brefi - headwaters to confluence with Teifi	1888	11	1414
GB110062043490	Groes - headwaters to confluence with Brennig	1349	11	740
GB110062043530	Camddwr - headwaters to confluence with Teifi	2655	43	1616
GB110062038960	Cneifa - headwaters to confluence with Cych	1375	23	857
GB110062038980	Talog - headwaters to confluence with Tyweli	2129	29	1402
GB110062039010	Dulas - headwaters to confluence with Cych	2241	35	2035
GB110062039030	Bargod - headwaters to confluence with Teifi	2688	42	1532
GB110062039041	Cych - headwaters to confluence with Teifi	5381	84	4643
GB110062039060	Duar - headwaters to confluence with Teifi	1465	23	1180
GB110062039090	Cynllo - headwaters to confluence with Teifi	1749	32	1257
GB110062039110	Ceri - Dulas to conf Teifi	1793	29	1552
GB110062039140	Cerdin - headwaters to confluence with Teifi	2804	42	2436
GB110062039160	Mwldan	1255	18	1071
GB110062039170	Arberth - headwaters to confluence with Teifi	1627	26	1780

Water body	Water body Name	Water body catchment Area (Hectares)	Count of Farm Business with Central Point within Water body	Farm Business Area per Water body (Hectares)*
GB110062039190	Ceri - headwaters to conf Dulas	2974	58	2224
GB110062039210	Creuddyn - headwaters to confluence with Teifi	1172	10	1094
GB110062039220	Clettwr - headwaters to confluence with Teifi	5934	87	5518
GB110062039240	Dulas - headwaters to conf Teifi	2973	48	2274
GB110062043470	Berwyn/Brennig - headwaters to confluence with Teifi	1728	14	629
GB110062043501	Teifi - conf with Meurig to conf with Brennig	3526	45	3139
GB110062043510	Fflur - headwaters to confluence with Teifi	1519	7	726
GB110062043550	Meurig - headwaters to confluence with Teifi	1469	15	896
GB110062043563	Teifi - Afon Ceri to estuary	4355	59	3142
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	5837	83	4421
GB110062043566	Teifi - Afon Brennig to Afon Dulas	6193	79	4786
N/A	No Water body (Estuary and Coast)	N/A	63	0

**Farm Business Area per Water body (Hectares) is an approximate figure calculated based off whether farm business central point is located within a water body, if so, the entire area of the farm business is included in the sum area. Farm business areas may cross the boundary of two water bodies, equally water bodies will contain parts of other farm businesses whose central points are not within their area. This is not represented in this calculation.*

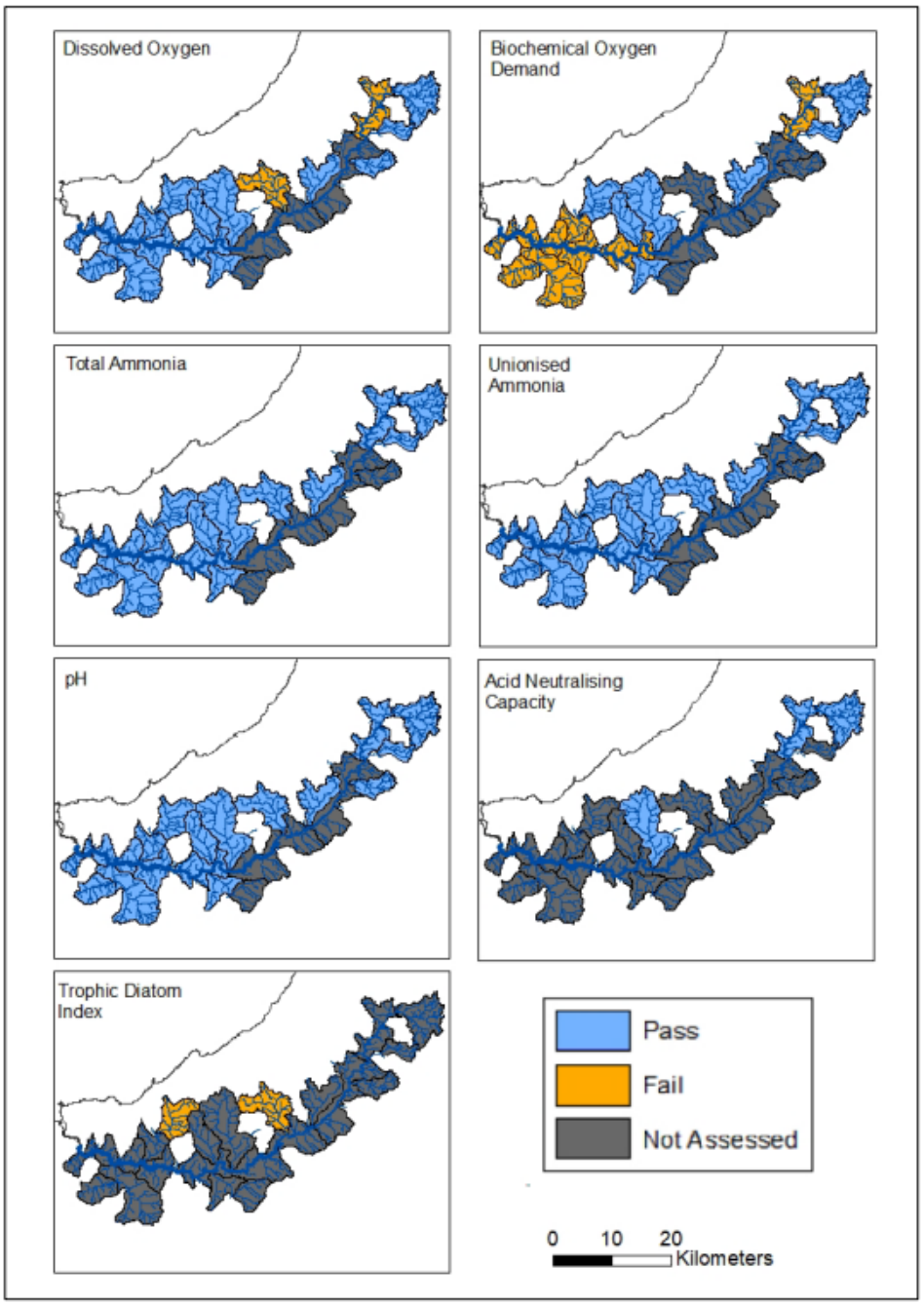
Appendix C Water Quality Exemptions

Water body ID	Water body Name	Overall Water body Status (WFD 2021)	No. of Sewage Discharge Water Quality Exemptions	Other Water Quality Exemptions
GB110062039110	Ceri - Dulas to conf Teifi	Poor	123	2
GB110062039130	Hirwaun - headwaters to confluence with Teifi	Poor	131	2
GB110062039160	Mwldan	Poor	92	2
GB110062039030	Bargod - headwaters to confluence with Teifi	Moderate	151	3
GB110062039050	Morgenau - headwaters to confluence with Teifi	Moderate	37	0
GB110062039070	Piliau - headwaters to confluence with Teifi	Moderate	45	0
GB110062039150	Cledlyn - headwaters to confluence with Teifi	Moderate	106	1
GB110062039170	Arberth - headwaters to confluence with Teifi	Moderate	114	2
GB110062039180	Dulas - headwaters to conf Ceri	Moderate	144	0
GB110062039190	Ceri - headwaters to conf Dulas	Moderate	212	1
GB110062039220	Clettwr - headwaters to confluence with Teifi	Moderate	311	2
GB110062039230	Grannell - headwaters to confluence with Teifi	Moderate	122	0
GB110062039240	Dulas - headwaters to conf Teifi	Moderate	79	0
GB110062043501	Teifi - conf with Meurig to conf with Brennig	Moderate	101	2
GB110062043510	Fflur - headwaters to confluence with Teifi	Moderate	3	0
GB110062043530	Camddwr - headwaters to confluence with Teifi	Moderate	129	2
GB110062043540	Teifi - headwaters to confluence with Meurig	Moderate	31	0
GB110062043550	Meurig - headwaters to confluence with Teifi	Moderate	15	0
GB110062043563	Teifi - Afon Ceri to estuary	Moderate	256	2
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	Moderate	349	5
GB110062043566	Teifi - Afon Brennig to Afon Dulas	Moderate	238	0
GB110062038950	Tyweli - headwaters to confluence with Talog	Good	64	0

Water body ID	Water body Name	Overall Water body Status (WFD 2021)	No. of Sewage Discharge Water Quality Exemptions	Other Water Quality Exemptions
GB110062038960	Cneifa - headwaters to confluence with Cych	Good	43	0
GB110062038980	Talog - headwaters to confluence with Tyweli	Good	44	1
GB110062039000	Siedi - headwaters to confluence with Teifi	Good	46	0
GB110062039010	Dulas - headwaters to confluence with Cych	Good	64	0
GB110062039020	Tyweli - confluence with Talog to confluence with Teifi	Good	59	0
GB110062039041	Cych - headwaters to confluence with Teifi	Good	213	0
GB110062039060	Duar - headwaters to confluence with Teifi	Good	44	0
GB110062039090	Cynllo - headwaters to confluence with Teifi	Good	134	2
GB110062039140	Cerdin - headwaters to confluence with Teifi	Good	196	2
GB110062039200	Clywedog - headwaters to confluence with Teifi	Good	31	1
GB110062039210	Creuddyn - headwaters to confluence with Teifi	Good	28	0
GB110062039250	Brefi - headwaters to confluence with Teifi	Good	24	0
GB110062043470	Berwyn/Brennig - headwaters to confluence with Teifi	Good	36	0
GB110062043490	Groes - headwaters to confluence with Brennig	Good	14	0
GB110062043564	Teifi - Afon Clettwr to Afon Ceri	Good	332	3
Total Water Quality Exemptions			4161	35

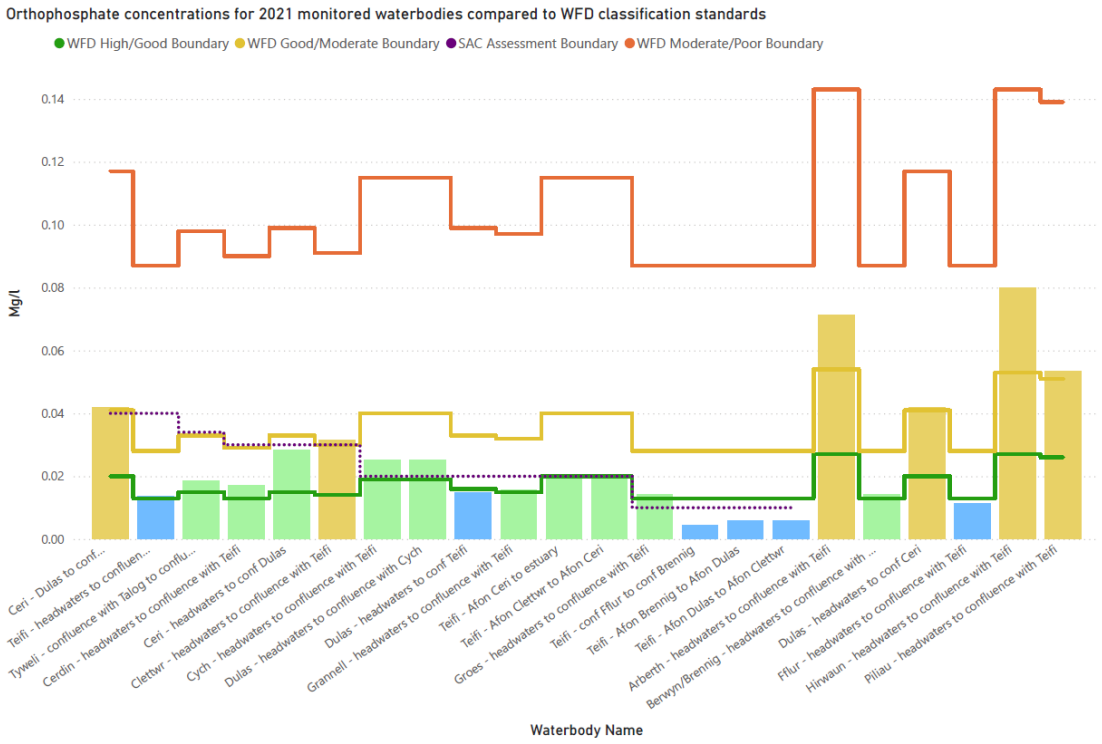
Appendix D Previous SAC Water Quality Assessment

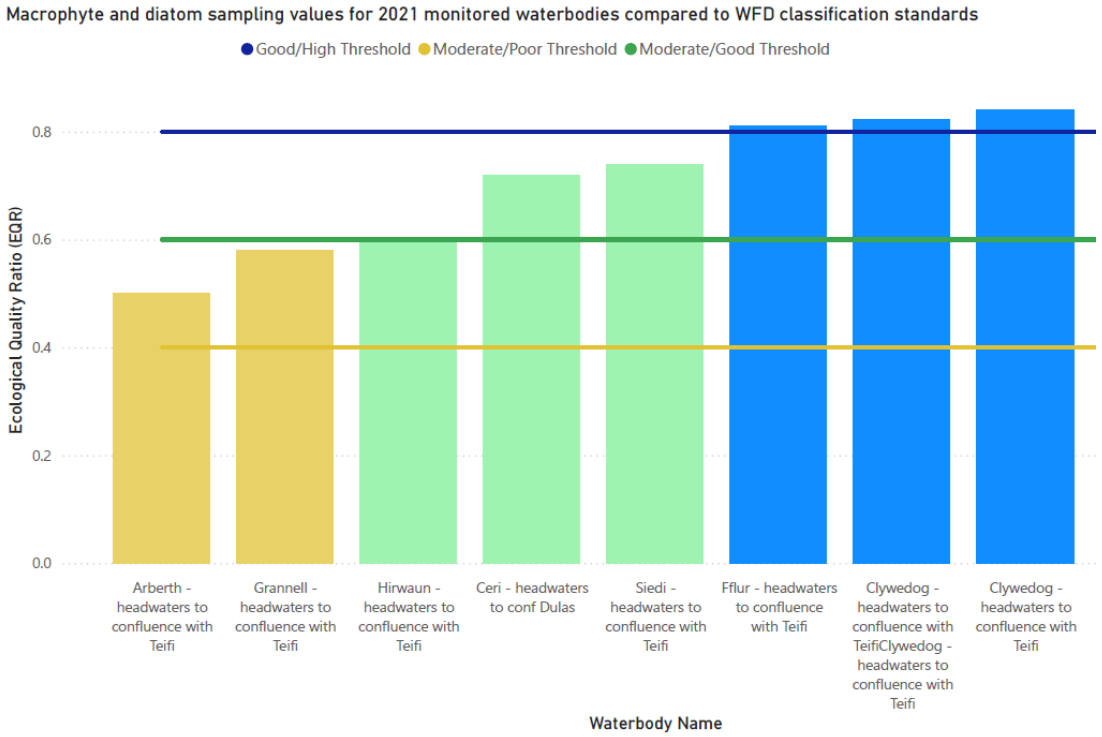
‘Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the Afon Teifi Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed’ (Foster et al., 2024 p.52)

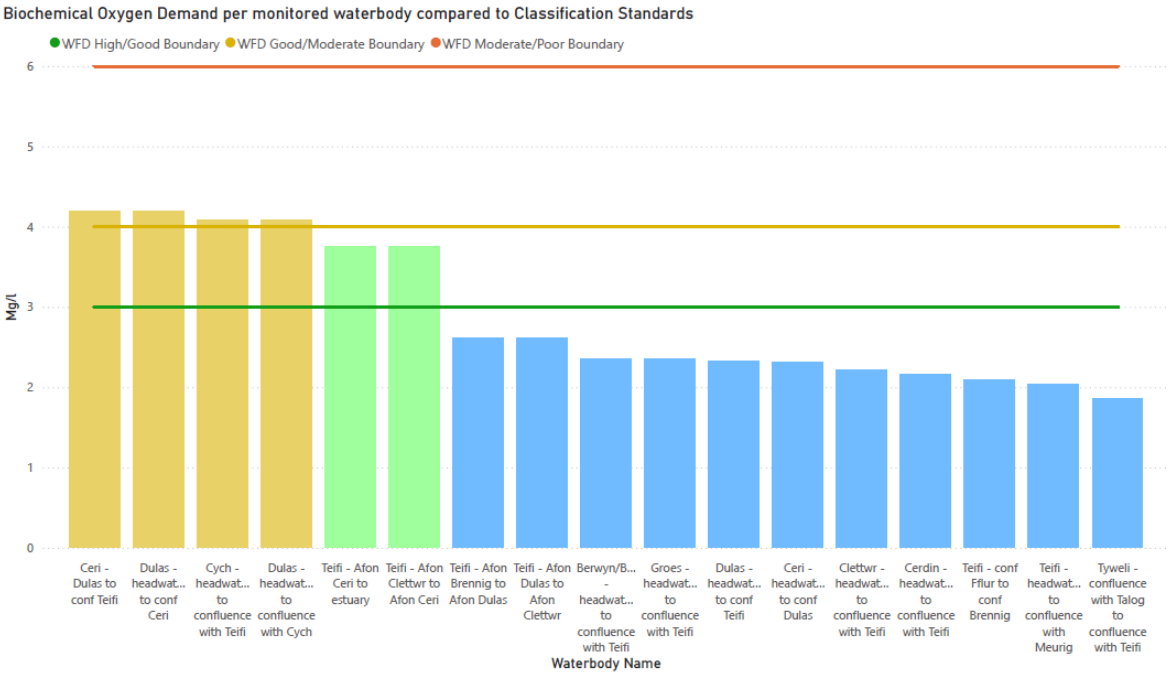


Appendix E Orthophosphate, Macrophyte and Diatom and BOD data graphs for the 2021 WFD Assessment

Bars are coloured to show their WFD Regulations classification - Blue: High, Green: Good, Moderate: Yellow. Line graphs showing the threshold for classification standards.




Macrophyte and diatom sampling values for 2021 monitored waterbodies compared to WFD classification standards
Good/High Threshold
Moderate/Poor Threshold
Moderate/Good Threshold
Ecological Quality Ratio (EQR)
0.8
0.6
0.4
0.2
0.0
Arberth - headwaters to confluence with Teifi
Grannell - headwaters to confluence with Teifi
Hirwaun - headwaters to confluence with Teifi
Ceri - headwaters to conf Dulas
Siedi - headwaters to confluence with Teifi
Fflur - headwaters to confluence with Teifi
Clywedog - headwaters to confluence with TeifiClywedog - headwaters to confluence with Teifi
Clywedog - headwaters to confluence with Teifi
Waterbody Name


Biochemical Oxygen Demand per monitored waterbody compared to Classification Standards
WFD High/Good Boundary
WFD Good/Moderate Boundary
WFD Moderate/Poor Boundary
Mg/l
6
5
4
3
2
1
0
Ceri - Dulas to conf Teifi
Dulas - headwat... to conf Ceri
Cych - headwat... to confluence with Teifi
Dulas - headwat... to confluence with Cych
Teifi - Afon Ceri to estuary
Teifi - Afon Clettwr to Afon Ceri
Teifi - Afon Brennig to Afon Dulas
Teifi - Afon Dulas to Afon Clettwr
Berwyn/B... - headwat... to confluence with Teifi
Groes - headwat... to confluence with Teifi
Dulas - headwat... to conf Teifi
Ceri - headwat... to conf Dulas
Clettwr - headwat... to confluence with Teifi
Cerdin - headwat... to confluence with Teifi
Teifi - conf Fflur to conf Brennig
Teifi - headwat... to confluence with Meurig
Tyweli - confluence with Talog to confluence with Teifi
Waterbody Name

Appendix F Table of Reasons for Not Achieving Good (RNAG) per water body

Water body ID	Water body Name	Overall Water body	Change to flow	Physical modification	Mine pollution	Rural area pollution	Wastewater pollution	suspect data
GB110062039030	Bargod - headwaters to confluence with Teifi	Moderate	No	No	No	Yes	Yes	No
GB110062039050	Morgenau - headwaters to confluence with Teifi	Moderate	No	Yes	No	Yes	Yes	No
GB110062039070	Piliau - headwaters to confluence with Teifi	Moderate	No	Yes	No	Yes	No	No
GB110062039110	Ceri - Dulas to conf Teifi	Poor	No	No	No	Yes	Yes	No
GB110062039130	Hirwaun - headwaters to confluence with Teifi	Poor	No	No	No	Yes	No	No
GB110062039150	Cledlyn - headwaters to confluence with Teifi	Moderate	No	No	No	Yes	Yes	No
GB110062039160	Mwldan	Poor	No	Yes	No	Yes	No	No
GB110062039170	Arberth - headwaters to confluence with Teifi	Moderate	No	No	No	Yes	No	No
GB110062039180	Dulas - headwaters to conf Ceri	Moderate	No	No	No	Yes	No	No
GB110062039190	Ceri - headwaters to conf Dulas	Moderate	No	No	No	Yes	No	Yes
GB110062039220	Clettwr - headwaters to confluence with Teifi	Moderate	Yes	No	No	Yes	No	No
GB110062039230	Grannell - headwaters to confluence with Teifi	Moderate	No	No	No	Yes	Yes	No

Water body ID	Water body Name	Overall Water body	Change to flow	Physical modification	Mine pollution	Rural area pollution	Wastewater pollution	suspect data
GB110062039240	Dulas - headwaters to conf Teifi	Moderate	No	No	No	No	No	No
GB110062043501	Teifi - conf with Meurig to conf with Brennig	Moderate	No	Yes	No	No	No	No
GB110062043510	Fflur - headwaters to confluence with Teifi	Moderate	No	No	No	Yes	No	No
GB110062043530	Camddwr - headwaters to confluence with Teifi	Moderate	No	No	No	No	No	No
GB110062043540	Teifi - headwaters to confluence with Meurig	Moderate	No	No	Yes	No	No	No
GB110062043550	Meurig - headwaters to confluence with Teifi	Moderate	No	No	Yes	No	No	No
GB110062043563	Teifi - Afon Ceri to estuary	Moderate	No	No	No	Yes	No	No
GB110062043565	Teifi - Afon Dulas to Afon Clettwr	Moderate	No	No	No	No	No	Yes
GB110062043566	Teifi - Afon Brennig to Afon Dulas	Moderate	No	No	No	No	No	No
		Total	1	4	2	14	5	2