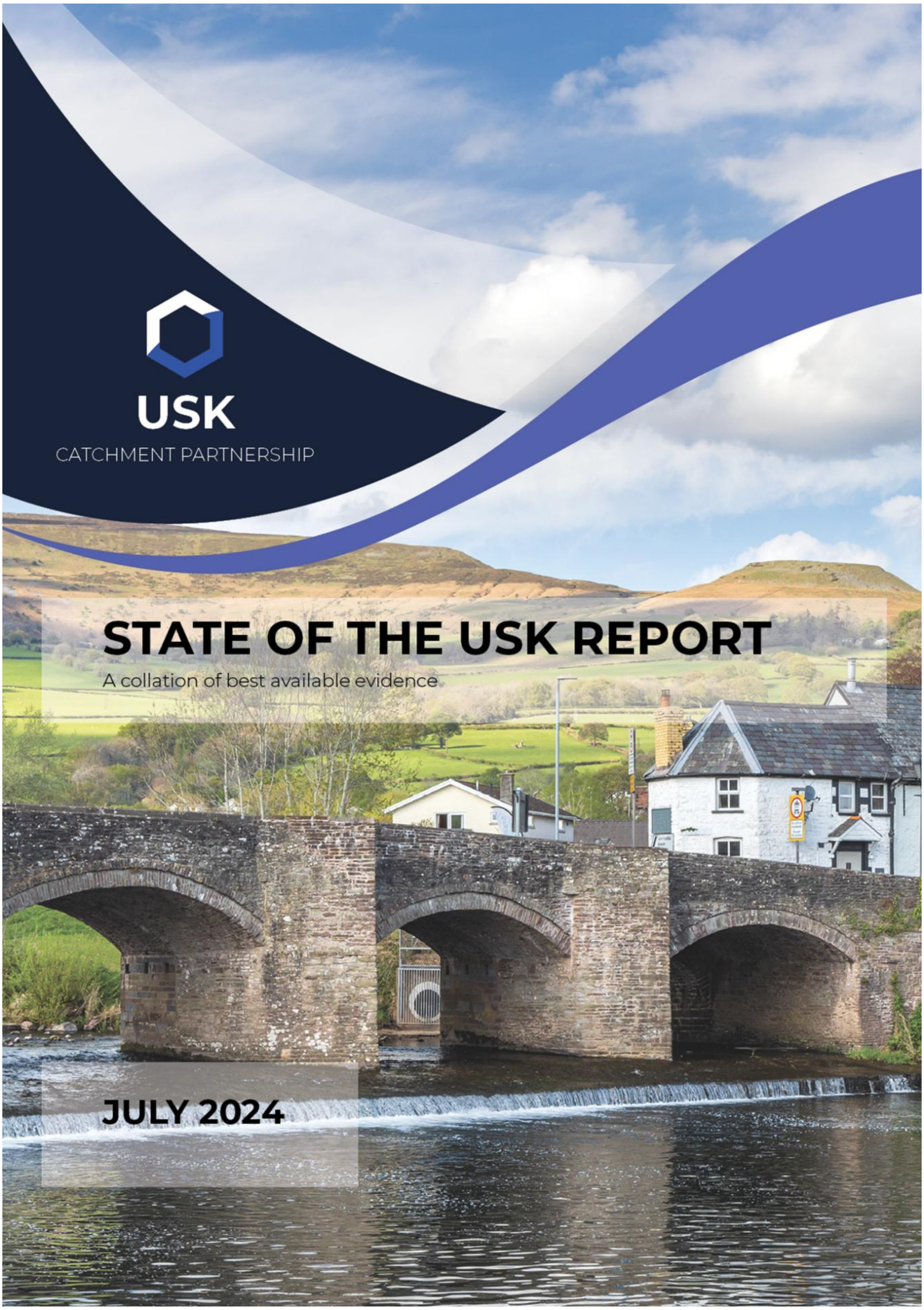
USK

CATCHMENT PARTNERSHIP

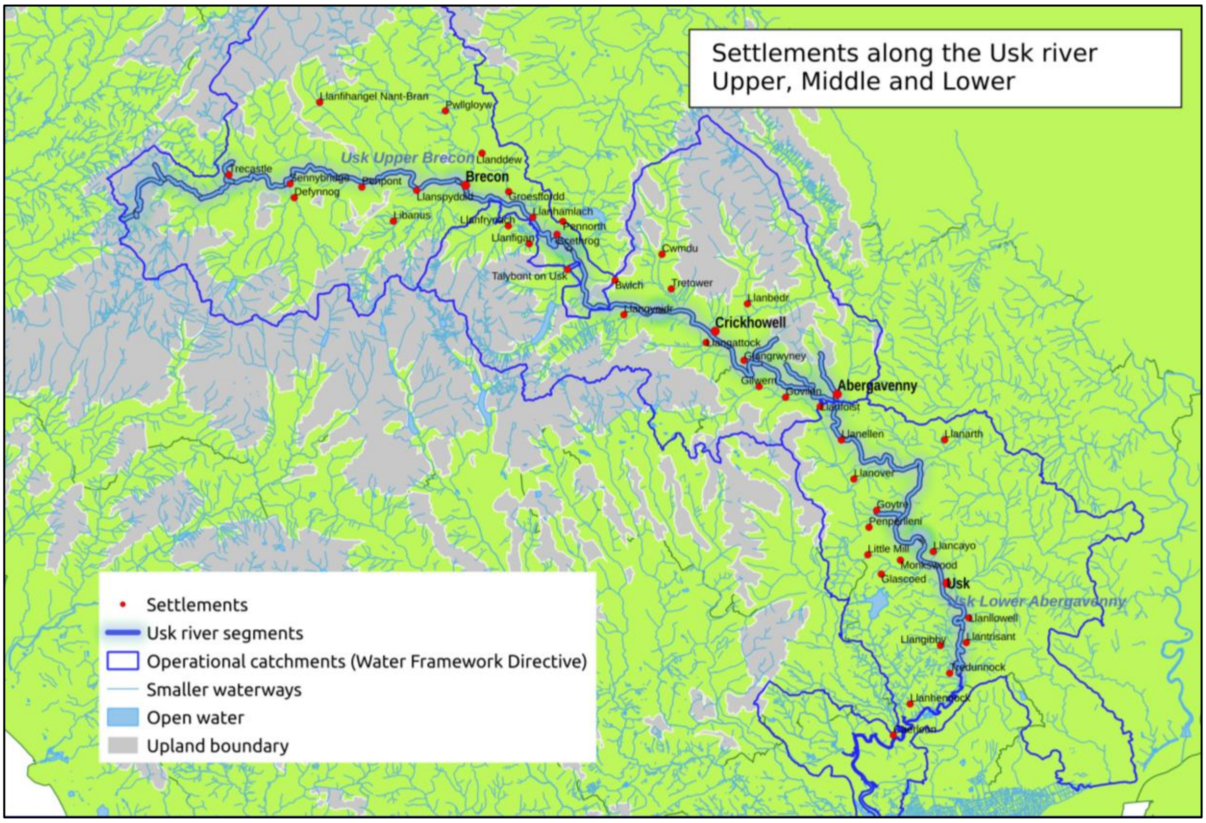
STATE OF THE USK REPORT

A collation of best available evidence



JULY 2024

Contents



Map showing main river settlements of the Usk Catchment, Open data layers from Natural Resources Wales, base mapping from OpenStreetMap. 1:300000

1.0 Introduction

1.1 About this report

1.1.2 This report has been commissioned by the Core Group[1] of the Usk Catchment Partnership and produced by the secretariat with support from the Knowledge Hub[2].and Knowledge Hub Independent Chair Dr Eleanor Kean[3]. The report has been commissioned in order to:

- Provide a succinct profile of the catchment and factors impacting water quality;
- Bring key evidence sources into a single report;
- Provide an overview of the ecological, environmental, cultural and social condition of the Usk Catchment as far is possible given the limits of available evidence;
- Identify key gaps in knowledge, including around data confidence levels to inform future research and enquiry;
- Create a shared understanding of key issues the catchment faces; and
- Agree a suite of baseline indicators from which to:
    - Identify areas for future action; and
    - Monitor the condition of the Usk Catchment into the future.

1.1.3 This report marks the initial step in a far larger project to identify necessary actions for maintaining the conservation status of the SAC and promoting socio-economic resilience for everyone in the catchment.

1.1.4 The Core Group aims to publish this Report as a starting point for a far broader discussion, involving as many people as possible. Through these discussions, our goal is to enhance our understanding of how others interpret the evidence regarding the Usk Catchment, gather insights from their viewpoints, and begin collectively envisioning a resilient and sustainable future for the river and their dependants.

1.2 About the Partnership

1.2.1 The River Usk is the longest protected river system entirely within Wales; it is designated both as a Site of Special Scientific Interest (SSSI) and as a Special Area of Conservation (SAC).

1.2.2 The Usk Catchment Partnership is seeking to take a more holistic approach to identifying and mitigating the multiple interacting stressors within the river catchment. The policy focus to date has largely singled out phosphorus and phosphates based on the concept of 'single nutrient limitation' of biological processes. Single nutrient limitation assumes a single stressor, e.g. phosphorus, is driving the response of a whole ecosystem. However, there is a growing body of scientific evidence that shows that combinations of multiple stressors, including both nutrients and environmental conditions, along with their relative abundances are much more important drivers (Perkins & Slavin 2019[4], Johnes et al. 2023[5]) and therefore a more holistic approach that aims to tackle multiple stressors within the freshwater system

[1] Core Group – Usk Catchment Partnership
[2] Knowledge Hub – Usk Catchment Partnership
[3] www.eleanorkean.com
[4] https://www.sciencedirect.com/science/article/pii/S0301479719305900
[5] https://research-information.bris.ac.uk/files/362972247/Johnes_et_al_2023.pdf

and how they interact with each other is more likely to provide successful mitigation and allow ecosystem recovery.

1.2.3 A more holistic approach which looks to address the wide range of pressures that freshwater ecosystems are facing and improve resilience is also advocated for by Natural Resources Wales (NRW).

"Management measures should take a holistic ecosystem approach to not only address pollution sources but also improve the resilience of freshwater ecosystems to the wide range of pressures affecting them."

NRW Compliance Assessment of Welsh River SACs Against Water Quality Targets Report

1.3 A Co-design approach

1.3.1 To date, the Partnership has been focused on developing a robust structure representative of the range and diversity of interests and issues that need to be addressed. Significant resource has been dedicated to co-designing this structure to ensure that it has the capacity to develop a deliverable action plan for the Usk. By focusing on co-designing the Partnership's structure, we have aimed to bake in consensus from the beginning. Partners involved in the co-design have included Dŵr Cymru Welsh Water, Natural Resources Wales, Bannau Brycheiniog National Park, Monmouthshire County Council, Powys County Council, Newport City Council, Canal and River Trust, Wye and Usk Foundation, Farmers' Union of Wales, National Farmers Union, Beacons Water Group (local farming group) and environmental Non-Governmental Organisations. Our work continues to be supported by the Welsh Government and their *Relieving pressures on Special Areas of Conservation (SAC) river catchments to support delivery of affordable house action plan*[6].

[6] https://www.gov.wales/relieving-pressures-special-areas-conservation-sac-river-catchments-support-delivery-affordable

1.4 Catchment overview

1.4.1 The River Usk rises on the northern slopes of the Black Mountain at an elevation of just over 500m in the Western area of Bannau Brycheiniog National Park. It flows in a long narrow catchment of great scenic beauty for approximately 125km, making it the longest river wholly within Wales. It first flows North into Usk reservoir before heading East through the towns of Brecon, Crickhowell, Abergavenny and then South through Usk, before discharging to the Usk estuary at Newbridge and then to the Severn estuary at Newport[7]. The Usk Catchment Partnership currently covers the area up until the tidal limit of the river at Newbridge but may include the tidal reaches of the river in future (Figure 1). The tidal reach of the catchment includes the Gwent Levels to the south, a large area of reclaimed coastal grasslands of historical and nature conservation importance.

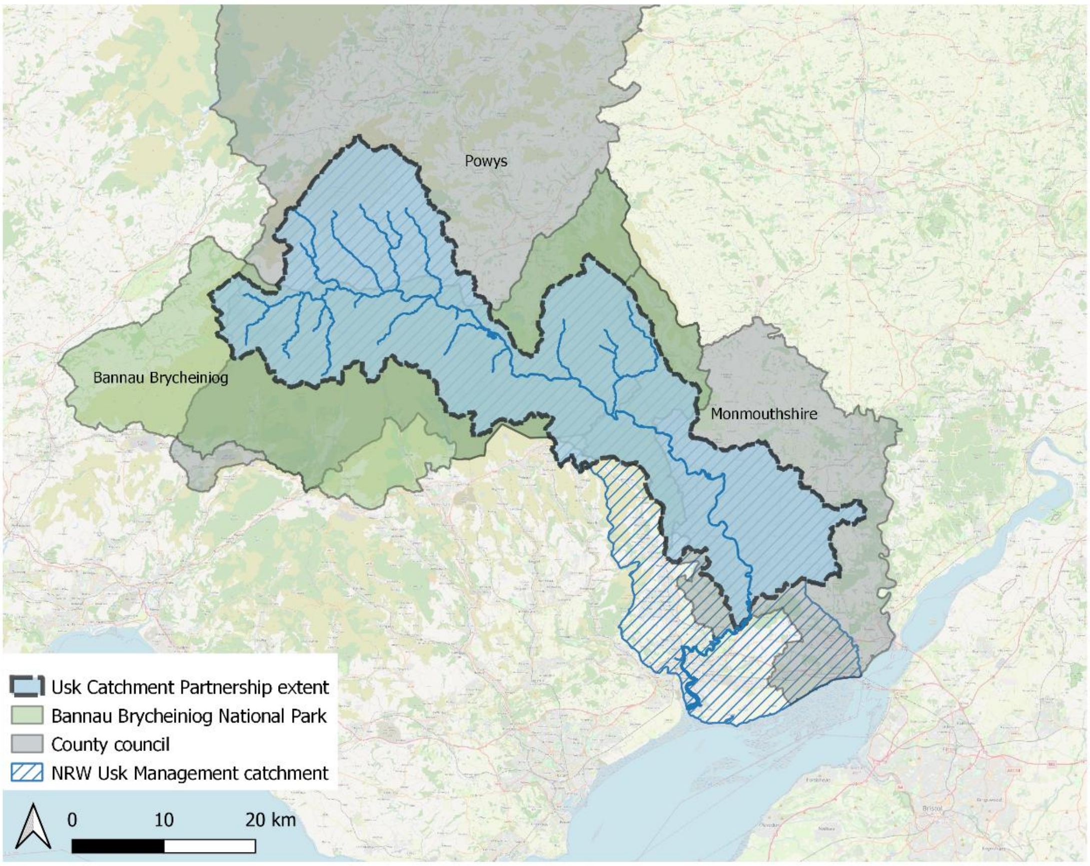


Figure 1: Map of the River Usk administrative boundaries; SAC, Partnership area, local authority partner organisations (Monmouthshire, Powys and Bannau Brycheiniog National Park) and NRW Management Catchments.

1.4.2 The Usk catchment can support a rich variety and abundance of wildlife. This potential for high ecological value is recognised through several national and international designations. The River Usk (Upper), River Usk (Lower) and River Usk (Tributaries) are all Sites of Special Scientific Interest (SSSIs) and a large part of the river is designated as a Special Area of

[7] https://naturalresources.wales/media/679394/2016_updated_usk_catchment_summary_nrw.pdf

Conservation (SAC)[8]. The SAC designation is primarily for a variety of fish species and otter (see Section 5 – Habitats and Ecology).

1.4.3 Tourism is important to the local economy, with Bannau Brycheiniog National Park and the Monmouthshire and Brecon Canal attracting visitors in search of outdoor recreation. The land within the catchment is predominantly used for agriculture (Figure 2), with sheep farming in the northern and western uplands, and beef, dairy, mixed and arable farming in the lowlands of the south and east. (Figure 2) There are also large areas of forestry.

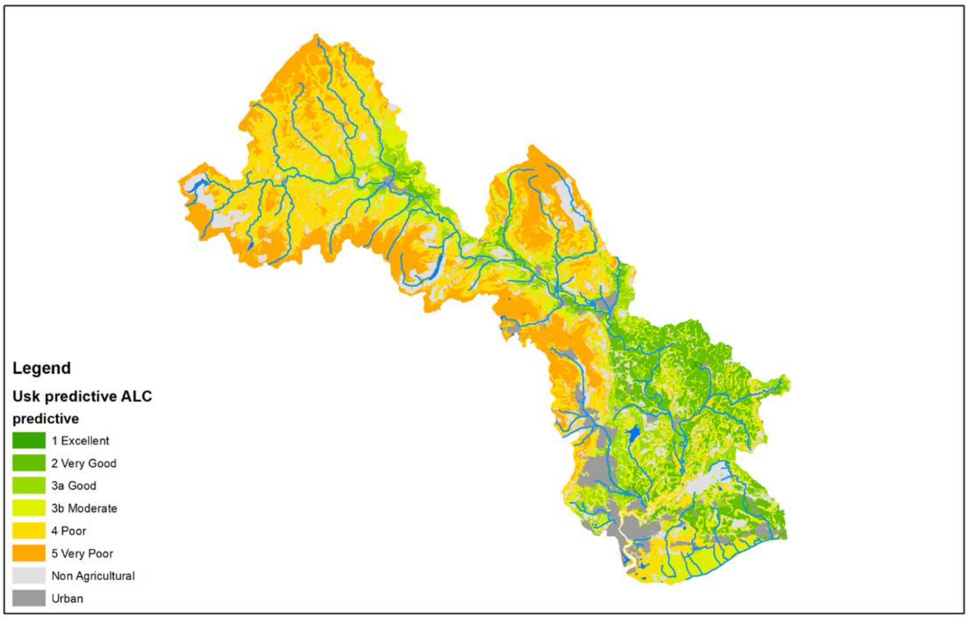


Figure 2: Agricultural Land Classification of the Usk. Non-agricultural areas in the Usk catchment are largely forestry

1.4.4 As a result, pollution from rural land use is widely considered a threat to the quality of wildlife and plants living in the water environment[9]; as are the inappropriate management of discharges from urban drainage, engineering works such as road improvement schemes, contaminated land, and other domestic and industrial sources can be significant causes of pollution. Point source pollution from large sewage treatment works has been progressively reduced. This, coupled with the review of environmental permits for the larger wastewater treatment works within the catchment, will alleviate some of the pressure resulting from elevated phosphorus levels, although issues remain locally, with combined sewer overflows and sewer misconnections. In some smaller tributaries, private sewage treatment works, including poorly maintained septic tanks, may also cause problems for water quality which would not be detected by routine monitoring.

1.4.5 Very little of the Usk is unmodified, free flowing river as the headwaters and three of its many tributaries are modified by dams to create the Usk, Crai, Talybont and Grwyne Fawr reservoirs. At Brecon some of the river's flow is diverted to feed the Monmouthshire and Brecon Canal and water from the lower River Usk is pumped to Llandegfedd water storage reservoir. Flows from the river, via reservoirs, supply drinking water to towns and cities in

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[8] https://afonyddcymru.org/wp-content/uploads/2022/11/river_usk-sac-core-plan.pdf
[9] https://naturalresources.wales/media/693312/sonarr2020-ecosystem-freshwater.pdf pp 34-48

southeast Wales beyond the catchment boundary. On the Gwent Levels, flows are regulated. Water is also taken from rivers and underground sources to use in agriculture, industry, hydropower and fish farms. Natural Resources Wales (NRW) works with Dŵr Cymru Welsh Water, the Canal and Rivers Trust and others to minimise the impact on the natural environment caused by the physical modifications and abstraction, while securing this valuable resource and maintaining flow levels.

1.4.6 The Usk has historically been a high-quality river for fisheries, supporting salmon and brown trout among other fish species. Barriers at Trostrey (a gauging weir), Llanfoist and Crickhowell (bridge footings) and Brecon (a weir supporting the canal abstraction) all restrict the upstream distribution of shad and sea lamprey. Barriers in some tributaries and the reservoir dams also restrict fish distribution and prevent access to suitable habitat. NRW's 4 Rivers For Life project is currently addressing some of these river barriers on the Usk, along with improving river habitats and working with landowners to reduce runoff from the land through riparian buffers and tree planting[10].

1.4.7 The NRW priorities for this catchment to achieve healthy waters are to improve the special habitats by reducing the impact of rural pollution, reducing the impact of physical modifications and abstraction while securing water supplies.

1.4.8 Within the Partnership area there are over 11,000 hectares of land, divided into more than 34,000 parcels of land (Figure 3), presenting a real challenge for the Partnership to engage with such a large number of landowners and tenants.

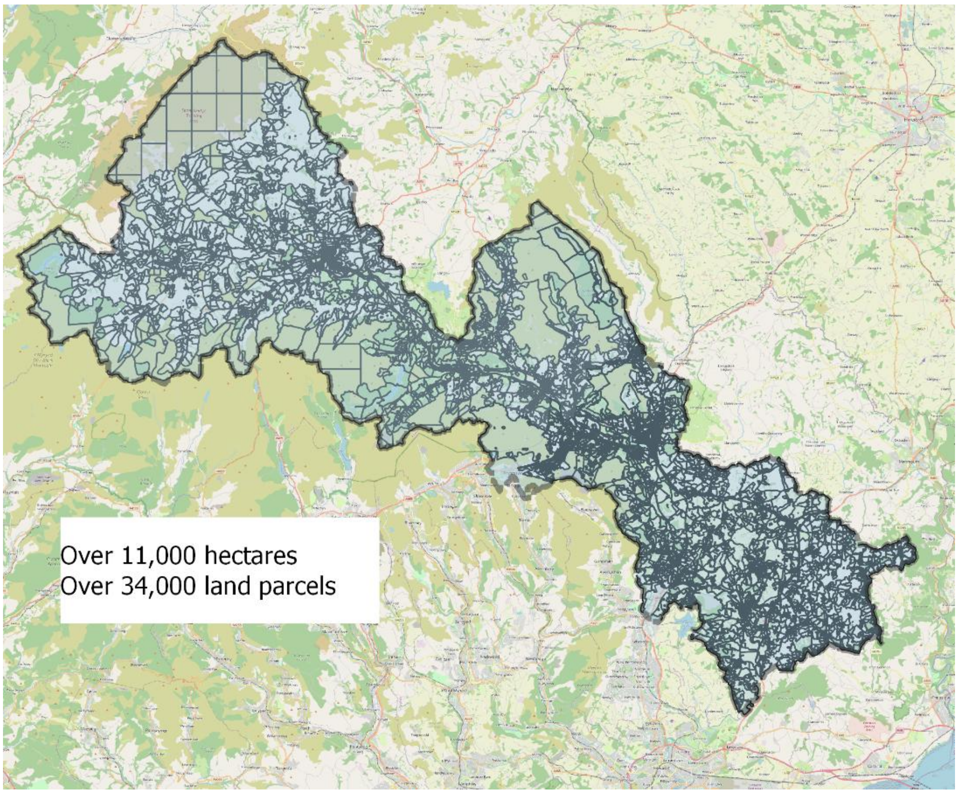

Figure 3: Indicative extent and position of registered freehold properties within the Usk Catchment Partnership Area[11]

[10] https://naturalresources.wales/about-us/what-we-do/our-projects/nature-projects/4-rivers-for-life/?lang=en
[11] https://use-land-property-data.service.gov.uk/datasets/inspire/download#local-authorities-for-P

2.0 Water quality

2.0.1 Water quality plays a critical role in catchment resilience, directly impacting the health and sustainability of ecosystems. The quality of water in a catchment area affects not only the aquatic life within streams and rivers but also the surrounding terrestrial habitats and the overall biodiversity of the area. Poor water quality can lead to a decline in species diversity, disruption of food chains and ecological processes, leading to further water quality degradation, and impacting the resilience of the entire catchment ecosystem. Understanding and maintaining good water quality is therefore essential for preserving the natural balance and long-term viability of catchment areas.

2.1 Phosphorus

SAC River Phosphorus Target Compliance

2.1.1 Phosphorus levels within SAC rivers in Wales are monitored for compliance by NRW against revised targets following guidance by the Joint Nature Conservation Committee (JNCC) recommending a significant tightening of P targets. These targets are water body and sample site specific as they are determined by a combination of altitude, alkalinity, and stream order[12]. Sampling at specific sites per water body is undertaken monthly, and a minimum of 8 samples per water body are required to calculate mean values. Annual mean and growing season mean (March – September) are calculated for each water body, with the highest value of the two being used to assess water body compliance against the set target. The results were last published in 2021 in the NRW Compliance Assessment of Welsh River SACs against Phosphorus Targets report[13]

2.1.2 Phosphorus targets for water bodies in SAC rivers in Wales were updated in 2023.[14] On the Usk one additional water body was added from the Grwyne Fawr tributary, *Grwyne Fawr source to the confluence with Grwyne Fechan*, and one phosphorus target was tightened from *Grwyne Fechan source to the confluence with Grwyne Fawr* from 28 µg l-1 to 15 µg l-1. Both of the water bodies included in these changes did not have sample point data across the 2017-2019 time frame used for the original phosphorus compliance report,[15] therefore the overall phosphorus compliance results for the Usk remain unchanged with 88% of the water bodies assessed failing their targets, but the number not assessed has increased by one to seven water bodies (Table 1).

[12] https://data.jncc.gov.uk/data/1b15dd18-48e3-4479-a168-79789216bc3d/CSM-Rivers-2016-r.pdf
[13] https://cdn.cyfoethnaturiol.cymru/media/693025/compliance-assessment-of-welsh-sacs-against-phosphorus-targets-final-v10.pdf?mode=pad&rnd=132557227300000000
[14] https://naturalresources.wales/evidence-and-data/research-and-reports/water-reports/update-to-phosphorus-targets-for-water-bodies-in-special-area-of-conservation-sac-rivers-in-wales/?lang=en
[15] https://cdn.cyfoethnaturiol.cymru/media/693025/compliance-assessment-of-welsh-sacs-against-phosphorus-targets-final-v10.pdf?mode=pad&rnd=132557227300000000

*Table 1: Summary of phosphorus compliance results for the Usk SAC river. *Not assessed includes the additional water body added in 2023 when the phosphorus targets were updated.*

Usk SAC river	Pass (of water bodies assessed)	Fail (of water bodies assessed)	Total Assessed	Not Assessed	Total
Number	2	15	17	7*	24
Percentage	12%	88%	71%	29%	100%

2.1.3 The phosphorus compliance on the Usk is worse than on any other SAC river in Wales and the percentage of failing water bodies is far higher than across all SAC rivers in Wales. The proportion of water bodies on the Usk which were not assessed for phosphorus compliance is also higher than the average across all SAC rivers in Wales indicating a data deficit for the Usk catchment (Table 2).

Table 2: Summary of phosphorus compliance across all SAC rivers in Wales

All SAC rivers	Pass (of water bodies assessed)	Fail (of water bodies assessed)	Total Assessed	Not Assessed	Total
Number	43	66	109	18	127
Percentage	39%	61%	86%	14%	100%

2.1.4 The failing water bodies occur across the whole catchment area, from the headwaters down to the lower reaches, indicating that significant phosphorus sources are present across the entire catchment including in the upper Usk (Figure 4). However, it is important to also acknowledge that this data is from 2017-2019, and therefore at least 4 years old; the current phosphorus compliance on water bodies on the Usk through official assessment is unknown, the next compliance assessment by NRW will be published in January 2025, which will give a more up to date view of compliance and any changes that have occurred since 2019.

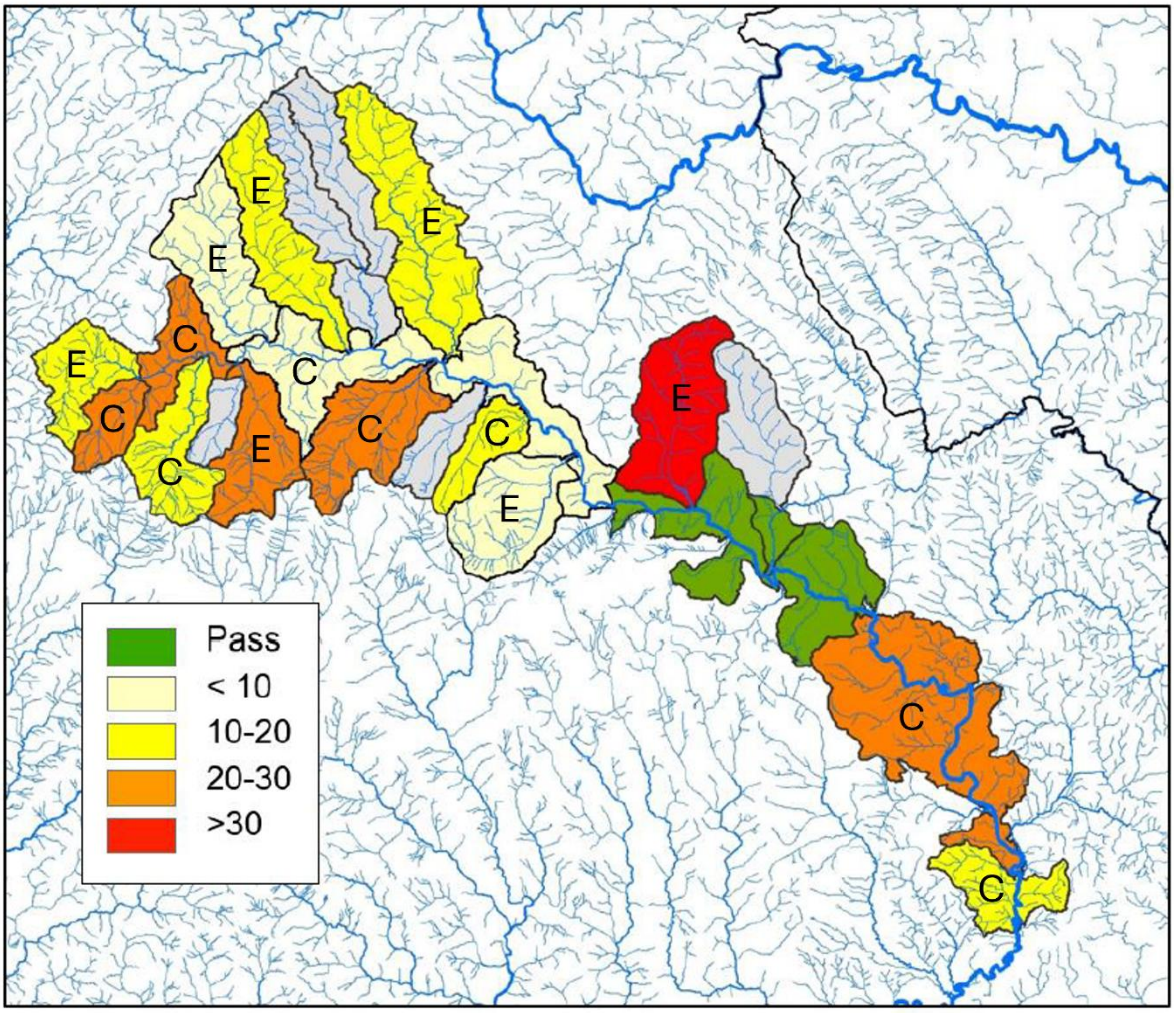

Figure 4: Compliance against phosphorus targets in the River Usk SAC. Water bodies shaded green pass their target. Other colours fail the target with different colours representing the magnitude of failures in µg l$^{-1,}$ expressed as the larger of annual means and growing season means. Failing water bodies are labelled by type of failure as determined by further analysis in the NRW compliance report, C = consistent, E = episodic. The additional water body 'Grwyne Fawr source to the confluence with Grwyne Fechan' added in 2023 is not shown on this map. Figure adapted from NRW's Compliance Assessment of Welsh River SACs against Phosphorus Targets report.

2.1.5: Across the water bodies within the catchment there was a large variation in number of samples taken to calculate the annual mean Phosphorus, from 10 to 34 samples. In water bodies with lower numbers of samples contributing to their annual mean phosphorus values, a single sampling point will have a larger effect on the outcomes. For example, the Rhiangoll (source to confluence with River Usk) water body had one very high reading in the monitoring data which caused the water body to fail. This was partly due to a low number of samples in that water body, but the very high reading (3110 µg l-1) was likely caused by a pollution event.

2.1.6: Based on the distribution of values for each water body, analysis was undertaken to determine if failures were likely due to episodic or consistent failures. Consistent failures reflect a water body where the majority of measurements exceed the target threshold, whereas episodic failures are due to spikes in values in a small number of samples that increased the mean to above the threshold. All target failures for water bodies on the Usk were confirmed using sensitivity-testing providing a higher level of certainty that they reflect true target compliance failures.

Unofficial update of SAC River Phosphorus Target Compliance

2.1.7 The Phosphorus monitoring data used to produce the official compliance assessment classifications is publicly available and an unofficial assessment of water body compliance has been made using this data from 2020 to 2023. It is important to flag that this is not the official assessment, which will undergo a full quality assurance process, be subject to full classification rules and be produced using the official classification tools. However, the methods used to calculate the annual and growing season means were the same as those used for the 2021 NRW Compliance Assessment of Welsh River SACs against Phosphorus Targets report[16], and the 95% confidence limits were determined using the methodology from the NRW Compliance Assessment of Welsh River SACs Against Water Quality Targets report[17] covering the same period. Additionally, 95% confidence limits were calculated retrospectively for the 2021 Phosphorus compliance assessment data (2017-2019) providing further data on whether the pass or fails highlighted in the original report were high or low confidence. The unofficial data shows an improving situation with regards to phosphorus compliance within the Usk river SAC, with many more water bodies considered to be within their target limits and a much-reduced incidence of high confidence fails of these target limits (Figure 5). There is also better data coverage across the SAC with only one water body not assessed in the 2024 dataset compared with seven (six at the original time of report publishing and one additional water body added during the phosphorus limit updates) in the 2021 dataset.

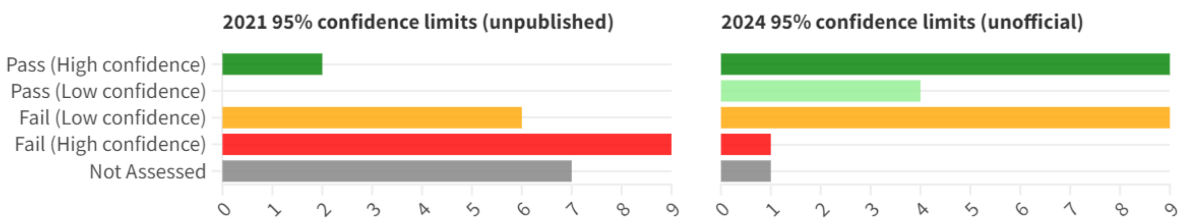

Figure 5: Unofficial analysis showing the number of water bodies passing or failing their phosphorus targets with 95% confidence limits in the Usk river SAC based on NRW data for 2021 assessment (2017-2019 data) and the future 2024 assessment (2020-2023 data).

2.1.8 Mapping these results indicates that there are likely reductions in phosphorus loading of the river Usk, particularly in some of the headwaters (Figure 6). Of the water bodies with data in both periods, seven moved from failing their target to passing their target between the 2021 assessment and 2024 unofficial assessment and 12 water bodies saw an improvement of some sort (e.g. moving from a high confidence fail to a low confidence fail, or from a high or low confidence fail to a high or low confidence pass).

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[16] https://cdn.cyfoethnaturiol.cymru/media/693025/compliance-assessment-of-welsh-sacs-against-phosphorus-targets-final-v10.pdf?mode=pad&rnd=132557227300000000
[17] https://cdn.cyfoethnaturiol.cymru/media/tgplrk4r/compliance-assessment-of-welsh-river-sacs-against-water-quality-targets-accessible-final-1.pdf?mode=pad&rnd=133492905742930000

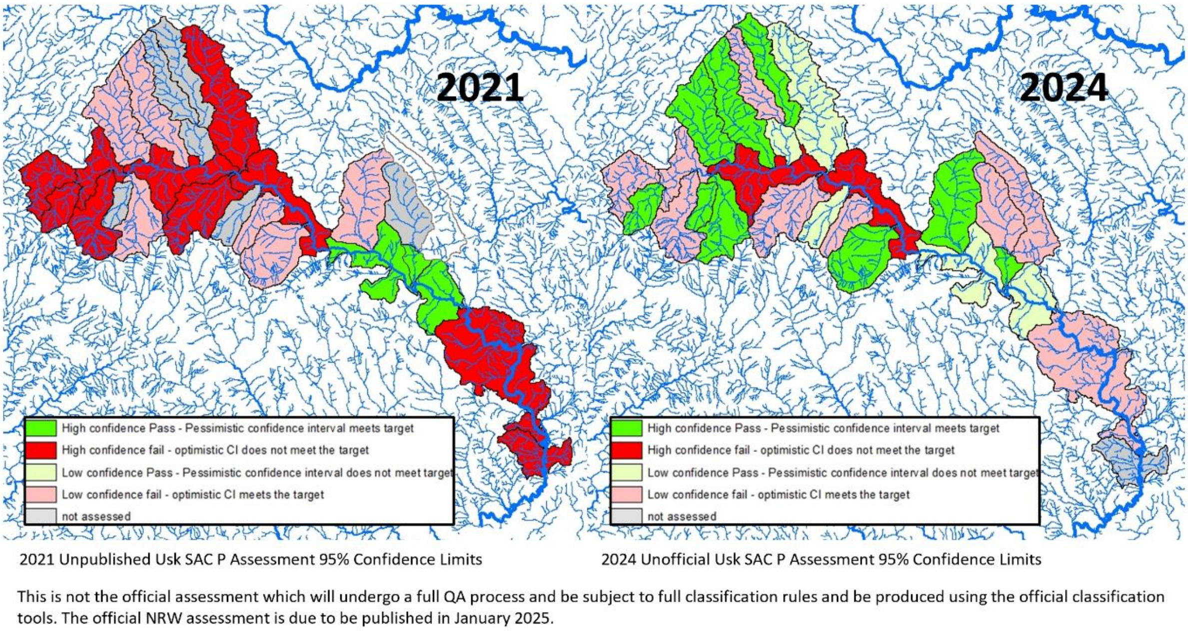

Figure 6: Map of unofficial 95% confidence limits for water bodies passing or failing their phosphorus targets in the Usk river SAC based on NRW data for the 2021 assessment (2017-2019 data) and the future 2024 assessment (2020-2023 data).

Citizen Science collected Phosphate Data

2.1.9 Data on levels of phosphate within the River Usk are being collected by citizen scientists across the catchment. The Wye and Usk Foundation, Save the River Usk and Gwent Wildlife Trust have all combined their citizen scientists' data collection to form one collective dataset[18], which isVisible to the public live online[19]. Handheld Hanna Phosphate Low Range Colorimeters (HI-713) are used at sites across the catchment to obtain a reading for phosphate (measured in Parts Per Million - PPM, detection limit 2.5 PPM) from water samples. Citizen science monitoring of water quality is intended to compliment the quality assured statutory monitoring. The data acquired through the use of low-cost equipment does not rival the accuracy and precision of professional standard equipment. However, their use has been tested by Cardiff University who directly compared results from the same low-cost equipment[20]. We can therefore be reasonably confident that the Hanna data is a sufficient level of accuracy for the purposes of identifying sites displaying unusual patterns. Specific protocols are in place to ensure consistency of data collection and also that collection sites are not within 100m of a wastewater treatment works output. The dataset was made up of a total of 1219 data points collected between 24/09/2023 and 03/06/2024, largely from repeat samples from fixed survey sites.

[18] Data compiled and written by James Hawkins and Jamie Carruth, Monitoring team, WUF as part of the CastCo Project

[19] UskViz | Tableau Public

[20] Von Benzon, E, Bagshaw, E, Perkins, R. (2022) Wye catchment citizen science water quality monitoring report March 2021 – February 2022. Prepared by Cardiff University on behalf of the Wye Catchment Collaborative Monitoring Network. Available from https://www.wyeuskfoundation.org/wye-catchment-collaborative-monitoring-network

2.1.10 In order to analyse this data several data screening checks were undertaken, firstly data points with no phosphate recorded (blank not 0 values) or no location data were removed from the dataset. Each data point was assigned to the WFD water body within which it fell using GIS tools, and visual checks were undertaken to ensure that each data point had the correct water body ID. A total of 1181 samples were retained after these data checks.

2.1.11 The Hanna test results were converted to orthophosphate as phosphorus in ug/l by multiplying by 0.3261 and then multiplying by 1000. This was done to allow comparison of the mean phosphorus values per water body to be compared to the NRW monitoring data. An average phosphorus value was calculated for each water body where there was a minimum of seven samples. The citizen science data (mean ug/l) was then compared to the NRW water body target to determine whether it was considered a pass (=mean value is less than target limit), or failure (=mean value is greater than the target limit). The results were mapped using the same extent of failure categories as the NRW compliance reports, only water bodies within the SAC were included in this map. A second map was produced showing the average PPM of phosphorus for each water body, all water bodies within the Usk catchment that had data were included in this map.

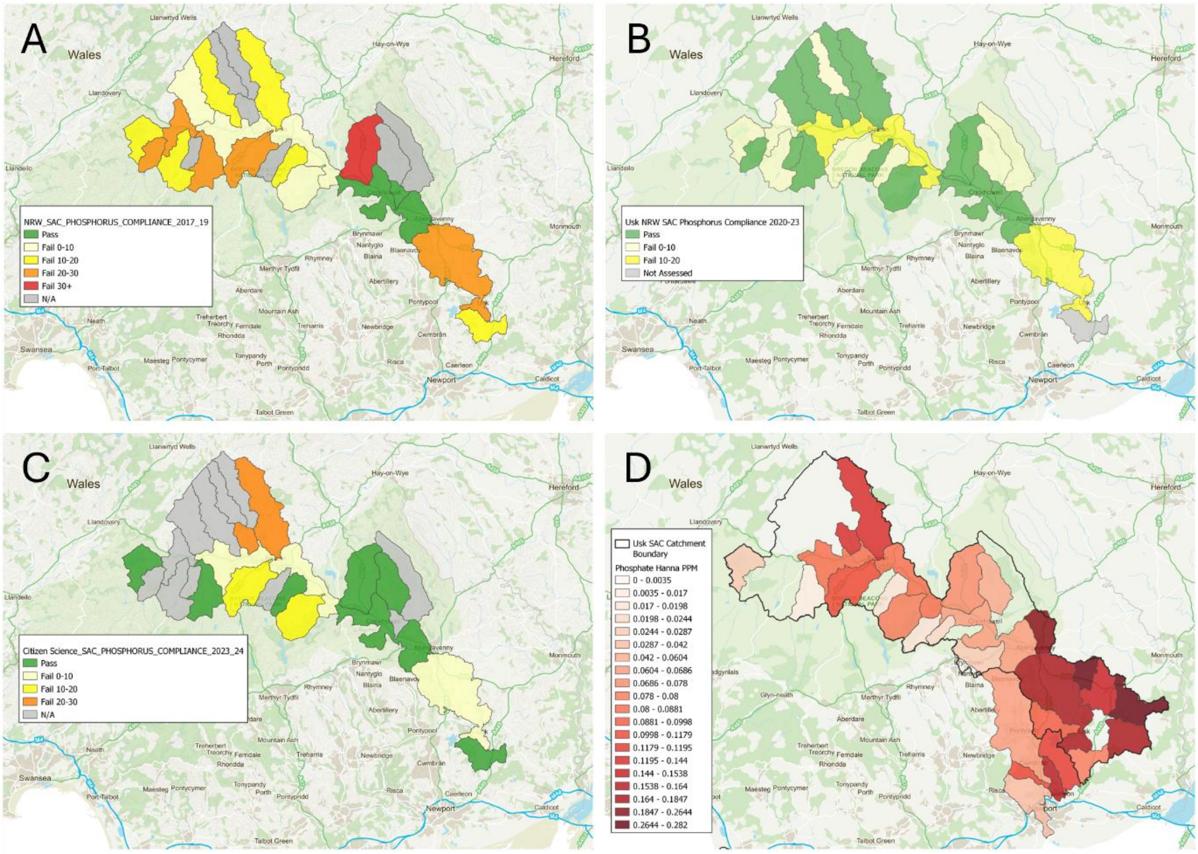

Figure 72: Phosphorus levels by water body across the Usk catchment as recorded through different mechanisms. A: NRW 2021 phosphorus compliance report data on water body target exceedances (2017-2019 dataset), B: Unofficial 2024 NRW Phosphorus compliance data on water body target exceedances (2020-2023 dataset), C: Citizen Science phosphorus data showing water body target exceedances (2023 – 2024 dataset), D: Citizen science average phosphate levels (PPM) by water body (this includes water bodies outside of the Usk SAC but within the wider catchment.

2.1.12 There were sufficient samples in 13 of the water bodies (54%) within the SAC designation to determine a mean phosphorus value for the water body and compare that to the NRW target for that water body. There were insufficient or no samples within 11 of the water bodies (46%) within the SAC designation for analysis and these are shown in grey as non-assessed (Figure 7 – Panel C).

2.1.13 Of the 13 waterbodies, seven had mean phosphorus values below their respective targets (54%) and six had mean phosphorus values above their respective targets (46%), of those failures two were in the 0 – 10 µg l^{-1} category, two were in the 10 -20 µg l^{-1} category and two were in the 20 – 30 µg l^{-1} category.

2.1.14 The citizen science data shows a largely improving situation with regards to the number and extent of the failures to meet phosphorus targets across the SAC water bodies compared with the 2021 NRW compliance data (Figure 8 – Panel A). The timing of the sampling is closer to that of the unofficial NRW compliance data (Figure 8 – Panel B) and the result are largely similar, although a small number of water bodies that passed with mean phosphorus levels below the target thresholds in the citizen science dataset were determined to fail from the NRW (2020-2023) dataset. Two water bodies 'Afon Yscir – conf Yscir Fechan to R Usk' and 'Honddu – Source to conf R Usk' were recorded as failures in the citizen science data with exceedances in the 20 – 30 µg l^{-1} category, but were classed as passing in the unofficial NRW dataset.

2.1.15 The Citizen Science mean PPM data (Figure 8 – Panel D) with wider coverage across the catchment shows higher mean values in the south-eastern water bodies outside of the SAC area. Further comparison of this data with the WFD monitoring data, which covers all water bodies across Wales may be worthwhile.

2.1.16 It is important to acknowledge that no attempt was made to identify outlier recordings (e.g. a one-off high recordings) in this analysis of citizen science collected data. One-off high readings can be enough to increase the average for a waterbody putting into a "fail" category. One-off high readings suggest a pollution incidence rather than consistently high recordings across the water body and this would impact the measures required. Whether caused by transcription errors or a one-off pollution incidence, outlier recordings warrant further investigation.

2.1.17 Citizen science monitoring data in the Usk is currently under-utilised and could add a lot more value than the simple averaging across waterbodies presented here. The greater spatial coverage and frequency of monitoring can fill in detail that statutory monitoring does not assess. UskViz[21] can be used to examine site time series plots that inform a baseline of what is normal for each site, thus identifying notable increases which, once transcription errors are ruled out, would indicate pollution incidences. Citizen science water quality data could be utilised as an early warning system, highlighting areas of concern for further investigation and action by statutory bodies and water utility companies. The Partnership could play a role in the greater utilisation of this resource through the development of processes for rapid identification of readings that indicate pollution, and rapid pathways to escalate concerns, this could lead to timely investigations, actions or enforcement of regulations if NRW are sufficiently resourced to respond.

[21] https://public.tableau.com/app/profile/wyeusk/viz/UskViz/START

Dŵr Cymru Source Apportionment Modelling for Phosphorus

2.1.18 Source apportionment modelling of the sources of phosphorus across the catchment was undertaken by DCWW (peer reviewed by NRW) to try and understand how different actors and inputs were influencing the levels of Phosphorus detected in the water bodies of the river[22].

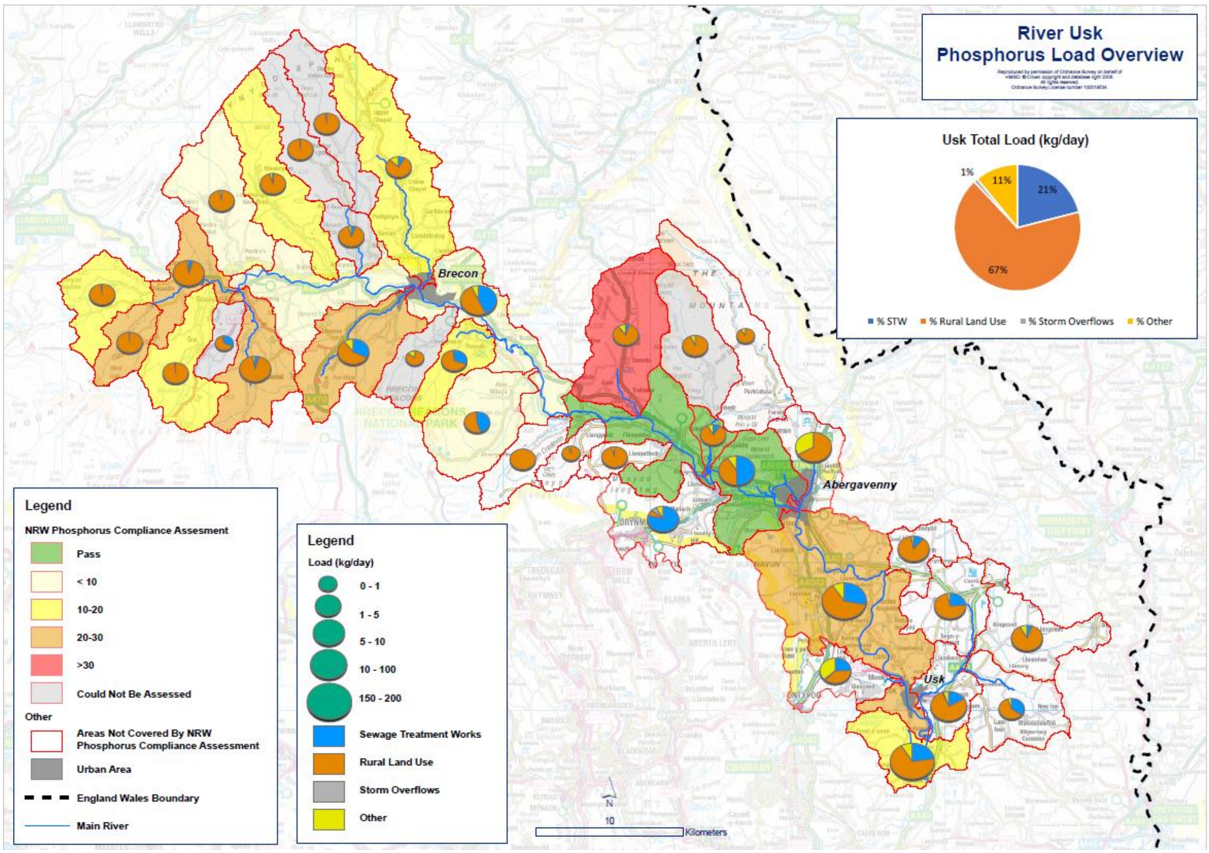

Figure 8: P loads and sector source apportionment of modelled P concentrations in each WFD water body sub-catchment within the Usk SAC catchment. Data source: (DCWW, 2023) [23]

2.1.19 The Source Apportionment Graphical Information System (SAGIS) was developed to model and visualise phosphorus (modelled as orthophosphate) discharges into the River Usk and apportion them to different sectors. The model estimated that 180kg of phosphorus is discharged from the Usk catchment daily. The apportionment of this load across the different sectors indicated that 21% could be attributed to effluent from sewerage treatment works, 67% to rural land use, 1% to storm overflows (also known as combined sewerage overflows) and 11% from other sources, such as, septic tanks and urban run-off (Figure 8). The model's main function is to provide information for wastewater planning and the apportionment to this sector has the most certainty. While the apportionment to the three other sectors (rural land use, storm overflows and other) is useful information, these values should be seen as

[22] *DCWW. (2023).* PHOSPHORUS SOURCE APPORTIONMENT SUMMARY: UPDATING THE SAGIS RIVER USK MODEL SAGIS. *Available at:* https://corporate.dwrcymru.com/en/community/environment/river-water-quality/sac-rivers

[23] https://corporate.dwrcymru.com/-/media/Project/Files/Page-Documents/Our-Services/Wastewater/SAC-Rivers/SAGIS-Reports/English/Updating-the-SAGIS-River-Usk-Model-2023-v6.ashx

indicative only as they have a greater level of uncertainty around their apportionment values. As with all models the estimates can only be as accurate as the data inputted, and therefore is it important to be aware of the datasets underpinning the model, for example, agricultural inputs were based on the agricultural census data for 2010, and as SAGIS is a catchment model the main river is likely to model better than small tributaries and upper river sections due to the cumulative number of data point above the location in question being larger for main river water bodies.

2.2 Sewage Wastewater Treatment Works and Combined Storm Overflows

2.2.1 As set out above, SAGIS modelling estimates around 21% of in river orthophosphate derives from treated discharge from sewage treatment works, with a further 1% from partially treated wastes from Combined Storm Overflows (CSOs).

2.2.2 There are 32 Sewage and Wastewater Treatment Works operated by DCWW which discharge into the Usk Catchment serving 14 water body catchments (Figure 9 and Table 3 below). UK wastewater treatment works process sewage through several stages, including screening, sedimentation, biological treatment, and sometimes advanced filtration and disinfection. Wastewater Treatment Works operate under permits issued by the environmental regulator NRW. These permits seek to ensure that there are no adverse impacts from such discharges. Whereas there is some concern within the wider community with regards to such discharges, the practice of discharging treated wastewater to rivers is widely considered environmentally acceptable. Rivers have a natural capacity to dilute and assimilate controlled levels of treated effluent without harm to the aquatic environment. Properly treated wastewater can benefit rivers by maintaining flow levels, especially in times of drought, and ensuring nutrient levels support aquatic life without causing eutrophication.

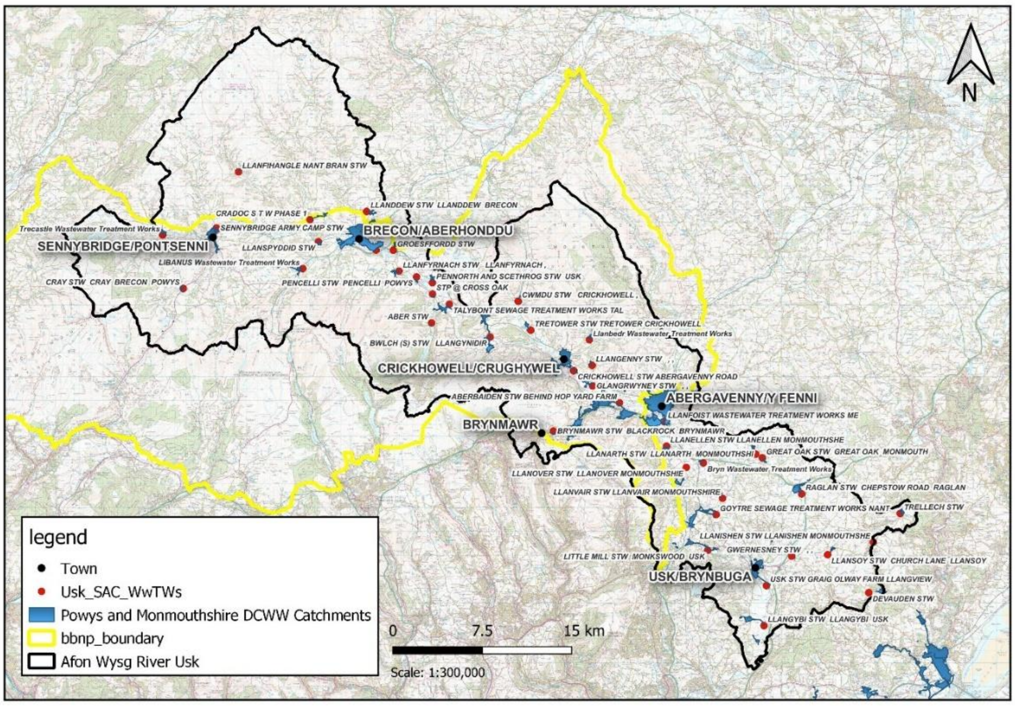

Figure 9: The locations of all Wastewater Treatment Works within the river Usk SAC catchment.

2.2.3 Following publication of the SAGIS data, and in accordance with the fair share or polluter pays principle (see WFD regulations and Environment Act 2021), across Wales DCWW are proposing investment of £153 million for improvements to their works and a further £3 million for investigations[24] This investment will enhance the effluent discharge performance of wastewater treatment sites to comply with regulatory standards set by Natural Resources Wales National Environment Programme (NRW NEP), as well as the Water Environment (Water Framework Directive) Regulations 2017 (WFD Regs)[25] and the Conservation of Habitats and Species Regulations 2017 (Habitats Regs)[26]. These Regulations aim to improve and protect Special Areas of Conservation (SACs) and achieve Good Ecological Status for WFD waterbodies. The investment focuses on controlling total phosphorus (P), ammonia (AmmN), biological oxygen demand (BOD), and suspended solids (SS) in final effluent discharges. Developed collaboratively with NRW and the EA, the programmes involve necessary interventions across wastewater estates to meet water quality targets. The plan includes phosphorus improvements at 149 sites and amendments to sanitary determinants at 19 sites, with 92 sites requiring new numeric limits as per NRW backstop requirements.

2.2.4 This investment supports compliance with NRW's review of environmental permits of wastewater treatment works in Special Areas of Conservation rivers. This review of permits focuses on discharges of at least 20m³/day, of which there are 30 in the Usk Catchment. All such works will have an initial discharge 'backstop' of at most 5mg/l, with further reductions being applied as per environmental requirements. The review process and amended P targets for the Usk Catchment are set out in the following table. The permits have all now been reviewed and a timeline for implementation defined.

[24] WSH68-11 Improving phosphorus removal at sewage works.pdf
[25] https://www.legislation.gov.uk/uksi/2017/407/contents
[26] https://www.legislation.gov.uk/uksi/2017/1012/contents

Table 3: Environmental Permit review information for WwTWs in the Usk catchment as issued by Natural Resources Wales at 1st July 2024. Two WwTWs no longer require a variation or phosphorus limits (shown in green) as they discharge under 20m³/day of treated sewage effluent. N.B. dates are subject to appeal– see NRW website for updates[27]

WwTW Name	Permit Number	Issue date of reviewed permit	P limit (1) mg/l	Effective date P limit (1)	P limit (2) mg/l	Effective date P limit (2)
LLANSOY CHURCH LANE	AN0106401	0	0	0	0	
TRETOWER CRICKHOWELL	AN0106601	0	0	0	0	
RAGLAN	AC0140201	13/04/2023	1mg/l	13/04/2023		
BRYNMAWR	AC0085601	11/05/2023	1mg/l	31/12/2023	1mg/l	01/01/2024
LLANFOIST	AB0038201	06/11/2023	5mg/l	13/11/2023	2mg/l	31/12/2025
BRECON	AB0041501	21/11/2023	5mg/l	28/11/2023	2mg/l	31/12/2025
GOYTRE	AC0116401	27/11/2023	5mg/l	04/12/2023	1.4mg/l	31/03/2030
LLANOVER	AB0043401	08/12/2023	5mg/l	15/12/2023		
LIBANUS	AB0076001	08/12/2023	5mg/l	15/12/2023	2mg/l	31/03/2030
USK	AB0044801	12/12/2023	5mg/l	19/12/2023		
LLANSBYDDID	AB0056601	21/12/2023	5mg/l	03/01/2024		
TRECASTLE	AD0000901	21/12/2023	5mg/l	03/01/2024	0.75mg/l	31/03/2030
SENNYBRIDGE ARMY CAMP	AC0094701	18/01/2024	5mg/l	25/01/2024	3.5mg/l	30/03/2030
ABERBAIDEN	AB0034101	23/01/2024	5mg/l	30/01/2025		
LLANGYBI USK	AB0046601	24/01/2024	5mg/l	31/01/2024		
CRICKHOWELL	AC0094701	31/01/2024	5mg/l	07/02/2025		
LITTLE MILL	AD0002501	31/01/2024	5mg/l	07/02/2024		
LLANELLEN	AB0046101	08/02/2024	5mg/l	15/02/2024		
TALYBONT	AD0001701	14/02/2024	5mg/l	21/02/2024	1mg/l	31/03/2030
LLANVAIR MONMOUTHSHIRE	AD0001501	20/02/2024	5mg/l	27/02/2025		
BWLCH LLANGYNIDR	AB0049501	13/03/2024	5mg/l	20/03/2024		
LLANFRYNACH	AD0002101	18/03/2024	5mg/l	25/03/2025	2.5mg/l	31/03/2030
DEVAUDEN	AA0001901	15/05/2024	5mg/l	26/01/2027		
ABER	AA0026701	16/05/2024	5mg/l	23/05/2024		
LLANDDEW BRECON	AC0140701	19/06/2024	5mg/l	26/06/2024	4mg/l	30/03/2030
LLANBEDR	AA0003101	19/06/2024	5mg/l	26/06/2024	1mg/l	31/03/2032
COEDWAUNGAER	AB0043501	24/06/2024	No limit	1/7/2024	5mg/ l	1/07/2025
CRADOC PHASE 1	AN0035901	24/06/2024	No limit	1/7/2024	5mg/ l	1/07/2025
TRELLECH	AN0214601	25/06/2024	No limit	02/07/204	5mg/l	20/07/2025
GROESFFORDD	AD0018101	27/06/2024	No limit	04/07/2024	5mg/l	28/01/2028
BRYN	AA0017501	13/06/2024	5mg/l	20/06/2024		
LLANARTH MONMOUTHSHIRE	AC0091901	21/06/2024	5mg/l	28/06/2024		

[27] https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/our-role-in-planning-and-development/phosphorus-limits-on-environmental-permits-for-waste-water-treatment-work-discharges/?lang=en

2.2.5 Along with WwTWs, Combined Storm Overflows (CSOs) form an integral part of the safe management of effluent. CSOs are designed to operate during specific hydraulic conditions to prevent the overloading of sewer systems. Typically, CSOs are activated during periods of heavy rainfall[28] when the volume of stormwater entering the sewer system exceeds its capacity. Under such circumstances, the excess combined flow of stormwater and wastewater is diverted to CSO outfalls to prevent flooding and the potential for untreated sewage backing up into homes, streets, and wastewater treatment facilities. It is during these high-flow events that CSOs discharge directly into nearby water bodies, functioning as a critical safety valve to ensure the overall integrity of the sewer infrastructure. Regulatory frameworks mandate that CSO discharges be managed via permitting to minimise environmental impact, necessitating ongoing monitoring, maintenance, and upgrades to CSO infrastructure to ensure compliance with water quality standards. Despite the necessity of CSOs within our current wastewater treatment infrastructure, frequent and significant CSO events can elevate phosphorus concentrations, which can lead to deteriorating water quality and pose a threat to the conservation objectives of these sensitive riverine ecosystems.

2.2.6 There are 46 operational (known and permitted) CSOs within the Usk Catchment. Event Duration Monitoring (EDM) Data[29] for 2023 shows that within the Usk Catchment area there were 2161 non-emergency CSO spills (Figure 10), totalling 20,107 hours for the year (Figure 11). Emergency overflows from CSOs are excluded from this data as this is not required by the regulators. Emergency overflows do operate within environmental permits, but these are strictly limited to operation in the event of mechanical issues such as pump failure.

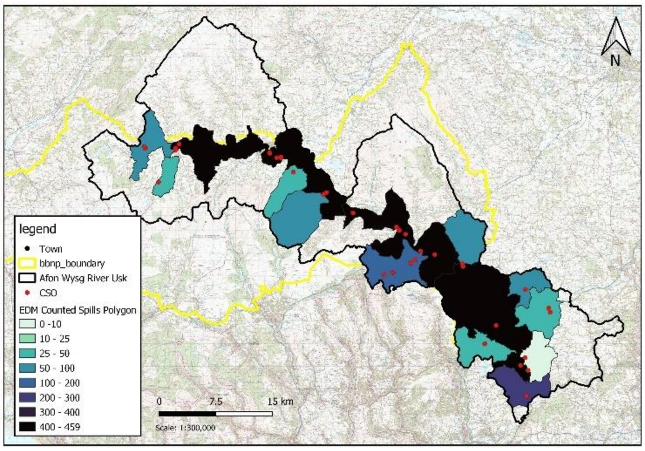

Figure 30: Number of Combined Sewerage Overflow (CSO) spills by water body within the Usk Catchment Partnership boundary using data from the Event Duration Monitoring (EDM) dataset from 2023.

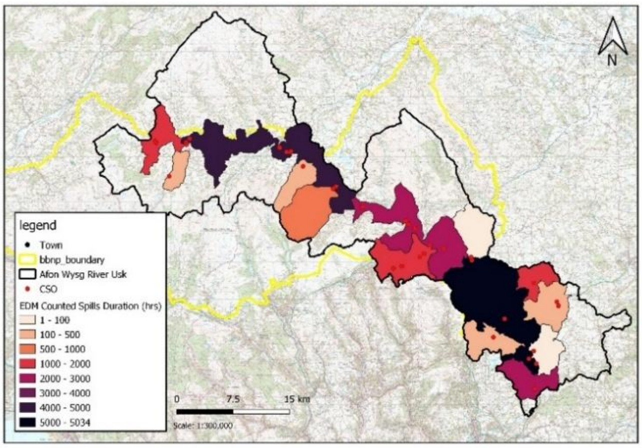

Figure 41: Total hours of Combined Sewerage Overflow (CSO) spills by water body within the Usk Catchment Partnership boundary using the Event Duration Monitoring (EDM) dataset from 2023.

2.2.7 Afonydd Cymru's analysis of the data demonstrate that the highest number of spills (across Wales in general) occur from overflows at wastewater treatment works themselves, either the inlet to works or from site's storm tanks[30]. Further, it is widely recognised that the

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[28] In England and Wales such conditions are permitted as 'exceptional rainfall' which NRW define as 4mm per hour.

[29] Event Duration Monitoring - Storm Overflows - 2023 (England and Wales) | Event Duration Monitoring - Storm Overflows - 2023 (England and Wales) | Catchment Based Approach Data Hub

[30] 2023 Storm Overflow Data – Beyond The Headlines | Afonydd Cymru

volume of outfall from CSO is critical in relation to potential impacts; these data are not available.

2.2.8 At present, DCWW do not routinely monitor volumetric outputs of CSOs, rather monitoring of overflows is undertaken based on 'ecological harm' by systematically monitoring the environmental impact both upstream and downstream of each overflow site. This assessment considers the frequency of discharges; the volume/concentration of the sewage; the conditions under which the discharges occur; and the capacity of the receiving river to mitigate the impact. This strategy aims to prioritise investments to address the overflows causing the most significant environmental damage. At present this data is not available for publication.

2.2.9 Research undertaken by Peter Hammond, on behalf of *Windrush Against Sewage Pollution* (WASP) in October 2023 and published by Afonydd Cymru identifies 52 breaches of CSO permits at the Brecon WwTW during the period 2018-2021[31] (Table 4). These events are defined as non-compliance with the Flow Passed Forward element of environmental permitting. The permitted flow passed forward limits the operation of a storm overflow. This is a rate of flow that is to be retained in the sewer and passed forward to the Wastewater Treatment Works before a spill can occur from the storm overflow (CSO). It must be set at a sufficient level to prevent an overflow discharging in conditions that will lead to unacceptable environmental impact. This ensures that the treatment plant manages as much of the combined flow as it can within its capacity, thereby minimising the frequency and volume of untreated or partially treated wastewater being released directly into water bodies.

Table 4: Annual breakdown of breaches of CSO permits, as published by Afonydd Cymru

Year	2018	2019	2020	2021
Number of CSO permit breaches	1	40	10	1

2.2.10 In response to these findings DCWW have provided additional data in relation to compliance with Flow Passed Forward compliance for the Crickhowell, Brecon, Aberbaiden and Llanfoist WwTWs (Figure 13). DCWW have also improved flow monitoring accuracy and reinforcement works to ensure consistent passing of required flow to treatment prior to operation of the CSO.

2.2.11 DCWW have identified improvements necessary in order to meet compliance and assurances have been provided that this will have been implemented by June 2024.

[31] FINAL_SUMMARY_Welsh_Water_Overview_WwTWs_Oct_17th_2023.pdf (afonyddcymru.org)

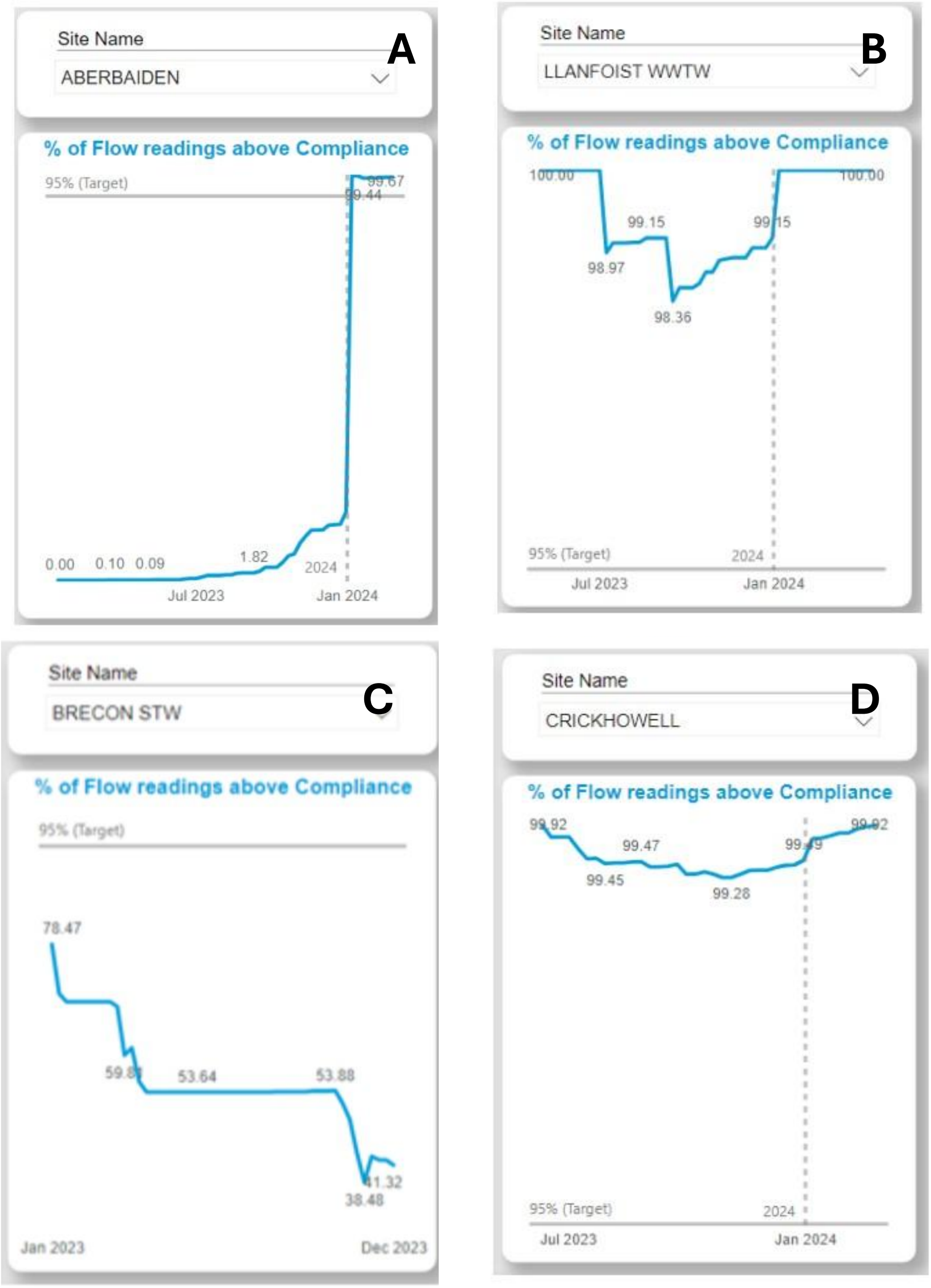

Figure 12: Flow reading compliance data as provided by DCWW in 2024 for WwTWs at Aberbaiden, Llanfoist, Brecon and Crickhowell.

2.3 Other SAC Water Quality Indicators

2.3.1 Alongside the Phosphorus compliance report, NRW also produced a 'Compliance Assessment of Welsh River SACs Against Water Quality Targets' report[32] looking at SAC river performance for an additional seven water quality attribute targets (Table 3).

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[32] https://cdn.cyfoethnaturiol.cymru/media/tgplrk4r/compliance-assessment-of-welsh-river-sacs-against-water-quality-targets-accessible-final-1.pdf?mode=pad&rnd=133492905742930000

Table 3: Other water quality targets for Welsh River SACs

Attribute	**Abbreviation**	**Area**	**Relevance**
Dissolved Oxygen	DO	Organic Pollution	Can indicate organic pollution but is also affected by other factors like temperature and river morphology
Biochemical Oxygen Demand	BOD	Organic Pollution	High values for BOD signal a risk of stress to fish and aquatic invertebrates due to lack of oxygen in the water column
Total Ammonia	T-NH_3	Organic Pollution	Indicator of nutrient enrichment
Unionised Ammonia	U-NH_3	Organic Pollution	Indicator of nutrient enrichment
Trophic Diatom Index	TDI	Ecological	Changes in diatom communities can indicate a riverine ecological response to nutrient enrichment
pH	pH	Metrics Regarding Acidity	Used to detect acidification of a river
Acid Neutralising Capacity	ANC	Metrics Regarding Acidity	Indicator of a river's resilience to acidic inputs (e.g. acid rain)

2.3.2 A minimum of eight samples were required to assess a water body for any of the attributes, except TDI which requires sampling in both spring and autumn, with six samples (three spring and autumn pairs over three years) being ideal but a minimum of two samples (one spring and autumn pair) deemed acceptable. Any water body that fell below these sampling thresholds is recorded as not assessed.

2.3.3 For the Usk SAC water bodies there were only failures for biological oxygen demand (BOD), total ammonia (T-NH_3) and Trophic Diatom Index (TDI). Both BOD and T-NH_3 indicate organic pollution, while TDI suggests that this is having an effect on the ecological communities within those water bodies (figure 13).

2.3.4 Each result is also given a confidence rating of either high or low. With high confidence indicating that the 95% confidence interval provides the same result as the mean (either pass or fail), and low confidence indicating that the 95% confidence interval crosses the boundary between pass and fail (see Table Table 8 for confidence data).

2.3.5 However, there are also large gaps in data on the Usk with none of the seven attributes assessed for all 24 water bodies. Six of the water bodies are not assessed for all attributes except TDI, these six are also not assessed for phosphorus meaning that we know very little about their water quality status. One water body is not assessed for four attributes, two water bodies for three attributes, 13 for two attributes and one water body for one attribute.

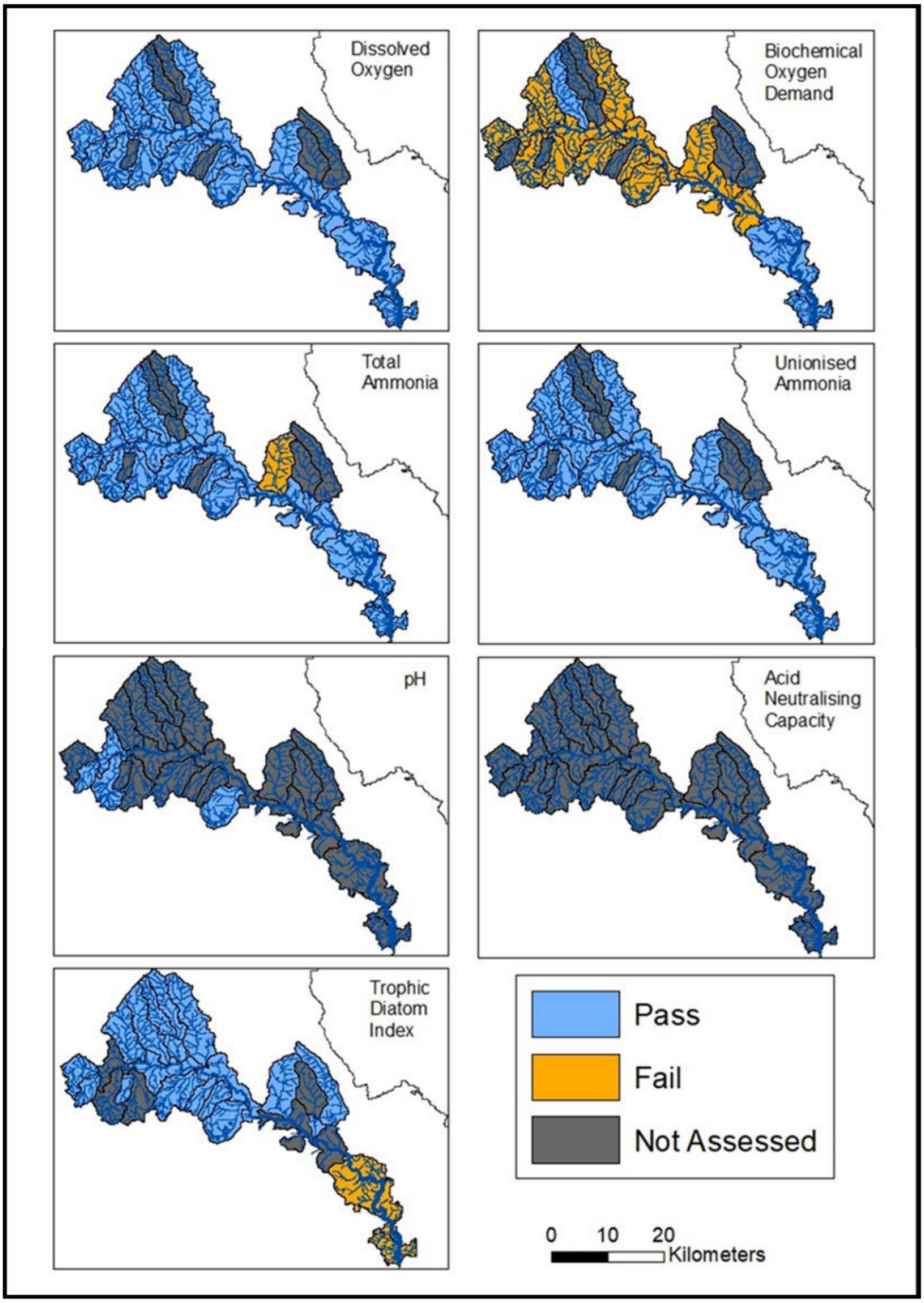

Figure 135: Maps showing compliance for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Ammonia, Unionised Ammonia, pH, Acid Neutralising Capacity (ANC) and Trophic Diatom Index (TDI) for the River Usk Special Area of Conservation. Water bodies shaded blue pass their target, water bodies shaded yellow fail their target and water bodies shaded grey were not assessed. Taken from the NRW report - Compliance Assessment of Welsh River SACs Against Water Quality Targets.

2.4 Impacts of peatland degradation on water quality

2.4.1 parts of the upper reaches of the Usk Catchment are shaped and characterised by the presence of upland peat (Figure 15). Peatlands play a crucial role in the hydrological processes of this region, influencing water flow, storage, and quality. The formation of the peat itself is a result of the accumulation of partially decayed plant materials in waterlogged conditions over an extensive period. The high water-retention capacity of peat helps regulate the flow of water within the catchment, affecting the overall hydrology and contributing to the unique ecosystem found in the uplands of the Usk Catchment. Understanding the dynamics of upland peat is essential for effective management and conservation strategies in this ecologically significant area.

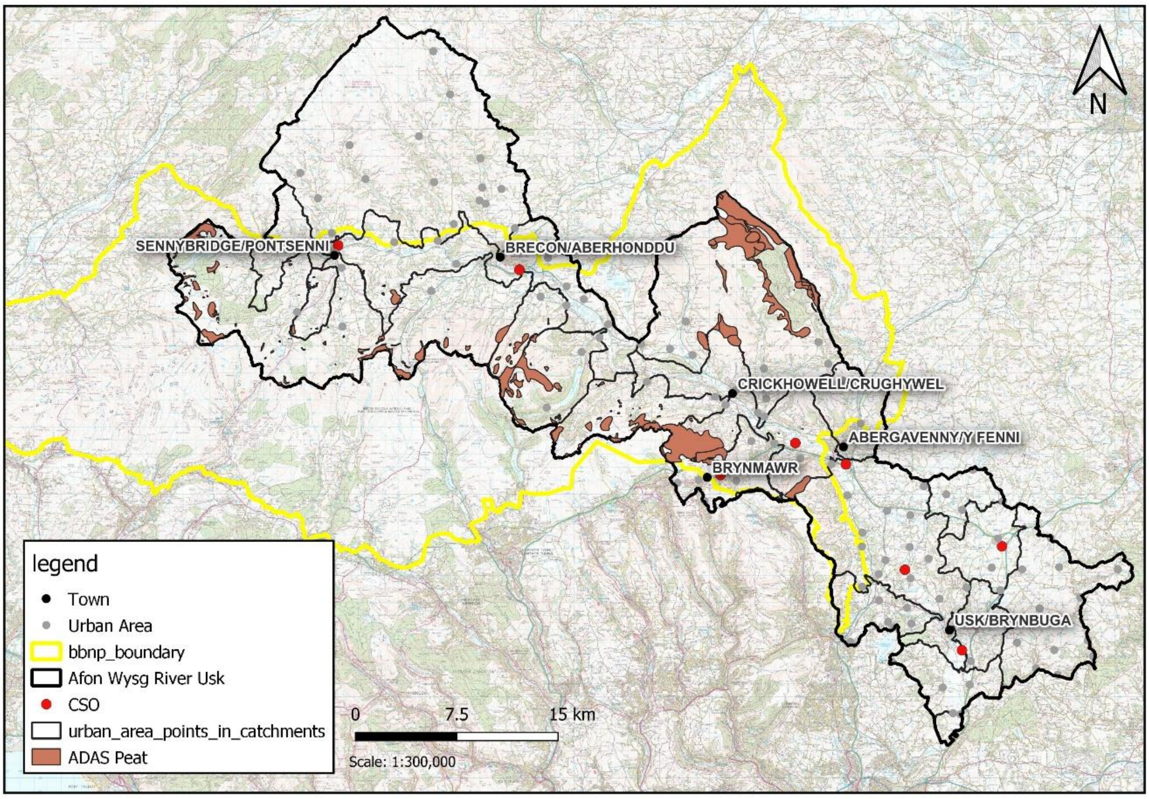

Figure 14: Map showing areas of peatland within the Bannau Brycheiniog National Park Authority area of the Usk Catchment Partnership prepared by ADAS for Bannau Brycheiniog.

2.4.2 Research undertaken by Y Bannau[33], shows that of the estimated 15,922 hectares of peatland across the geographic extent of the National Park most are in unfavourable condition defined as a degraded or partially degraded state, that is its natural structure, composition and function is compromised. Carbon is being released, both into the atmosphere and into the watercourses due to drying and erosion. This can also be assumed for the peat within the Upper regions of the catchment. This degradation is mostly as a consequence of a range of historic pressures including overgrazing, repeated damage by fire,

[33] https://future.bannau.wales/action/peatland-recovery-project/

atmospheric pollution, fertilisation by pollutants, trampling (human and livestock), erosion (livestock and human pressures) and afforestation for commercial plantations.

2.4.3 It is considered that the effects of peat degradation on water quality are significant and multifaceted[34]. Erosion and drainage of blanket peatlands expose bare peat surfaces to surface water, leading to increased concentrations of fine particulate organic matter (FPOM) and sediment in streams. This not only affects freshwater ecosystems directly by reducing species diversity and community structure[35], but also indirectly by transporting metal-contaminated sediments (if present) downstream[36]. The impacts of peat degradation on water quality are not known fully within the Usk Catchment, however evidence for similar upland environments such as the Peak District, have been directly correlated to failures against ecological WFD indicators.

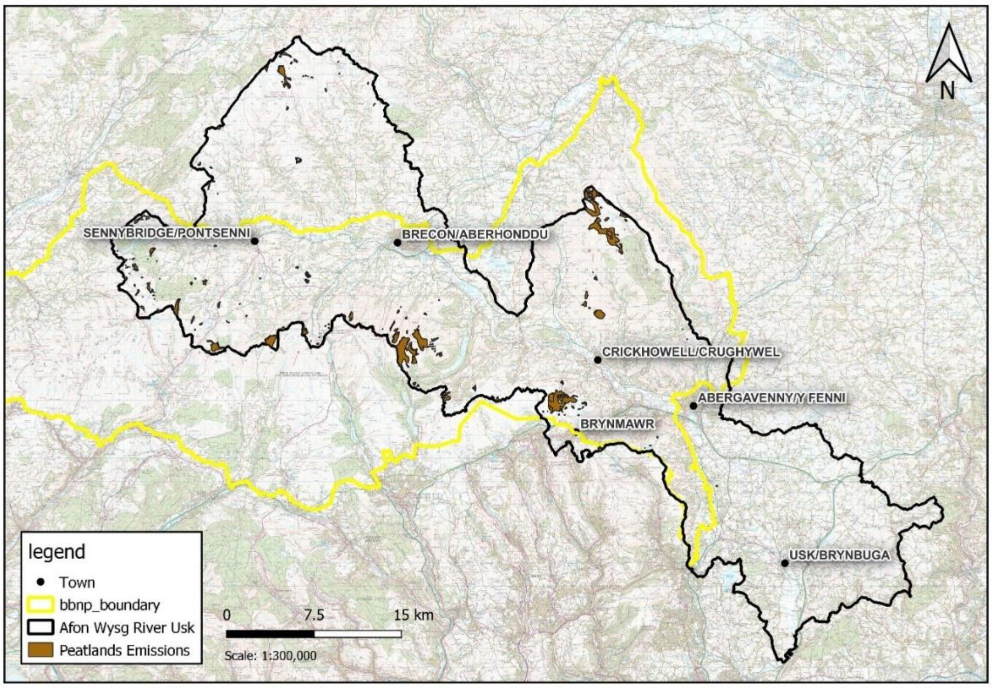

Figure 15: Maps showing estimated areas of peatland and relative sequestration/emission of tCO2e/Ha/Yr. Maps can be utilised as proxy for condition of peat as emissions are associated with degradation of peatland layer. [37]

2.5 Water Framework Directive Water Quality Indicators

2.5.1 The Water Framework Directive (WFD) is an EU directive[38] that was put in place to protect and improve the water environment for the wider benefits to people and wildlife. As part of this, water bodies across Wales, including rivers, lakes, ground water and coastal waters, are

[34] https://www.sciencedirect.com/science/article/abs/pii/S2212041614000655
[35] https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2664.2011.02075.x
[36] https://www.sciencedirect.com/science/article/abs/pii/S0925857408002346

[37] https://smnr-nrw.hub.arcgis.com/apps/d18ef8c74ecc4dc4a0cbf71ab6935ba0/explore
[38] Directive 2000/60/EC https://www.legislation.gov.uk/eudr/2000/60/contents

monitored and their status determined from this data (Table 46). The default aim is for all water bodies to achieve a status or potential of 'good' or higher by 2027.

Table 4: River water body condition, restriction and impact categories for the five different Water Framework Directive statuses

Status	High	Good	Moderate	Poor	Bad
Conditions	Near natural conditions	Slight change from natural conditions because of human activity	Moderate change from natural conditions because of human activity	Major change from natural conditions because of human activity	Severe change from natural conditions because of human activity
Restrictions	No restrictions on the beneficial uses of the water body	No restriction on the beneficial uses of the water body	Some restriction on the beneficial uses of the water body	Some restrictions on the beneficial uses of the water body	Significant restriction on the beneficial uses of the water body
Impacts	No impacts on amenity, wildlife or fisheries	No impact on amenity or fisheries Protects all but the most sensitive wildlife	No impact on amenity Some impact on wildlife and fisheries	Some impact on amenity Moderate impact on wildlife and fisheries	Major impact on amenity Major impact on wildlife and fisheries with many species not present

2.5.2 The data collected for WFD monitoring covers both biotic and abiotic factors, with an overall status being produced for each water body alongside an ecological status and a chemical status. The most recent WFD data and status determination for the Usk catchment is from 2021, with Cycle 3 of the WFD running from 2021 - 2027. As part of continued works to improve the status of water bodies River Basin Management Plans are produced for each WFD cycle. The River Usk falls into the Severn River Basin, with the Environment Agency in England taking the lead on publishing the associated River Basin Management Plan, in close collaboration with NRW[39].

2.5.3 The WFD datasets provide an additional resource for looking at the water quality and its driving elements in status determination across the whole catchment, not just for the SAC. In 2021 Cycle 3, a total of 44 river water bodies were assessed across the entire Usk management catchment (note that this goes beyond the current boundary of the Catchment Partnership) with 32% (n = 14) achieving good status, 61% (n = 27) achieving moderate status, 5% (n = 2) achieving poor status and 2% (n = 1) achieving bad status (

Table 5). Across the whole of Wales, 40% of all water bodies achieved good status or higher (rising to 44% for river water bodies only)[40], and therefore the Usk is below average in this regard with a higher-than-average percentage of moderate, poor and bad status water bodies within the

[39] https://www.gov.uk/government/publications/severn-river-basin-management-plan-summary-and-cross-border-catchments-england-and-wales/severn-river-basin-management-plan-summary-and-cross-border-catchments-england-and-wales
[40] https://www.gov.wales/written-statement-publication-storm-overflow-evidence-wales-report

river catchment. Of these 44 water bodies, 35 fall within the current Usk Catchment Partnership (UCP) boundary, and 24 fall within the Usk river SAC (Table 7). Within the current UCP boundary 40% of the water bodies achieved good status, 54% moderate status and 6% poor status (Table 7), indicating a larger proportion of the water bodies achieve good status compared with the whole Usk Management Catchment. Within the SAC all water bodies have a status of either good or moderate indicating that water quality is in general of a higher condition within the Usk river SAC than outside of it.

Table 5: Water Framework Directive status from 2021 (Cycle 3) for river water bodies in the NRW Usk Management Catchment, Usk Catchment Partnership and the Usk river SAC.

WFD Status 2021	Usk Management Catchment Water bodies		Usk Catchment Partnership Water bodies		Usk SAC Water bodies	
	Number	Percentage	Number	Percentage	Number	Percentage
High	0	0%	0	0%	0	0%
Good	14	32%	14	40%	11	46%
Moderate	27	61%	19	54%	13	54%
Poor	2	5%	2	6%	0	0%
Bad	1	2%	0	0%	0	0%
Total	44	100%	35	100%	24	100%

2.5.4 Within the Usk Catchment Partnership boundary the ecological status of water bodies matches the overall status in both number and spatial distribution, the chemical status of the majority of water bodies is considered high, with two water bodies classed as moderate (Figure 16616). For the chemical status there are a large proportion of the 35 water bodies within the UCP boundary that have not been assessed for some of the groups of chemicals. Of the 35 water bodies, 66% were not assessed for ‘specific pollutants’ and the remaining 12% which were tested achieved high status, 86% were not assessed for ‘priority hazardous substances’, with 9% of water bodies achieving high status and 6% achieving moderate status for this class of substances, 86% were not assessed for ‘priority substances’ with the remaining 14% achieving high status, and 89% were not assessed for ‘other pollutants’ with the remaining 11% achieving high status. While it is clear that of those water bodies assessed for these classes of chemicals, the vast majority are achieving high status with only two water bodies achieving moderate status across all four categories, nonetheless, this is a data gap with such a high proportion of water bodies not assessed for any given category of chemicals.

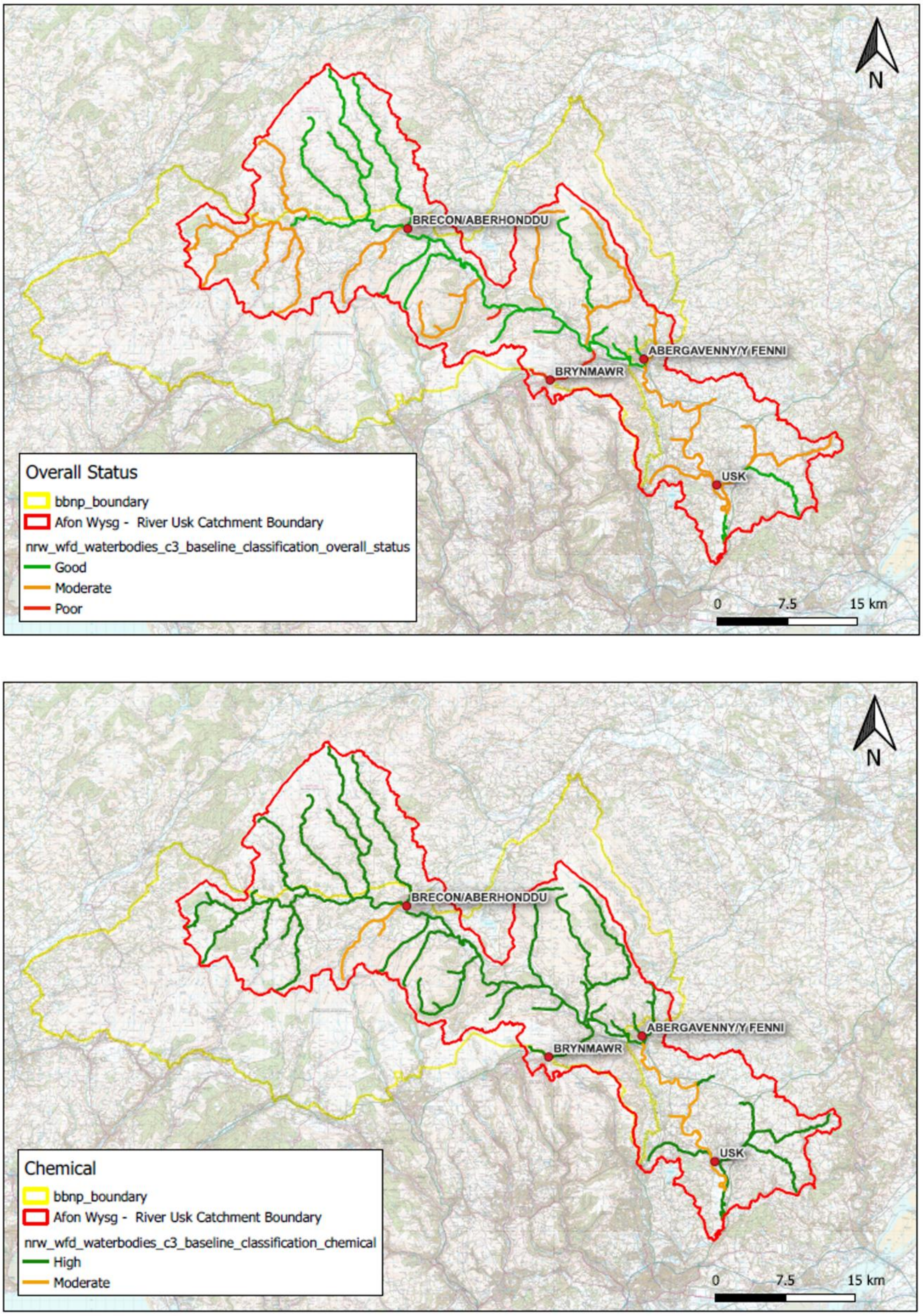

Figure 166: Water Framework Directive status for water bodies within the Usk Catchment Partnership Boundary. The top panel shows the overall status for each water body, this matches the ecological status and therefore only one map is shown. The bottom panel shows the chemical status for each water body.

2.5.5 The methodologies for determining water body status, management catchment and some water body boundaries have changed over the three cycles of WFD monitoring (Cycle 1: 2009 – 2015, Cycle 2: 2015 – 2021, Cycle 3: 2021 – 2027) and therefore direct comparison of results across the three cycles could be misleading. However, NRW calculated water body status using both Cycle 1 and Cycle 2 methodologies in 2015, and both Cycle 2 and Cycle 3 methodologies in 2021, allowing temporal comparisons within these two discrete time period-cycle methodology combinations respectively (Table 8).

Table 6: Comparison of WFD river water body status within discrete time-period - cycle methodology combinations. Different cycles include different numbers of water bodies. C1 = Cycle 1, C2 = Cycle 2 and C3 = Cycle 3. The Usk Management Catchment Boundary of Cycle 2/3 has been applied to all.

WFD Overall Status	2009 C1		2015 C1		2015 C2		2021 C2		2021 C3	
	#	%	#	%	#	%	#	%	#	%
High	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Good	8	16%	21	42%	17	39%	14	32%	14	32%
Moderate	35	70%	23	46%	22	50%	27	61%	27	61%
Poor	7	14%	6	12%	5	11%	2	5%	2	5%
Bad	0	0.0%	0	0.0%	0	0.0%	1	2%	1	2%
Total Assessed	50	100%	50	100%	44	100%	44	100%	44	100%

2.5.6 Between 2009 and 2015, using Cycle 1 methodology, there was an increase in water bodies achieving good status from 16% to 42% across the 50 river water bodies assessed, there was also an associated reduction in the number of river water bodies achieving moderate and poor status in 2015 compared with 2009. Between 2015 and 2021, using Cycle 2 methodology, there was a decrease in river water bodies achieving good status from 39% to 32%, and an increase in river water bodies achieving moderate status from 50% to 61% and a reduction in water bodies achieving poor status from 11% to 5%. The 2021 classifications under both Cycle 2 and Cycle 3 saw the first water body classed as bad for the Usk, this was the Nedern Brook is outside of the Catchment Partnership's current boundary as it is in the lower reaches and discharges directly into the Severn estuary.

2.5.7 The differences in the status class of water bodies classified for the same year but for different cycles are largely down to methodological changes in the assessment process. For 2015 Cycle 1 compared to 2015 Cycle 2 one water body was classed as a higher status due to changes in the diatom tool, 14 water bodies were classed as a lower status; seven due to differences in fish classifications, five due to changes in phosphorus targets, two due to changes in diatom methods, two due to mitigation measure updates and one due to a new zinc classification (some of the 14 water bodies showed different classifications across more than one of these elements). There were no changes in overall status for any of the water bodies in 2021 when comparing Cycle 2 and Cycle 3 results.

2.5.8 Between 2009 and 2015 (using Cycle 1 methodology) 17 water bodies improved their status and four declined in status, with the remaining 29 showing no change (Table 9). The majority of these improvements (15 of 17 water bodies) were due to improvements in the fish classification. The four declines in status were all due to new classifications of ecological elements that were not assessed in 2009. Between 2015 and 2021 (using Cycle 2 methodology) six water bodies improved their status and eight declined in status (Table 9). Of the six improvements, three due to improvements in the fish classification, two with improvements in the phosphorus classification and one with improvements in the invertebrate classification. Of the eight declines, seven had worse classifications for phosphorus, five had worse classifications for fish and one had a worse classification for invertebrates (some of the eight water bodies showed declines across multiple of these). The water bodies with no change between time periods within the same cycle methodology can be split into those achieving and maintaining good status, and those remaining at moderate status or worse. Across the Cycle 1 and Cycle 2 temporal comparisons 29 and 30 river water bodies saw no change in their status respectively. Of these 24% were classed as good between 2009 – 2015 and 33% were classed as good between 2015 – 2021.

Table 7: Change in WFD status of water bodies over time using time-period and cycle methodology combinations.

Change in status	2009 - 2015 C1		2015 - 2021 C2	
	#	%	#	%
Improved	17	34%	6	14%
Declined	4	8%	8	18%
No Change (all)	29	58%	30	68%
Total	50	100%	44	100%
No Change (≥Good)	7	24%	10	33%
No Change (≤Moderate)	22	76%	20	67%
Total	29	100%	30	100%

Table 80: All statutory water quality data collated for the River Usk SAC water bodies across NRW water quality compliance and WFD classification datasets

		NRW Compliance Assesment of Welsh River SACs								NRW WFD Cycle 3 River Waterbody Catchment Classification			
Waterbody ID	**Waterbody Name**	**P**	**DO**	**BOD**	**T-NH_3**	**U-NH_3**	**pH**	**ANC**	**TDI**	**Overall**	**Ecological**	**Chemical**	**Driving Element(s)**
GB109056039970	Usk - source to conf Afon Hydfer	F	P	F*	P	P	na	na	P*	Moderate	Moderate	High	P
GB109056033030	Afon Hydfer - source to conf R Usk	F	P	na	P	P	P	na	P	Moderate	Moderate	High	Fish;P
GB109056039980	Usk - conf Afon Hydfer to conf Afon Senni	F	P	F*	P	P	P	na	na	Moderate	Moderate	High	P
GB109056033040	Cwm Treweryn - source to River Senni	na	na	na	na	na	na	na	P	Moderate	Moderate	High	P
GB109056033050	Senni - source to conf River Usk	F	P	F*	P	P	na	na	na	Moderate	Moderate	High	P
GB109056033080	Afon Crai - source to conf R Usk	F	P	F*	P	P	P	na	na	Moderate	Moderate	High	P
GB109056040030	Cilieni - source to conf R Usk	F	P	F*	P	P	na	na	P*	Moderate	Moderate	High	Fish
GB109056040050	Yscir Fechan - source to conf Afon Yscir	na	na	na	na	na	na	na	P	Good	Good	High	Fish;P
GB109056040070	Afon Yscir - source to conf Yscir Fechan	na	na	na	na	na	na	na	P	Good	Good	High	Inverts;P
GB109056040020	Afon Yscir - conf Yscir Fechan to conf R Usk	na	na	na	na	na	na	na	P	Good	Good	High	Fish;P
GB109056040081	Usk - conf Afon Senni to conf Afon Crawnon	F	P*	F*	P	P	na	na	P*	Good	Good	High	Inverts;P;Temp
GB109056040060	Honddu - source to conf R Usk	F	P	F*	P	P	na	na	P	Good	Good	High	Fish;Inverts;P
GB109056040082	Usk conf Afon Crawnon to conf Gavenny R	P	P	F*	P	P	na	na	na	Good	Good	High	Inverts;Mac_Phyto;P
GB109056033070	Afon Tarell - source to conf R Usk	F	P	F*	P	P	na	na	P	Moderate	Moderate	Moderate	PAH;Fish;P
GB109056033020	Afon Cynrig - source to conf R Usk	na	na	na	na	na	na	na	P	Good	Good	High	Fish;Inverts;Hydro;Morph
GB109056040000	Grwyne Fawr - source to conf Grwyne-Fechan	na	na	na	na	na	na	na	P	Moderate	Moderate	High	Fish
GB109056032980	Grwyne Fawr - conf Grwyne-Fechan to conf R	P	na	na	P	P	na	na	P	Moderate	Moderate	High	Fish
GB109056039960	Grwyne-Fechan - source to conf Grwyne Fawr	na	na	na	na	na	na	na	na	Good	Good	High	Fish;Inverts;Morph
GB109056033000	Caerfanell - source to conf R Usk	F	P	F*	P	P	P	na	P*	Moderate	Moderate	High	Mit_Assmnt
GB109056039990	Rhiangoll - source to conf R Usk	F	P	F*	F*	P*	na	na	P	Moderate	Moderate	High	Fish;P
GB109056040040	Nant Bran - source to conf R Usk	F	P	P*	P	P	na	na	P*	Good	Good	High	Fish;P
GB109056033010	Nant Menasgin - source to conf R Usk	F	P	F*	P*	P	na	na	P	Good	Good	High	Inverts;Morph;P
GB109056040083	Usk - conf R Gavenny to conf Olway Bk	F	P	P*	P	P	na	na	F	Moderate	Moderate	Moderate	PAH;Fish;Mac_Phyto;P
GB109056026890	Usk - conf Olway Bk to New Br	F	P*	P*	P	P	na	na	F	Good	Good	High	Mac_Phyto;P;Temp

NRW Compliance Assesment of SAC Rivers Classification Key

P	Pass (High - all except P & TDI), (quite certain or very certain - TDI only
P*	Pass (low - all except P & TDI), (Uncertain - TDI only)
F*	Fail (low - all except P & TDI)
F	Fail (Very Certain - TDI only)
na	not assessed

NRW WFD Cycle 3 River Waterbody Catchment Classification Key

Classification	
H	High
G	Good
M	Moderate

2.6 Evidence Gaps

2.6.1 The gaps in NRW data for compliance monitoring of phosphorus on the Usk SAC will be addressed in the next compliance report (due Jan 2025) to give a fuller official picture across all of the water bodies in the river Usk SAC and show where there have been any changes in compliance since 2017-2019. Further work on incorporating more of the citizen science monitoring data could be useful in providing more frequent water quality data updates and for greater spatial coverage across the catchment.

2.6.2 In terms of understanding the effects of nutrients and other abiotic factors on the ecological health of the river, more attention is needed to incorporate current and emerging research on the importance of a wider range of factors and interactions between them. For example, in lakes and reservoirs, the ratio of ammonia to nitrate has been shown to affect algal growth and the production of bad tastes and odours that affect drinking water quality (Perkins & Slavin 2009). There is ongoing research in the river Wye looking at this and how relative nutrient abundance affects a river system; when this is made public the Usk Catchment Partnership should to learn from this. There is also emerging work on the importance of dissolved organic matter which is often not considered and remains largely unregulated (Johnes et al. 2023). The Quantum project is looking at this across the UK, and field sites are being looked for in the Usk catchment subject to the relevant conditions being met[41]. Within the Partnership, citizen science groups are collecting data on nitrate, ammonia, turbidity, electrical conductivity and temperature, which could be utilised to examine wider factors affecting freshwater health beyond phosphate.

2.6.3 There is also a lack of evidence on wider chemicals and emerging contaminants in our freshwater systems, including within the Usk. The Water Framework Directive monitoring has large gaps in the chemical assessment, including the majority of water bodies being not assessed for the following collections of chemicals, specific pollutants, priority hazardous substances, priority substances and other pollutants. The state of plastic pollution in the river is also lacking evidence, but a study published in 2019 showed that 50% of macroinvertebrates sampled contained micro-plastics, with two of the study sites on the Usk[42].

2.6.4 We know that there is degraded peat present in the upper headwaters of the Usk catchment and its tributaries; we do not know the extent of this degradation, nor the nature of its impact on water quality or the wider catchment. Future work should seek to map on an Usk catchment wide basis, rather than limit to the National Park boundary. There is however a sufficient body of evidence from elsewhere to support peat restoration projects.

2.6.5 There has been limited discussion on the significance and reason for widespread BOD failures in SAC compliance monitoring. The widespread and regular nature of these BOD failures is a potential cause for concern, particularly given the extent of failures in the upper part of the catchment[43]. Some feel they could in part be due to peat in the water[44].

[41] https://quantumfreshwaters.org/
[42] https://www.sciencedirect.com/science/article/pii/S0048969718327669
[43] https://cdn.cyfoethnaturiol.cymru/tgplrk4r/compliance-assessment-of-welsh-river-sacs-against-water-quality-targets-accessible-final-1.pdf?mode=pad&rnd=133492905742930000
[44] Personal communication John Gibbs

3.0 Water quantity

3.0.1 Water quantity, especially large variations in water quantity, can cause stress for the ecology and human communities of the Usk. High flows can increase erosion, sedimentation of the river and flood risk for communities within the catchment. Low flows can exacerbate pollution problems through lower dilution factors and can also affect water temperature.

3.1 River flow

3.1.1 River flow rates are a crucial factor influencing the resilience of catchment areas, as they dictate the availability of water resources and shape the physical characteristics of landscapes. The flow rates in rivers and streams within a catchment area play a key role in maintaining the environmental balance and supporting diverse ecosystems. Fluctuations in river flow can impact water quality, aquatic habitat availability, and the overall health of the ecosystem. Understanding the dynamics of river flow rates is essential for assessing the resilience of catchment areas to environmental changes such as droughts, floods, or land use modifications. Managing and monitoring river flow rates effectively is vital for preserving the integrity and functionality of catchment ecosystems in the long term. Climate change poses a significant threat to water quantity in rivers within catchment areas, with shifts in precipitation patterns, increased evaporation rates, and changing hydrological cycles leading to potential water scarcity issues.

3.1.2 The National River Flow Archive (NFRA) hosted by the UK Centre for Ecology and Hydrology publishes hydrometric data from gauging stations operated by the UK Measuring Authorities. In Wales this is the responsibility of NRW. For the hydrometric area of the Usk the NFRA holds data for 13 stations (Figure 17), of which 9 are currently operational and 6 have current peak flow data publicly available (Figure 18) [45].

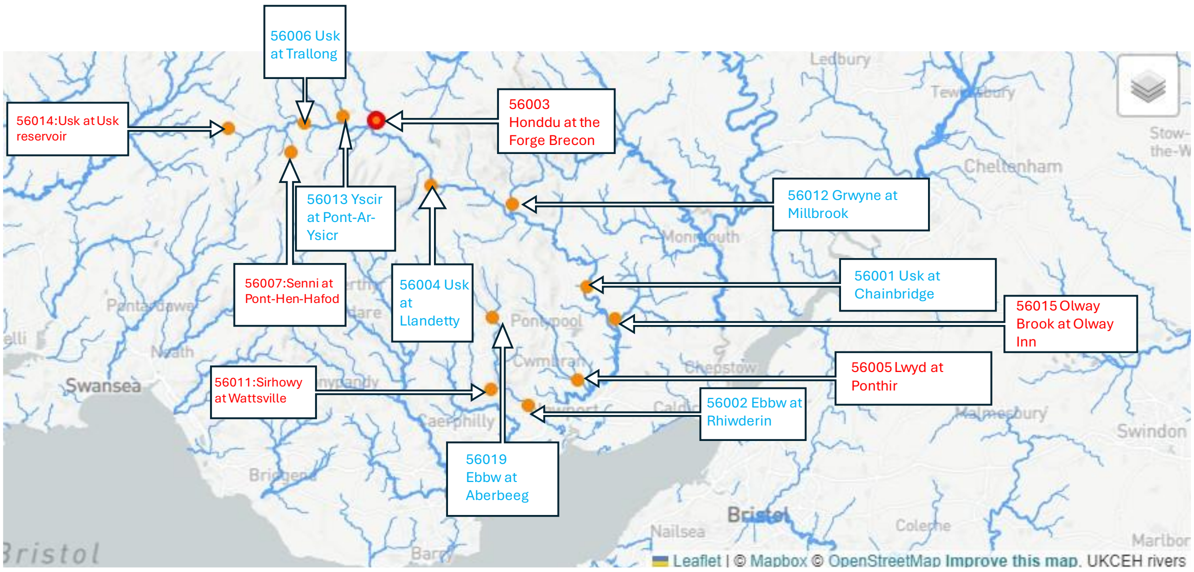

Figure 17: showing geographic location and details of current (blue) and historic (red) gauging stations within the Usk Catchment. DATA SOURCE: National River Flow Archive hosted by the UK Centre for Ecology and Hydrolog

[45] https://nrfa.ceh.ac.uk/data/search

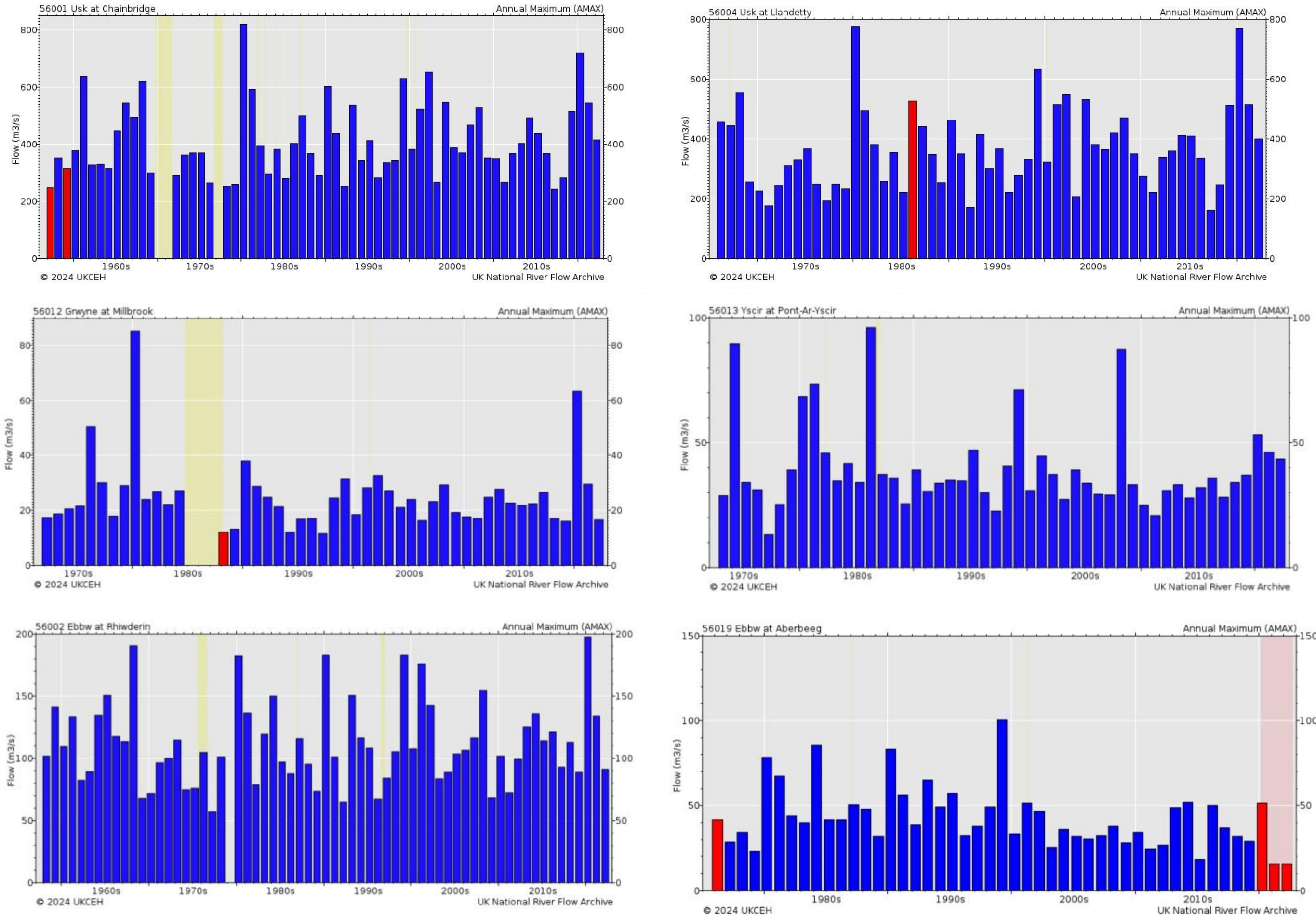

Figure 18: Peak flow data for known monitoring periods for all operational gauging stations on Usk Catchment. Yellow areas indicate years with missing data. Red bars are data that are considered unreliable. Usk at Chainbridge (top left) Usk at Llandetty (top right).Grwyne at Millbrook (middle left) Yscir at Pont Ar Yscir (middle right) Ebbw at Rhiwderin (bottom left) Ebbw at Aberbeeg (bottom right). DATA SOURCE National River Flow Archive hosted by the UK Centre for Ecology and Hydrology

3.2 Flood Risk

3.2.1 Climate change observed trends indicate that Wales is experiencing an increase in flood risk due to more frequent and severe weather events. Analysis on the frequency, duration and pattern of the risk of flood events may be drawn from the historic flood warnings and flood alerts[46] which started in 2006. In the Usk catchment the number of flood warnings/alerts per year ranges from zero to ten (Figure 19). Further analysis was prepared by NRW of storm events in 2020 [47]. Storm Dennis in 2020 caused significant flooding affecting roads, homes and businesses, particularly in Crickhowell and LLangattock. A month's worth of rain fell in 48 hours, onto ground already saturated from Storm Ciara, and the River Usk at Llanfoist reached 5.6m at its peak.

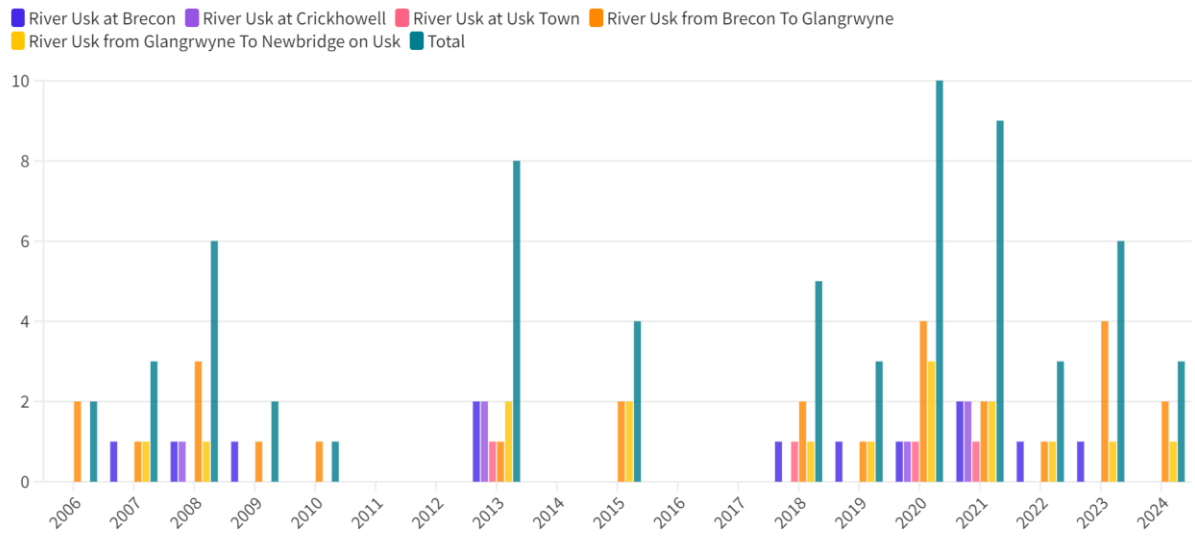

Figure 19: Graph showing the frequency of flood warnings/alerts for Usk Catchment for the period 2006-2024. Data Source DataMapWales

3.2.2 The Flood Map for Planning[48] represents the best available information Natural Resources Wales holds on flood risk. The Flood Map for Planning has the following layers, which show the potential extent of flooding, assuming no defences are in place:

- Rivers – Flood Zone 2: Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
- Rivers – Flood Zone 3: Areas with more than 1% (1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
- Rivers & Sea – Flood Zone 2: The combined 0.1% risk of flooding from rivers and the sea including climate change.
- Rivers & Sea – Flood Zone 3: The combined 1% risk of flooding from rivers and the sea including climate change.

[46] Historic Flood Warnings and Flood Alerts | DataMapWales (gov.wales).
[47] Natural Resources Wales / February 2020 flood review: Storm Ciara and Storm Dennis.
[48] Flood Map for Planning (naturalresources.wales

- Sea – Flood Zone 2: Areas with 0.1% to 0.5% (1 in 1000 to 1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.
- Sea – Flood Zone 3: Areas with more than 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.
- Surface Water and Small Watercourses – Flood Zone 2: Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.
- Surface Water and Small Watercourses – Flood Zone 3: Areas with more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.
- TAN15 Defended Zones: Area that benefit from Risk Management Authority flood defences with the following minimum Standard of Protection:
- 1 in 100 year (present day) for rivers
- 1 in 200 year (present day) for the sea
- For flood defences built from 2016 onwards there must be allowance for climate change and design freeboard.
- Recorded Flood Extents: Areas that are recorded as having flooded previously.

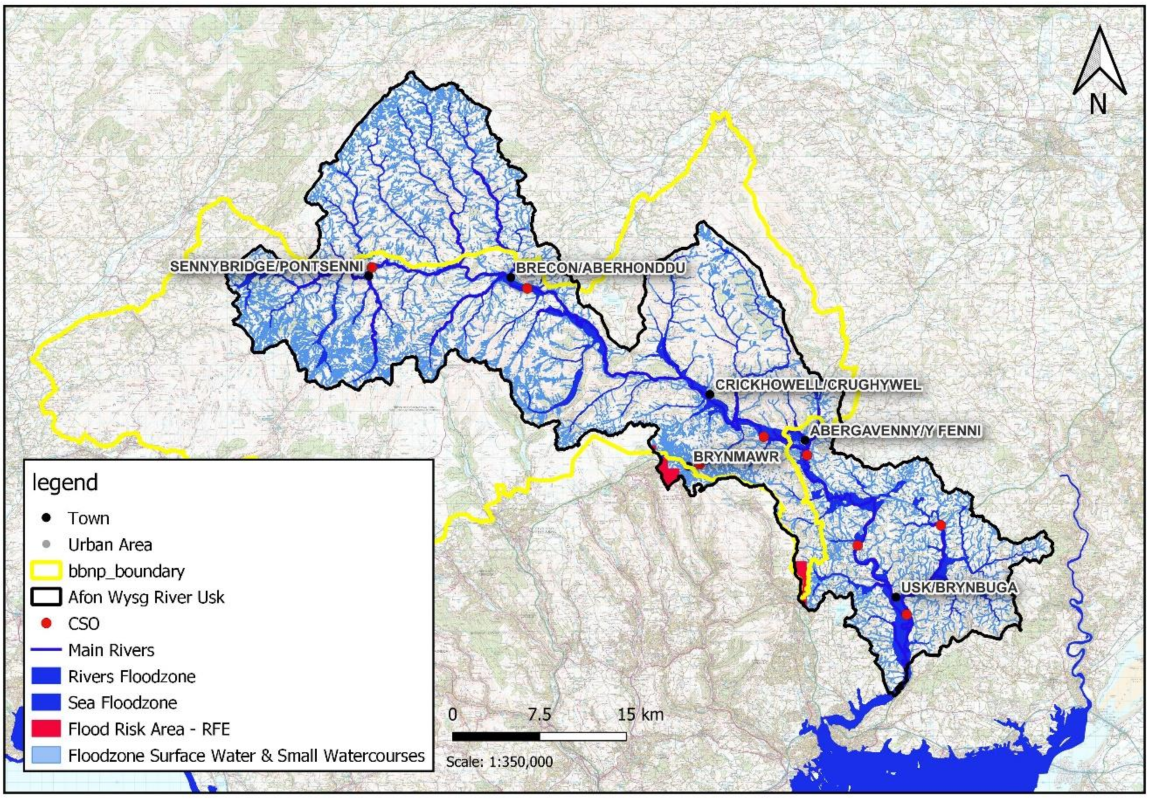

Figure 20: Flood map for planning data for the Usk Catchment. Data Source: DataMapWales

3.2.3 The National Flood Risk Management Plan 2023 to 2029[49] sets out how Natural Resources Wales will manage flood risk from main rivers and sea in key areas across Wales until 2029. The plans explain the priorities and actions NRW propose to manage the risk of flooding at

[49] Natural Resources Wales / Flood risk management plan 2023 to 2029

a national and local level and consider how we need to adapt and mitigate against climate change. The Usk catchment is within two regions: Mid Wales[50] and South East Wales[51]. Within the catchment, these show the communities identified by the Communities at Risk Register[52] that are most at risk of flooding from rivers or the sea as being **Crickhowell**, **Abergavenny and Usk**. By 2100, **Brecon** is predicted to be in the top 5 communities facing the biggest change in danger by 2120.

3.2.4 NRW are responsible for flood risk from main rivers and seas only. The Local Authorities have flood risk management responsibility for ordinary watercourses, surface water and groundwater. It was beyond the scope of this report to review their strategies and plans. There is also a Communities at Risk register which identifies risk across all flood sources.

3.3 Water abstraction

3.3.1 The Usk is a key source of abstracted water serving the catchment and beyond. The largest abstraction is permitted for public water supply (94% of licensed abstraction), as well as some hydropower generation (nonconsumptive – water is returned), agriculture, industrial and amenity/environmental purposes[53]. Abstraction of water for the Monmouthshire and Brecon Canal until recently was exempt from licensing and therefore has not been accounted for in the abstraction percentage given above.

3.3.2 Low flows can exacerbate pollution impacts through lower dilution factors and can also affect water temperature. The purpose of abstraction licenses are to limit abstraction to ensure there is sufficient water during low flow periods to support the species and habitats of the Usk.

3.4 Climate Change

3.4.1 The effects of climate change are likely to alter future rainfall patterns and rates. NRW have used the Met Office Hadley Centre led UK Climate Projections 18 (UKCP18) model[54] which provides information on temperature, precipitation, wind, sea level rise, storm surge, snow and weather types to provide the following pan-Wales projections for 2050[55]:

- Summer average temperatures rise by an estimated 1.34^{o}C
- Winter precipitation increases by an estimated 5%
- Summer precipitation decreases by an estimated 16%
- Sea level rise of an estimated 24cm (at Cardiff)
- More intense rainfall events

3.4.2 All of these changes could have negative effects on the river through changing flow regimes. Increased winter rainfall, especially if this is combined with more intensive rainfall event could exacerbate flooding and erosion risk in the catchment. While warmer, drier summers could result in lower flows and warmer water temperatures. Low flow would reduce the dilution of any pollution events along with wastewater treatment works discharges and therefore increase the relative concentration of nutrients within the river. Low flows could also mean physical barriers to movement for aquatic species, while higher temperatures will

[50] Natural Resources Wales Flood Risk Management Plan: Mid Wales Place
[51] Natural Resources Wales Flood Risk Management Plan: South East Wales Place
[52] Communities at Risk Register 2024 – Present Day (CaRR) | DataMapWales
[53] NRW, 2017. River Usk Abstraction Licensing Strategy. Natural Resources Wales, Cardiff.
[54] UK Climate Projections (UKCP) - Met Office
[55] Wales river basin management plan 2021 overview annex (naturalresources.wales) p17-18

have negative effects on temperature sensitive species. While average precipitation is predicted to decrease, occasional high intensity rainfall events are also predicted: after very dry conditions, rain falls on hardened soils which can lead to flash flooding.

3.4.3 The NRW Wales River Basin Management Plan 2021 Overview Annex Wales also identified high-risk impacts on water across a range of sectors in Wales (Table 91: High risk impacts of climate change projections on water as determined by the first UK Climate Change Risk Assessment. Taken from NRW's River Basin Management Plan Overview Annex Wales, published in October 2021.)[56]

Table 91: High risk impacts of climate change projections on water as determined by the first UK Climate Change Risk Assessment. Taken from NRW's River Basin Management Plan Overview Annex Wales, published in October 2021[57].

Theme	**Main Risks**
Agriculture and Forestry	Drier soils; reducing crop and timber yields, extra demand for water for irrigation; loss of agricultural land for floodplain.
Business	Flooding; increased competition for water; disruption of transport networks and communication links; indirect risks from changes in agriculture and the natural environment.
Health and Wellbeing	Injury, death and stress/mental health problems due to flooding; increase in water-borne diseases and food poisoning.
Buildings and Infrastructure	Flooding of road, rail, river bridges, water supply and energy infrastructure; performance of buildings in higher temperatures; "Urban Heat Island" effect.
Natural Environment	Lower summer river and estuarine flows may lead to poor water quality; warmer rivers, lakes, estuaries and coastal waters may suit some species, but others will not thrive; invasive species may gain advantage; native species may not be able to move to track favoured conditions; more rain falling in intense bursts might increase agricultural runoff.

3.4.4 With their evidence suggesting that the following measures (although not exhaustive) could mitigate some of these risks:

- Vegetation planting within catchments (including riparian tree planting to provide river shading) to increase habitat connectivity, keep rivers cool and manage run-off.
- Increase soil carbon and improve soil structure (including peatland restoration) to manage run-off, improve habitat condition and avoid carbon losses to water and the atmosphere.
- Reconnecting rivers with their floodplains and naturalising river channels to increase habitat connectivity and manage episodes of greater rainfall intensity.
- Promotion of water efficiency and high flow storage to avoid deterioration in wetland habitats and help agriculture to remain viable in the face of decreasing water resource availability.
- Adopting Water Sensitive Urban Design, which brings multiple benefits including reducing flooding; reducing discharges of storm water to watercourses; resilience to drought; and more attractive neighbourhoods with more green space.

[56] Wales river basin management plan 2021 overview annex (naturalresources.wales) p19-20
[57] Wales river basin management plan 2021 overview annex (naturalresources.wales) p19-20

3.4.5 Future flow projections for the Usk river catchment under UK Climate Projections 09 (UKCP09) have been modelled by the Future Flows and Groundwater Levels project at CEH[58]. Currently work is ongoing to update this with UKCP18 predictions and NRW are likely to use the outputs to explore climate change impacts on water bodies in Wales. This could provide more detailed information on high flows might change in the Usk catchment in the future.

4.0 Geology and Soils

4.1 Geology

4.1.1 The underlying geology consists predominantly of Devonian Old Red Sandstone with a moderate base status, resulting in waters that are generally well buffered against acidity. This geology also produces a generally low to moderate nutrient status, and a moderate base-flow index, intermediate between baseflow dominated rivers and more flashy rivers on less permeable geology[59]. The run-off characteristics and nutrient status are significantly modified by land use in the catchment and therefore may deviate from the geological expectations. More detail of the geology and topography are included in the citations of the River Usk SSSIs (Upper, Lower and Tributaries) [60]

4.2 Soil types

4.2.1 The Usk catchment is dominated by freely draining (72%, Table 12) slightly acid loamy soils (Soilscape 6)[61]. The Usk differs from the neighbouring catchments of the Monnow (Wye) which is more clayey, and the valleys to the west, which have a mixture of soil types. Indeed, the main soil type in the Usk catchment covers just 17% of England and Wales. Soilscapes can help identify areas of lower permeability or higher surface runoff, where surface NFM interventions may provide greater 'return on investment' for managing floods and nutrient runoff than in areas of more permeable soils where in field actions and changes to grazing regimes may have a greater impact.

4.2.2 The risks to water associated with freely draining slightly acid loamy soils are: groundwater contamination with nitrate; siltation and nutrient enrichment of streams from soil erosion on certain of these soils[62]. Some soil types in the upland areas are at risk of accelerated run-off and erosion from over grazing.

[58] https://www.ceh.ac.uk/our-science/projects/future-flows-and-groundwater-levels

[59] CORE MANAGEMENT PLAN INCLUDING CONSERVATION OBJECTIVES FOR Afon Wysg / River Usk SAC (naturalresources.wales)

[60] SSSI Citation River Usk (Lower Usk)/Afon Wysg (Wysg Isaf), SSSI Citation River Usk (Upper Usk)/Afon Wysg (Afon Wysg Uchaf),SSSI Citation, River Usk (Tributaries)/Afon Wysg (Isafonydd)

[61] Cranfield University (2024). Soilscapes Viewer on LandIS website https://www.landis.org.uk/soilscapes/

[62] Cranfield University (2024). Soilscapes Viewer on LandIS website https://www.landis.org.uk/soilscapes/

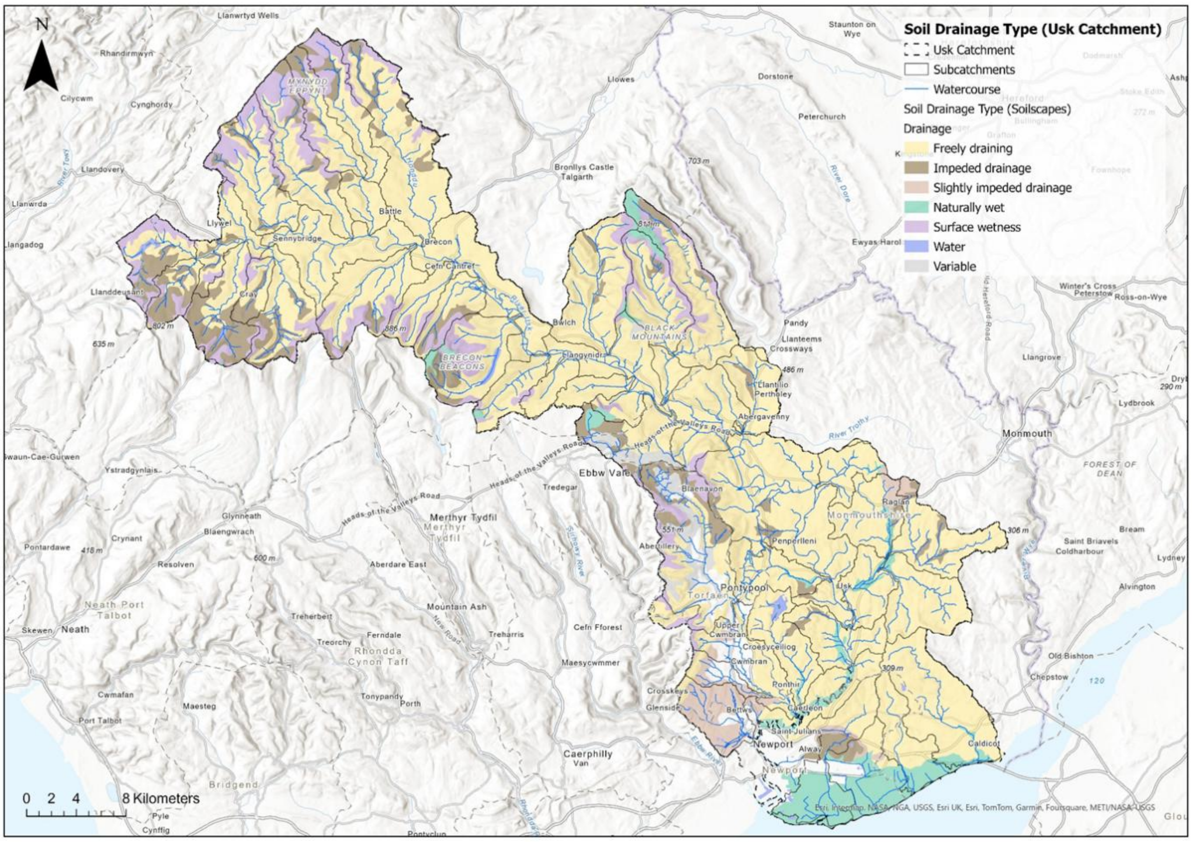

Figure 21 and Table 12: Soil types within the Usk prepared by Wye and Usk Foundation using Soilscapes[63] . Soilscapes displays broad regional differences in the soil landscapes of England and Wales and is therefore not suitable for detailed site investigations.

Drainage type	Area km^2	Area %
Freely draining	1016.093	68.98
Impeded drainage	133.45	9.06
Naturally wet	74.541	5.06
Slightly impeded drainage	35.918	2.44
Surface wetness	128.03	8.69
Variable	21.958	1.49
Water	6.764	0.46
Unsurveyed/Urban	56.246	3.82
TOTAL	**1473**	**100**

While the area of naturally free draining soils is very large, there is a significant amount of soils with impeded drainage present within the catchment – this is largely due to land management techniques resulting in compaction.
WUF have undertaken detailed 'on the ground' work to evaluate the water holding capacity of soils in specific parts the Usk catchment, with impressive results– indicating potentially large volumes of storage in soils – which have the potential to positively impact flood and drought conditions in the future.

[63] Cranfield University (2024). Soilscapes Viewer on LandIS website https://www.landis.org.uk/soilscapes/

4.3 Erosion Risk Maps

4.3.1 Organisations within the Partnership (WUF and Dŵr Cymru Welsh Water) currently identify erosion risk using SCIMAP[64]. Often used in conjunction with information gathered on the ground (known as walk-over surveys), SCIMAP can help to identify areas of fine sediment pollution. As the level of detail is too great to meaningfully view the entire Usk catchment on one page, one water body catchment is presented here as an example (Figure 22). SCIMAP does not always identify all pressures e.g. man made erosion pathways, bank erosion, and does not take current mitigation measures into account e.g. an area can be identified as high risk, but is currently managed well. SCIMAP uses elevation, stream order, rainfall, connectivity and landcover to predict where is most at risk of erosion. New outputs from the developing Nutrient Management Plan will enhance this evidence to include field scale data and the less obvious but impactful man-made erosion pathways.

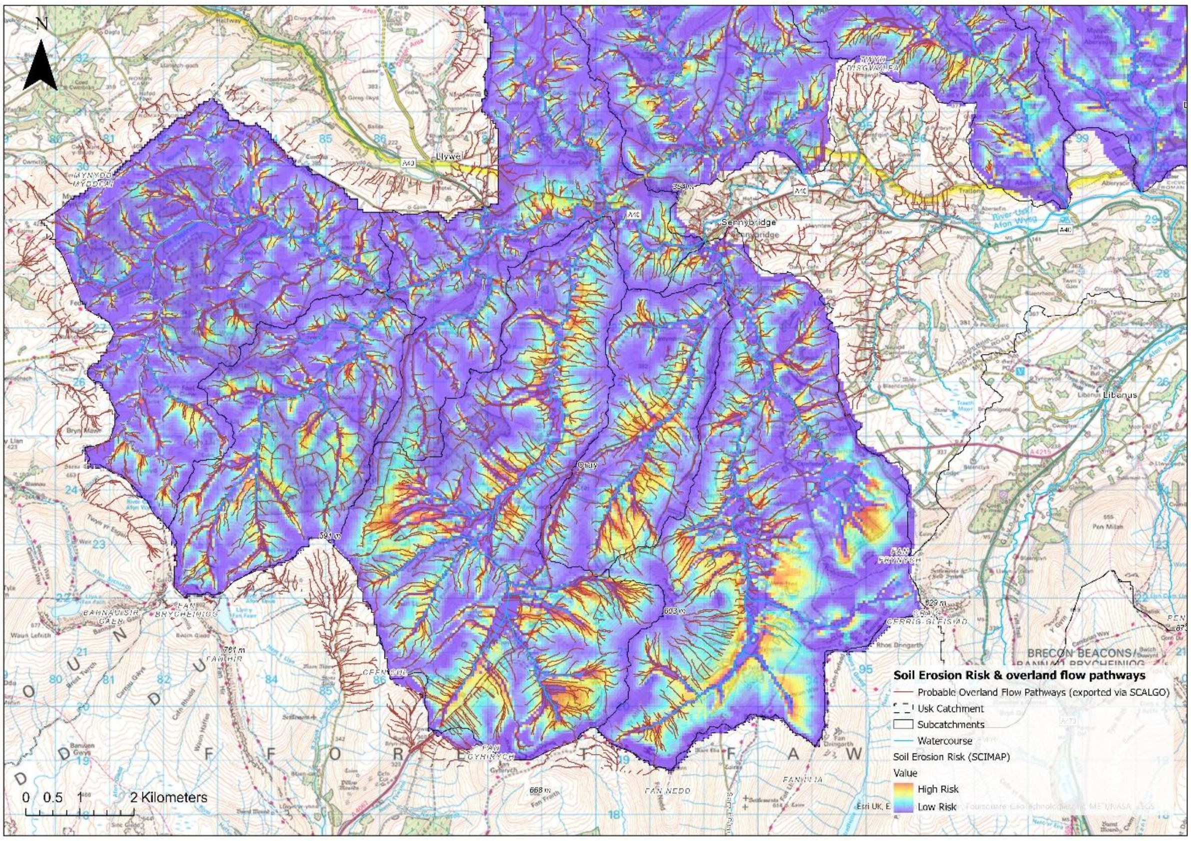

Figure 22: Example soil erosion risk and overland flow pathways map prepared by Wye and Usk Foundation using SCIMAP. Such maps have been prepared for each water body catchment within the Partnership area but are too detailed for inclusion here.

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64 Durham University https://scimap.org.uk/

4.4 Slope and opportunities for nature-based solutions

4.4.1 Slope gradient can be used to inform the choice of nature-based actions to improve water quality and quantity. Slope gradient maps (Figure 24) and erosion risk maps (previous section) can be used as part of a suite of evidence to inform on site actions. Slope gradient can be used to prioritise nature-based solutions/natural flood management actions appropriately, which may be structures that intercept surface water flows and/or to adjust farming and land-use practices.

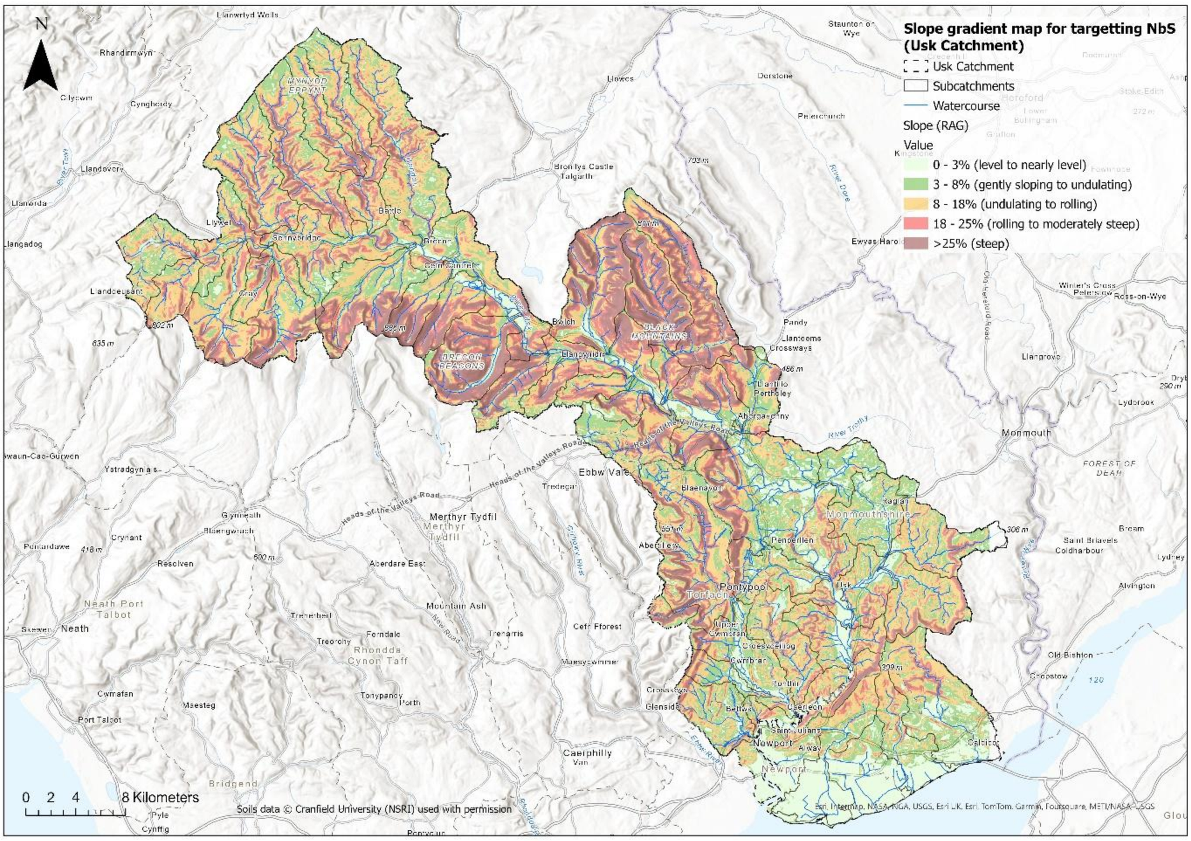


Figure 24: Slope gradient map can be used for targeting nature-based solutions. Note some detail is lost by presenting at this scale. 4.4.2

4.4.2 Nature-based solutions appropriate for each mapped slope gradient category[65]:

- 0 – 3% = floodplain restoration, riparian planting, floodplain reconnection / re-meandering, scrapes, ponds, wetlands
- 3 – 8% = woodland planting, cross slope hedge planting, buffer strips, ponds, scrapes, leaky woody structures (LWS), online/offline wetlands/ponds, SuDS (Swales etc), sediment traps
- 8 – 18% = field bunds, LWS, drain blocking, cross flow hedge planting, buffer strips, (ponds/scrapes – with caution e.g. depending on the level of earthworks required + risk of erosion etc)

[65]Wye and Usk Foundation

- 18 – 25% = cross slope hedge planting, bunded hedges, (LWS – with caution, depending on site and surroundings), general land management to reduce run off / erosion
- >25% = cross slope hedge planting, bunded hedges, general land management to reduce run off / erosion

4.2.3 Maps such as this are based on modelled historic data, and as such local knowledge and data should ultimately be used to inform actions. Additional information on protected species should also be sought. As well as gradient there are other factors which may mean that nature based solutions are more impactful to help reduce flood risk e.g. the greater the catchment size, the greater number and/or size of interventions needed.

4.2.4 Future efforts should use these maps and other knowledge to describe the upstream catchments of the communities at risk of flooding, including size, topography and known issues of sediment/debris.

5.0 Habitats and ecology

5.0.1 *Ecological status forms part of Water Framework Directive - see the water quality section of this report for details.*

5.0.2 The Usk system, comprising the River Usk and including its upper tributaries, represents a large, linear ecosystem that acts as an important wildlife corridor, an essential migration route and key breeding area for many nationally and internationally important species. The Usk is of special interest as a fine example of a river running over sandstones and for its associated plant and animal communities. Its character spans a wide range of types from an upland base-poor stream to a large lowland river with extensive tidal reaches. Its overall diversity is a product of its geology, soil types, adjacent land-use and hydrology.

5.0.3 Whilst the habitats and species present in the SSSIs and SAC were described in detail at the time of citation, it is not clear how well these dated descriptions reflect the current wildlife communities.

5.0.4 In 2021 Guy Mawle summarised available data on protected species within the River Usk, which highlighted degraded and deteriorating ecology, along with inadequate monitoring[66].

5.1 Habitats

5.1.1 The most common habitat types in the Usk catchment are cultivated/managed vegetation (41%), and broadleaved woodland (11%). The remaining area is split into multiple habitat types, all comprising less than 10% of the area each (Figures 24 and 25) [67]. Freshwater habitats are important in regulating the flow of water through the catchment, cycling of nutrients, and are hotspots for biodiversity and human use. In the UK an estimated 90% of wetland habitats have been lost. In the Usk catchment open water accounts for less than 1% of all habitats, but there is 9% Fen/Marsh/Swamp, and 1% bog.

When comparing land on farms in the Usk to the rest of Wales, there is a smaller proportion of rough grazing (Usk:4%, Wales: 13%) and a higher proportion of permanent pasture (Usk: 70%, Wales: 63%)[68]. There are an estimated 7600 hectares of crops, 568,700 sheep, 765,800 poultry, and 33,500 cattle in the Usk catchment. Across the catchment, sheep and poultry are kept at higher densities than the Wales average (see section 6.2.) while cattle are kept at a lower density (this is an average, and is not the case for all farms). We await historical agricultural data from Welsh Government/NRW, to examine trends over time. However, internationally recognised research has provided evidence that the large-scale agricultural intensification of the 20th century in the Usk has altered stream/river invertebrate communities through catchment-scale land-use change and sedimentation[69].

[66] Mawle, G. (2021). A dying river? The State of the River Usk. Available from Afonydd Cymru

[67] Living Wales (Broad) 10m resolution. Land Cover Classification for Wales based on globally applicable Food and Agriculture Organisation's (FAO) Land Cover Classification System (LCCS) https://earthtrack.aber.ac.uk/livingwales/maps.html

[68] NRW provided Usk specific data from Welsh Government Survey of agriculture and horticulture: June 2023 [HTML] | GOV.WALES

[69] Combined effects of habitat modification on trait composition and species nestedness in river invertebrates - ScienceDirect

20% Woodland

Broadleaved (11%), needleleaved (4%), woodland and scrub (4%), Young trees/felled/coppice (1%)

41% Cultivated/Managed vegetation

Improved grassland (33%), arable crops (8%)

26% Other semi-natural habitats

8% Semi-natural grassland
9% Fen/Marsh/Swamp
5% Bracken
3% Semi-natural herbaceous vegetation (unclassified)
1% Bog

8% Heathland and scrub

5% Artificial Bare Surfaces

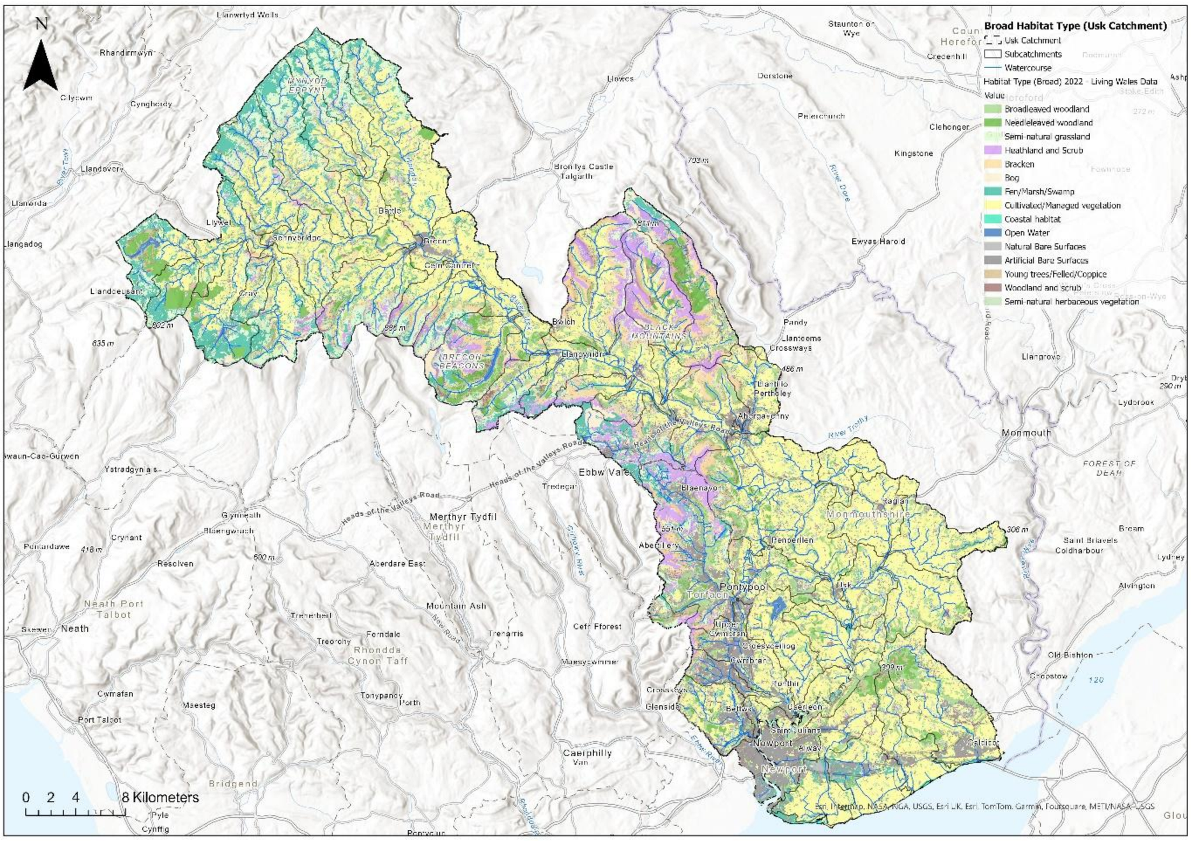
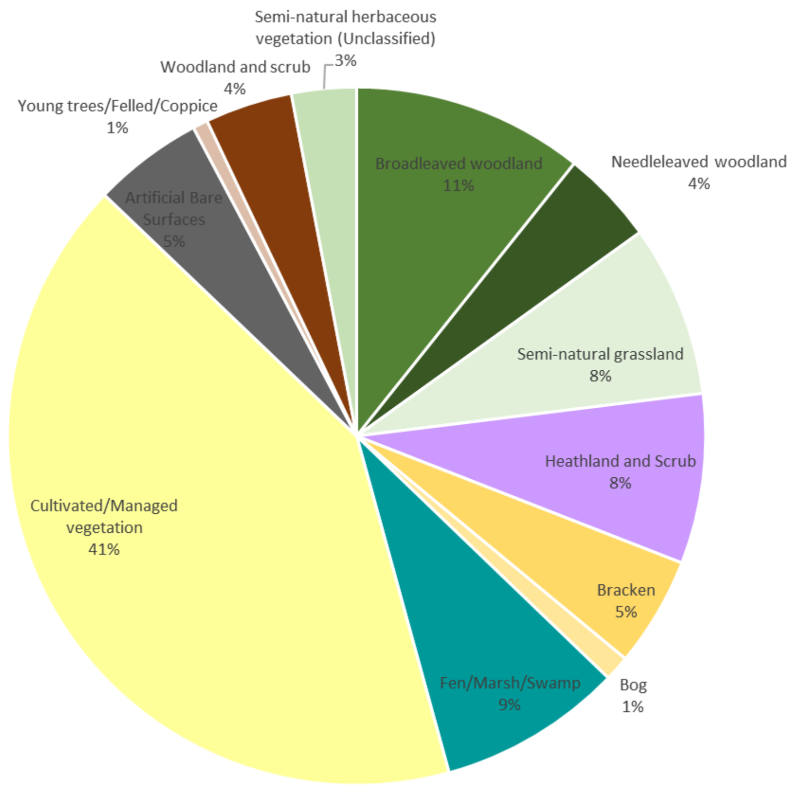


Figure 25: Map of broad Habitat Types in the Usk Catchment from Living Wales 2022



Living Wales 2022 Broad Habitat Type. Habitat types covering less than 1% not represented on pie chart: Coastal water, open water, natural bare surfaces.

Figure 26: Broad Habitat Types in the Usk catchment (Percentage cover)

5.1.2 In the Upper Usk, the extent of different habitats within 10m and 1km of the watercourse have been calculated by the Biodiversity Information Service for Powys and the Brecon Beacons National Park (BIS)[70] and the five most common habitat types (Tables 13 and 14) are presented here. As yet, no such calculation has been done for the river catchment below Abergavenny.

5.1.3 Over fifty percent of the riparian habitat in the riparian zone (within 10m of the water course) is woodland, or scrub whose root systems can stabilise riverbanks, holding soil in place, and filtering nutrients and chemicals. The second most common habitat type is improved grassland (17%) which could be contributing to erosion, sedimentation and diffuse pollution. Riparian woodland also plays an important role in shading water, keeping it cool, and contributing leaf litter and woody debris - important food sources for aquatic invertebrates. Woody debris also contributes to slowing water flow, creating pools for fish. Though there is some evidence that some mature or sparce woodland does not have the same beneficial impact on water.

5.1.4 There is a limit to the benefits of riparian zone restoration, and management beyond the riparian zone is required for full ecosystem protection[71]. Improved grassland is even more

[70] Grant funds from J. Gibbs to Wildlife Trust for South and West Wales
[71] https://www.sciencedirect.com/science/article/abs/pii/S0043135418302987

common in the wider riparian buffer - 35% of land within 1km of the watercourses (Table 14 and Figure 26) and 33% of land within the whole catchment[72].

Table 13: Five most common habitat types in the Upper Usk within 10m of watercourse

Habitat	Area (ha)	Area (%)
Broadleaf woodland	237.11	35.58
Improved Grassland	113.96	17.10
Ulex dominated scrub	59.6	8.94
Woodland and scrub (unclassified)	55.14	8.27
Juncus rushes	47.93	7.19
All other habitat types		*22.92*

Table 14: Five most common habitat types in the Upper Usk within 1km of watercourse

Habitat	Area (ha)	Area (%)
Improved grassland	18591.54	34.55
Broadleaved woodland	6221.54	11.56
Acid grassland	4813.75	8.95
Bracken	3239.01	6.02
Arable crops	2702.03	5.02
All other habitat types		*33.9*

72 Data not displayed. Detailed habitat type from Living Wales (Broad) 10m resolution. Land Cover Classification for Wales based on globally applicable Food and Agriculture Organisation's (FAO) Land Cover Classification System (LCCS) https://earthtrack.aber.ac.uk/livingwales/maps.html

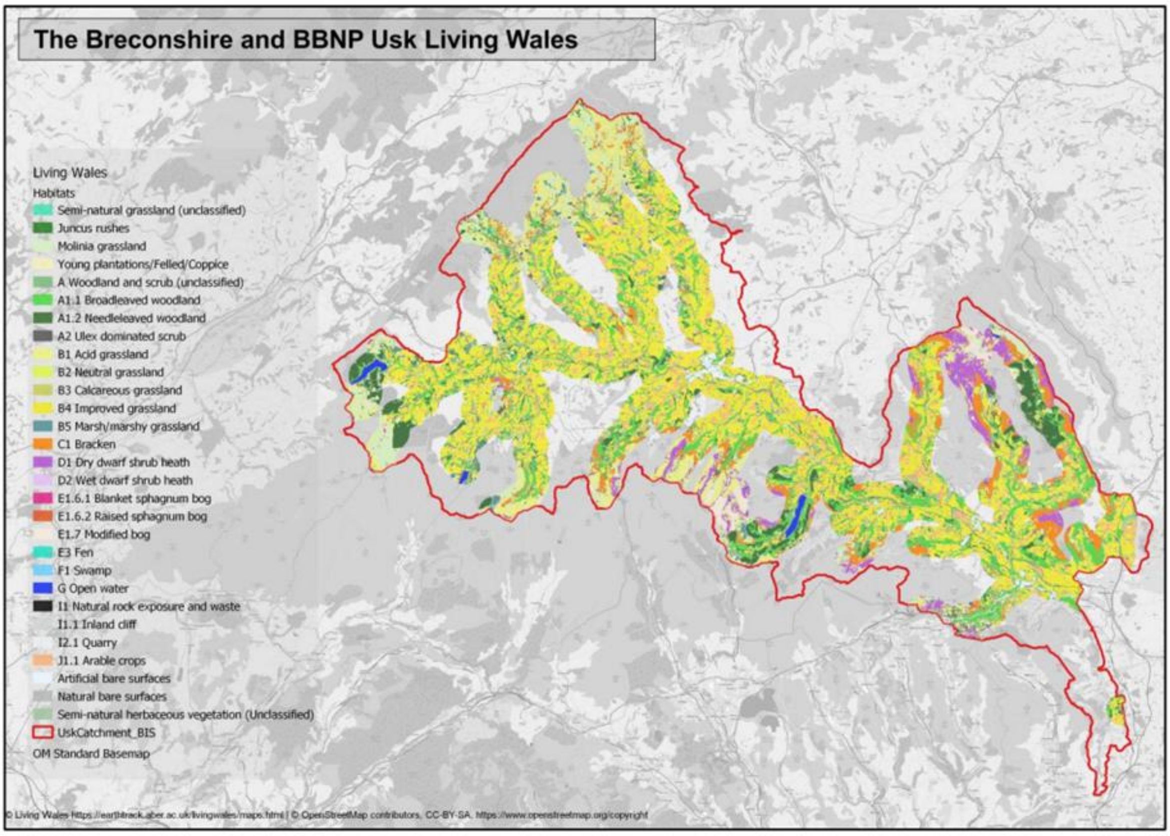


Figure 26: Habitat map with 1km buffer of watercourses. Data derived from Living Wales remote sensed satellite imagery combined with ground measurements and modelling. Map produced by Biodiversity Information Service for Powys & Brecon Beacons National Park

5.1.5 **Knowledge gaps:** What changes have occurred in habitats that could contribute to poor freshwater health?

What opportunities are there for habitat improvements that would improve freshwater health?

5.2 SAC designation: Species and Habitats

5.2.1 The Usk was designated as a Special Area of Conservation (SAC) in 2004, primarily for the presence of seven species: sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, twaite shad *Alosa fallax*, Atlantic salmon *Salmo salar*, bullhead *Cottus gobio* and otters *Lutra lutra* (Figure 28) [73]. Two further qualifying, but not primary, features form part of the designation: Allis shad *Alosa alosa*, and the habitat known as “3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation”.

[73] River Usk/ Afon Wysg - Special Areas of Conservation (jncc.gov.uk)

A

B

C

D

By © Hans Hillewaert, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=5678810

E

F

G

H

Figure 28: Images showing designated features for the River Usk SAC: (A) Brook Lamprey (B) Sea Lamprey (C) River Lamprey (D) Twaite Shad (E)Atlantic Salmon (F) Bullhead (G) Otter and (H) Qualifying feature, Water Crowfoot and (I) Allis Shad

5.3 Evidence to assess SAC feature condition

5.3.1 It must be recognised that most of the information on the condition of SAC features is not current and up to date, and that this places a considerable limitation on its usefulness to inform the work of the Usk Catchment Partnership. Many documents are many years old, and/or the evidence on which they are based is much older (e.g. the latest JNCC published Standard Data Form for River Usk SAC is from 2015[74]). For some documents the source data is not specified in detail (e.g. NRW Protected sites baseline assessment,[75]).

5.3.2 The most recent published assessment by NRW of the condition of SAC features is the 2020 NRW Protected sites baseline assessment[76]. In that assessment all nine SAC notified and qualifying features were given an indicative condition of "unfavourable", with a mixture of low to high confidence in the evidence behind those assessments (Table 15). The evidence sources for the majority of features (8/9) were unspecified "previous condition", with the exception of otters where evidence came from "species or site records". An Afonydd Cymru commissioned review highlighted concern about a lack of recent assessment of SAC features and deterioration of conservation status of some [77]. Additionally, the indicative condition of SSSI features in the Usk (Upper, Lower and Tributaries) indicate they are all either in unfavourable condition (24/41) or unknown condition (17/41).

Table 15: Indicative condition, and quality of evidence for River Usk SAC notified and qualifying features, as appears in NRW Protected sites baseline assessment, 2020.

Feature name	Indicative condition	Confidence	Evidence source	Evidence quality
Allis Shad - *Alosa alosa*	Unfavourable	Low	Previous condition	Low
Atlantic Salmon - *Salmo salar*	Unfavourable	High	Previous condition	High
Brook Lamprey - *Lampetra planeri*	Unfavourable	Medium	Previous condition	Medium
Bullhead - *Cottus gobio*	Unfavourable	High	Previous condition	High
Otter - *Lutra lutra*	Unfavourable	Medium	Species or site records	Medium
River Lamprey - *Lampetra fluviatilis*	Unfavourable	Medium	Previous condition	Medium
Rivers with floating vegetation often dominated by water-crowfoot	Unfavourable	Medium	Previous condition	Medium
Sea Lamprey - *Petromyzon marinus*	Unfavourable	Medium	Previous condition	Medium
Twaite Shad - *Alosa fallax*	Unfavourable	Low	Previous condition	Low

[74] Standard Data Form for River Usk SAC
[75] NRW Protected sites baseline assessment
[76] NRW Protected sites baseline assessment
[77] https://afonyddcymru.org/a-dying-river-the-state-of-the-river-usk/

5.3.3 Current monitoring efforts for three SAC features are more readily available than for other species – salmonids, otters and ranunculus. Better understanding of the current population status and factors limiting the SAC feature species and habitats should be sought. This may include collation of data from current monitoring schemes e.g. Four Rivers for Life are monitoring Shad, bullhead, salmon, water crowfoot, and lamprey.

5.3.4 **Salmon and Trout:** Electrofishing in the Usk and tributaries has been undertaken by the Wye and Usk Foundation over many years. They report previously widespread high densities of juvenile salmon at the top of the Usk catchment (in 2018, Figure 28), with consistently good densities also in the main river. In 2020 both juvenile trout and salmon numbers crashed, and while trout recovered, salmon did not. In 2023 juvenile salmon numbers remained low, as they have done since 2020, with recruitment, at low densities, almost completely limited to the very top of the Usk and its tributaries. The mainstem of the Usk, which had previously been an important source of juvenile salmon, has now had almost no successful spawning for four years.

5.3.5 The exact factors associated with salmonid distribution and reproduction success in the Usk are unclear. Salmonid declines are being investigated by the Wye and Usk Foundation in combination with other data (water quality, soil infiltration, eDNA) collected as part of the Usk being a demonstration catchment in CaSTCo (an Ofwat funded innovation project).

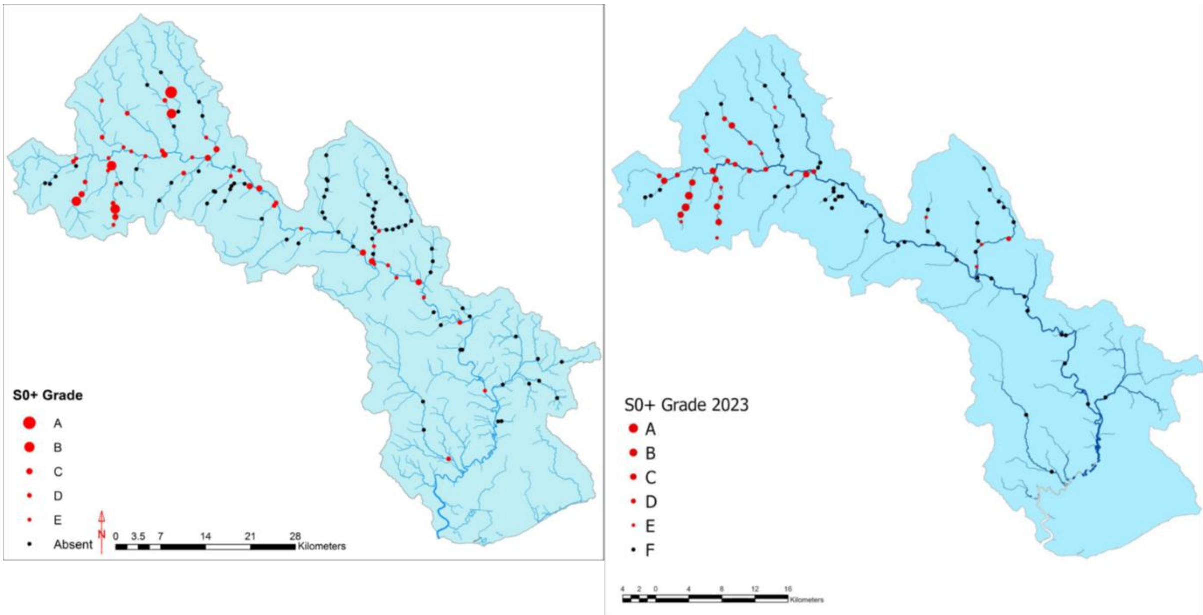


Figure 28: Juvenile salmon: grading of Usk electrofishing sites based on juvenile salmon numbers, 2018 on left, 2023 on right[78].

5.3.6 **Otters:** The sixth national otter survey saw a repeat survey of 58 sites in the Usk catchment between 2015-17. For the first time since national scale otter surveys began in the 1970s, there was a decline in the number of sites where otter signs were found (26% decline since

[78] Maps produced by Wye and Usk Foundation from their electrofishing data

the fifth survey in 2009-10)[79]. The seventh national otter survey will be repeated in 2024/25 and will assess if this decline is a trend.

5.3.7 **Water crowfoot:** With funding from the Gibbs Trust, Gwent Wildlife Trust surveyed for *Ranunculus* in 2022 and 2023 49km upstream of Newbridge on Usk. *Ranunculus* was limited to between Newbridge on Usk to just upstream of Usk Bridge[80]. Important stands were previously described as extending much further upstream from Newbridge-on-Usk as far as Abergavenny, and habitat suitability studies suggest that the natural range of the feature may be more widespread within the SAC[81].

5.4 Invasive non-native species

5.4.1 Invasive weeds affect riverbank areas throughout the catchment, in particular Himalyan balsam[82], [83]. Giant hogweed (subject to previous control efforts) and Japaneese Knotweed are present, but less common. Himalyan balsam, not only out-competes native flora negatively impacting terrestrial and freshwater food webs, it is also shallow-rooting and does not bind soil as effectively as the root systems of native flora, this significantly increases erosion risk.

5.4.2. Signal crayfish have been found in the Gavenny Brook and the Usk near Abergavenny[84] and there are American mink records in the upper Usk area (N.B. records in the lower Usk have not been requested)[85].

5.5. Evidence Gaps

5.5.1 Up to date monitoring of all SAC designated features is urgently required.

5.5.2 Better understanding of the current population status and factors limiting the SAC feature species and habitats should be sought.

5.5.3 A far greater array of evidence may be available on the many habitats and species present in the Usk catchment that do not form part of the SAC designation, and reviewing and summarising all of these were beyond the scope and capacity given to this report.

5.5.4 Assessments such as WFD Good Ecological status can be seen as a blunt tool that may obscure progress that is being made with respect to specific aspects of the aquatic environment[86].

5.5.5 Agricultural data collated by from Welsh Government is not shared in a format where it is possible to examine trends over time by river catchment or SAC catchment. Whilst at a

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[79] Kean EF, and Chadwick EA 2021. Otter Survey of Wales 2015-2018. NRW Report No: 519, NRW
[80] Karran, A, 2022. River Usk – Ranunculus Surveys Interim Report (2022). Available from Gwent Wildlife Trust on request
[81] NRW (2022) Core Management Plan Including Conservation Objectives for Afon Wysg/River Usk SAC.
[82] NRW (2022) Core Management Plan Including Conservation Objectives for Afon Wysg/River Usk SAC.
[83] Karran, A (2022). River Usk – Ranunculus Surveys Interim Report. Gwent Wildlife Trust
[84] Mawle, G 2021 Adyling river? The State of the River Usk. Available from Afonydd Cymru
[85] BIS (2024). Ecological Baseline Study on the Breconshire and BBNP Usk. Report produced for The Wildlife Trust of South and West Wales and John Gibbs.

[86] https://www.britishecologicalsociety.org/wp-content/uploads/2024/03/BES_Delivering-biodiversity_priority-actions-for-fresh-water.pdf

national level, livestock numbers have reduced in recent years, localised trends may be different, but is not currently possible to assess this.

6.0 People and Place

6.1 Heritage and the Historic Environment

6.1.1 Rivers are fundamental to Wales's landscape, heritage and culture. The stories that our cultural heritage provides gives us a sense of place and belonging in the society to which we are born, and a deeper understanding of how our species has developed over time. Throughout history, humans have shaped rivers for navigation, irrigation, and flood protection. In turn, the relationships people have maintained with rivers and other waters have shaped societies.

6.1.2 The River Usk has been a key natural resource, shaping the communities of the catchment for millennia. Its name, 'Usk,' is derived from the Common Celtic word meaning 'abounding with fish', signifying its cultural and historic significance as a prosperous habitat for wildlife and a valuable resource for food. This certainly describes the reputation of the Usk as far back as 1188, when Giraldus Cambrensis (Gerald of Wales) mentioned Trout in the river.

6.1.3 The Bannau Brycheiniog National Park Farmstead Character Statement[87] outlines how the farmed landscape and the many various farmsteads which sit along it, illustrate the emphasis placed on arable-based farming that has characterised this area from the medieval period. Legacies from the River's past functions and roles are evident along the length of the Usk's banks. The Usk valley contains many sites of prehistorical archaeological significance, and the valley has long been a trade route, settlement area and an avenue into Wales for successive invaders such as the Romans and Normans. Iron Age Hillforts and defensive structures such as Pen y Crug (a formidable iron age structure located 3km north-west of Brecon, Figure 29) dot the Usk landscape and indicate a period of social stratification and increased territoriality. The southern-most section of the river is home to the village of Caerleon where a strategically important 1st century Roman fortress sits next to Britain's largest and most complete amphitheatre.

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[87] Traditional Farm buildings and their Landscapes in Bannau Brycheiniog National park. | Bannau Brycheiniog National Park Authority

Figure 29: Pen-y-Crug Hillfort, RCAHMW

6.1.4 Following the construction of the Monmouthshire and Brecon Canal which follows the Usk, industrial settlements such as Talybont and Govilon became important locations on the transportation network for iron and coal produced in the Heads of the Valleys and transported down to Newport, as well as lime which was sent up to Brecon for agricultural use.

Figure 30: Crickhowell Bridge, Visit Wales

6.1.5 The beautiful historic towns and villages past which the Usk flows, have long acted as a focus for social and economic activity, providing jobs and attracting investment, business and visitors Crickhowell and Brecon have Conservation Areas; classified as diverse places which reflect the nation's vibrant past. Restoration of heritage structures not only conserves heritage for future generations but also brings with it a range of broader benefits such as tourism, community, education, commerce and sustainability[88]. Crickhowell Bridge (Figure 30), for example, is the longest stone bridge in Wales and its survival for more than 200 years is a result of vigilance and preventative maintenance, as engineering techniques improved. The bridge became a Grade I listed structure in 1998, being an example of one of Wales's finest early bridges. Brynich aqueduct is another fine example of a scheduled monument over the River Usk which has withstood the power of flooding and is carefully conserved and protected. This structure is one of the largest canal aqueducts ever built in South Wales, its four stone arches carry the canal across the Usk enabling boats to reach Brecon.

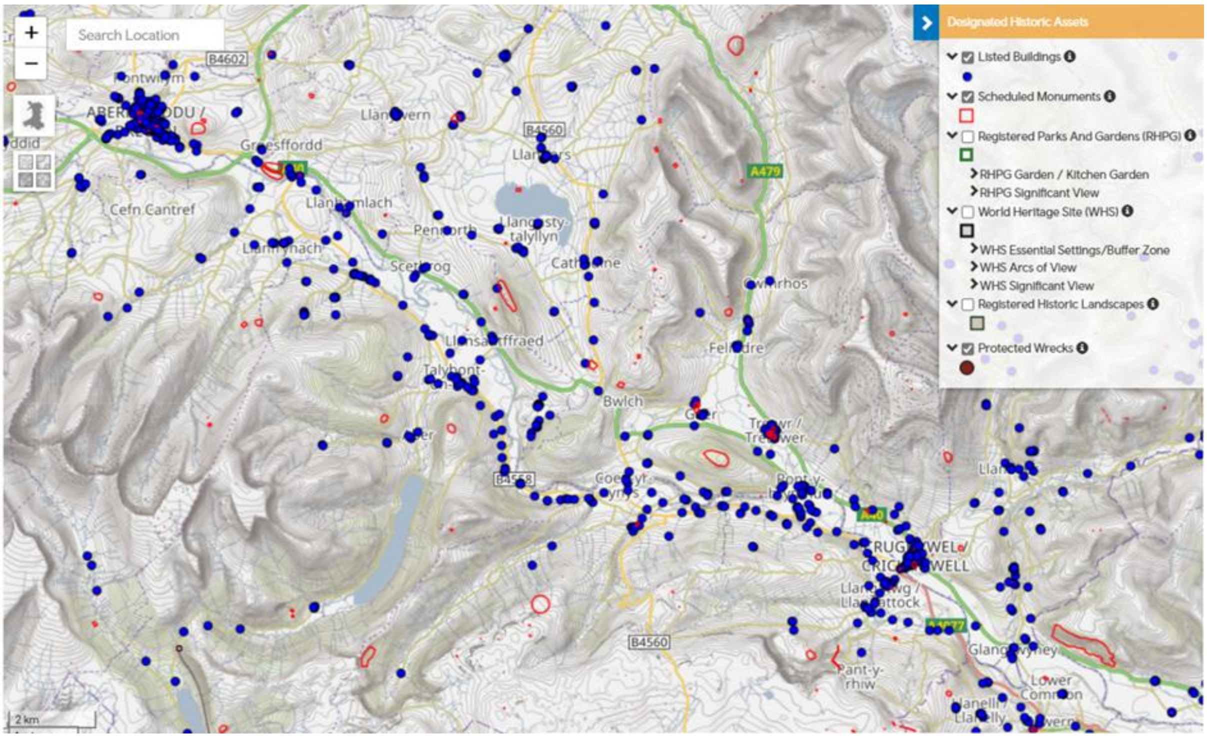

Figure 31: Scheduled monuments and listed buildings in the Usk Valley between Brecon and Crickhowell[89]

6.1.6 Historic assets scatter the landscape of the River Usk (Figure 31 example section of the river). From great hillforts, spectacular castles, to buried and underwater archaeological remains, the fabric of these landscapes evidence how people have interacted with, managed and lived within these mountains and valleys for thousands of years. Heritage links to the past help support the present and influences the future. Maintaining and protecting these valuable sites and assets which dot the beautiful landscape ensures the resilience of the heritage of the River Usk well into the future.

6.2 Living and working within the Usk catchment

6.2.1 The Usk catchment supports a large resident population and is exploited by sectoral economic activity, such as agriculture and tourism. The catchment provides drinking water for a large part of the south Wales resident population. Figure 32 below highlight key areas of habitation and community.

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[88] Heritage-in-waterway-restoration-projects-Joint-CRT-IWA-document.pdf
[89] Cadw Historic Assets - Online Map

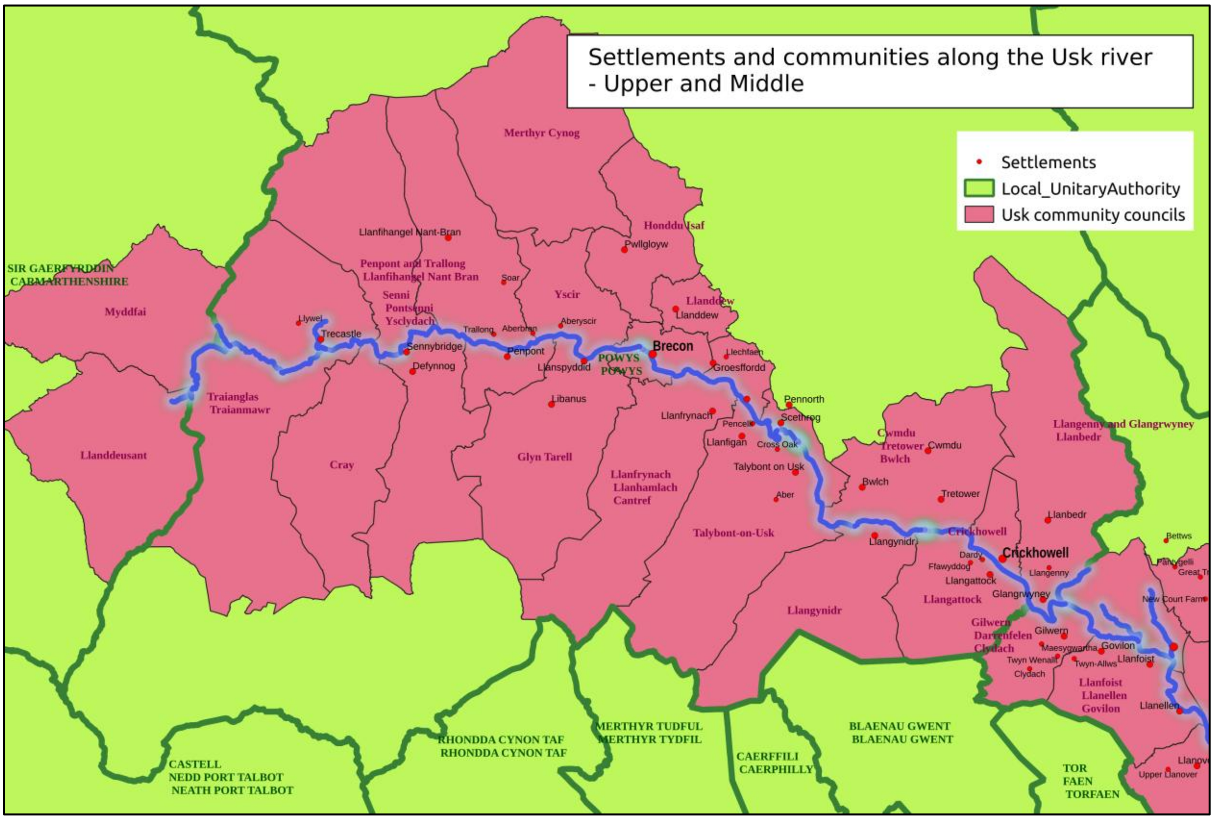


Figure 32: Settlements and communities of the Usk. Open data layers (two maps for the Upper and the Middle and Lower Usk catchment) from DataMapWales, base mapping from OpenStreetMap 1:200000

6.2.2 Agriculture is an important economic activity within the Usk catchment area. It is a form of enterprise and cultural identity for many people in the area. Compared with the rest of Wales sheep and poultry are farmed at a higher density in the Usk catchment (Figure 33)[90]

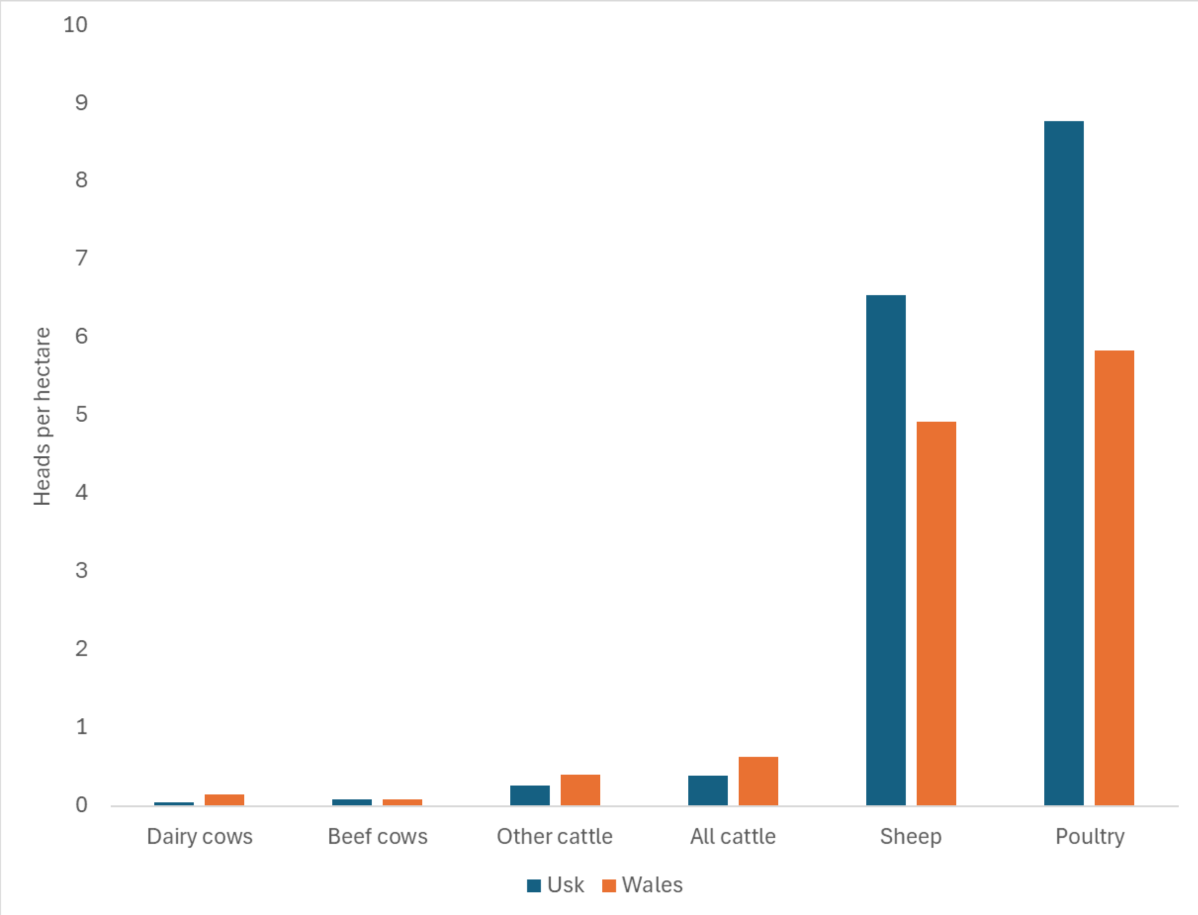


Figure 33 Livestock heads per hectare on farms in the Usk catchment, compared to all of Wales.

6.3 Settlement profiles

6.3.1 Eleven settlements are centres of significant population within the Catchment Partnership area. In total, these settlements account for a population of just under 32,000, with most of that population located in the towns of Brecon and Abergavenny (Table 16). The Partnership area currently excludes the stretch of the river below Caerleon, where it runs through the urban area of the City of Newport.

[90] NRW provided Usk specific data from Welsh Government [Survey of agriculture and horticulture: June 2023 [HTML] | GOV.WALES]

Table 16: Population data and community facilities (schools and libraries) for the 11 largest settlements of the Usk catchment[91]

Name	**Population (2021)**	**County**	**Secondary school**	**Primary school**	**Library**
Sennybridge	515	Powys	-	Sennybridge (bilingual)	-
Crai	321	Powys	-	-	-
Brecon	*8,254*	*Powys*	*Brecon High* *Penmaes* *Christ College*	*Mount Street* *Llanfaes* *Priory Church* *Penmaes School* *Ysgol Y Bannau (Cymraeg)*	*Y Gaer*
Talybont on Usk	684	Powys	-	-	-
Llangynidr	1,034	Powys		Llangynidr	
Crickhowell	2,109	Powys	Crickhowell	Crickhowell	Crickhowell
Gilwern	2,185	Mons		Gilwern	Gilwern
Govilon	1,342	Mons			
Llanfoist	2,006	Mons		Llanfoist	
Abergavenny	*10,613*	*Mons*	*King Henry VIII*	*Cantref* *Deri View* *Ysgol Gymraeg* *Our Lady & Saint Michael's Catholic School*	*Abergavenny*
Usk	2,629	Mons		Usk CV	Usk Hub
Total	**31,692**				

6.4 Demographic trends and Housing need

6.4.1 Key demographic and housing issues playing out nationally also play out within the catchment and are further impacted by the rurality of the area.

6.4.2 Many of the settlements listed above are experiencing outmigration of younger residents seeking economic opportunities in urban areas and changing household structures, leading to an aging demographic (Figure 35). The scenic beauty of the area has a significant impact on house prices, with average house prices in the catchment being unrelated to average wages for jobs located in catchment (Table 17). This decoupling of the link between wages and house prices, combined with the scenic value of much of the catchment, means that many of the available housing stock is purchased by incoming retirees, or utilised for second and holiday homes[92]. These trends have implications for the social fabric, economy, and overall well-being of the catchment. This results in the need for interventions to address national failures in the housing and employment markets.

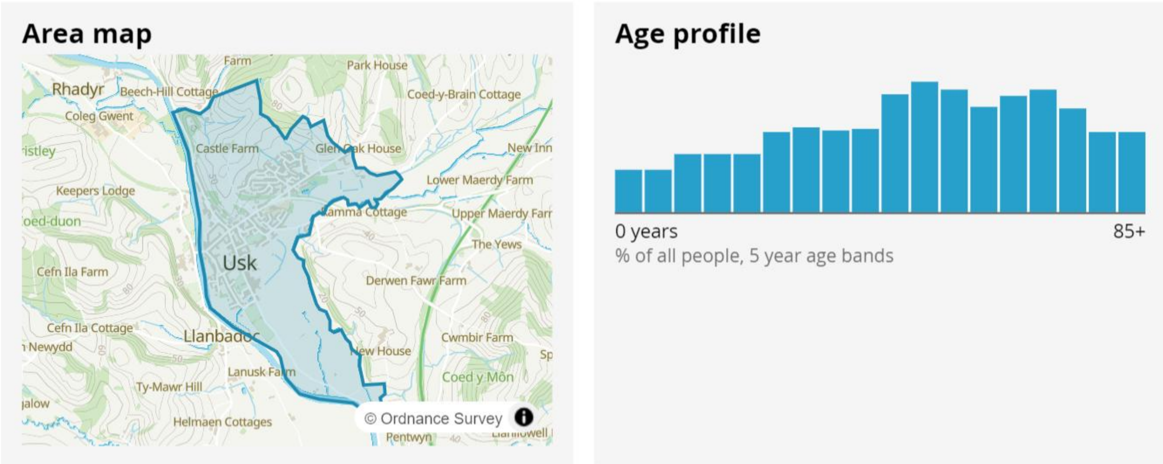
[91] Census Maps - Census 2021 data interactive, ONS

[92] See for example research undertaken by Y Bannau https://bannau.wales/the-authority/evidence-and-research/

Table 17: Comparison of average wages, house prices and dominant age bracket for each of the five main settlements in the Usk valley.

Settlement	Average wage[93]	Average House Price[94]	Mortgage multiplier:	Dominant age bracket[95]
Sennybridge	(no data)	£235,833.00		60-64 (9.9% of population)
Brecon	£31,283.00	£238,896.00	1:8	25-29 (7.8% of population)
Crickhowell	£27,758.00	£360,909.00	1:13	70-74 (11.2% of population)
Abergavenny	£30,503.00	£318,457.00	1:10	50-54 (7.9% of population)
Usk	£40,483.00	£348,683.00	1:9	50-54 (8.3% of population)
Wales	£34,190.00	£204,911.00	1:6	55-59 (7.2% of population)
UK	£38,032.00	£285,000.00	1:7	18-24 (8.3% of population)

Usk

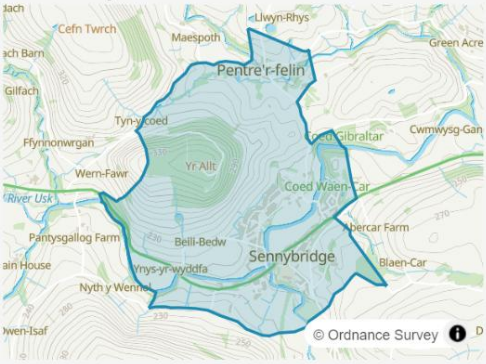


Source: Office for National Statistics - Census 2021

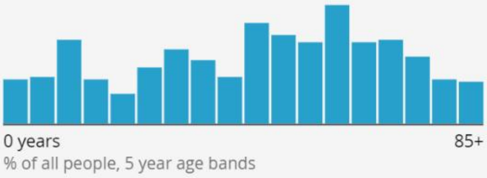
93 https://www.adzuna.co.uk/jobs/salaries/
94 https://www.rightmove.co.uk/house-prices/brecon-beacons.html
95 https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration

Sennybridge

Area map



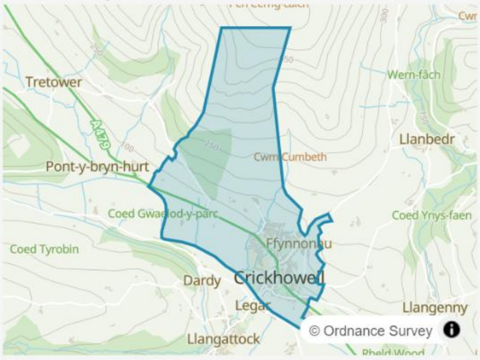
Age profile



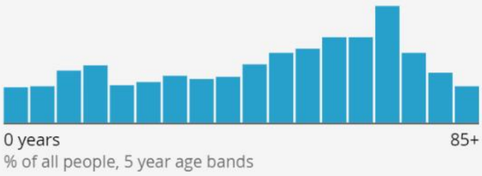
Source: Office for National Statistics - Census 2021

Crickhowell

Area map



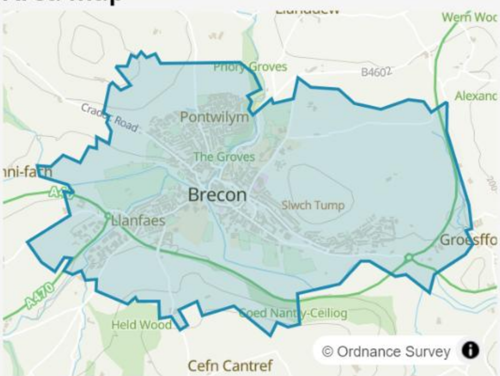
Age profile



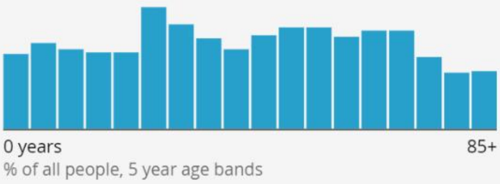
Source: Office for National Statistics - Census 2021

Brecon

Area map

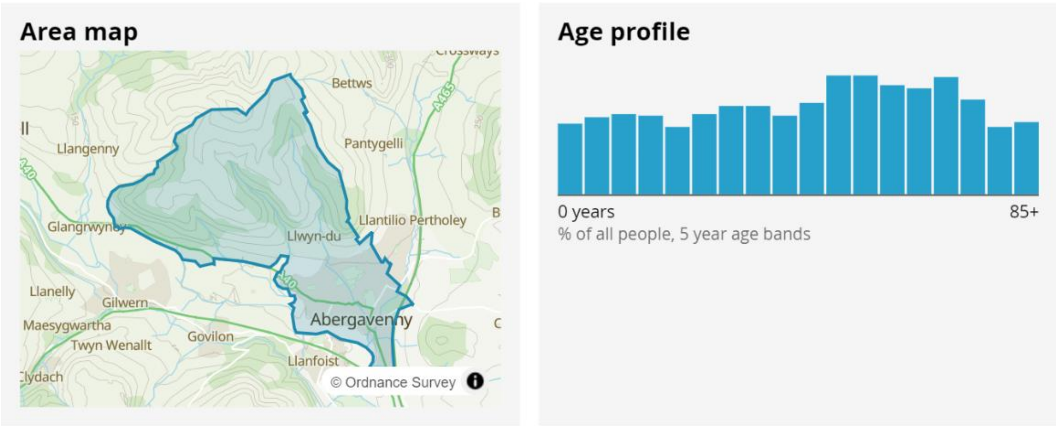


Age profile



Source: Office for National Statistics - Census 2021

Abergavenny



Source: Office for National Statistics - Census 2021

Figure 35 Community areas and age profiles for the five principal settlements within catchment partnership area. Data Source: Office for National Statistics[96]

6.4.3 In an attempt to introduce a local regulatory approach to address a national market failure, albeit one which can be particularly apparent in National Parks, Eryri National Park Authority have recently undertaken consultation on the introduction of an Article 4 Direction which would mean the change of use of a dwelling to a short-term holiday let would require express planning permission.

6.4.4 This is laid bare in the Local Housing Market Assessments (LHMA) of Powys County Council[97] and Monmouthshire County Council[98], each of which cover the area, analysis from which shows a need within the catchment for some **1107*** new affordable homes to be built over and above turnover of existing stock and planned supply during the next five years.

**Based on assumption that Brecon and Crickhowell Housing Market Areas (HMA) from Table 5 in Powys LHMA are within the Usk Catchment and that within the Monmouthshire LHMA, all of Abergavenny HMA and from the Central Rural sub-HMA will be in the Usk Catchment. Also, excludes Brynmawr[99] and Pontypool – as WwTW does not discharge to the Usk.*

6.5 Visitor Pressure

6.5.1 The river provides cultural ecosystem services for people exploring its upper reaches in the Bannau Brycheiniog National Park, designated in 1957:

> *"Whether you wish to study history or watch birds on lake or reservoir, or amidst woods or crags, whether you prefer walking or pony trekking, boating on lake, canal or river, cycling or motoring, or fishing some of its famous waters, this park will satisfy your wants."* [100]

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[96] https://www.ons.gov.uk/visualisations/customprofiles/draw/
[97] Local Housing Market Assessment | Have Your Say Powys
[98] Local Housing Market Assessment app1.pdf (monmouthshire.gov.uk)
[99] **Erratum:** Brynmawr does discharge into the Usk catchment at the top of the Clydach. The STW had an early nutrient removal scheme because of the modelled impact.
[100] TCPA Journal 1957 No. 9 September Page 016 - Town & Country Planning Association

6.5.2 The river continues to draw people seeking out recreation and there is even a long-distance walk 'The Usk Valley Walk'[101]. The Beacons Way crosses the Usk Valley as does the National Cycle Network.

6.5.3 The Steam Report 2011 – 2022 shows the National Park received 5.29 million visitors for that 10-year period, 3.88 million of which were in 2022 alone (Figure 36), with 12% being staying visitors. Visitor numbers peak in the summer months of July and August. Whilst the data isn't broken down by river catchment within the National Park, it provides an indication of the extent of the visitor pressure in the upper reaches of the river.

Figure 36: Data for visitor numbers

6.5.4 Such pressure is largely unmanaged in hotspots such as Brecon Promenade where the Carparks have turned into Campervan Parks during the summer months in particular, and many people and local businesses appear to pay little attention to the signage (Figure 37) advising the river is navigable from this location in a downstream direction only and only between October and March. Invasive Non-native Species (INNS) are widespread and riverbank vegetation cleared.

Figure 37: Images of Brecon Promenade

[101] Usk Valley Walk - LDWA Long Distance Paths.

6.6 Evidence Gaps

6.6.1 Developing socio-economic data at the catchment scale has been challenging as data is not actively collected for social-economic issues within a bioregional framework such as a river catchment.

6.6.2 The partnership acknowledges much more targeted research will need to be undertaken here especially in relation to the economic base of the catchment. Particular evidence gaps surround the impact of provisioning of cultural ecosystem services, especially in relation to tourism pressure, and its resulting socio-environmental impacts.

6.6.3 Similar research gaps exist in relation to how residents and visitors experience the river, their connections to it and the value it brings to overall wellbeing. Whereas there is general data to suggest that blue/green infrastructure such as river corridors provide significant benefits, this is not fully understood for the Usk, nor has any significant assessment been made of the recent rise in consciousness of water quality issues on perceptions of the Usk and its relative social value.

7.0 Emerging evidence

7.1 CaSTCo Usk demo – "WaterBlitz" (CU and WUF) undertaken in May 2024, eDNA sampling at 45 sites, some results expected to be available in Autumn 2024. eDNA results will help to better understand how land use and morphology and local water management practices shape river microbiome and biodiversity.

7.2 Dr Ingrid Juettner, Museum Wales has been surveying diatoms from 15 tributaries of the Usk, Diatom communities can indicate ecological responses to nutrient enrichment. Aims to share findings in spring 2025.

7.3 Developing Productive Buffers, Rhun Fychan from IBERS Aberystwth University

7.4 University of Bristol, QUANTUM project is working with scientists, farmers, industry and regulators to quantify the nutrient enrichment, pathogenic and ecotoxicological impacts of livestock farming on UK rivers. Looking for field sites in the Usk.

7.5 Research group led by Rupert Perkins, Cardiff University investigating relative ratios of nutrients in the Wye, and other drivers of algal blooms.

8.0 Next steps

8.1 This report is a synthesis of best available evidence at the time of writing. The value of this report is in bringing all this information into one place to provide as holistic as possible view of the Usk Catchment and its challenges.

8.2 Where evidence gaps have been identified, these will be passed to the Knowledge Hub which supports the partnership to consider the best way to address. In some instances, bespoke research will need to be commissioned, in other areas it may be that we accept the limitations of our knowledge and proceed with the best information we can.

8.3 From this point of understanding, we hope to develop a better understanding of areas where interventions are needed in order to reverse decline, and help move towards restoration of the catchment so it can thrive into the future. The publication of this report is the starting point in a much wider conversation with a far greater range of stakeholders towards that future.

8.4 If you have comments, or queries about any of the above please contact uskpartnership@beacons-npa.gov.uk