A dying river?

The State of the River Usk

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October 2021

'It is not too late to make a difference, but only if we start taking action now.'

Future Generations Commissioner for Wales, 2020

A plume of raw sewage from an unconsented discharge by Dwr Cymru Welsh Water in Usk town, 10 September 2021 (Photo: Emma Blackwell)

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'*What gets measured, gets managed*'[64]. NRW does neither for sedimentation.
Soil eroded from farm land polluting the Usk upstream of Crickhowell, 2016. Erosion from fields will have worsened with more being used for arable or fodder crops and left bare during heavy rain, itself increasing due to climate change[63]. Pesticides are another concern.
(Photo: Wye & Usk Foundation).

Summary and Conclusions

This report shows that the ecology of the River Usk is degraded and deteriorating. If it is to be restored, or even resilient, there will have to be a sea change in strategy, resources, regulation and management.

The designated features of the Usk as a Special Area of Conservation (SAC) have not been fully assessed since 2012. Most now appear to be in worse condition including the otter, salmon, shad, lamprey and water crowfoot. Prey for the otter has become scarcer. The salmon, once hugely abundant and supporting valuable fisheries, is now scarce or absent from much of the catchment.

Other protected species are also declining or worse. The abundance of brown trout has declined by two-thirds in key monitoring sites and is the lowest on record. The stock of sea trout is 'At risk'. The status of the Yellow Mayfly and White-clawed crayfish is unclear but both may be threatened. The freshwater pearl mussel could be extinct. Eel abundance is a small fraction of its historical level.

The last published classification under the Water Framework Directive in 2018, using older data, found that half of the water bodies in the Usk catchment did not even achieve 'Good' ecological status. In an SAC, 'High' status would be ideal. 'Good' waterbodies were mostly in the upper part of the catchment. 'Good' may not even mean good. The main reason for failure was depleted fish populations where these were assessed. On most of the main river, fish populations were not assessed and ecological status was determined by phosphate concentrations, which were excessive, in parts at least, even against old standards.

The next WFD classification is due to be published this autumn. It is expected to show deterioration due not only to poorer fish populations but also because more water bodies are failing new phosphate standards. The Usk, as a SAC, is the worst in Wales for excessive phosphate with 88 percent of its water bodies failing. NRW has identified inputs from sewage and agriculture as the main sources of excessive phosphate. There is little prospect of these being significantly reduced to meet targets by 2027.

While climate change is clearly a factor, NRW has not identified why fish populations are in decline in the Usk or, more to the point, what can be done to reverse it. NRW does not even monitor how potential key drivers such as pesticides or sediment are changing, as both the climate and land use change.

Despite being a Special Area of Conservation, the future of the river Usk and its ecology looks bleak. Other than salmon, the designated features are not being well monitored, let alone being '*maintained and restored*'. If the decline of the Usk, and Wales' other rural rivers, is to be halted and reversed, radical and urgent changes are required. 'Business as usual' means further deterioration due to climate change, poor agricultural practice, and inadequate sewage treatment. It is hoped that this failure will be recognised by the Future Generations Commissioner and Audit Wales.

The Usk may not be dead yet but much of it is dying. NRW's and the Welsh Government's aspiration for the Sustainable Management of Natural Resources has, for this river at least, been little more than delusional rhetoric: 'Greenwash'.

1. Introduction

In 2020, Natural Resources Wales (NRW) published its second State of Natural Resources Report (SoNaRR)[1]. At the official launch in January 2021, Clare Pillman, Chief Executive, noted that Wales had made significant progress in enhancing the natural environment. That report does not show what progress, if any, there has been for rivers in Wales since the first SoNaRR in 2016 but it does highlight their degraded state, including:

- 66% of river water bodies fail to achieve 'good ecological status' under the Water Framework Directive.
- All Habitats Directive freshwater features are in 'unfavourable' status, with the exception of the otter.
- Continued widespread agricultural diffuse pollution resulting in elevated nutrient and sediment loadings into freshwaters.
- Illegal removal of gravel from rivers is a significant problem on some catchments, and results in direct loss of invertebrate and fish habitat.
- Three species –white-clawed crayfish, freshwater pearl mussel and southern damselfly -are at risk of extinction in Wales. (Habitats Directive 2013-2018)
- The latest salmon and sea trout stock assessments show continuing decline since the last SoNaRR.

In the light of that damning indictment of the state of Wales' rivers as a whole, this note looks at the current state of the fauna and flora of one of our principal rivers, the Usk. Particular attention is given to those species given special protection under national legislation. There may be wider lessons for Wales' rivers and streams, a '*priority habitat*' under the Wales (Environment) Act 2016[29].

Not 'Good agricultural practice': Runoff from a maize field during heavy rain carrying sediment to pollute an Usk tributary throughout winter 2019/20. The fields were harvested in late autumn by heavy machinery compacting the ground. It was not under-sown. This field was bare again in 2020/21 and this year. This would be illegal in England[57]; NRW feels unable to stop it.

2. The Usk as a Special Area of Conservation

Much of the Usk catchment, including all of the main river, is a Special Area of Conservation (SAC) protected under the UK Habitats Regulations[2] that relate to the EU Habitats Directive[3]. There are seven features designated, one for habitat and six for species[4]. The '*necessary conservation measures'* should be taken to '*maintain or restore*' these features at 'f*avourable conservation status*'.[3] Appendix 1 gives more detail.

The official vision in NRW's Core Plan[5] for the river Usk as an SAC is:

'The aquatic plant communities that characterise parts of the river are not only attractive but also give a good indication of the overall quality of the environment. They contain the variety and abundance of species expected for this type of river, in conditions of suitably clean water and bed substrate combined with a relatively stable flow regime. Locally, there are patches of white-flowered water-crowfoots. In the more shaded reaches, aquatic plants may be scarce, consisting mainly of mosses and liverworts.
The special fish species found in the river, both residents such as the bullhead and brook lamprey, and migratory species such as the Atlantic salmon, sea lamprey and shad, which swim up river to spawn and go through their juvenile stages in the river, are present in numbers that reflect a healthy and sustainable population supported by well-distributed good quality habitat. The migratory fish are able to complete their migrations and life cycles largely unhindered by artificial barriers such as weirs, pollution, or depleted flows.
The abundance of prey and widespread availability of undisturbed resting and breeding sites, allows a large otter population to thrive. They are found along the entire length of the river and its main tributaries.'

2.1 What makes the Usk special: the designated features

The features are described on the Government website[4]. Excerpts are shown below in italics for each feature with pictures and additional comments.

2.1.1 Water crowfoot: Ranunculion habitat:

'***Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation****…. This habitat type is characterised by the abundance of water-crowfoots Ranunculus spp….. Floating mats of these white-flowered species are characteristic of river channels in early to mid-summer. They may modify water flow, promote fine sediment deposition, and provide shelter and food for fish and invertebrate animals*.' [4]

Water crowfoot was abundant in the early 1960s from the tidal reaches upstream to Crickhowell, with notable 'weed growth' up to Trecastle[7]. In 2008, the Core Plan for the SAC[5] made the lower river, between Abergavenny and Newbridge-on-Usk, and one upper tributary, the Senni, the key locations for Ranunculion habitat. According to the Plan[5]: management to maintain or increase the feature in these locations should be a priority.

Pictures: **Above:** Water Crowfoot, Ranunculus sp., on the lower Usk in 2013. **Below:** the lower Usk about 3 km downstream of Usk town in June 2004, showing Ranunculus from bank to bank (picture from Google Earth).

2.1.2 Lampreys:

'*The Usk is … important for its population of* ***sea lamprey Petromyzon marinus****. …. this species is mainly restricted to the lower reaches of the catchment.'*

'*The Usk … supports a healthy population of* ***river lamprey Lampetra fluviatilis*** *and is considered to provide exceptionally good quality habitat likely to ensure the continued survival of the species in this part of the UK. The river also supports important populations of …* ***Brook lamprey Lampetra planeri****…'*[4]

Pictures: Right: Half a sea lamprey left by an otter on the bank of the lower Usk. Note the otter spraint on the edge of the rock.

Below: Sea lampreys preparing a gravel redd for spawning on the lower Usk, 19 June 2013. Note how clean the gravel is, even outside the redd (Photo: Ken Evans).

2.1.3 Shad:

Twaite shad (*Alosa fallax*): '*The Usk is one of only four sites in the UK where a known breeding population of twaite shad occurs (the Rivers Wye and Tywi are other SAC sites). Water quality and quantity are considered favourable for this species. The main channel is largely unmodified and a variety of aquatic habitats are present, including good quality spawning gravels and deep pools used for cover by adults and fry.'* [4]

Allis shad (*Alosa alosa*): *'a member of the herring family. It is difficult to distinguish from its close relative … Twaite shad*'. [4]

Picture: A twaite shad accidentally caught by a salmon angler on the lower Usk, 19 May 2007 (*Photo, John Hardy).*

2.1.4 Bullhead:

*'The Usk represents **bullhead Cottus gobio** in the southern part of its range in Wales. It is considered to have exceptionally high-quality habitat with good water quality, abundant cover and a variety of aquatic habitats. Bullhead are widespread throughout the Usk system.'* [4]

Picture: A bullhead between cobbles on the bed of the lower Usk, April 2003.
Note the algal growth during a period of low flow.

2.1.5 Atlantic salmon:

*'The river Usk is a river famous for its salmon **Salmo salar**, with a high proportion (c. 30–40%) of multi sea winter fish recorded in the rod catch. In 1999 the Usk had highest estimated egg deposition of any British river south of Cumbria, and was one of the few rivers in England and Wales to exceed its spawning target for salmon. The Usk has a mixed catchment with a largely unmodified river channel, no significant obstructions to salmon migration, good quality spawning gravels and a diversity of habitats providing excellent habitat for salmon parr. The most important tributaries for salmon spawning are included within the site boundary.'* [4] This description of spawning gravels and parr habitat quality may no longer be so widely applicable[52].

A multi-sea-winter salmon about to be returned by an angler, June 2012

Salmon spawn from the headwaters to the tide though mostly in the middle and upper reaches, and their tributaries[6]. The whole of the main river and most of the tributaries, even in the lower reaches, have been nursery areas for salmon[5,7]. In 1963, the abundance of salmon parr was described as 'Good' or 'Very good' in the whole of the main river from Trecastle to the tidal reaches perhaps reflecting, in part, the extensive weed growth at that time.[7]

Picture: Two patches of clean gravel show salmon redds cut, amidst Ranunculus, just upstream of the mouth of the Olway Brook in the lower river Usk, December 2013.

2.1.6 Otter

*'The River Usk is an important site for **otters Lutra lutra** in Wales. They are believed to be using most parts of the main river, from Newport upstream, and in recent years signs of otters have increased. In 1991 an expansion upstream of known otter ranges was recorded on several tributaries, including the Honddu, Senni and Crai.'* [4]

Pictures: Above: A dog otter returns to the river to hunt in flood water at Llanbadoc Church, Usk, heedless of the photographer, 1440 hours, 18 February 2020.

Below: Where an otter left the lower Usk, January 2021.

2.2 The 2013 Assessment of the Usk SAC features

In 2013, based on information collected from 2007 to 2012, NRW[8] reported on the condition of the features against targets defined in its Core Plan[5]. These targets included:

- for **Ranunculion habitat**: macrophyte population and extent, as well as required conditions for flow, water quality, habitat structure, banks, and 'negative indicators' such as filamentous algae.
- **For each species**: population status and a variety of required conditions such as flow, water quality (e.g. suspended solids and phosphate), river morphology and substrate.

Aside from the otter (*Lutra lutra*), all the features were 'unfavourable' as summarised below with the reasons for the failures of each feature. Other than the population status, where assessed, water quality issues were identified, particularly phosphate concentrations and suspended solids.

SAC Feature	Overall assessment in 2013	Reasons for failure
Ranunculion habitat	Unfavourable-unclassified	'macrophyte population and extent .. not assessed… ; failed for flow …biology, suspended solids and phosphate. Plant community… and levels of negative indicator species … not assessed….channel profile…failed'
Lamprey: *Lampetra sp.*	Unfavourable-unclassified	Population condition: Fail Biological GQA, phosphate, suspended solids and flow: Fail
Lamprey: *Petromyzon*	Unfavourable-unclassified	Population condition: Fail Phosphate, suspended solids and flow: Fail
Allis & Twaite shad	Unfavourable-unclassified	Failure includes: 'The extent of spawning distribution has contracted.' Suspended solids and flow: Fail
Bullhead	Unfavourable-unclassified	Population attribute: Fail. All environmental targets except chemical GQA: Fail
Salmon	Unfavourable-unclassified	Juvenile populations: Pass. Adult status: Fail. Biological GQA, phosphate, suspended solids, river morphology and flow: Fail

GQA: General Quality Assessment

2.3 The state of SAC features in the Usk since 2013

Since the 2013 assessment, the conservation status of some, at least, of the designated features of the Usk has deteriorated. Despite legal requirements (e.g. as in Appendix 1), there has been limited monitoring by NRW of most features and the conditions that they require[9]. NRW published a 'Protected sites baseline review 2020'[58] that now describes all the Usk's SAC features as 'unfavourable', including the otter. In fact, the review gives every qualifying feature of the Upper and Lower River Usk SSSIs as 'unfavourable' or 'unknown.'

This section summarises information from NRW reports since the data used in 2013, some unfinished, and other sources.

2.3.1 Water crowfoot: Ranunculion habitat: *Ranunculus* is still present in some upper tributaries including the Bran, Crai and Afon Senni[10]. It has been lost from almost all of the lower main river Usk where it was previously extensive and only two patches remain.

With Ranunculus: one of two remaining patches on the lower Usk, both at the head of the tide just upstream of Newbridge, 29 July 2021.

Without Ranunculus: A few hundred metres upstream, Ranunculus, previously abundant, has gone from the tail of this pool. Note the lack of cover for fish and uniformity of habitat. 29 July 2021.

This loss of Ranunculus is important in itself but will also have affected the fauna. Young salmon, trout and some other fish species are more abundant around beds of Ranunculus[11,12]. The loss will also affect the abundance and diversity of insect and other invertebrate life.

In recent years, under lower flows, the river bed is at times now coated with filamentous algae, '*a negative indicator*' for the feature, sometimes also with fine sediment.

Picture: The bed of the Usk, devoid of Ranunculus and coated with filamentous algae on 7 May 2020, 3 km downstream of Usk where Ranunculus had previously been abundant (as shown in 2.1.1 above). The algal growth was similar in late April, 2021.

NRW has not, apparently, monitored Ranunculus or the macrophyte community in the river or other features which are '*mandatory*' for this protected habitat [13]. However, it did a partial assessment of five sub-attributes using data from 2013-2015. The report[14] concluded that '*the River Usk SAC River Habitat Structure did not meet any of the sub-attribute targets and was assessed overall as FAIL*'.

2.3.2 Lampreys & shad

A survey in 2013 commissioned by Welsh Water looked at the abundance of juvenile lampreys.[53] Young river and brook lampreys (both *Lampetra spp.*) can't be distinguished but they were widespread and in sufficient numbers to be in favourable conservation status. Very few young sea lampreys (*Petromyzon* marinus) were found and annual surveys were recommended. NRW recognised in a draft report[16] that it had the in-house skills to set up an annual lamprey sampling programme for the River Usk SAC but, if done, no results have been reported.

Observations at Usk[15] and downstream in the last few years suggest that both shad and sea lamprey abundance has declined, see Appendix 2. Although a few shad were caught by salmon anglers in 2021, they now tend to be large, old fish suggesting a failure to spawn successfully in recent years.

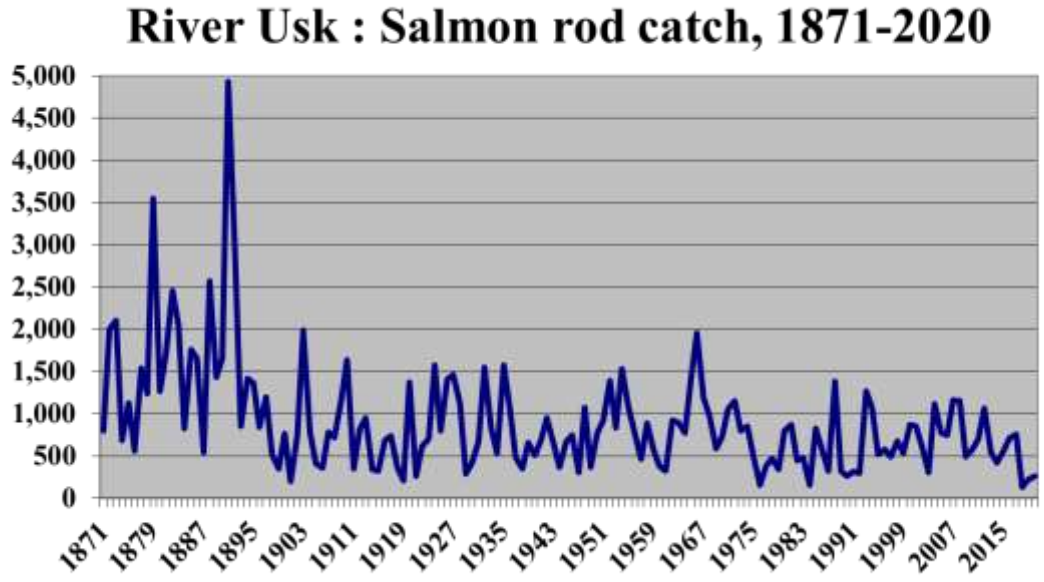
NRW did do an assessment for shad spawning, from 2013 to 2016, repeating its previous conclusion that: '*The extent of spawning has declined … so the population continues to fail to meet this attribute*' [17]. Shad eggs were recorded at few sites in 2016.

2.3.3 Bullhead

NRW also did a later assessment for the bullhead population[18]. It failed as: '*less than half of the SAC units (44%) had an annual mean density that met the target.'*. This suggests a possible decline since the survey in 2012, which led Cascade, commissioned by Welsh Water[19], to conclude that: *'the River Usk bullhead population should be considered to be favourable'.*

2.3.4 Salmon

The best documented feature of the Usk SAC is the salmon. A basic measure of adult abundance in the river is the catch declared by anglers. Records, from NRW and its predecessors, go back to 1871, as shown in the graph below, which are the longest of any river in Wales. In 2018, 129 salmon were caught, shared between at least 390 anglers; this was the lowest catch ever recorded. It is possible that the rod catch in 2021 may be worse. By contrast, one Victorian angler, John Crawshay, on his own caught more than twice this number in a year: 264 salmon in 1888 and 324 in 1891[20]. Prof. Daniel Pauly's phrase of '*trying to maintain the miserable left-overs*' seems apposite [21]. The Usk salmon has gone from a source of food to a source of recreation to a threatened species.

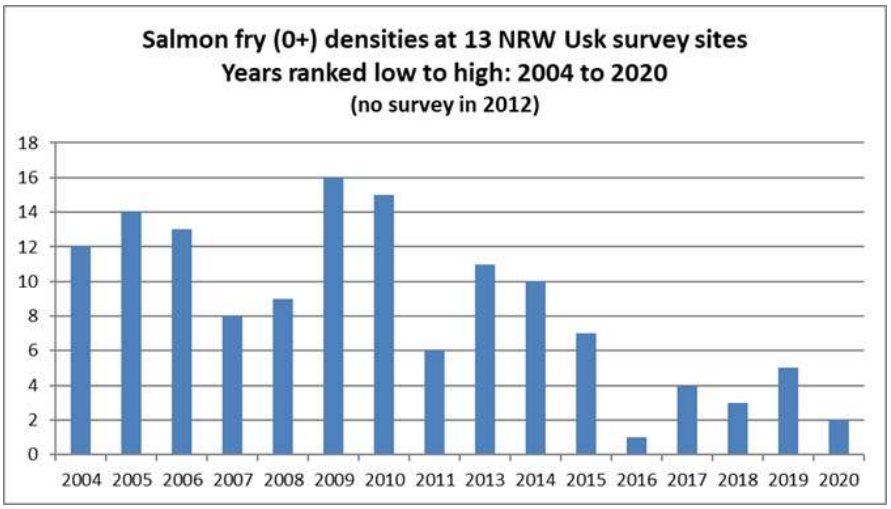


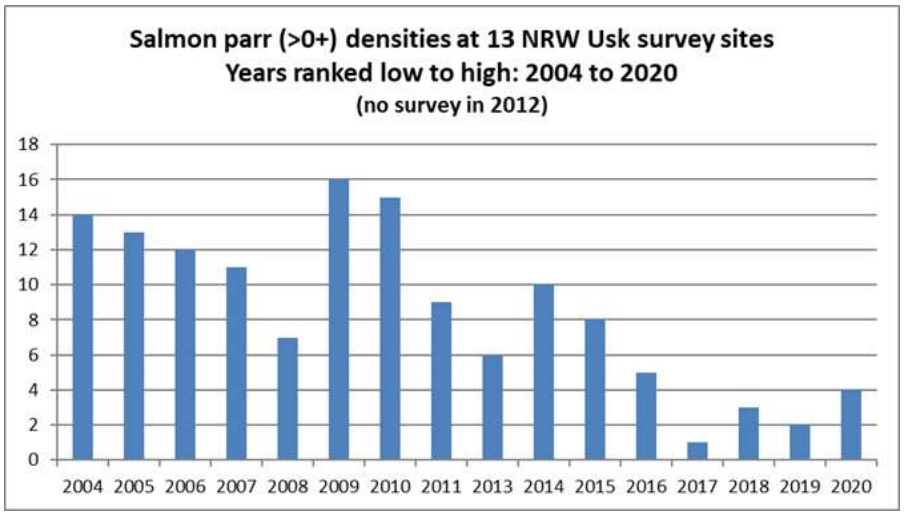
The rod catch had improved since the 1990s, especially for larger '*multi-sea-winter'* salmon, reflecting in part greater restrictions on both legal and illegal fishing[22], as well as improved water quality in the estuary. Legal salmon fisheries are no longer an issue. In both home and distant waters, those that target salmon have either been closed or, in a few cases, required to release their catch. The exception is a coastal subsistence fishery in Greenland.[23]

Over the last decade, catches of both larger and small salmon have declined. Overall, adult abundance in the Usk is classed by NRW as 'Probably at Risk'[23]. NRW's surveys show that in many

nursery areas, young salmon are now scarce or absent[24]. In 2018, almost half of thirteen sites, selected to monitor salmon annually, held no young salmon at all. From 1993 to 2015, salmon had always been recorded at these sites.

At the sites surveyed annually, the last five years have been the worst since 2004, as shown below[25]. Provisional results for these sites indicate some improvement in 2021 but juvenile abundance remains patchy and poor.





In the 2013 assessment of SAC features[8], juvenile populations had received a 'Pass'. Both facets of the salmon, adults and juveniles, as a feature of the SAC would undoubtedly now fail a formal assessment.

The decline in adult abundance reflects, in part, issues at sea and has been sharpest since 2017. Nonetheless the paucity of young salmon started earlier, from 2016 if not before, pointing also to problems within the river. Extreme temperatures and more frequent floods[63] have been a factor[26] but it is not clear that they provide a full explanation for the catastrophic lack of young salmon since 2016.

2.3.5 Otter – 'an abundance of prey'?

Although the otter population recovered from the impact of persistent agricultural pesticides in the 1950s and 1960s, it is still listed as 'Vulnerable' in Wales on the IUCN Red List[27]. The downgrading of its status on the Usk in 2020 to 'unfavourable' may reflect a poorer habitat through either pollution or a poorer food supply[59]. Otters eat a wide range of prey, including waterfowl, small mammals, crayfish and frogs, but their staple diet is fish[28]. The original vision[5] for the Usk SAC, quoted at the beginning of Section 2, is for '*an abundance of prey*' to allow a strong otter population to thrive. The depletion of a range of fish species, large and small, including SAC features, in the Usk may be having consequences for otters.

Above: A shad, partly eaten, found on the lower Usk, 15 May 2008.

Below: Left: Otter fodder: a sea lamprey left next to the spine of an 8lb salmon, accidentally killed by angling, that an otter had retrieved from shallow water nearby and eaten, 5 June 2017. **Right:** Otters will feed extensively on small fish species[28]; the abundance of small fish in the Usk is not well documented, though the status of bullhead is 'unfavourable'[59].

Left: Salmon, dead or moribund after spawning, offered an easy meal in winter, even in the lower reaches, January 2007.

Below: left: Dace (*Leuciscus leuciscus*) and **Right:** chub (*Squalius cephalus*), October 2006, are no longer abundant in the middle and lower reaches.

Bottom: Half-eaten, an eel left by an otter on the lower Usk, June 2003. The eel, an important food for otter, is now 'Critically Endangered' on the IUCN Red List.

3. Other protected species

3.1 Brown and sea trout

Although it is not a protected species under the Habitats Directive, the native trout *Salmo trutta*, both brown and sea trout, is a priority species for the UK Biodiversity Action Plan, and in Wales under the Environment (Wales) Act 2016[29], S.6.

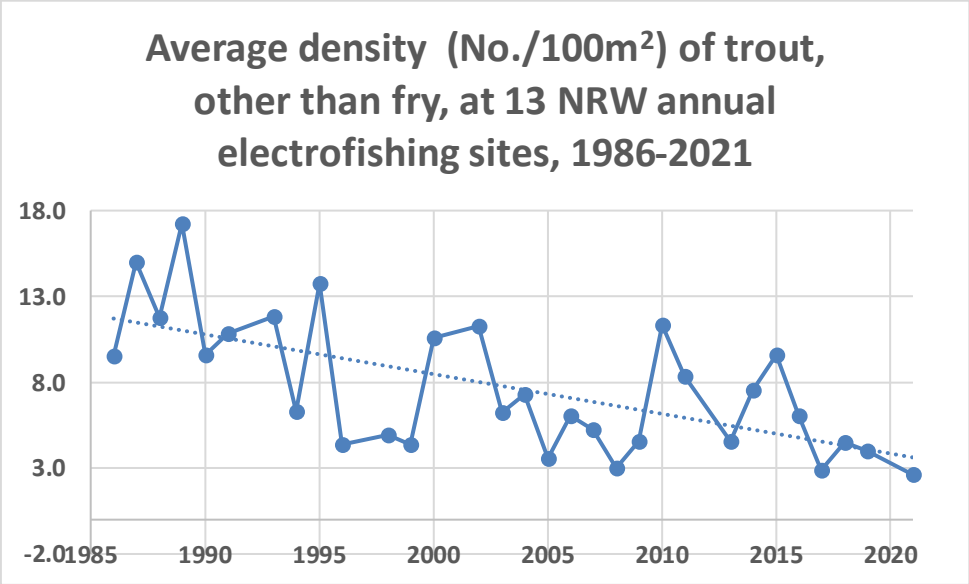
A brown trout from the lower Usk

In its sea-going form, below, trout from the river Usk contribute to the sea trout stock within the Severn Estuary, a Ramsar site[30], ostensibly given the same protection as a feature of the SAC by NRW and the Welsh Government.

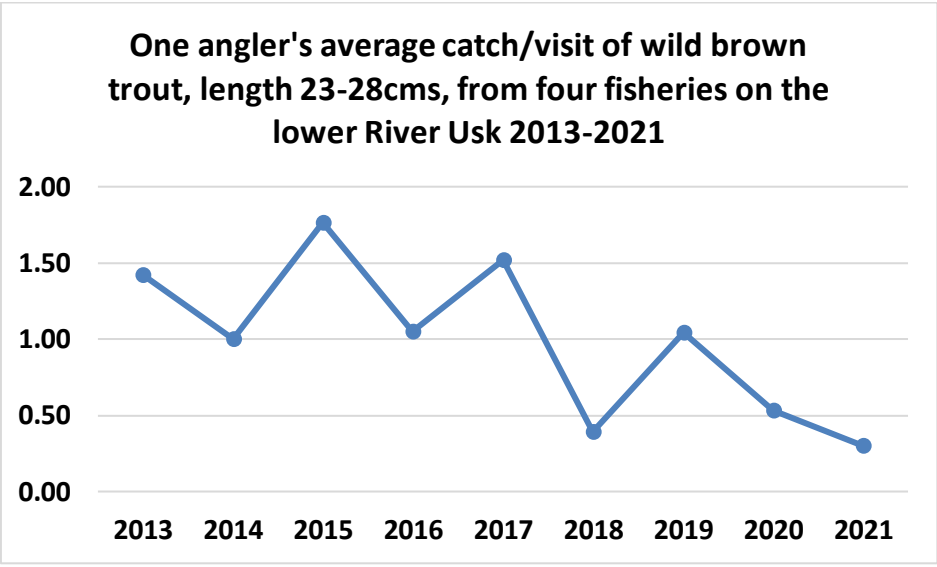
A sea trout in sea-going livery from the tidal Usk

NRW classed sea trout in the Usk as 'At Risk' in 2020, a grade lower even than salmon. The spawning stock was quite healthy around 2000 but has collapsed since and is now only a tenth of what it should be.[31] Despite this, and in contrast to its regulations for salmon and eels, NRW proposes to allow anglers to continue to kill sea trout, subject to Ministerial approval.

NRW has little information on adult brown trout stocks in the main river Usk but it does survey tributaries and upper reaches. In 2019, trout were scarce in sites in several tributaries[24]. Though variable from year to year, the number of parr and older trout has been declining. As shown below, in the thirteen sites sampled each year, there are now about a third of the number recorded in the 1980s.



Unlike salmon and sea trout, there are few detailed records of anglers' catches of trout to provide a long-term perspective of abundance or size in the main river. In 1861, Usk trout, caught by fly or net, were clearly very abundant, being sold as food in almost every town and inn up the valley[55]. John Crawshay, who caught so many salmon, also recorded his trout catches [20]. His best day, fishing near Brecon, was 57 fish weighing 28lbs. His best years with trout were in 1882 and 1884, 658lbs and 643lbs. That suggests he twice caught, and presumably killed, over 1300 trout in a year. Nowadays, many anglers return most or all of the trout they catch. Despite that, to catch a dozen trout in a visit or over a hundred in a year would be very good. Some anglers have expressed concern about the lack of smaller trout in the main river. These are supported by one angler's records for the lower river, below.



3.2 Freshwater Pearl Mussel

The Freshwater Pearl Mussel *Margaritifera margaritfera* is expected to be extinct in Wales within twenty years due to continued pressures[32]. It may already be extinct in the river Usk, reflecting a degraded environment. Despite being a protected species under the Habitats Directive, it was not designated a feature of the Usk SAC as there was little evidence of a surviving population. Adult mussels were recorded in 1992 but none were found in a 1997 survey[33]. The only records since, such as in 2012 shown below, have been of shells but no one has made a comprehensive search, perhaps using eDNA techniques. It is possible that, as on the Wye, a residual colony requiring protection remains undiscovered. Will the river Usk appear in NRW's action plan[54] for this species over the next six years or is the Usk is already deemed beyond redemption as suitable habitat?

Freshwater pearl mussel shells found on the bank of the lower Usk on 11 June 2012. The shells were joined when found suggesting the mussel may have died not long before.

3.3 White-clawed Crayfish

Another species, protected under the Habitats Directive, but threatened with extinction in Wales[1] is the white-clawed crayfish *Austropotamobius pallipes*. Like the freshwater pearl mussel, the species is or was present in the Usk and its tributaries[34,35,36]. It is not given protection as a designated feature of the SAC, unlike the populations in the adjacent River Wye. The Signal Crayfish *Pacifastacus leniusculus*, an invasive species, has been found in the Gavenny Brook and the Usk near Abergavenny. If it spreads upstream, it could further threaten the Usk's remaining population of native White-clawed crayfish.

The remains of a Signal Crayfish found on the Usk downstream of Abergavenny, 26 June 2020 (Photo: Mike Bolt).

3.4 Yellow Mayfly

The Yellow Mayfly *Potomanthus luteus* is one of Britain's rarest mayflies with most records from the rivers Usk and Wye[37]. There was concern that it might have become extinct on the Usk but there have been recent records[38]. It is a priority species for the UK Biodiversity Action Plan, and in Wales under the Environment (Wales) Act 2016[29]. Records come mainly from the lower river including tributaries such as the Olway and Sor brooks; its current status on the Usk needs assessing[37].

The characteristic wing venation of the Yellow Mayfly; a subimago from the lower Usk, 21 July 2020.

3.5 Eel

As for salmon, there has been a severe decline in the abundance of eels (*Anguilla anguilla*). Unlike salmon, the stock of eels is not specific to the river Usk but pan-European. The decline is of such concern that, in 2007, the European Council made a specific regulation establishing measures for its recovery.[39] The status of eel stocks in Wales and England is reported as the estimated production of silver eels migrating to sea for River Basin Districts. The Usk is within the Severn River Basin District (RBD). The last report[40], using data from 2014-16, estimated that the weight of silver eels produced from the whole Severn RBD:

- Was 3 percent of that before 1980; and
- Had halved since the first assessment, for 2009/10.

As for salmon, NRW has now closed all commercial fisheries for eels or elvers in Wales and anglers must return alive any eels they catch.

One protected species relies on another: a dog otter eats an eel caught from the Usk at Usk town, 18 February 2020.

4. Ecological status in relation to the Water Framework Directive (WFD)

'Water Watch'[41] documents the state of each of the water bodies in Wales as classified by NRW in 2015 and 2018. These relate to the standards of the EU's Water Framework Directive as enshrined by regulations in UK law[42]. The initial default objective was for most water bodies to achieve 'good' ecological and chemical status by 2015 though this was extended to 2021, and now, given the lack of achievement, to 2027, 2033 or even 2039 [50].

4.1 Ecological status - the 2018 classification

NRW's classification of river waterbodies in South East Wales, focussed on the Usk, is shown in Figure 1. Most of the middle and lower part of the catchment was classed as only 'moderate' or 'poor' while the upper catchment, with some exceptions, was classed as 'good'.

Not including the river Ebbw and some streams which flow directly into the Severn Estuary, there were forty water bodies defined on the Usk and its tributaries. Their ecological, as opposed to chemical, status, as classified in 2018, is summarised in Table 1.

Ecological status	No. of water bodies	Proportion of water bodies in the Usk catchment
Good	20	50%
Moderate	17	42.5%
Poor	3	7.5%

Table 1: The ecological status of water bodies in the river Usk and its tributaries, 2018 classification as described in WaterWatch[41].

Only half of the water bodies reached 'good' ecological status. Most of the rest were only 'moderate'. Three were 'poor': the Afon Crawnon, Clydach and upper reaches of the Afon Lwyd.

Ecological status is driven by data on fish, macroinvertebrates (mainly insects), plant life (both macrophytes and diatoms), and in some cases phosphate concentration and temperature. Not all of these elements were used to assess every water body. For example, only 33 of the 40 water bodies had data for Fish, excluding most of the main river Usk and the Olway Brook. The weakest of the elements assessed generally drives the overall ecological status. For most water bodies, it was the 'moderate' or 'poor' assessments for Fish and/or Phosphate that drove the ecological status, as summarised in Figure 2.

Of the 31 water bodies in the Usk that were assessed for invertebrates, all except one were at least 'Good' and most were 'High'. This is not as encouraging at it appears. The method used was designed to detect organic enrichment such as untreated sewage though it can also indicate toxic pollution. It may not show sedimentation or periodic pollution by pesticides. Both were detected by the Riverfly Census[49] at sites on the Usk in 2018 though even this is unlikely to tell the whole story.

Although the classification is dated 2018, the data on which it is based may have been obtained significantly earlier. For example, the classification for Fish is actually based on data from 2013, 2014, and 2015 which were input to a Fish assessment tool run in 2016 by the Environment Agency across England and Wales[43].

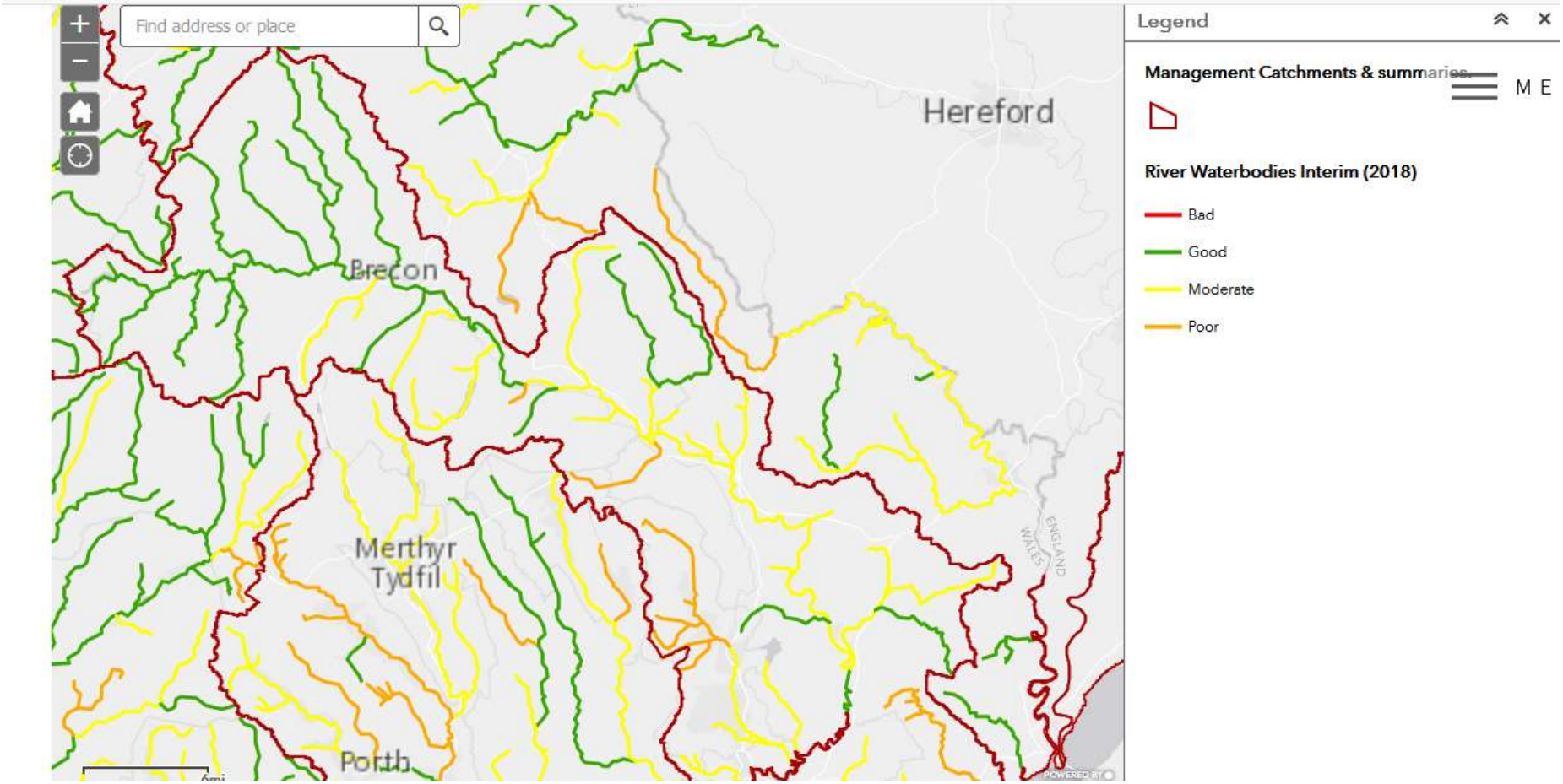


Figure 1: River Waterbodies Interim (2018) classification, focussed on the river Usk taken as a screenshot from NRW's Water Watch website[41]: https://waterwatchwales.naturalresourceswales.gov.uk/en/

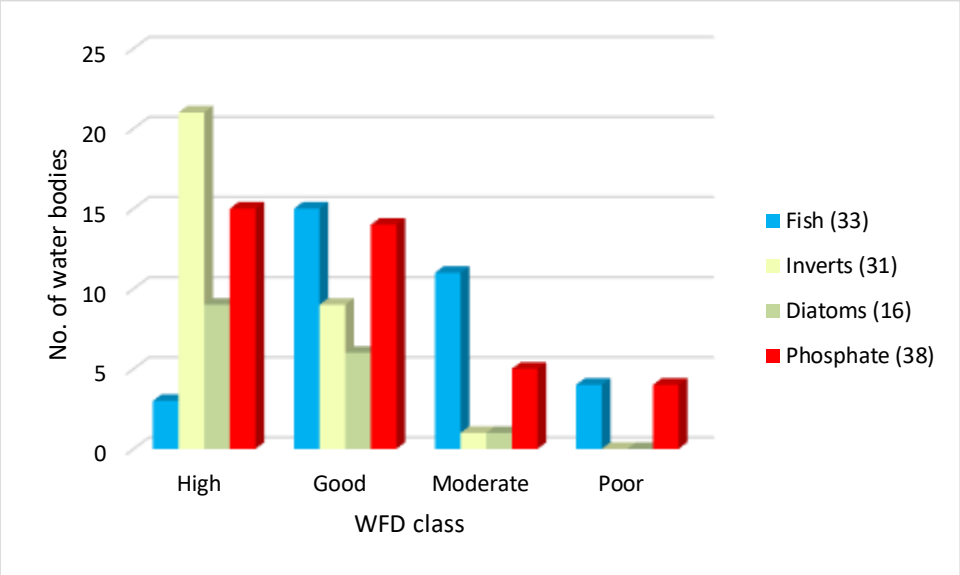


Figure 2: The number of River Usk water bodies in each Water Framework Directive class at 2018 as assessed for Fish, Invertebrates, Diatoms and Phosphate. Source: NRW's Water Watch[41].

Of the water bodies assessed for Fish in 2016, using earlier data, 45 percent failed to achieve 'Good' status. For those failing, Water Watch[41] lists 'FishSppFail2016' to show which species were failing, as summarised in Table 2. Most failures were associated with salmon and/or trout, with over a quarter failing for trout.

'FishSppFail2016'	No. of water bodies failing	As a proportion of the number assessed for Fish
Trout	9	27%
Salmon	6	18%
Eel	4	12%
Bullhead	3	9%
Stoneloach	2	6%
Species failures not given	2	6%
No. of water bodies worse than 'Good' for Fish (2018 classification)	15	45%
No. of water bodies assessed for Fish	33	

Table 2: The number of water bodies failing for individual species at 2016, using data from 2013-2015, in relation to the total numbers failing and assessed for Fish.

The Usk falls within the River Basin Management Plan (RBMP) for the Severn catchment. The next version of this Plan is due to be consulted on in autumn 2021, delayed because of Covid-19. The Fish data supporting the original draft Plan, dated December 2020, is the same as the 2018 classification. As such it will mostly be from 2013-2015, five to seven years old. Some data could be older. NRW is doing a new classification this year, 2021, prior to the autumn consultation on the next Plan. It remains to be seen whether it will be based on the 2018 or the 2021 classification.

The chemical status of the main river Usk downstream of Abergavenny also 'Fails' because of sustained pollution with Fluoranthene. The source has not been identified.

4.2 Changes from 2015 to 2018

At first sight, there was some improvement. The data on Water Watch[41] show that four of the water bodies on the Usk improved from 'Moderate' to 'Good'. However, the accompanying briefing note[44] advises that these may not be real environmental improvements but artefacts of '*what was monitored, monitoring frequencies or the methodology and some … anomalous results*'.

4.3 Changes since the 2018 classification

4.3.1 Draft Fish Classification 2019

NRW[43] has a draft assessment for the Fish element for 32 water bodies made in 2019, using data from 2013 to 2018, which may be used in the 2021 classification. It indicates some changes, up and down. Overall, this presents a slightly worse picture, with half of the water bodies assessed being less than good for Fish, compared with 45 percent in the 2016 assessment. The survey method is only practical on tributaries and the very upper reaches. NRW therefore had no assessment for Fish on most of the main river in either 2016 or 2019.

The number of failures for individual fish species, FishSpp2019, increased by 42 percent to 34, from 24 in the 2016 assessment. The main, but not sole, reason was the number of failures for salmon which doubled, as shown in Table 3.

'FishSppFail2019'	No. of water bodies	Proportion of the number assessed for Fish
Trout	10	31%
Salmon	12	38%
Eel	7	22%
Bullhead	4	13%
Stoneloach	1	3%
Species failures not given	0	-
No. of water bodies worse than 'Good' for Fish	16	50%
No. of water bodies assessed for Fish	32	

Table 3: The number of water bodies failing for individual species at 2019, using data from 2013-2018, in relation to the total numbers failing and assessed for Fish. Note: these are draft results.

The WFD classifications can be misleading. Meeting a standard of 'Good' does not mean that fish populations were good. Firstly, the general definition of 'Good' allows for some degradation in terms of abundance, species composition and age structure of fish populations [51]. Secondly, NRW uses an averaging method that allows a water body to be assessed as 'Good' when, across most of it, they may be 'Moderate'. For example, the water body at the top of the main river Usk was assessed in 2019 as 'Good' for Fish based on three sampling sites. Only one of the three sites achieved 'Good' status. The other two were 'Moderate' including the only one on the main river, one of NRW's annual monitoring sites. The salmon is a 'key species' on this stretch of the main river of the Usk

SAC[5]. As shown in Figure 3, there have been hardly any salmon found at this site since 2015, and none at all in 2018. Yet the water body was still assessed as 'Good' for Fish, albeit in 'draft', in 2019.

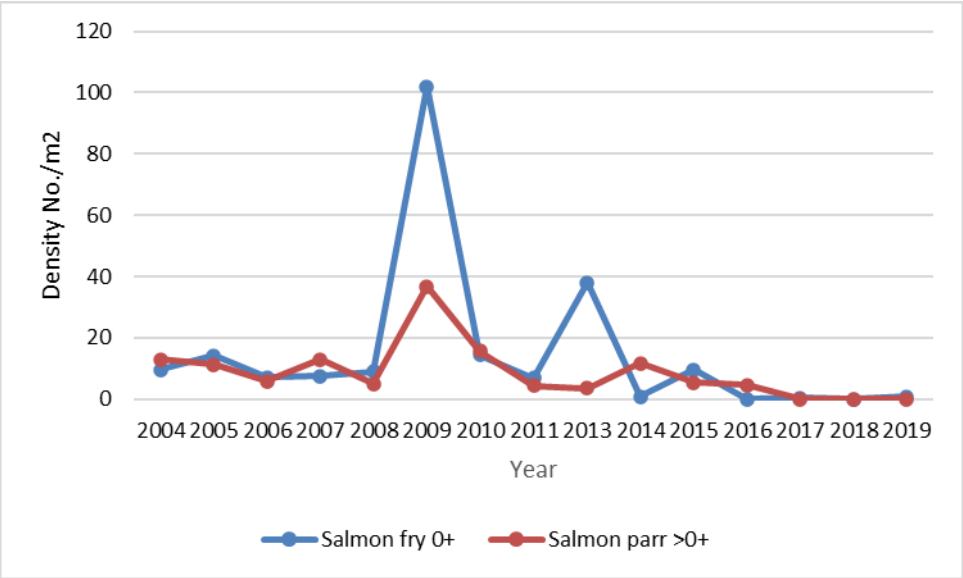


Figure 3: The density of juvenile salmon recorded annually by NRW at site U001 on the upper Usk from 2004 to 2019. There was no survey in 2012. Data from NRW.

4.3.2 New Phosphate standards

Much of the Usk catchment, including all of the main river, is a Special Area of Conservation (SAC) under the EU Habitats Directive. Following national (UK) advice, phosphate standards have recently been revised and assessed for river SACs[45]. The Usk was the worst in Wales with 88 percent of 17 water bodies failing the new standards.

This new assessment largely reverses the picture presented by the 2018 WFD classification when, with less stringent standards and older data, 88 percent of the same 17 water bodies had been classed as 'Good' or better for phosphate. However, some of the failing water bodies, notably in the lower main river, were failing even the old standard for the SAC of 0.06 mg/l, on and off, for many years, as shown in Table 4 below.

The consents for sewage treatment works to discharge to the Usk SAC were reviewed in 2009[46], using data from 2000 to 2004. This was, apparently, the only period when phosphate levels on the lower river were within the standard and judged likely to remain so. Had this not been the case, phosphate stripping would presumably have been required at both Brecon and Abergavenny's Llanfoist Sewage Treatment Works so would probably now be in place. Given failures recorded both before and after that review, it is regrettable that there is still no date for stripping phosphate from the major sewage effluents discharging to the Usk.

Data Period	Phosphate standard mg/l	Assessment against standard	Source
1995-2000	0.06	Failure	Stage 3 Review of Consents[46]
2000-2004	0.06	Pass	Stage 4 Review of Consents[46]
2006-2008	0.06	Failure	NRW presentation to Usk Local Fisheries Group, May 2021
2006-2008	0.12	Pass	2009 WFD Classification[41]
2007-2012	0.06	Failure	SAC 2nd Reporting Cycle Condition Assessment[8]
2012-2014	0.066 (to Olway Bk) & 0.073 (d/s Olway Bk	Failure – Unreliable data in 2014[44]	2015 WFD Classification[41]
2010-2012 or 2011-13	0.066 (to Olway Bk) & 0.073 (d/s Olway Bk)	Pass: data is 5 to 8 years old[44]	2018 WFD Classification[41]
2017-2019	0.05 & 0.06	Failure	NRW Compliance Assessment 2020[45]
Most recent: Jan 2018 to Feb 2020	0.05 & 0.06	Failure	Average from data provided by NRW[47]

Table 4: Historical performance of the main river Usk from Abergavenny down to the tidal reaches against standards for Phosphate.

Diffuse pollution from agriculture is another major source of phosphate[47]. New agricultural regulations[48], if retained, enforced and adhered to, may eventually help reduce this source. There is, however, limited cause for optimism. Firstly, they are being phased in over several years. Secondly, similar regulations have applied for years to much of the Olway Brook subcatchment as a Nitrate Vulnerable Zone (NVZ) but recent NRW data[47] show that phosphate levels in this tributary are still some of the worst in the Usk catchment.

The 2021 WFD classification, due shortly, will presumably present a more degraded state of the Usk. While this will partly reflect the new phosphate standards, NRW and its predecessor have failed to address the long-standing, excessive levels of phosphate in the river, especially downstream of Abergavenny.

5. Wider lessons?

The status quo on the Usk is not gradual improvement or even stasis but deterioration.

There may be wider lessons to be learned for Welsh rivers, particularly those designated as Special Areas of Conservation (SACs), and their ecology.

Knowledge of the current situation

- Natural Resources Wales' (NRW) presentation of the state of Welsh rivers in the State of Natural Resources Report 2020 is out of date:
    - It uses the 2018 Water Framework Directive classification, based on data now 7 or 8 years old.
    - NRW has not been effectively monitoring the designated features in individual river SACs, as required.
    - As of 2020, the Otter is now in 'unfavourable status' in the Usk and other SACs.
- NRW has limited knowledge of resident fish stocks, other than in headwaters and tributaries.
- Other than for salmon and sea trout, NRW has not recognised the deterioration in the condition of the river's ecology and so has not informed the Welsh Government, the Future Generations Commissioner, or the public.
- The Future Generations Commissioner[60] pointed to '*otters recovering from the brink of extinction*' as a '*sign of cautious hope*'. That recovery was due to policy decisions and actions taken decades ago. The status of the otter is now 'unfavourable'.
- '*If it's not measured, it's not managed*'. NRW has not documented changes in land use or pesticide use, both of which have become potentially more damaging. Neither has it been monitoring sediment or pesticides in the river. Both are likely drivers for the declining ecology.

Good Ecological Status

- 'Good' ecological status may not be good due both to the definition of 'Good' and assessment methods.
- For water bodies in a SAC, the ideal is for 'High', i.e. largely undisturbed status, though an objective of 'Good' may be appropriate in some cases.
- Ecological status is mostly driven by Fish, where assessed, especially salmon and trout. To deliver better ecological status, NRW needs to understand more clearly what pressures are affecting fish populations.

Failures

- NRW and Welsh Government plans have failed to maintain and restore the river's ecology.
- Protected species are not well protected.
- '*Wales is in the worst 25 percent of countries for biodiversity loss… globally*'[60]. The deterioration of the Usk and our rural rivers is part of the '*Nature Emergency*' publicly declared by the Senedd in June 2021.

- In 2016, Audit Wales[54] noted that NRW's targets for the condition of SACs and halting biodiversity loss were not being met. NRW's response to that failure and delivery of its legal duties (e.g. Appendix 1) might be challenged.
- Despite the resources spent on monitoring, there has been little follow-up investigation and only superficial analysis of data, even when there is clearly a problem.
- Where Fish is not assessed so unknown, especially in larger rivers, they cannot determine ecological status. That is typically driven, for practical purposes, by phosphate. Standards have been failed for years in some places without effective action.

Prospects

- Most water bodies are supposed to achieve even 'Good' ecological status in 2027. That assessment will use data from 2024 to 2026, at the latest. It is highly improbable that significant improvement will be achieved so soon given the status of water industry investment, rural payment schemes to farmers, inadequate agricultural regulations, and the lack of robust enforcement.
- The NRW Board was recently advised that, in responding to the Emergency, NRW will be on track to deliver remaining water related investigations and develop updated River Basin Management Plans (RBMPs) and that SAC rivers are a priority[56]. The ineffectiveness of action since the last RBMP or the Nature Recovery Plan for Wales in 2015 is not encouraging.
- As noted by the Future Generations Commissioner[60]: '*The climate and nature crises have risen significantly up the agenda amongst the general public in Wales*'. Will political attitudes change in response?
- If the Usk and our rivers are to be restored, or even to be resilient, there will have to be a sea change in strategy, resources, regulation and management. 'Business as usual' means further deterioration due to climate change, poor agricultural practice, and inadequate sewage treatment.

'All public bodies … including Welsh Government … should start taking urgent action at a pace and scale to combat the loss of biodiversity.'

Future Generations Commissioner for Wales, 2020[60]

Acknowledgements

My thanks to all those, particularly NRW staff, who provided data, photographs, and advice on the Usk, its ecology, and a draft of this report. The interpretation and opinions expressed are my own.

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…. but wrecking its rivers

Appendix 1: Legal requirements in Wales under the EU Habitats Directive.

Duties in Wales are imposed by the UK Habitats Regulations[3]:

For the Minister and NRW:

Under:

9.—(1) The appropriate authority, the nature conservation bodies and, in relation to the marine area, a competent authority must exercise their functions which are relevant to nature conservation, including marine conservation, so as to secure compliance with the requirements of the Directives.

The *'appropriate authority*' is the Minister (see S3(1)) and NRW is '*the nature conservation body'* for Wales.

…..

Some key requirements of the Habitats Directive for SACs are:

Article 6: http://www.legislation.gov.uk/eudr/1992/43/article/6

1. For special areas of conservation, Member States shall establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites.

2. Member States shall take appropriate steps to avoid, in the special areas of conservation, the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive.

Annex I includes Ranunculion habitat: http://www.legislation.gov.uk/eudr/1992/43/annex/i) and Annex II includes otter, shad (2 species), salmon, lamprey (3 species), and bullhead: http://www.legislation.gov.uk/eudr/1992/43/annex/ii)

Article 11: https://www.legislation.gov.uk/eudr/1992/43/article/11

Member States shall undertake surveillance of the conservation status of the natural habitats and species referred to in Article 2 ('of 'Community interest' including those listed in Annex I and II) …

As implemented by UK **Regulation 50: Surveillance of conservation status of habitats and species:** https://www.legislation.gov.uk/uksi/2017/1012/regulation/50

Appendix 2: Records by anglers of sea lamprey and shad at Upper Llangybi Fishery about 3km downstream of Usk town

Year	Records of sea lamprey	Records of shad
2000	21/6 to 25/6	12/5; 13/6; 14/6
2001	Foot & Mouth Disease	Foot & Mouth Disease
2002	21/6	None recorded
2003	9/5 to 18/6	11/5; 31/5
2004	1/5 to 17/5	2/6
2005	27/4 to 18/6	27/5; 29/5; 2/6; 4/6; 21/6
2006	None recorded	25/5; 28/5; 29/5; 1/6
2007	25/5	19/5; 23/5; 1/6; 2/6; 6/6; 9/6; 8/7; 10/7
2008	3/5 to 1/6	4/5; 14/5; 23/5; 1/6; 24/6
2009	None recorded	20/5; 22/5; 23/5; 15/6
2010	6/6	23/5
2011	24/4 to 11/6	18/5; 11/6; 27/6; 29/6
2012	None recorded	None recorded
2013	30/5 to 19/6	None recorded
2014	29/4 to 15/6	26/5; 9/6
2015	25/5 to 20/6	23/5; 16/6
2016	None recorded	None recorded
2017	14/4 to 5/6	4/5 & 7/5
2018	4/6	4/6
2019	None recorded	8/6; 20/6
2020	26/5; 5/6	None recorded
2021	None recorded	11/6; 24/6
Range	**14/4 to 25/6**	**4/5 to 10/7**