



The
Wye & Usk
FOUNDATION

Wye & Usk Foundation General Meeting

15 November 24

Visit Our Website

wyeuskfoundation.org

Image by Meyrick Ames



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Investigate

Determine

Deliver

Agenda

| Theme | Time | Presenter | Role |
|-------------------------------|----------------|---------------|-------------------------------|
| Introduction | 1830 -1845hrs | Jon Fry | COO |
| How 'Green is the Wye Valley' | 1845 – 1900hrs | Vernon Amor | Chief Exec Wye Valley Brewery |
| Investigating our Rivers | 1900 – 1915hrs | James Hawkins | NFM Lead |
| Electrofishing Results 2024 | 1915 – 1945hrs | Jamie Carruth | Monitoring Officer |
| Break | | | |
| Saving our Rivers | 2015 – 2045hrs | Simon Evans | CEO |
| Questions | 2045 – 2100hrs | | |

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Our Capabilities



- Habitat
- Monitoring and Data
- Catchment Advisory – Farm
- Catchment Advisory – Nature Based Solutions
- Catchment Advisory – Natural Flood Management





Our Objectives



Establish Payment for Ecosystem Services (PES) markets at the appropriate scale to solve the catchments problems



Secure position on DCWW eNGO Framework



Deliver wider cultural change around food production and environmental services



Utilise Catchment partnerships to deliver multi partner goal alignment



Create conditions for cross border regulatory alignment



Capture, use and share knowledge and data better whilst learning and growing from feedback.



Create a functional and fully resourced organisation to meet the demands of new opportunities, both professionally and personally

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Our Objectives



Establish Payment for Ecosystem Services (PES) markets at the appropriate scale to solve the catchments problems



Maximise opportunity for the Foundation via the eNGO framework.



Deliver wider cultural change around food production and environmental services



Utilise Catchment partnerships to deliver multi partner goal alignment

An aligned team who understand how the work they do is linked to the strategic objectives of the Foundation



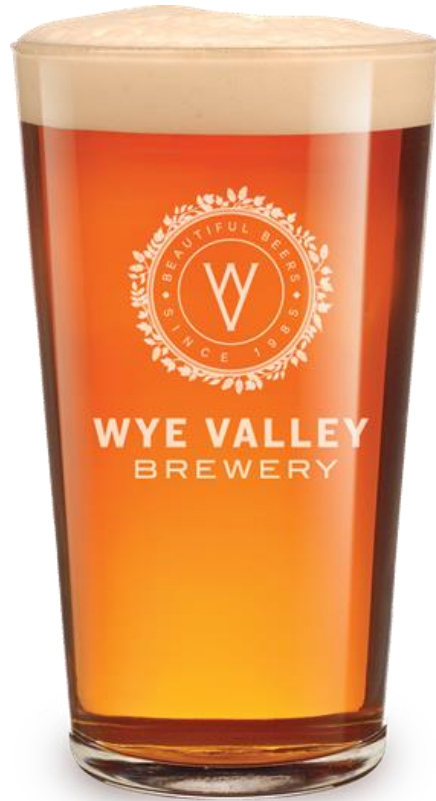
Capture, use and share knowledge and data better whilst learning and growing from feedback.



Create a functional and fully resourced organisation to meet the demands of new opportunities, both professionally and personally

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How Green is Wye Valley ?

Vernon Amor

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WYE VALLEY BREWERY



About Wye Valley Brewery



About Wye Valley Brewery



About Wye Valley Brewery

- 15,500,000 pints per annum
- 85% draught , 15 % bottle / can
- 70% direct delivered within 60 miles
- 74 full time staff



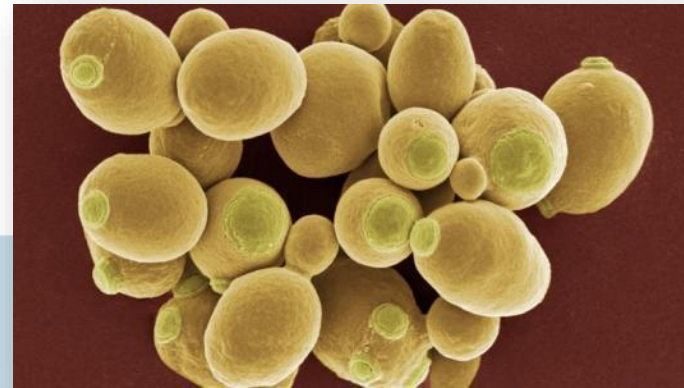
About Wye Valley Brewery

We are a brewer offering consistently outstanding quality products with exceptional personal service.

We are committed to supporting our staff, respecting our local community and minimising our environmental impact.



Brewing Process



2019

2013

Investment in Sustainability

- Identify and address largest energy consumers first
- New brewhouse
- Thermal Fluid System
- Vapour recovery
- First solar panels installed 100kW



2019

2016

Investment in Sustainability

- Second stage of solar installation 113kW

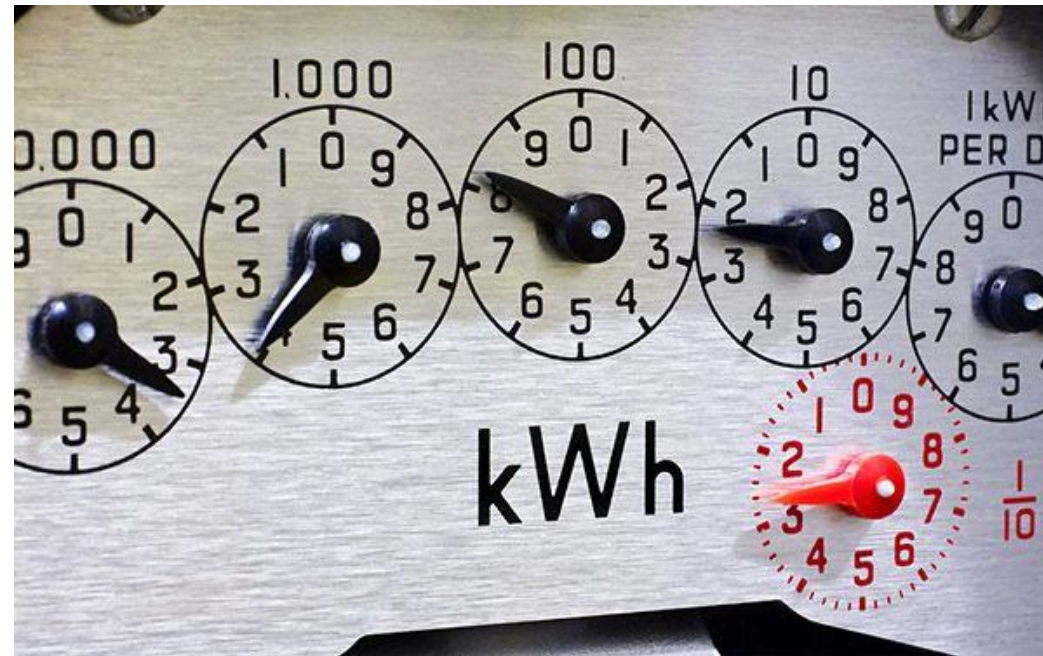


2019

2017

Investment in Sustainability

- Sub-metering



2019

2018

Investment in Sustainability

- New warehouse reducing forklift movements
- First electric forklift
- Third stage of solar installation 65kW
- And we put in a pond



2019

2019

Investment in Sustainability

- First electric car 2016
- We now have 3 fully electric, 6 hybrid, 12 EV charging points
- Our insurance underwriters don't like EV charge points
 - Annual safety inspection



2019

2022

Investment in Sustainability

- Free Air Cooler

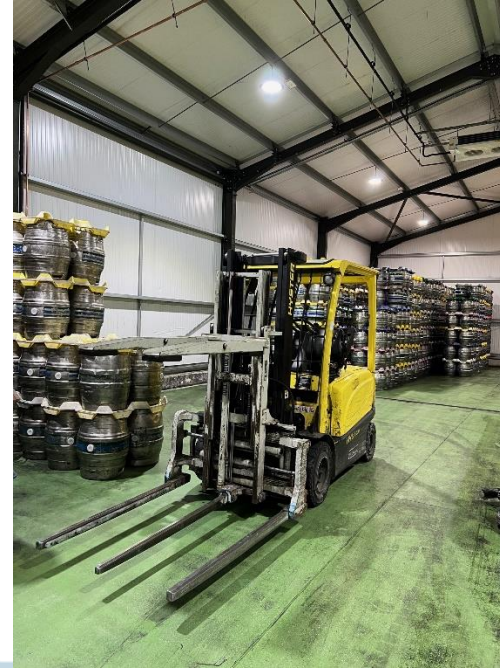


2019

2023

Investment in Sustainability

- Fourth stage of solar installation 78kW
 - Insurance inspections
- 3 more electric forklift trucks



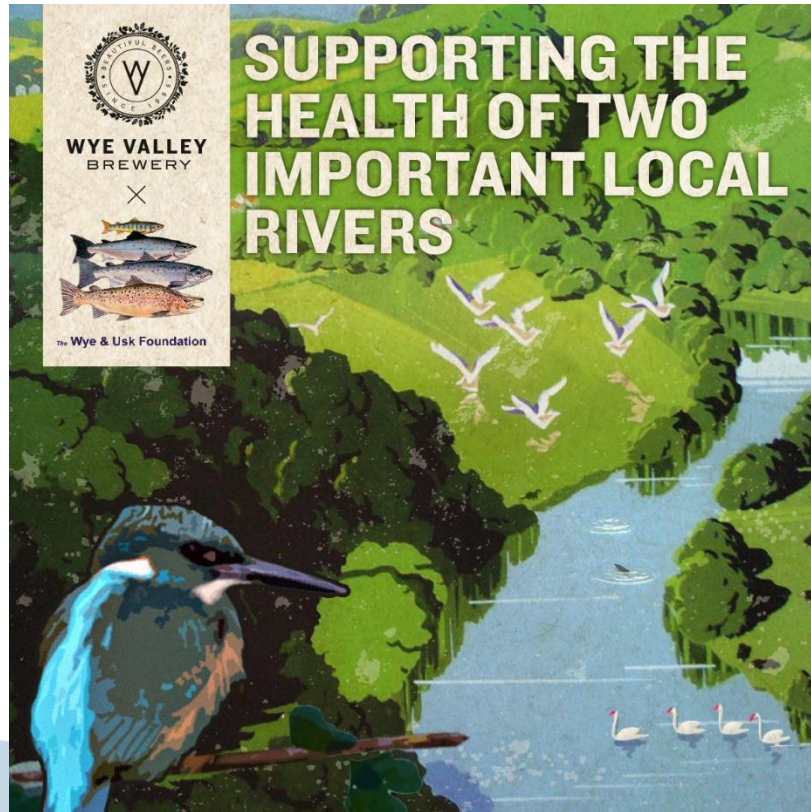
2019

2024

Wildlife habitats / biodiversity



Corporate sponsorship



Investment in Sustainability

| | 2012 | 2023 |
|--------------------|-----------------------|-----------------------|
| Beer sold | 25881 Brewers barrels | 53013 Brewers barrels |
| Electricity | 597,000 kWh | 570,000kWh |
| Water | 4.7:1 | 3.6:1 |

Direct CO₂ emissions down 40%
Water usage down 24%



Future Plans & Challenges

- Keep looking at the biggest energy consumers
- New energy efficient brewhouse – NO FOSSIL FUELS
- New waste water treatment plant
 - Water recovery by reverse osmosis
- More solar panels – National Grid limitation
- Distribution – bio diesel – Euro 6 D engines
- Rebuild offices and visitor centre-sustainable architecture
- More ponds and wildlife habitats
- Waste material bailers for recycling
- Long term vision





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James Hawkins

Head of monitoring & NFM Lead

'Investigating' rivers on catchment scale

Investigate

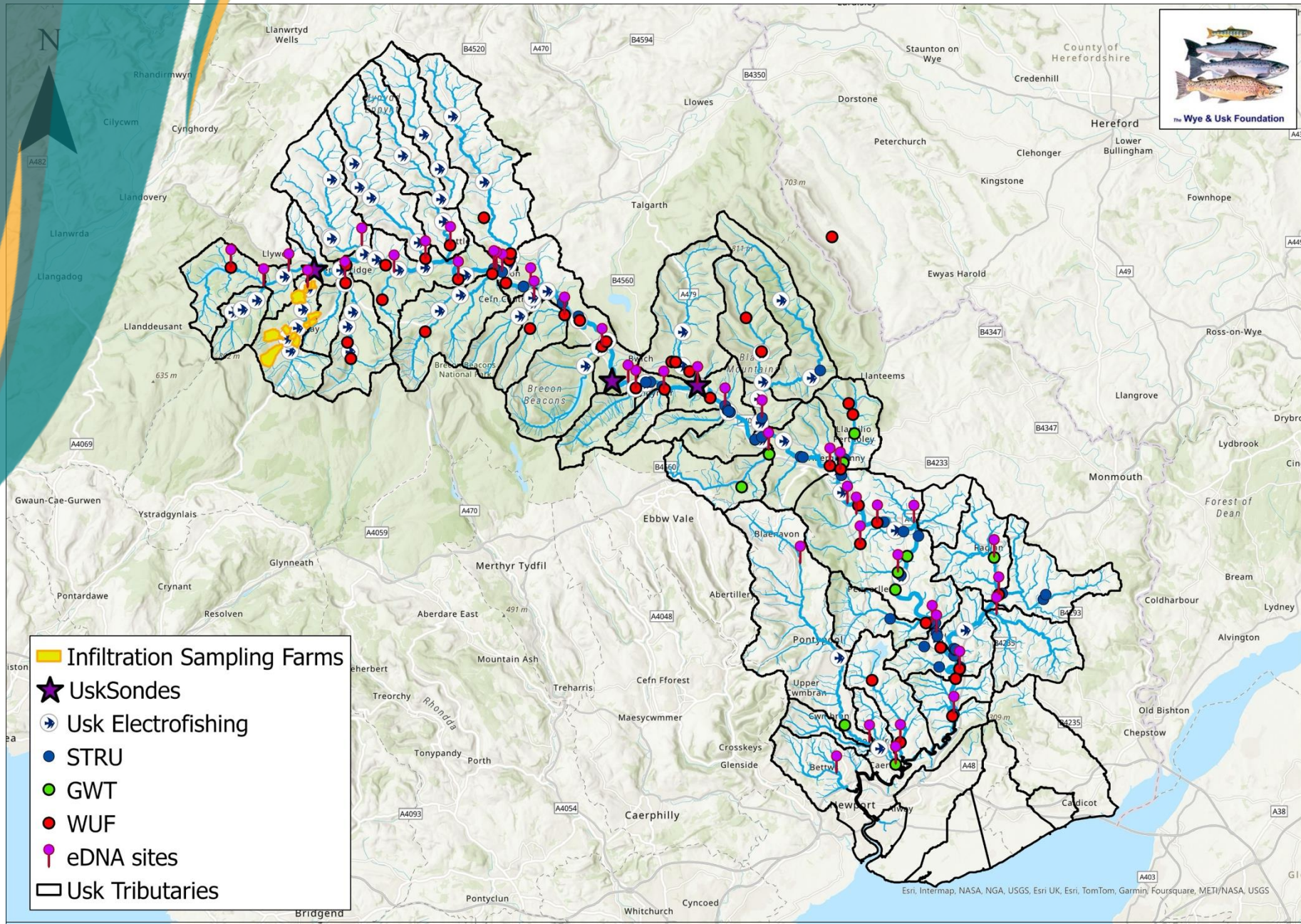
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The River Usk

Photographed by Keith Lawson



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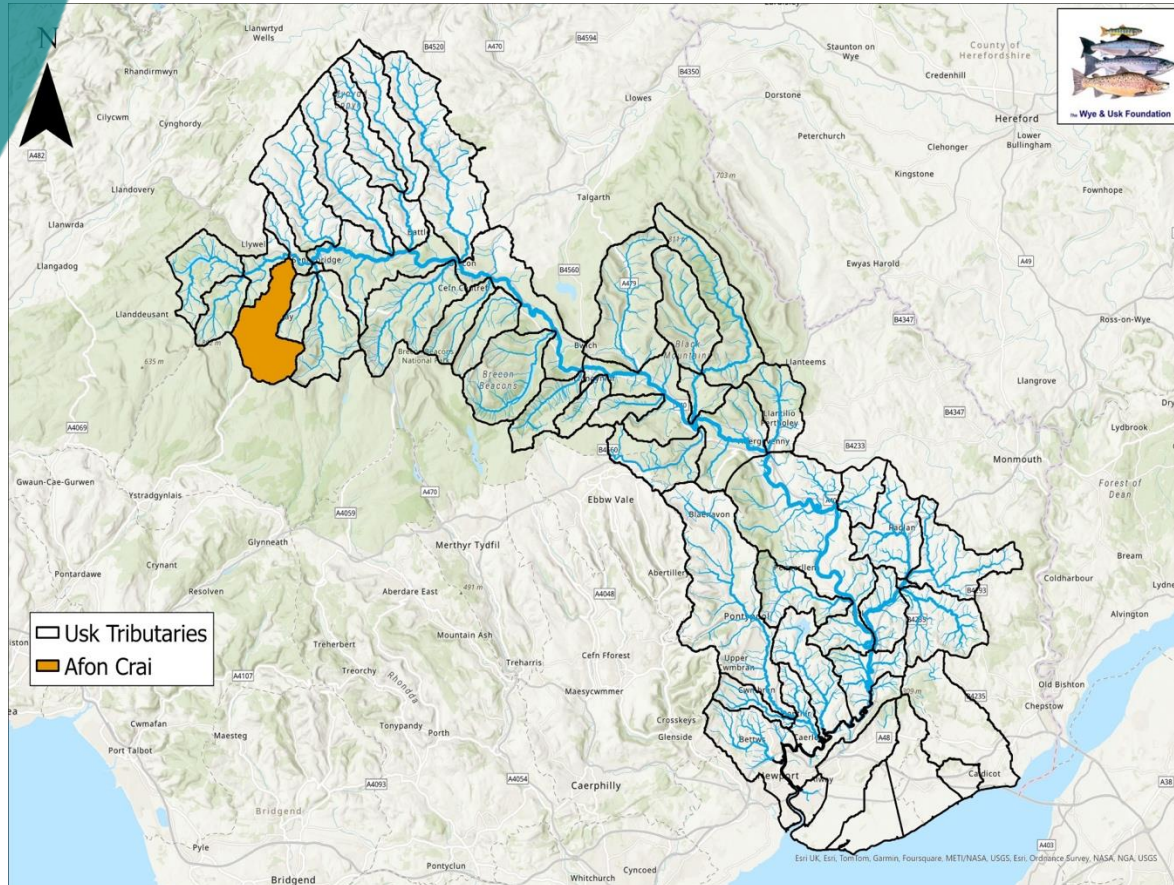


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On Farm Investigations



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- Relationships with farmers
- Wet weather surveys to assess opportunities:
 - Grazing Management changes
 - Trees and Hedges
 - Fencing Watercourses

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Citizen Science

Testing across the whole
Catchment:

- Phosphate
- Turbidity
- Electrical conductivity
- Nitrate
- Nitrite
- Temperature
- Ammonia



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Ymddiriedolaeth
Natur
Gwent

SAVE THE RIVER USK

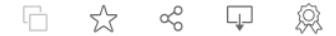
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UskViz by [Wye and Usk Foundation](#)



START NOTES CHARTS FOR CITIZEN SCIENT... Site search and details Site overview* Site level trends* Site level trends (detail)* Site photos and comments* Site phosphate with target Site context data MAP

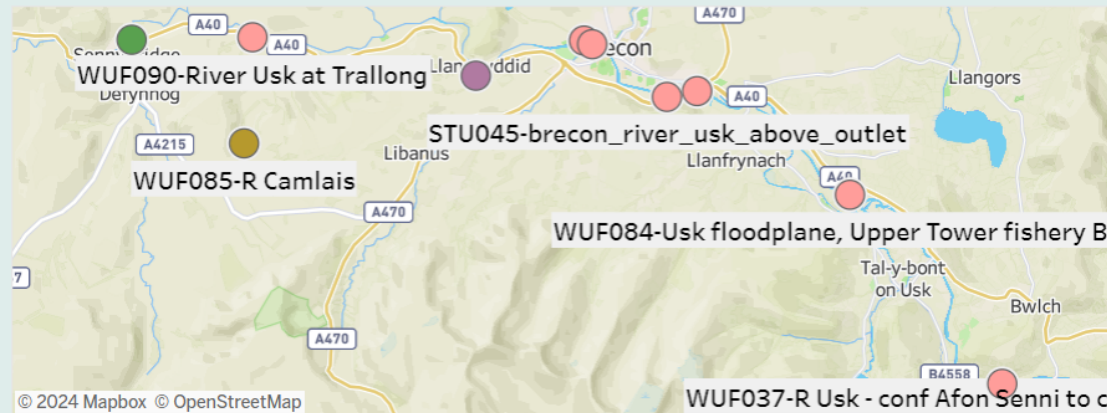
Site Overview

This page shows a map of the chosen site, along with others in the same catchment (if the map shows all of Wales then the chosen site is the only one in its catchment.) The chart on the right shows how the chosen measure varies between these sites

Select ... Select watercourse (optional)

Selected site and others in its catchment

Colour of the dot denotes watercourse (see legend below).



Watercourse

- Afon Senni
- Misc
- R Camlais
- Usk

Which sites (based on recent responses)

- ok
- deteriorating
- low
- inactive?

Which measure to show in chart

- Electrical conductivity ($\mu\text{S}/\text{cm}$)
- Phosphate (ppm)
- Nitrate (strips, ppm)

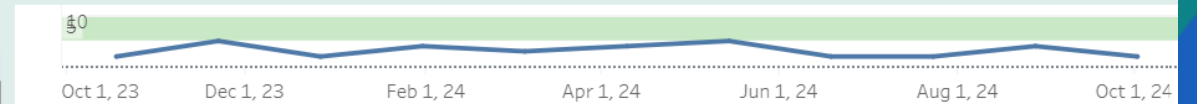
Date range

9/22/2022

Location

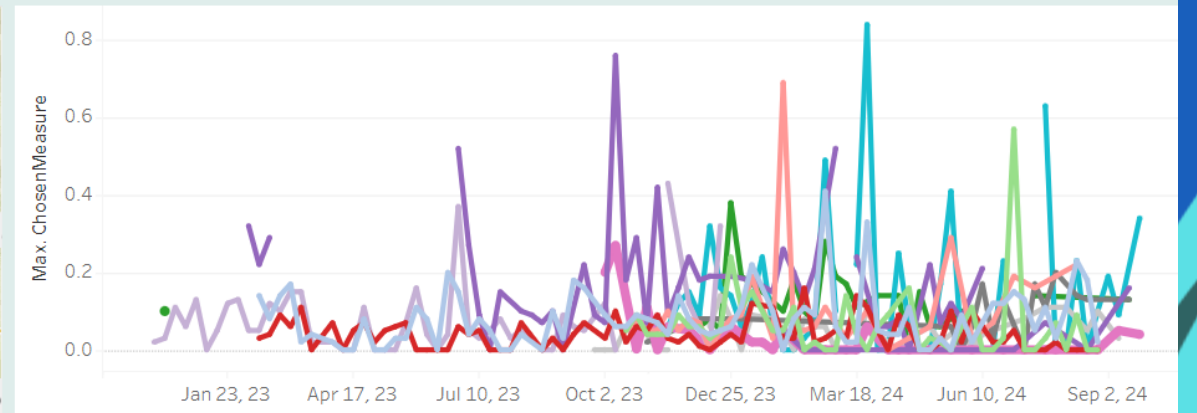
- STU039-brecon...
- STU045-brecon...
- STU047-brecon...
- STU048-peters...
- STU044-a40_b...
- STU046-brecon...

Submissions per 5 week period for chosen site



Trend (for chosen measure & date range) for this site and those in the same catchment

If more than one sample was taken in a particular week then the maximum value is shown.



How do we Validate Data?



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Challenges with citizen science

There are, however, challenges with using citizen science approaches. Like any scientific endeavour, quality assurance processes need to be carefully considered, otherwise there can be issues with data quality. While many projects have demonstrated that citizen collected data can be of the same quality as that collected by professional scientists (Cooper et al., 2015), others have reported problems with data quality and concerns about data quality in citizen science projects is still a major barrier to its use (Kosmala et al., 2016, Lukyanenko et al., 2016).

Food Standards Agency, 2020

What are the drawbacks? The Week Magazine, 2024

Critics of citizen science argue that, "untrained citizens could collect shoddy or even biased data that won't have scientific rigor or reliability," Wired said. While data collected by the public could provide valuable insight, the lack of data-collection training could pose issues. "Designing and implementing citizen science projects require a unique set of skills and knowledge outside the research itself, such as communication planning and execution, community building and participant management," the Nature Reviews Methods Primers study said.

Without proper oversight and organization, the data collected may not be reliable.

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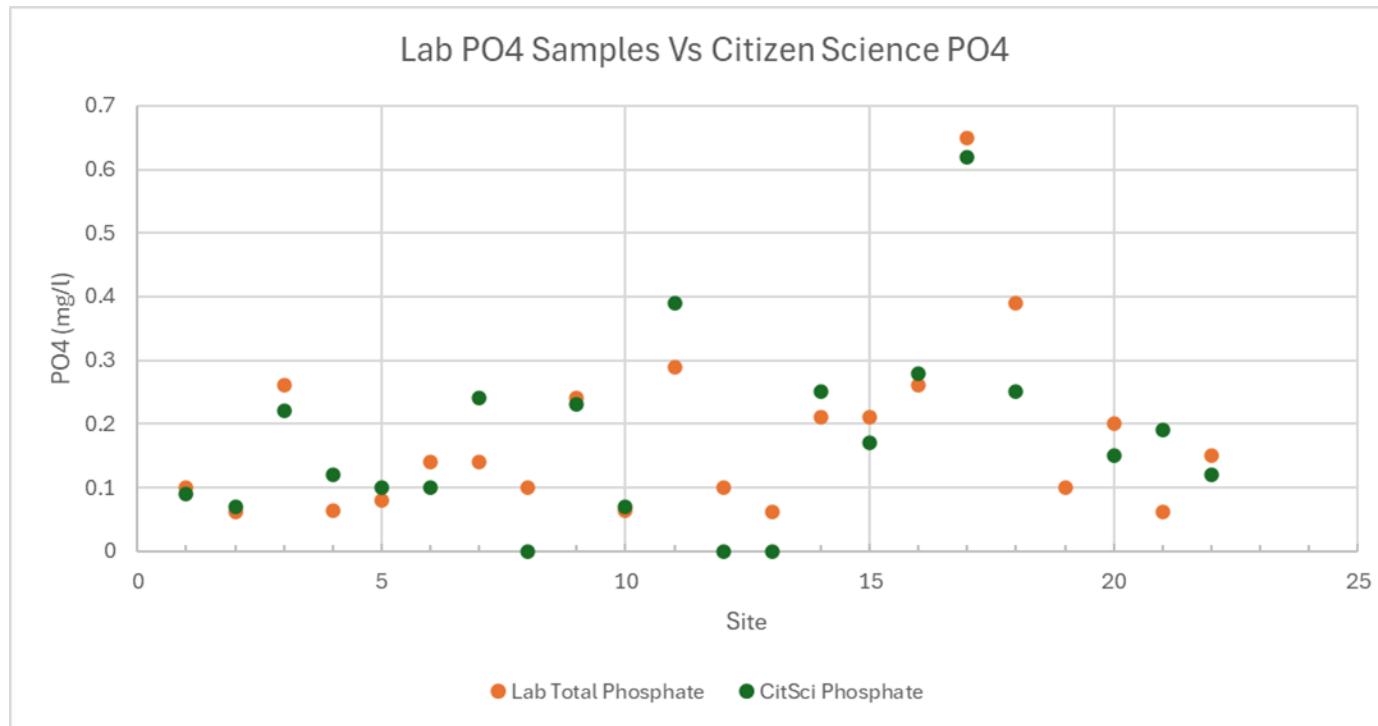
Waterblitz



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- Side by side Citizen Science testing and accredited lab testing
- Widescale validation of citizen science testing on the Usk



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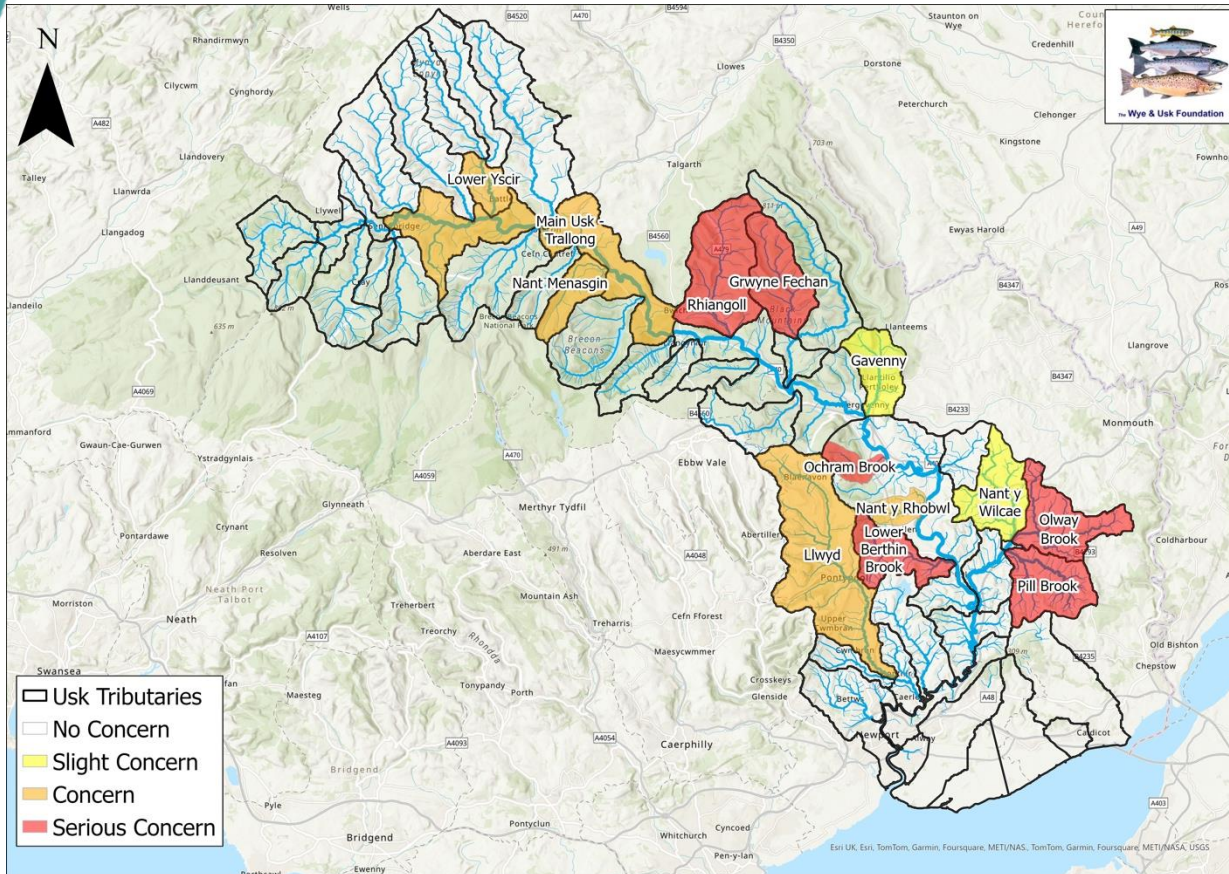
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Using Citizen Science Data to further investigations



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Taking our Understanding further



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- Joining forces with Cardiff University

CARDIFF
UNIVERSITY

PRIFYSGOL
CAERDYDD

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eDNA

- Utilised existing citizen scientists
- Strategically selected sites
- Took eDNA samples alongside CitSci sampling and Lab sample
- Provides snapshot of the life in each tributary



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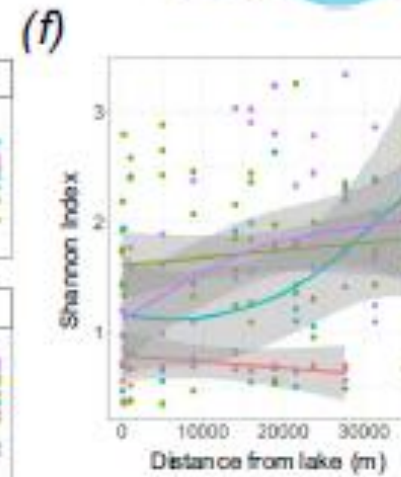
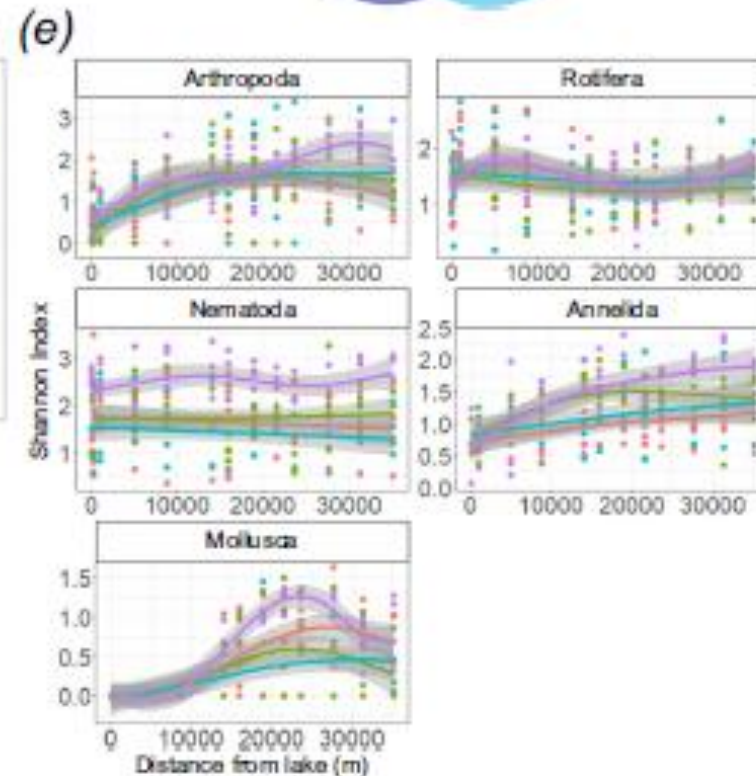
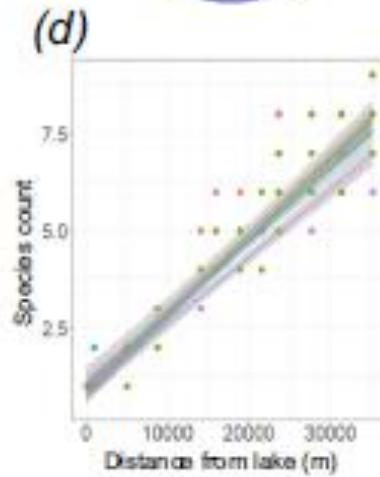
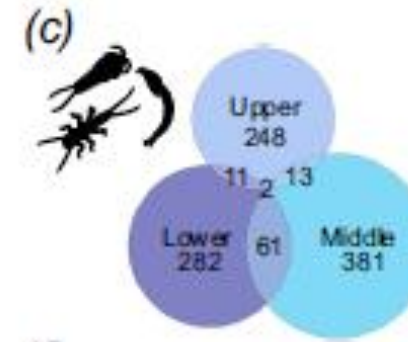
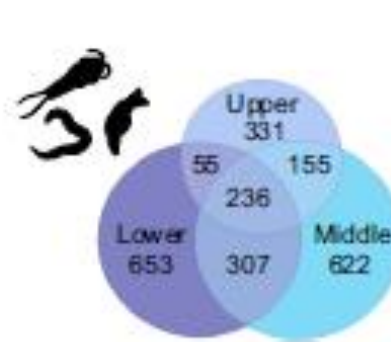
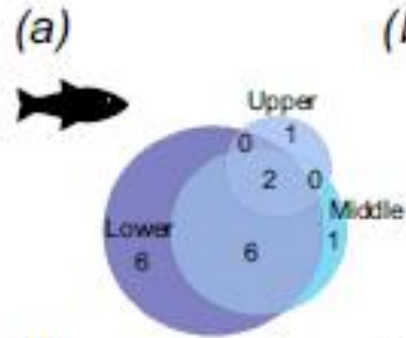


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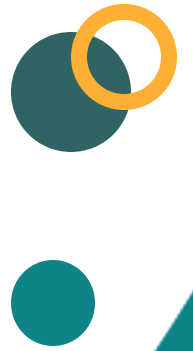
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eDNA (cont)





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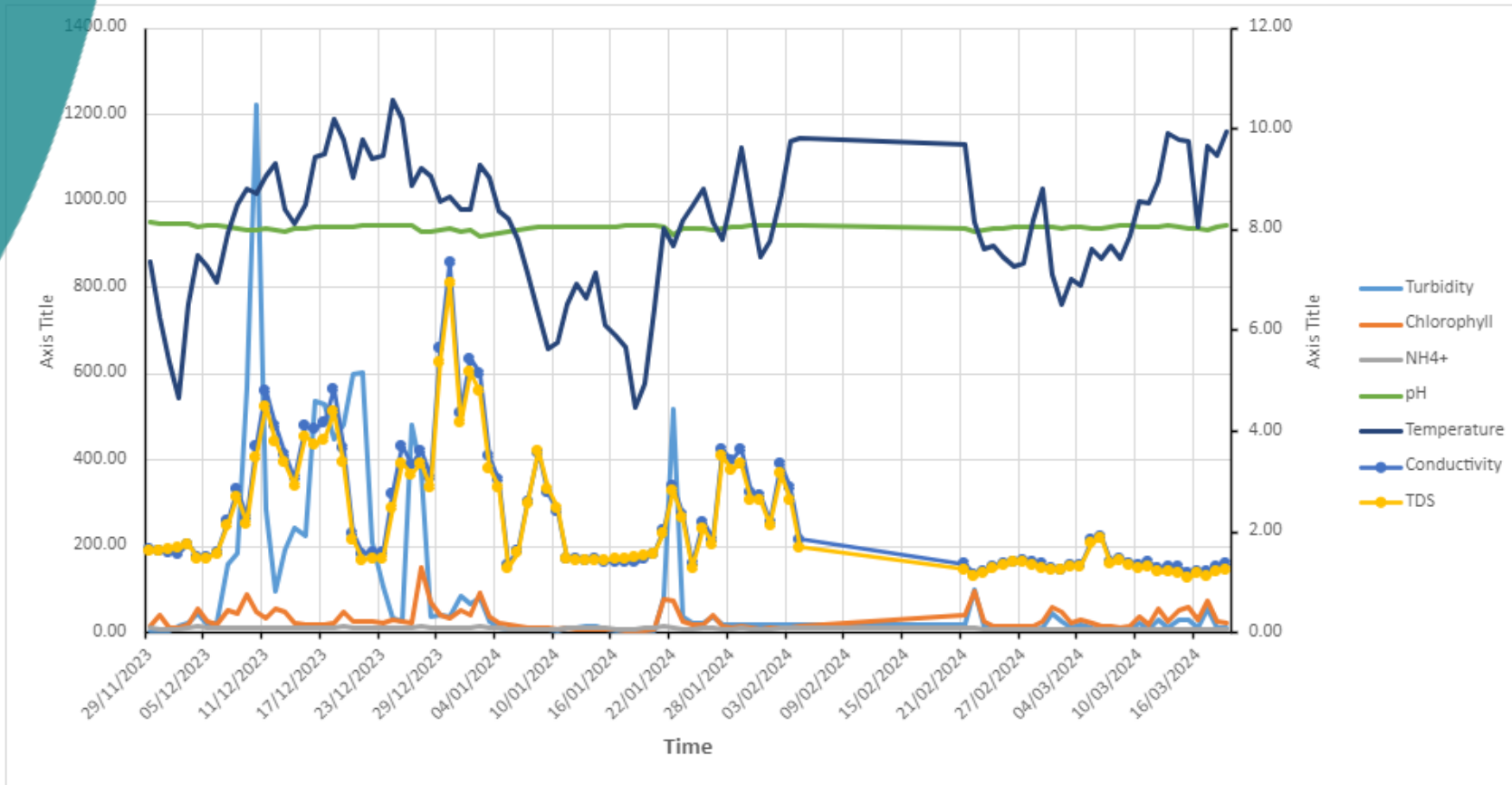
Robust Scientific Monitoring

Investigate

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Sondes



- 3 sondes across the Usk
- Measuring a range of parameters over time at a high quality and resolution

Investigate

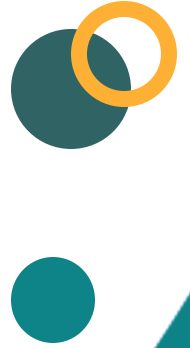
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Conclusions



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- **Catchment scale monitoring works** through:
- Collaboration
- The effort of citizen science
- Wide scale sampling blended with robust scientific monitoring

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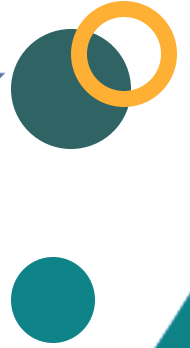
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Jamie Carruth
Monitoring team

2024 Electro fishing season

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Electrofishing Summary



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- 150 sites across the Wye and Usk.
- Area covered around 100km in 3 directions from Talgarth.
- 5-minute riffle surveys.
- Improves understanding of salmonid spawning success trends.
- Informs future work.

Investigate

Determine

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Contents



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- High level breakdown of Wye & Usk survey salmon fry results.
- More detailed discussion on what we think caused the good and the bad.
- Will lead us into what we need to target and how.

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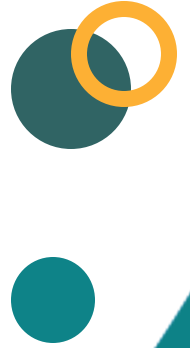
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Wye 2024



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Fantastic Irfon tributary – Garth Dulas

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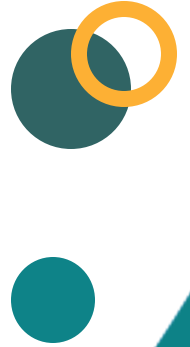
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Mainstem Wye



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- Exceptional results.
- Near-record numbers seen across almost entire surveyable main-stem Wye.
- Blows any results seen in the last two decades out the water.

Investigate

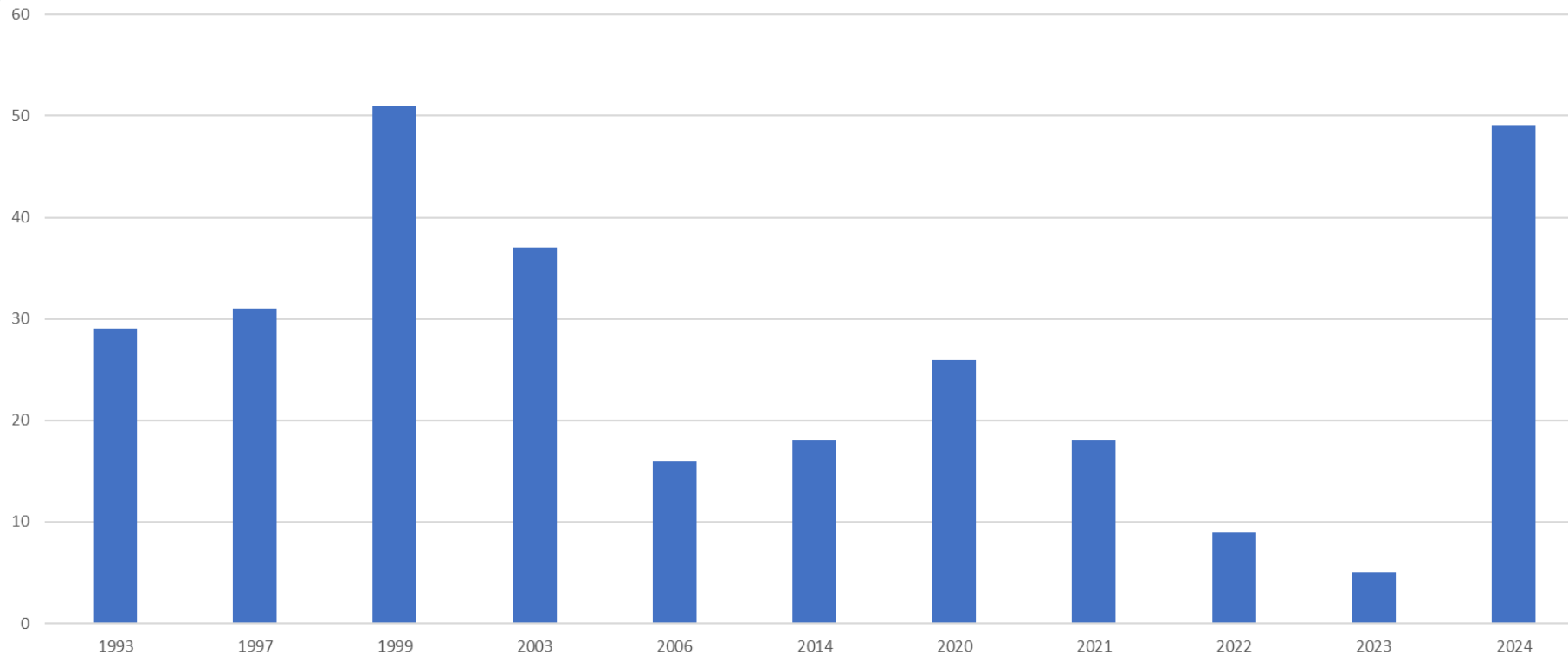
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Mainstem Wye Average Salmon Fry – Historic results vs recent years



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Major Wye Tributaries



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- Largely followed the same pattern as the mainstem Wye.
- Irfon, Ithon, Elan, Edw fantastic.

Investigate

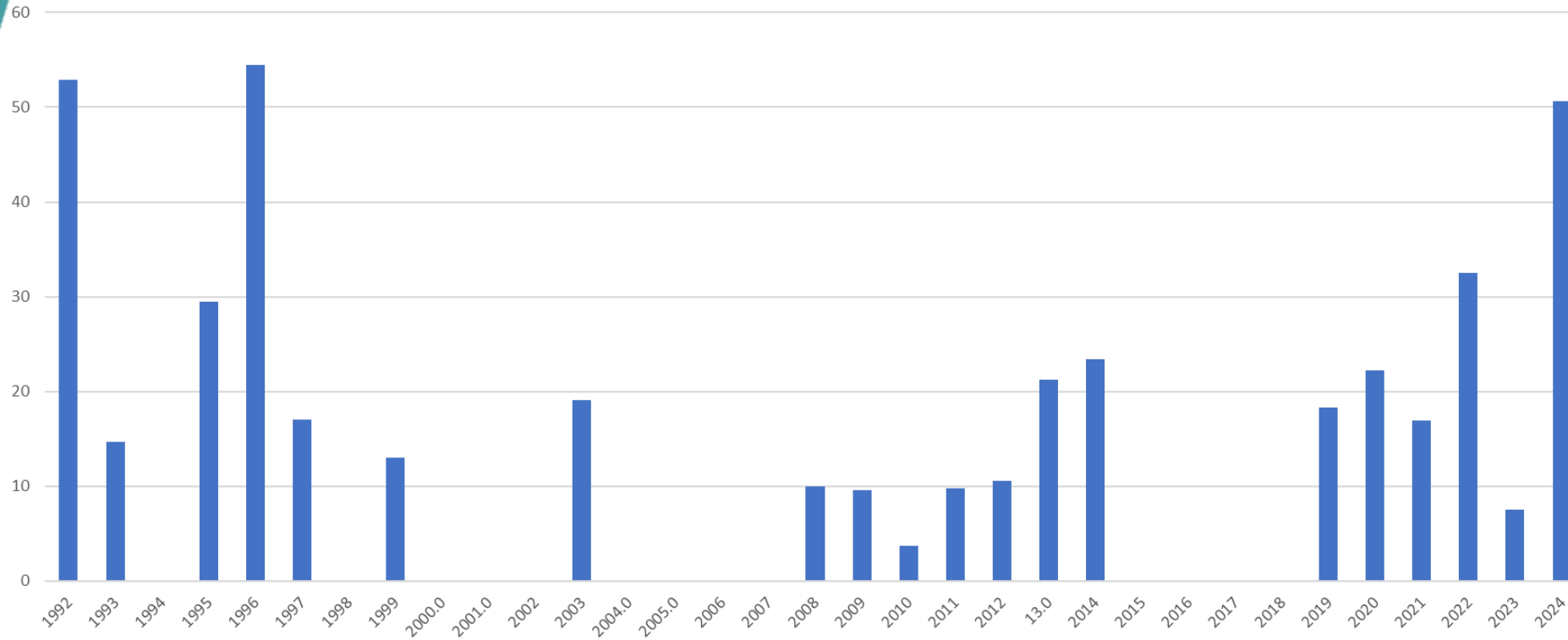
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Irfon average Salmon fry over 30 years



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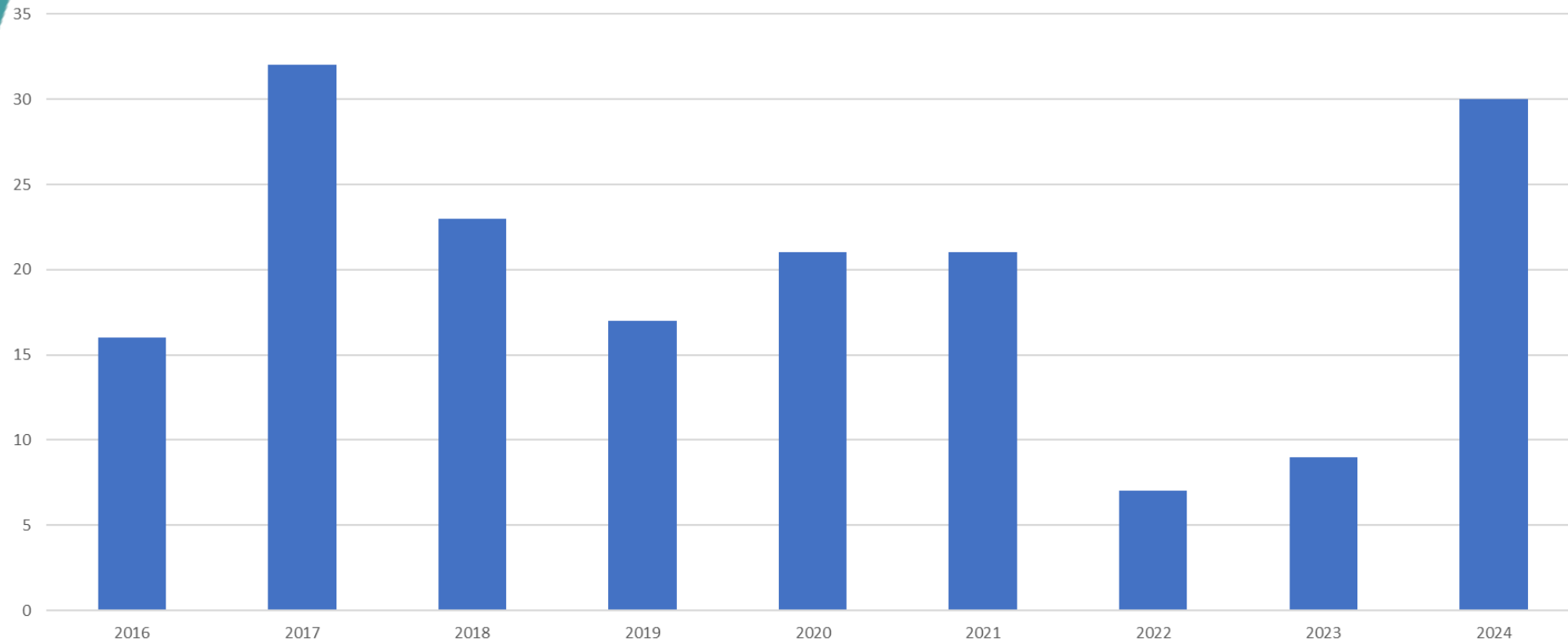
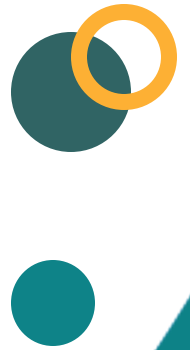
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Ithon – 2016 to 2024



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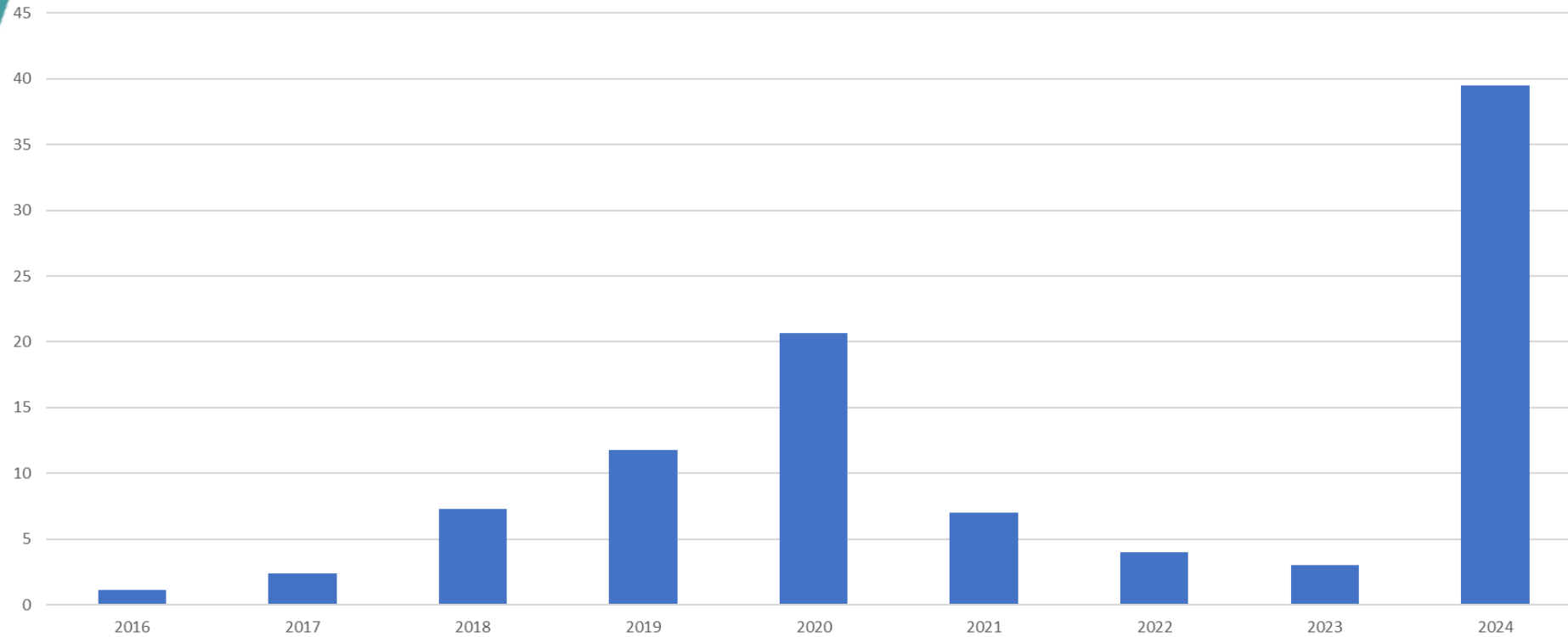
Determine

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Elan – 2016 to 2024



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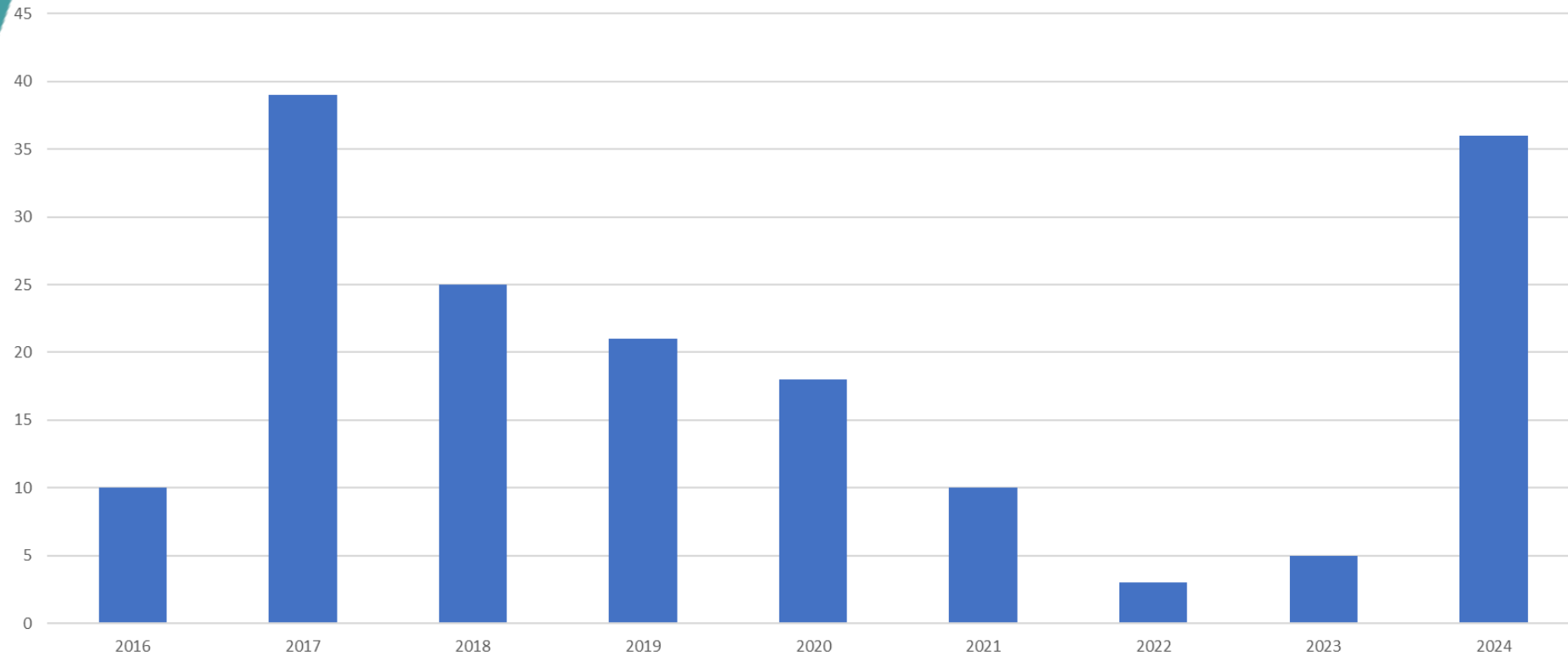
Determine

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Edw – 2016 to 2024



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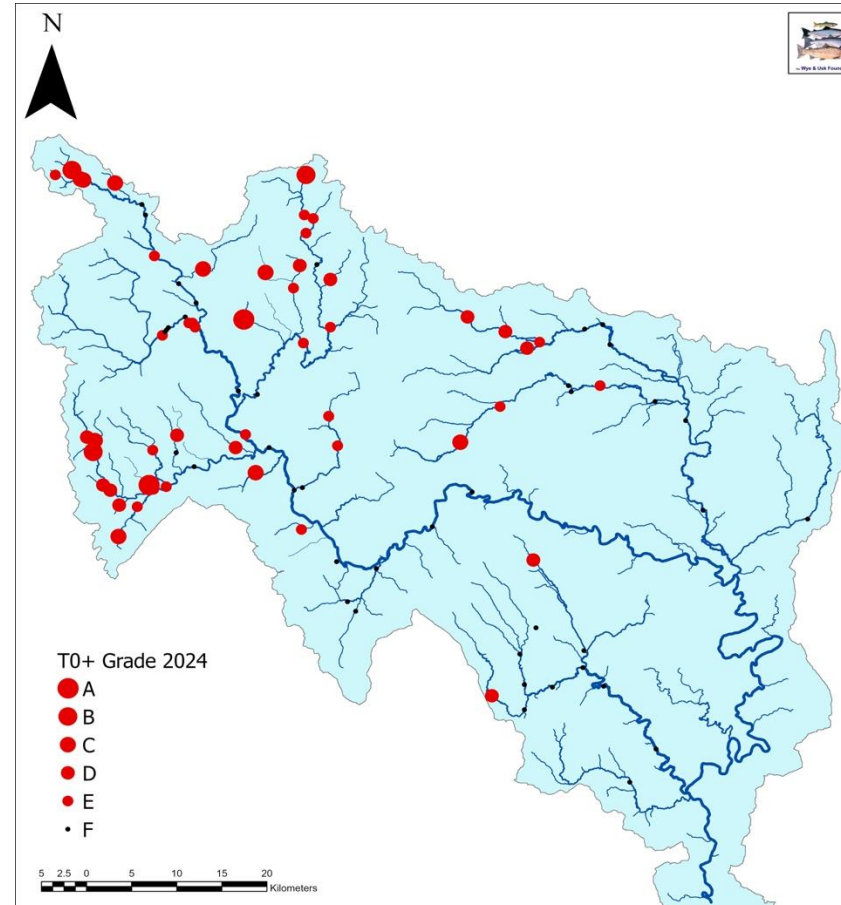
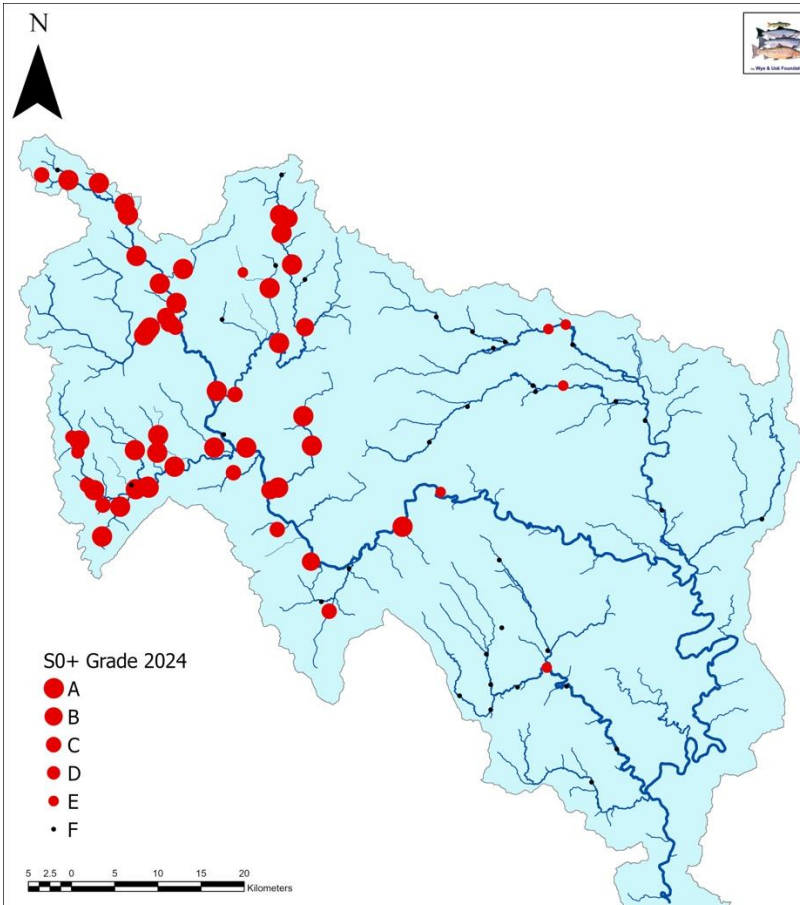
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All positive, except...



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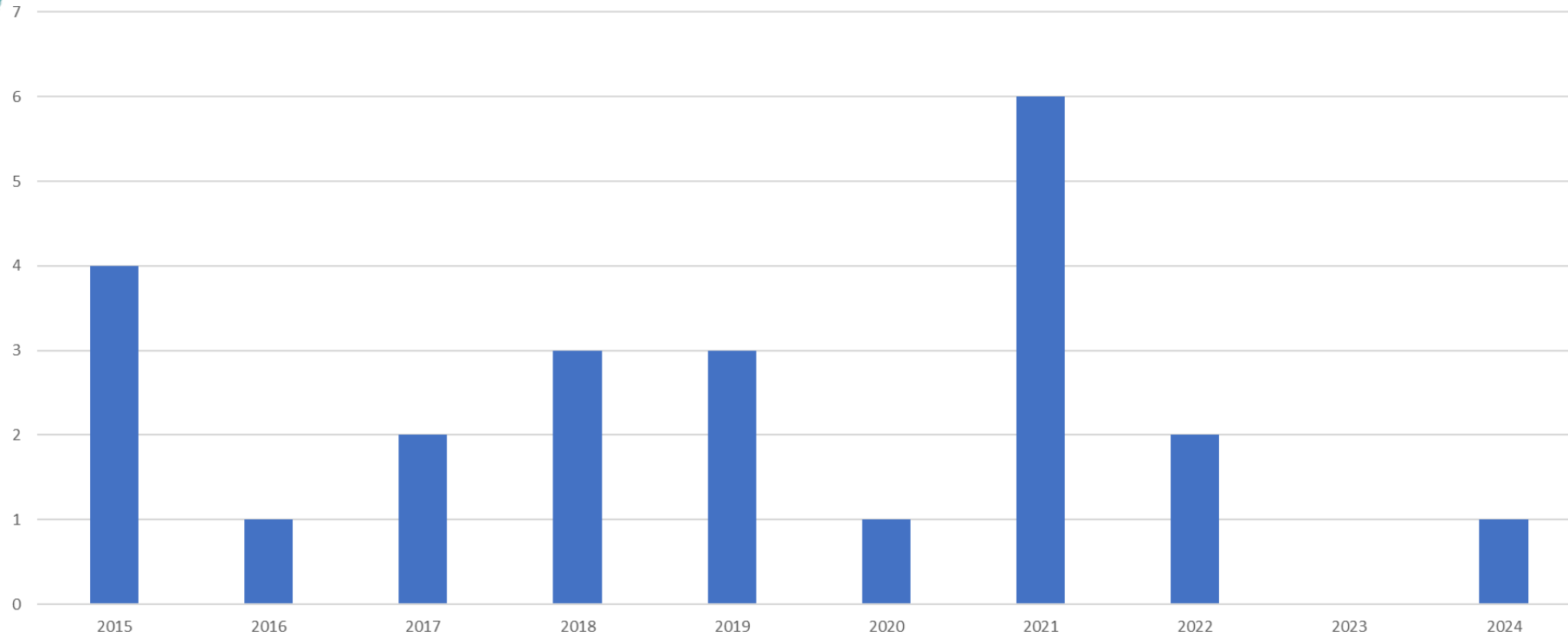
Determine

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Lugg – 2015 to 2024



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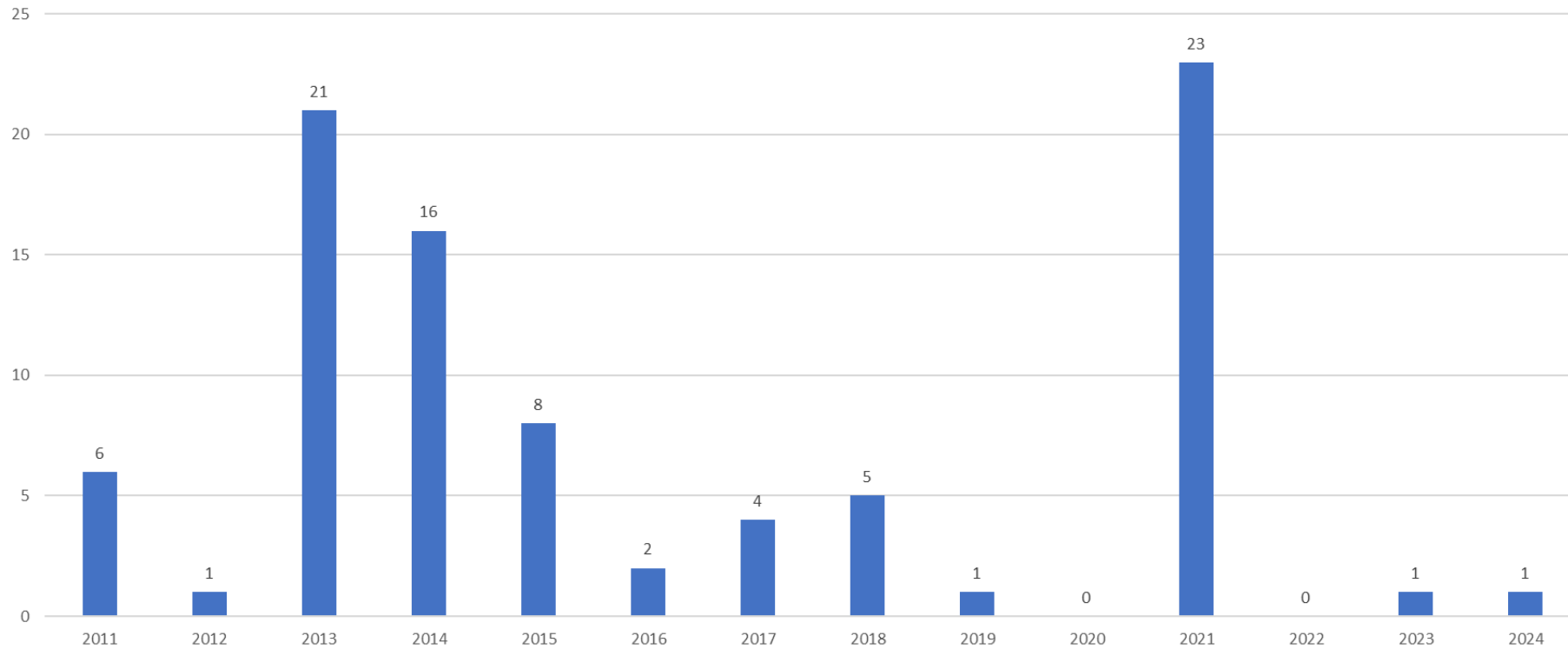
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Arrow – 2011 to 2024



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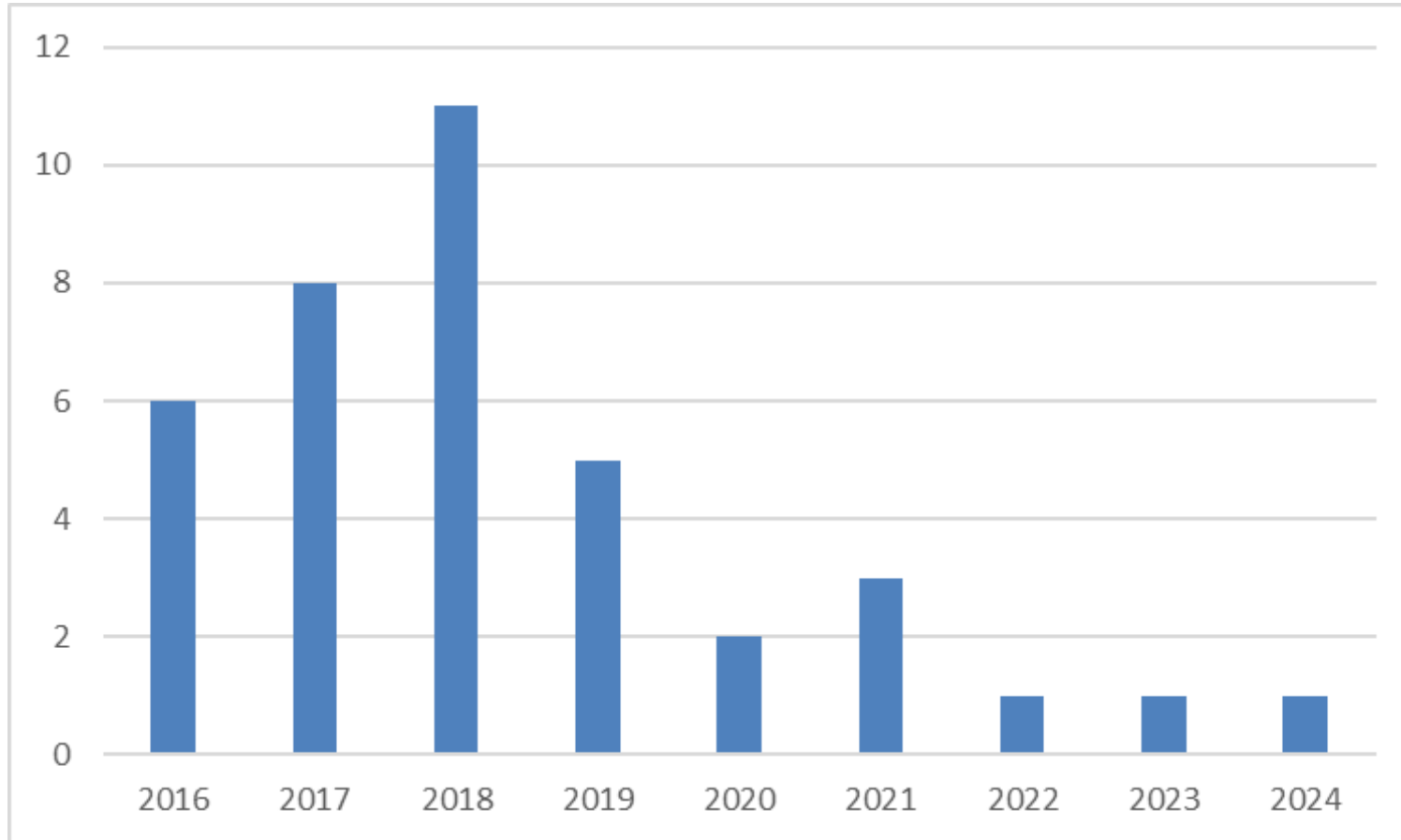
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Monnow Catchment – Trout 2016 to 2024



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Usk 2024



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Favourite site of the year: upper Senni



This site's catches

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Usk Tributaries Above Brecon



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- By far the best year since our comprehensive electrofishing programme began in 2016.
- Fry numbers bounced back to comparable levels to 2010–2015.
- Stand-out tributaries were the ones we'd expect: Crai, Senni, Cileini, Bran, Yscir.

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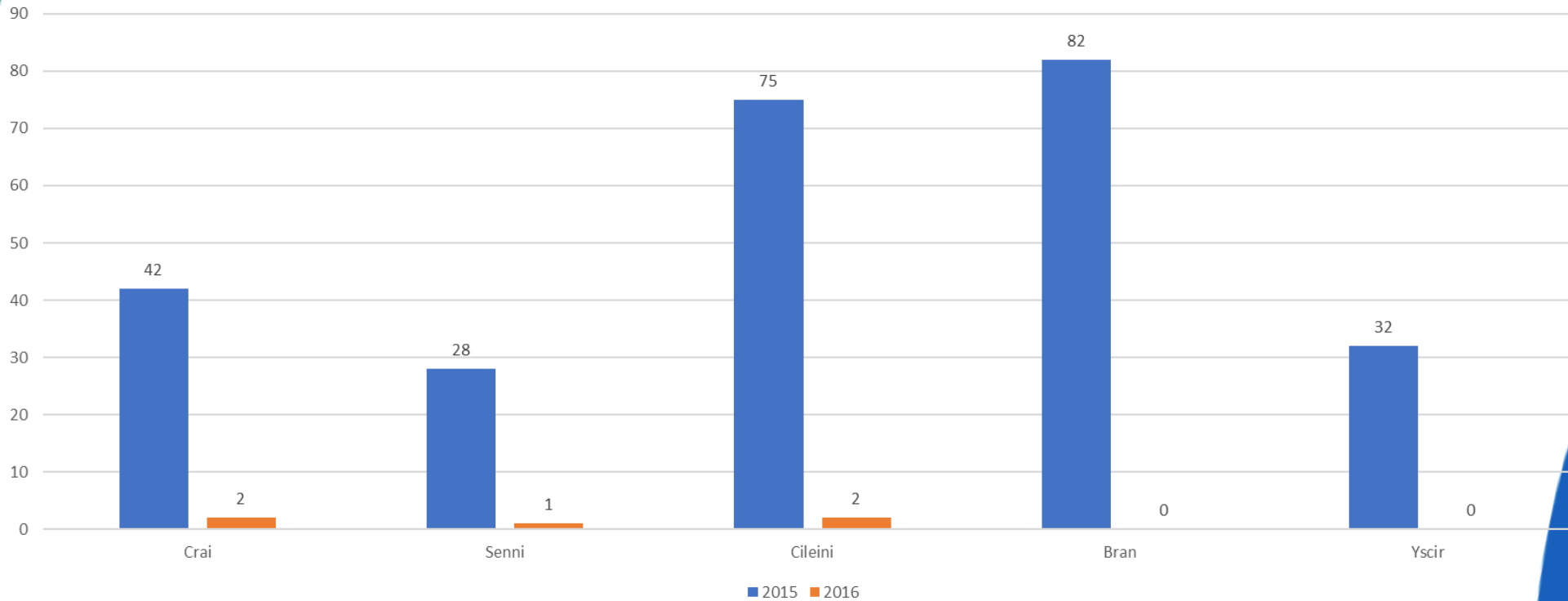
Upper Usk Tributary Average Salmon Fry 2015 vs 2016



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Upper Usk Tributary Salmon Fry 2015 vs 2016



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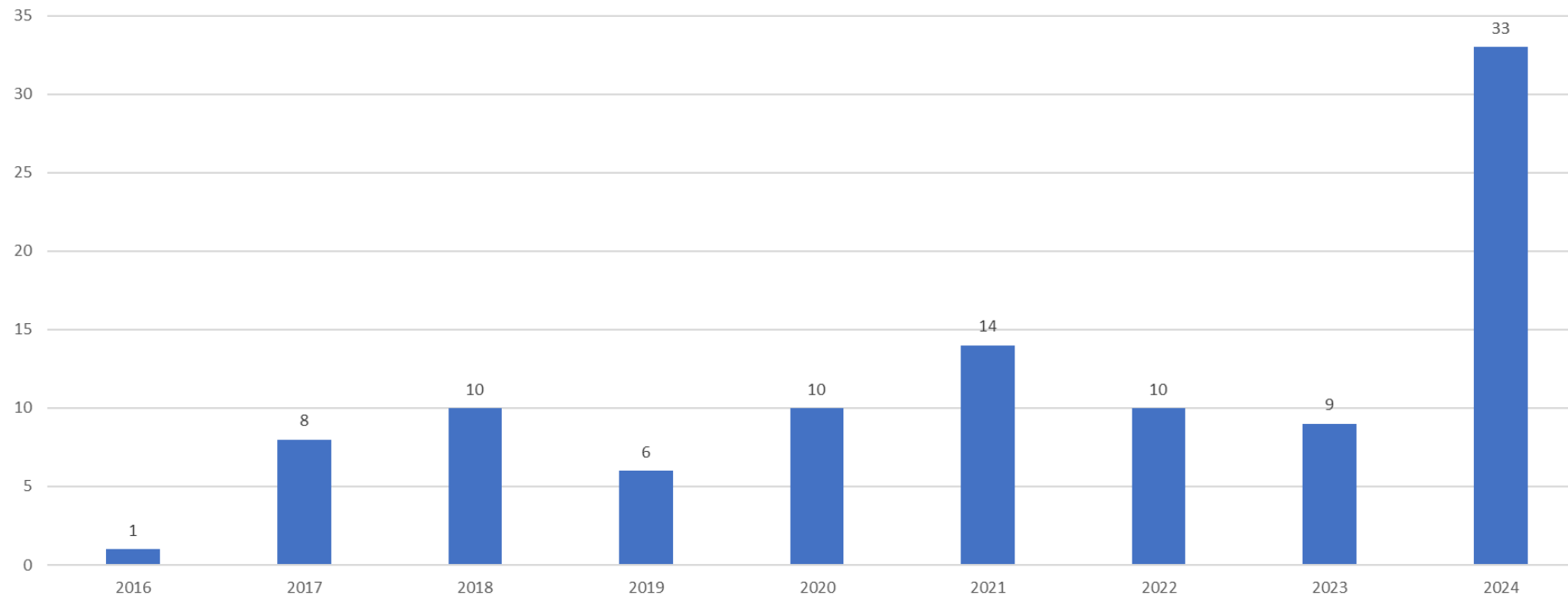
Senni Average Salmon Fry Catch 2016-2024



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Senni Average Salmon Fry Catch Since 2016



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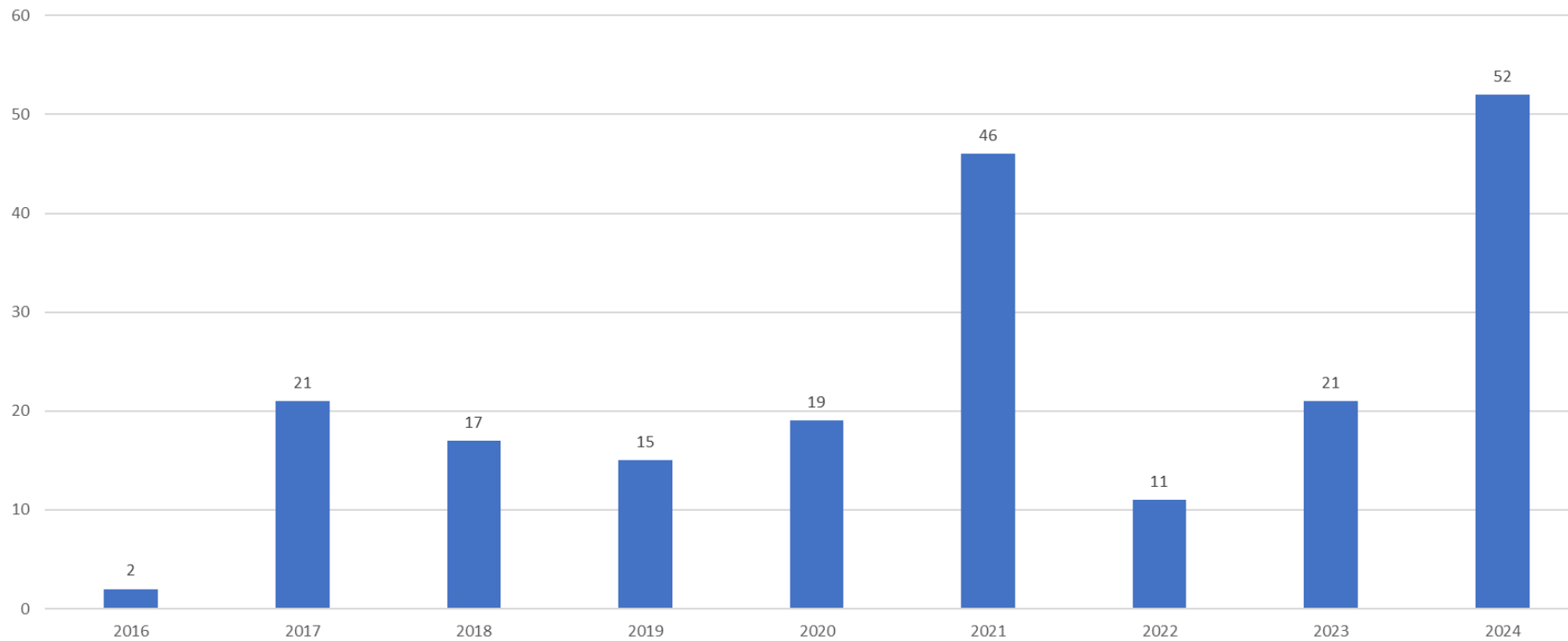
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Crai Average Salmon Fry Catch 2016-2024



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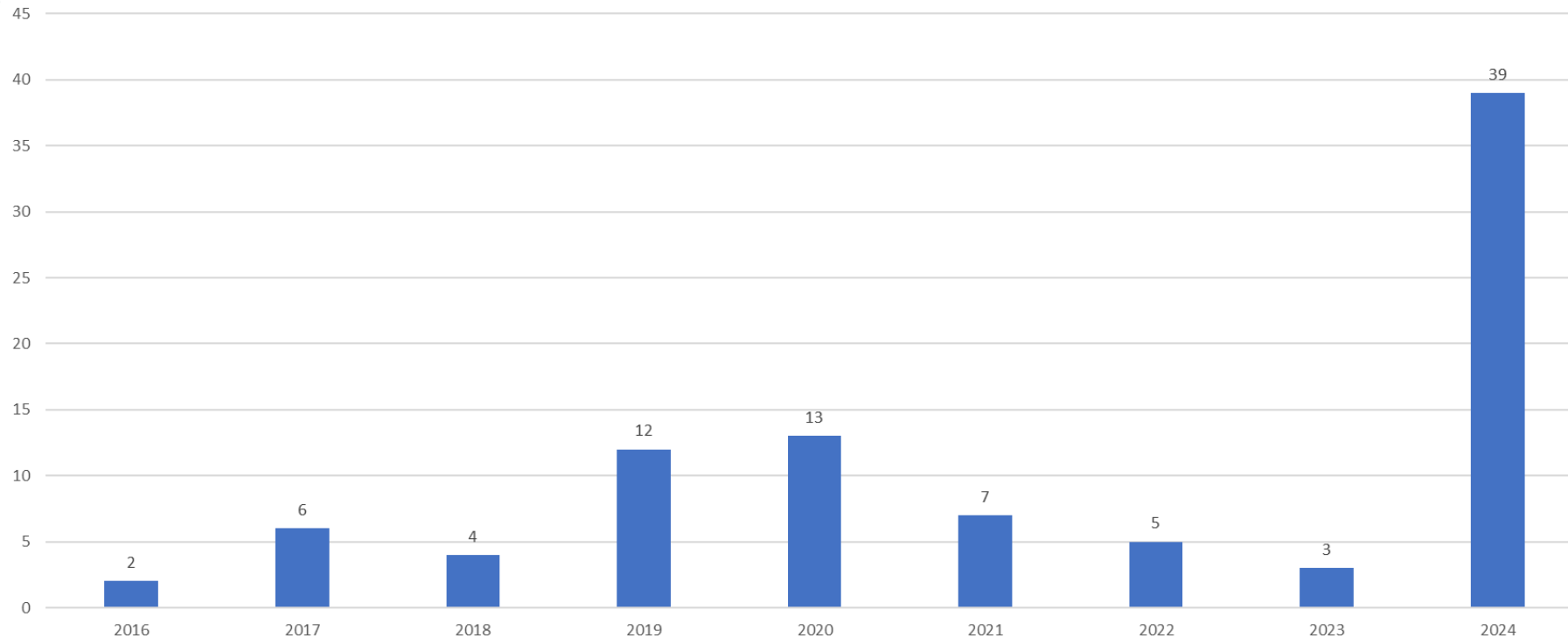
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Cileini Average Salmon Fry Catch 2016-2024



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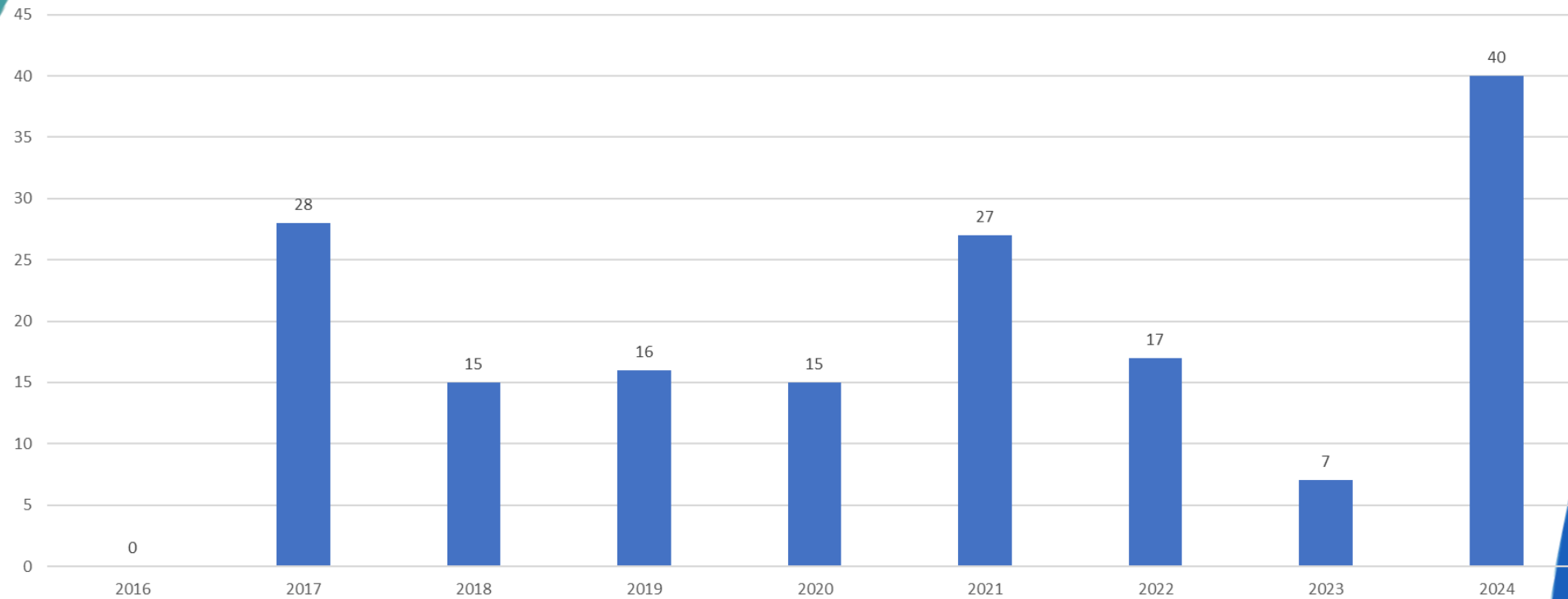
Bran Average Salmon Fry Catch 2016-2024



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Chart Title



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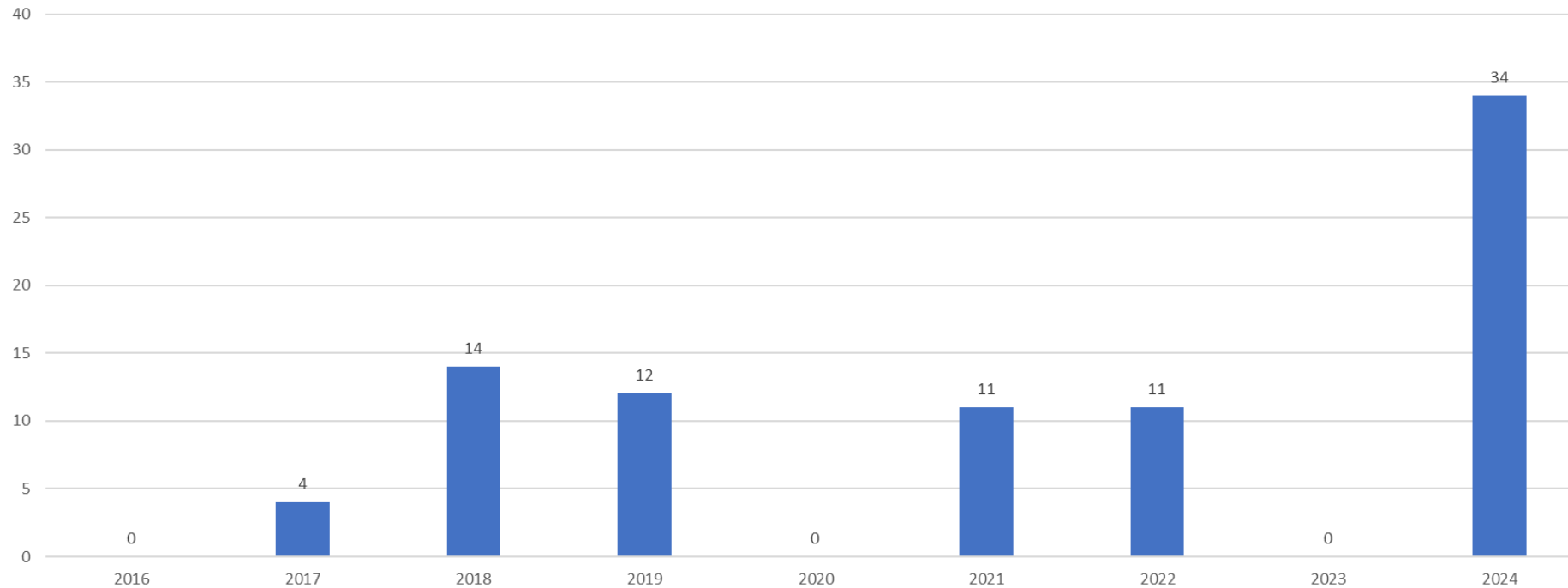
Yscir Average Salmon Fry Catch 2016-2024



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Chart Title



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Usk tributaries – Brecon to Crickhowell



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- Main Tributaries in this area: Tarrell, Honddu, Rhiangoll, Cynrig and Gwryne.
- All these tributaries dropped off at various times between 2010-2020 and have remained poor, including 2024.

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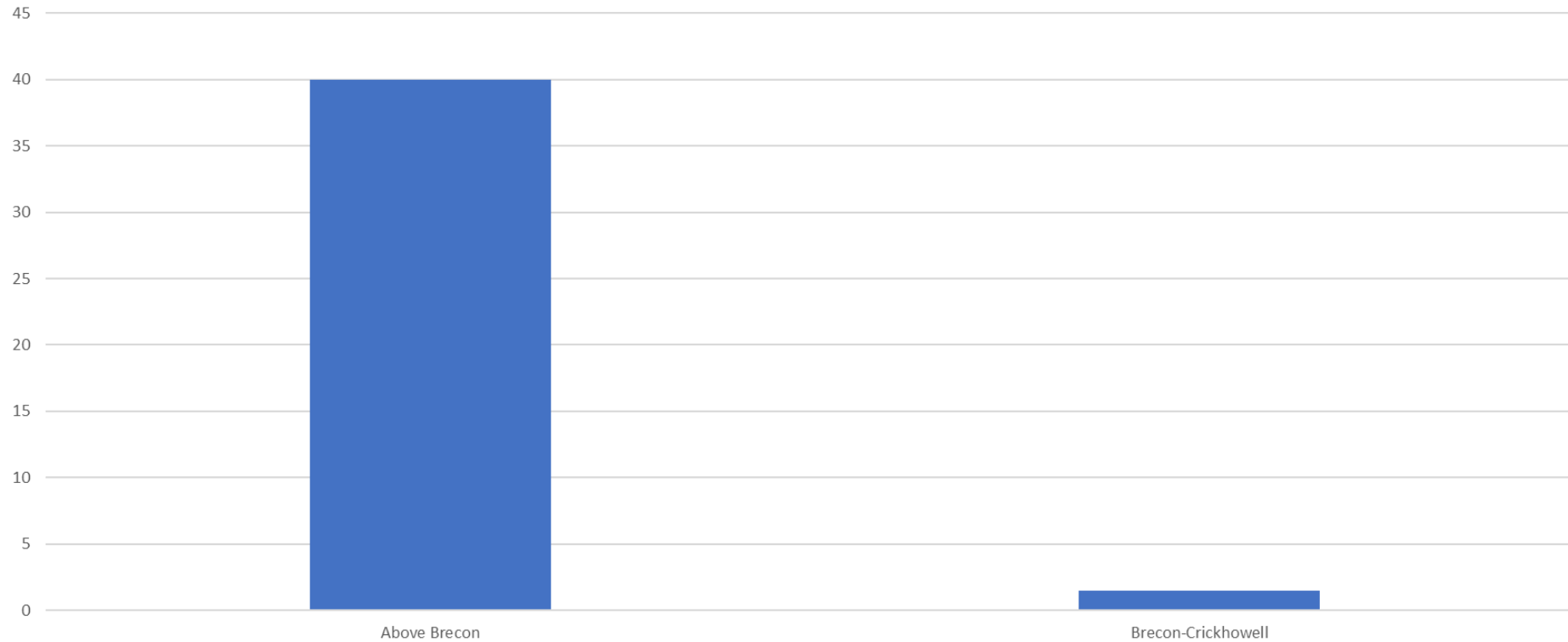
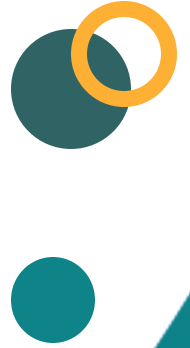
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2024 Average Salmon Fry Catch – tribs above Brecon vs Brecon-Crickhowell



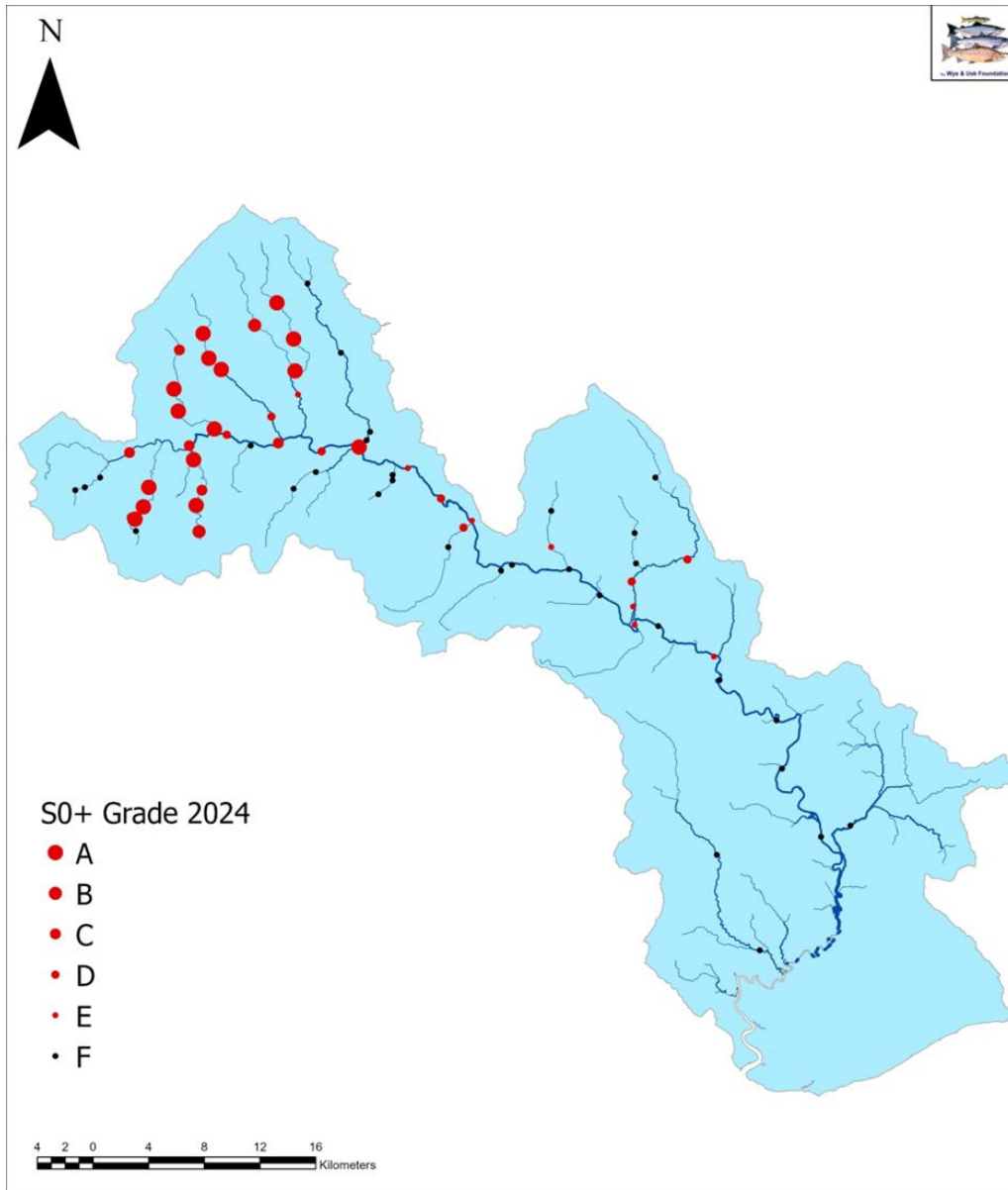
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Mainstem Usk



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- Bounced back from disastrous year last year.
- Fairly similar to last decade but still well below historic numbers, largely due to reduction in successful spawning below Talybont.

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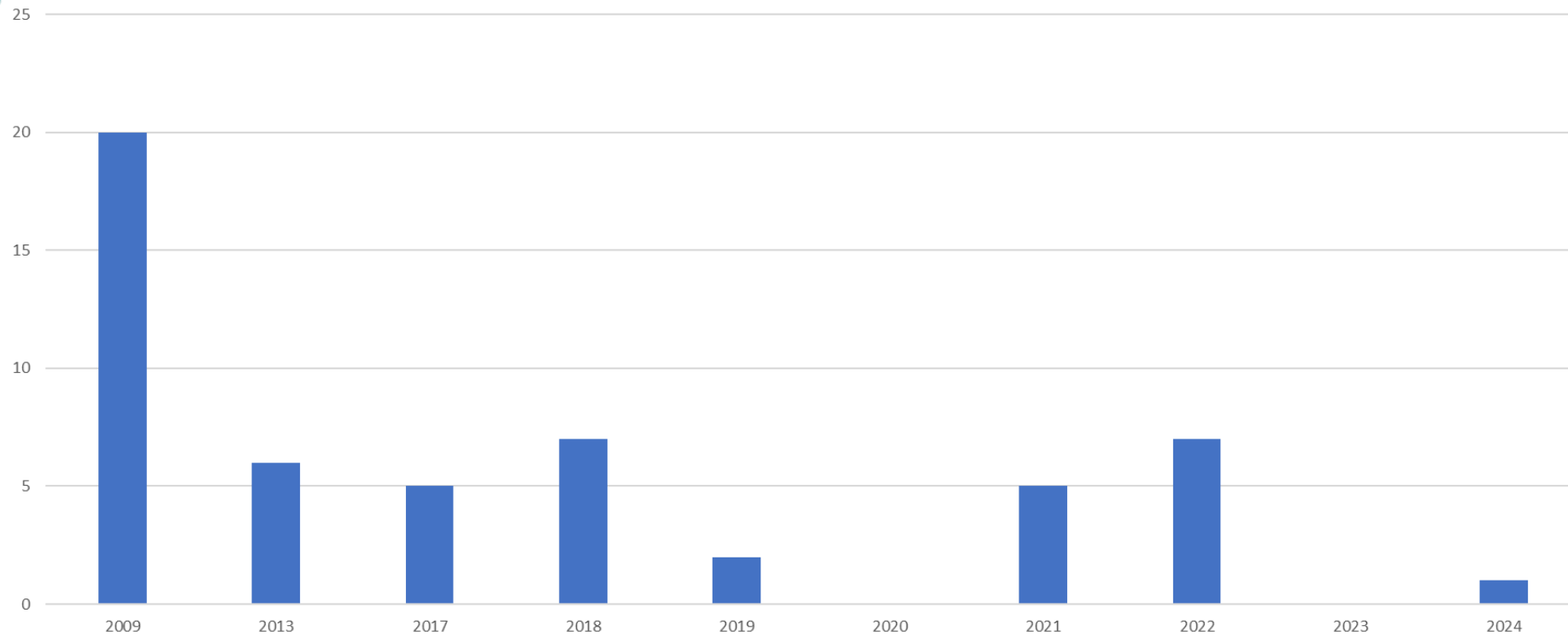
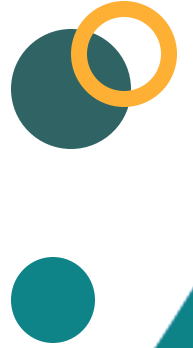
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Average salmon fry catch below Talybont



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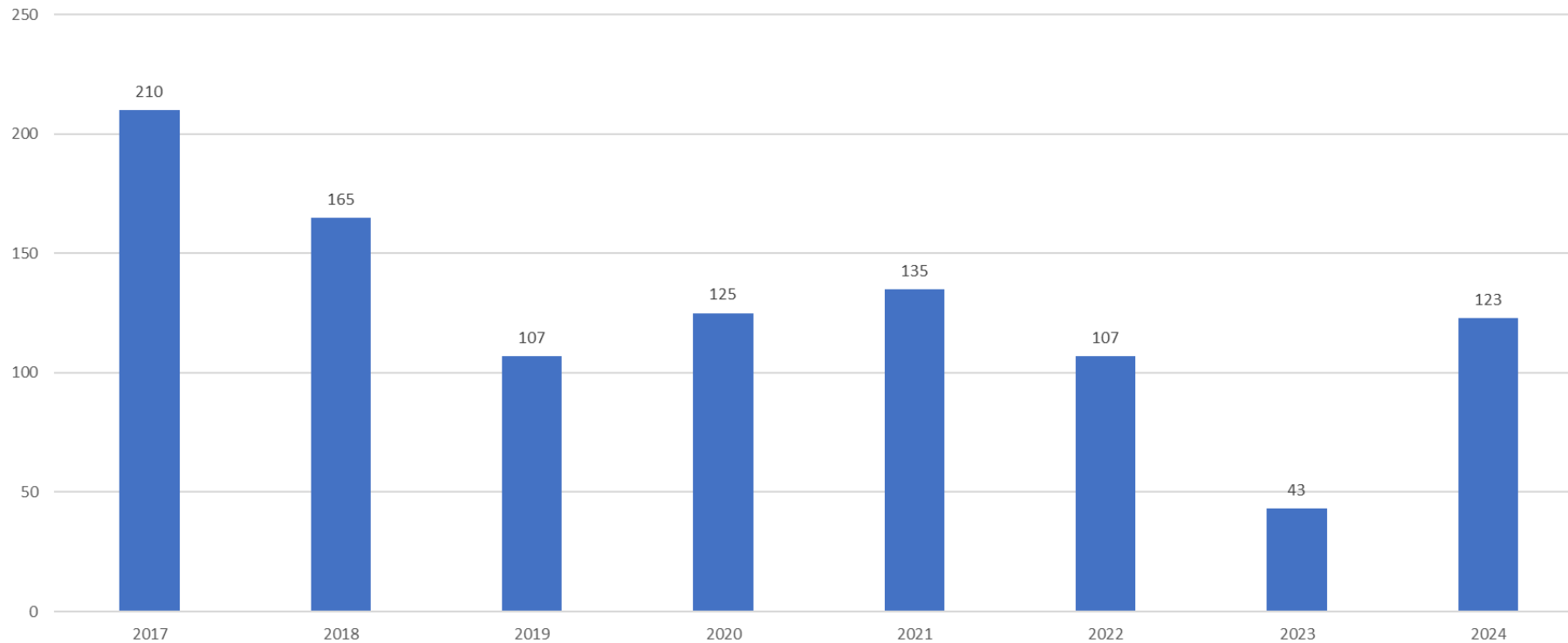
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Mainstem Usk juvenile salmon catch 2017-2024



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Wye & Usk 2024 – Overall Patterns



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- We saw similar patterns on both the Wye and Usk.
- Many parts of both catchments were fantastic, bouncing back to near-record levels of salmon fry.
- However, both catchments had notable areas which had not shown that same response. Lugg, Arrow, Monnow on Wye. Middle/lower Usk and its tributaries.
- Usk catchment scale monitoring has given us a plethora of information to contextualise electrofishing results.
- Due to the consistency in patterns between both catchments, we can apply conclusions from Usk to the Wye.

Investigate

Determine

Deliver

Why was the bad, bad?

Likely case-by-case



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- Disappointing Usk tributaries dropped off at different times between 2010 and 2020. Points to different reasons for drop-off?
- Enough data to start to paint a picture.
- Honddu – Citizen Science indicates notable ammonia and turbidity spikes. Issues with migratory barriers.
- Rhiangoll – Citizen Science and sonde indicates very high winter ammonia and turbidity spikes.
- Grwyne – Unidentified migratory barrier (now removed). Citizen scientist identified extreme ammonia spikes out of the Grwyne Fechan.
- Main-stem Usk drops off where these tributaries flow in.

Investigate

Determine

Deliver

Why was the good, good? More 2023 adult Salmon than we thought



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- As unlikely as it seems, more salmon must have run these rivers than 51 and 238 rod catch on Usk and Wye respectively suggests.
- Using 8% catch rate, 638 Usk and 2,975 Wye salmon. Simply cannot have produced the widespread, high numbers of 2024 salmon fry.
- Usk fish counter trialled for two weeks in June and two weeks in October. Counted 414 salmon entering the river in those four weeks.
- For 65% of total salmon suggested by rod catch to have run during <15–20% of period we know salmon run the river, with good water levels throughout, extremely unlikely.
- 2021 had good spring flows leading to 84% tagged wild smolt survival (vs 24% in 2022 with poor spring flows). 2SW salmon predominant in Wye and Usk. 2024 fry would be their progeny.

Investigate

Determine

Deliver

Why was the good, good? Excellent egg-fry survival



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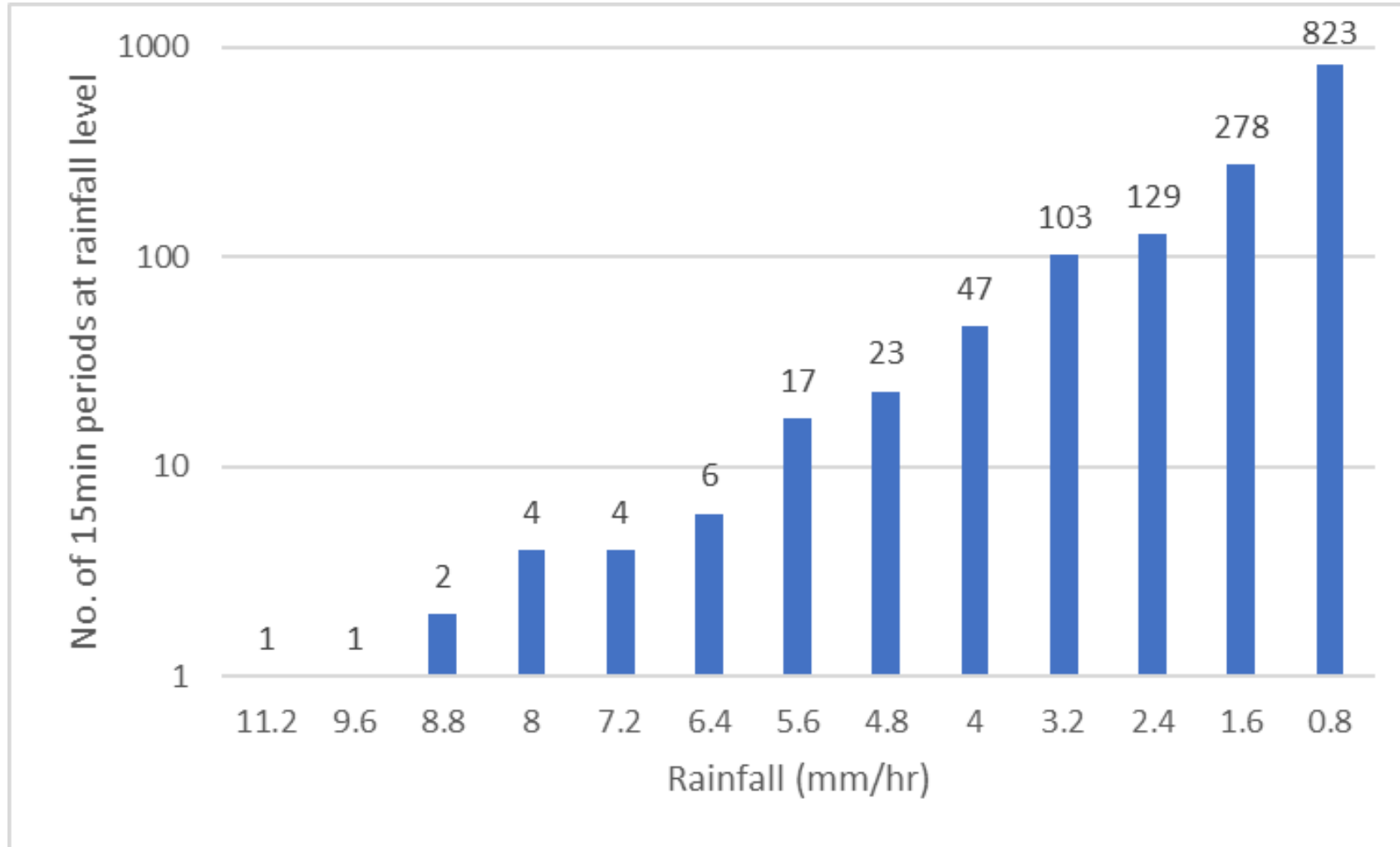
- We have seen decent spring flows/smolt survival in some other recent years without the same resulting fry numbers as this year. Points to high survival of eggs last winter to fry this summer.
- Many sub-catchments across two separate rivers affected. Has to be caused by a shared major factor.
- Points to weather conditions from Autumn 2023 to Spring 2024.
- Temperature or rain?
- Tested 'degree day' theory using sonde and citizen science temperature data. Possibly cooler winter/lower water temperatures? No evidence, in fact, winter was warmer.
- Tested winter rainfall using historic rainfall and river level data. Less extreme rainfall last winter?

Investigate

Determine

Deliver

2023 Winter Rainfall



Investigate

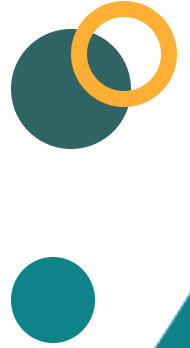
Determine

Deliver

Why was the good, good? Excellent egg-fry survival



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- Despite even higher than average total winter rainfall, the rainfall was exceptionally soft.
- Which led to maximum infiltration, reduced soil-runoff/turbidity.
- Turbidity damages gills, compacts gravel and covers redds.
- Supported by citizen science data. Areas without major turbidity spikes had great fry numbers. Areas with high winter turbidity remained poor.

Investigate

Determine

Deliver

What we have learnt



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- We need to get to a place where:
- Smolt survival doesn't drop from 84% to 24% when there is low spring rainfall.
- Catchments are resilient enough that, even with more extreme rainfall, turbidity levels remain under control.
- Currently, we need the luck of perfect spring flows and exceptionally soft winter rainfall to re-create the conditions which resulted in this year.
- After the break, Simon will be talking about how we can allow the catchments to consistently re-create these conditions, even when tested by increasingly volatile and unpredictable weather.

Investigate

Determine

Deliver

BREAK



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**+ RAFFLE TICKETS & DONATION FORMS
AVAILABLE HERE TONIGHT**



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Simon Evans

CEO Wye & Usk Foundation

Changing the System to Benefit the Usk

Investigate

Determine

Deliver



Imagine.....

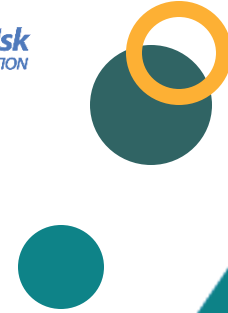
Imagine a situation in which clean cool water flows down the Usk, floods are mitigated, base flows are stronger, the rural economy and the ecology thrives and we mitigate rather than exacerbate the effects of climate change.

It is possible, and we want to work with you to make it happen

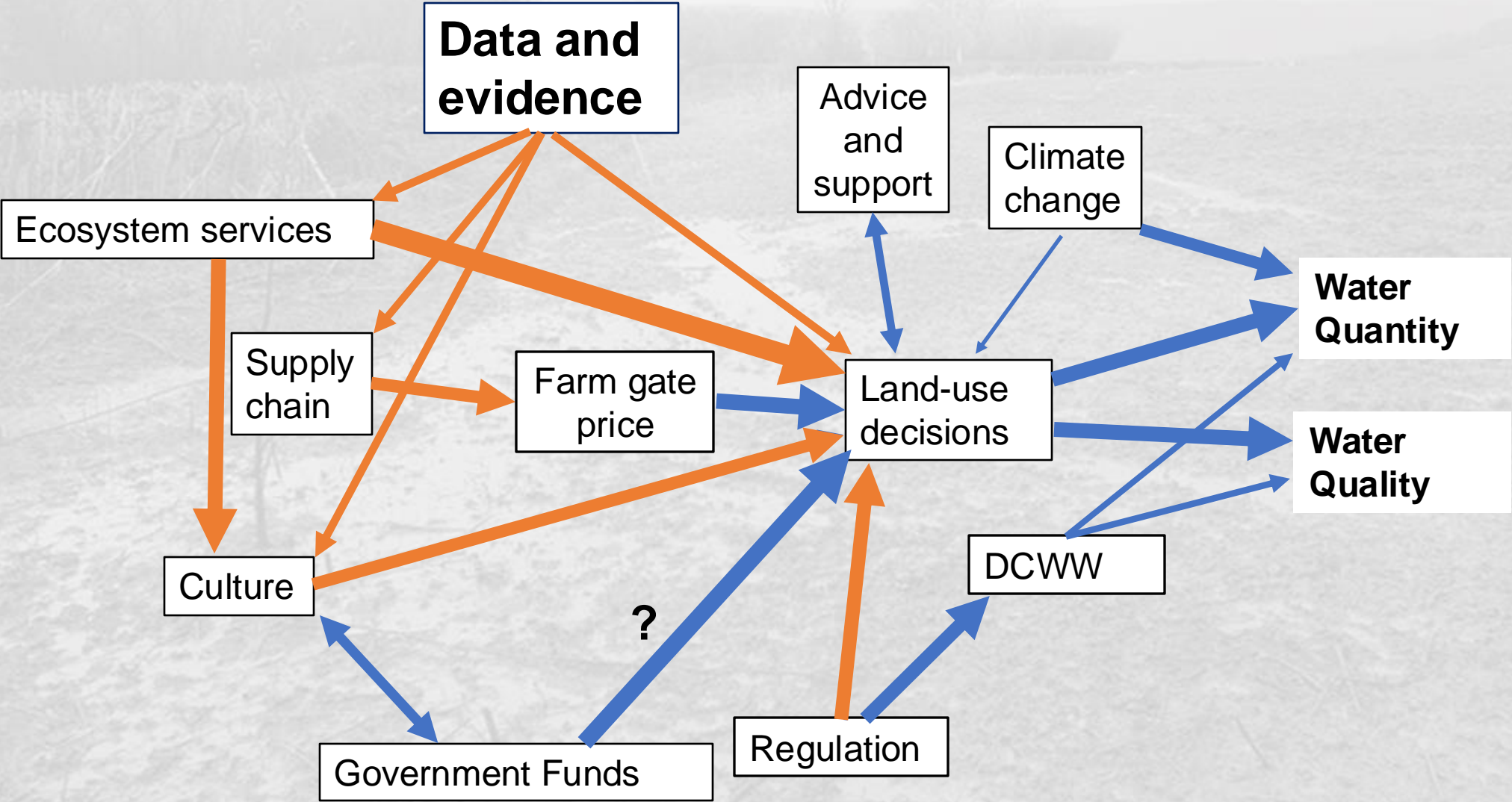
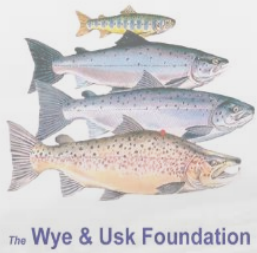
Investigate

Determine

Deliver



Understanding the systems driving the problems and how to change them

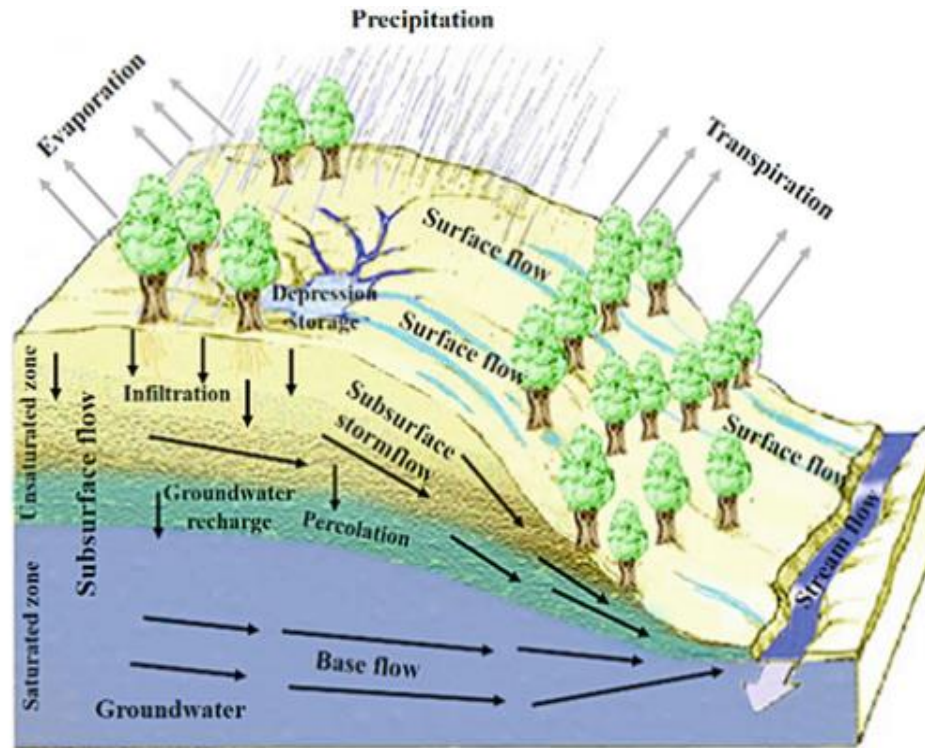
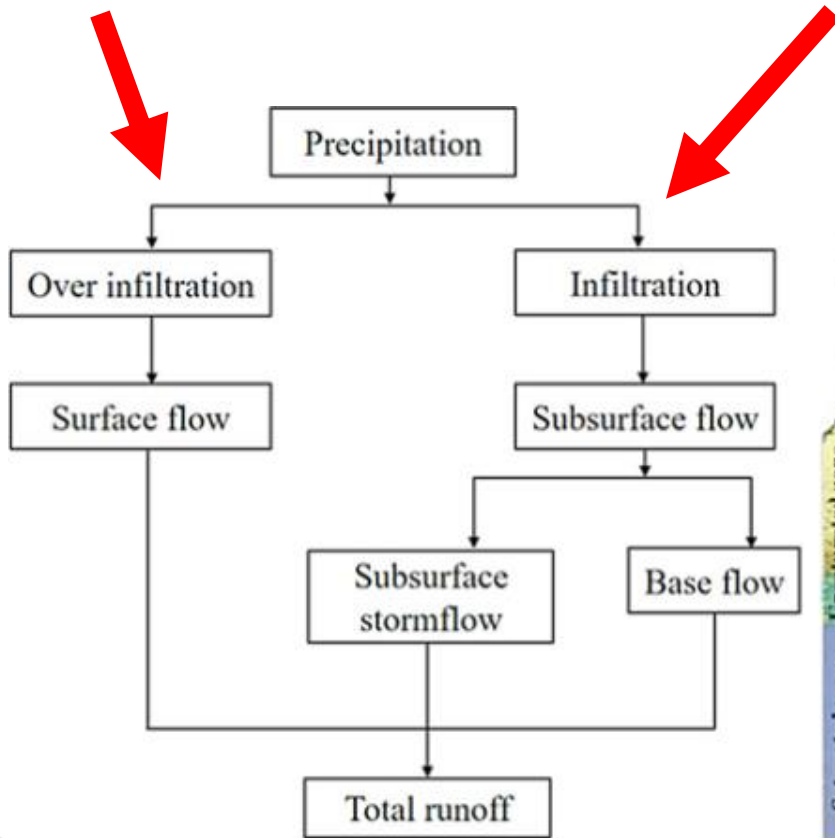


Existing Situation

Accelerates discharge narrows the hydrograph,
Exacerbates Flooding and drought
Washes in soil and pollutants

The Alternative

Attenuates discharge, reduces flood peaks and increases recharge of aquifers
Naturalised flows, eliminates soil loss, regulates temperature and reduces other pollutants



| | Area in Km2 | Total storage MI |
|----------------|-------------|------------------|
| Usk Reservoirs | 18 | 72,000 |
| Channels | 8.5 | 25,500 |
| Floodplains | 106 | 63,600 |
| Soils | 1782 | 623,700 |

Investigate

Determine

Deliver

Why the Usk?

The shape of the catchment, topography and rainfall distribution

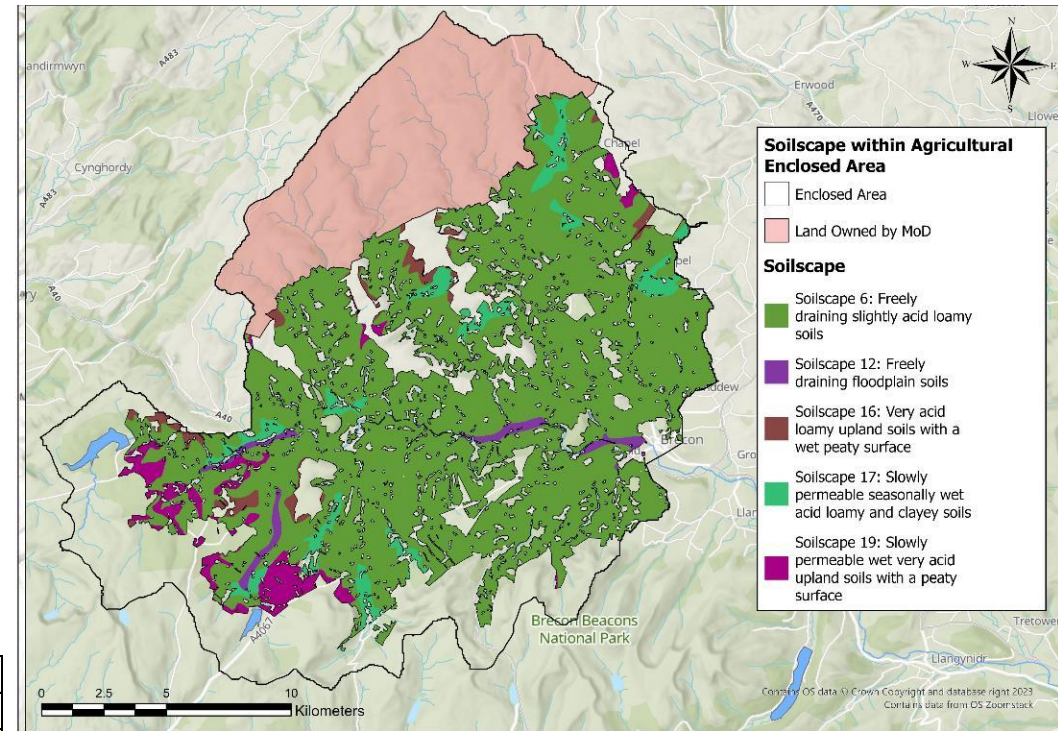
72% of upper catchment is freely draining brown earth soils

86% of farmland is freely draining brown earth soils.

83% of farmland is improved grassland

A relatively porous underlying geology of Devonian sandstone and mudstones.

Highly protected and of high economic importance



| Within Enclosed Agricultural Area | | |
|--|---------------|------------|
| Land Cover Type | Area (ha) | % |
| Improved grassland | 18,834 | 83% |
| Acid grassland | 3,106 | 14% |
| Arable | 752 | 3% |
| Soil Type | Area (ha) | % |
| Freely draining slightly acid loamy soils | 19,506 | 86% |
| Freely draining floodplain soils | 373 | 2% |
| Very acid loamy upland soils with a wet peaty surface | 505 | 2% |
| Slowly permeable seasonally wet acid loamy and clayey soils | 1,292 | 6% |
| Slowly permeable wet very acid upland soils with a peaty surface | 1,023 | 5% |

Investigate

Determine

Deliver

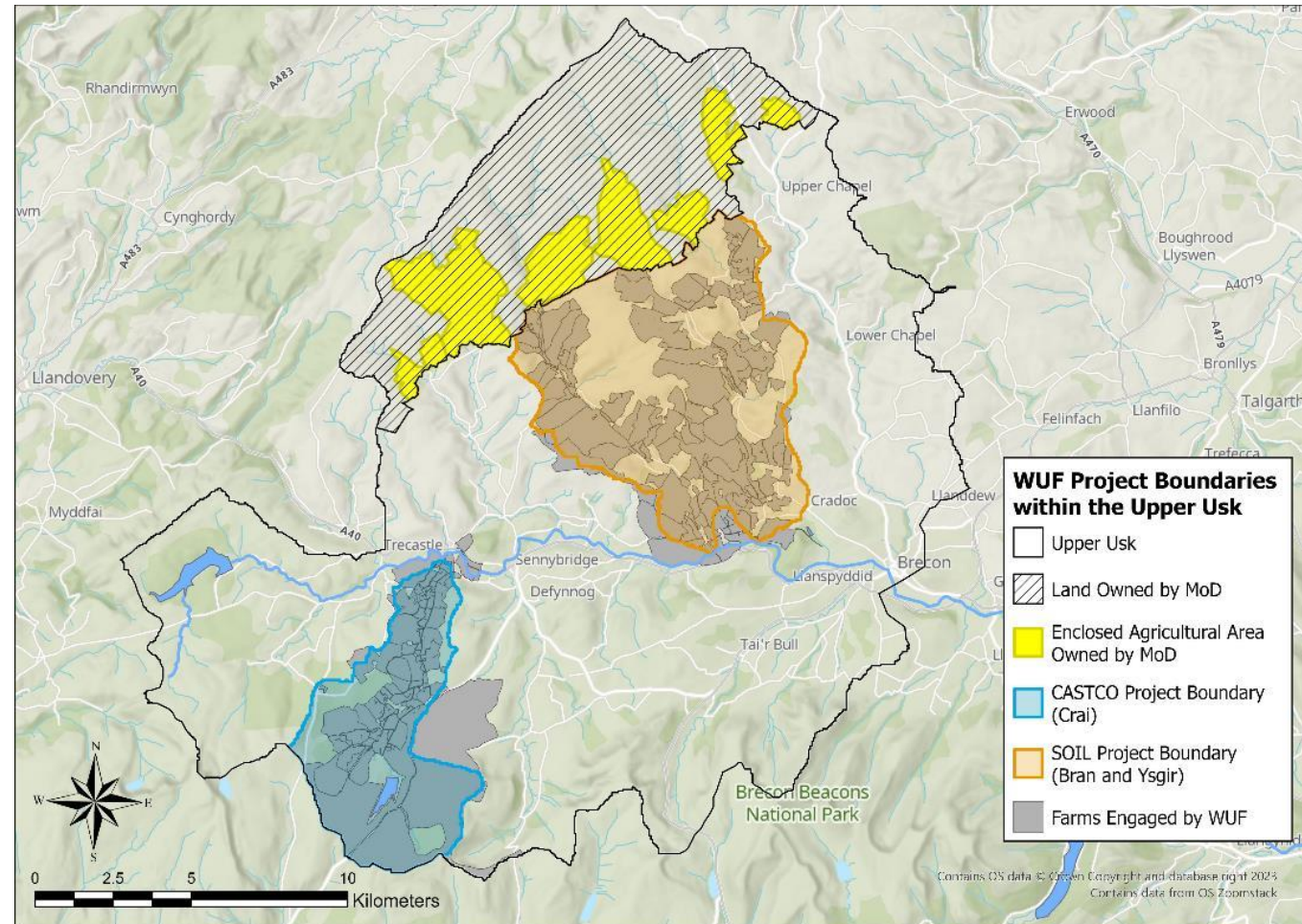
WUF is engaging landowners and developing collective understanding

WUF has won 3 projects to develop this and:

- Engaged 92 landowners (to date) and worked with them to develop the evidence base around....
- Effect of land-use on infiltration rates
- Response of uplands to rainfall
- Flow lines and connectivity
- Opportunities for change
- Effect of interventions
- Barriers to (and appetite for) system change

Also linking with other projects

- Brecon Beacons Mega Catchment
- Rivers for Life



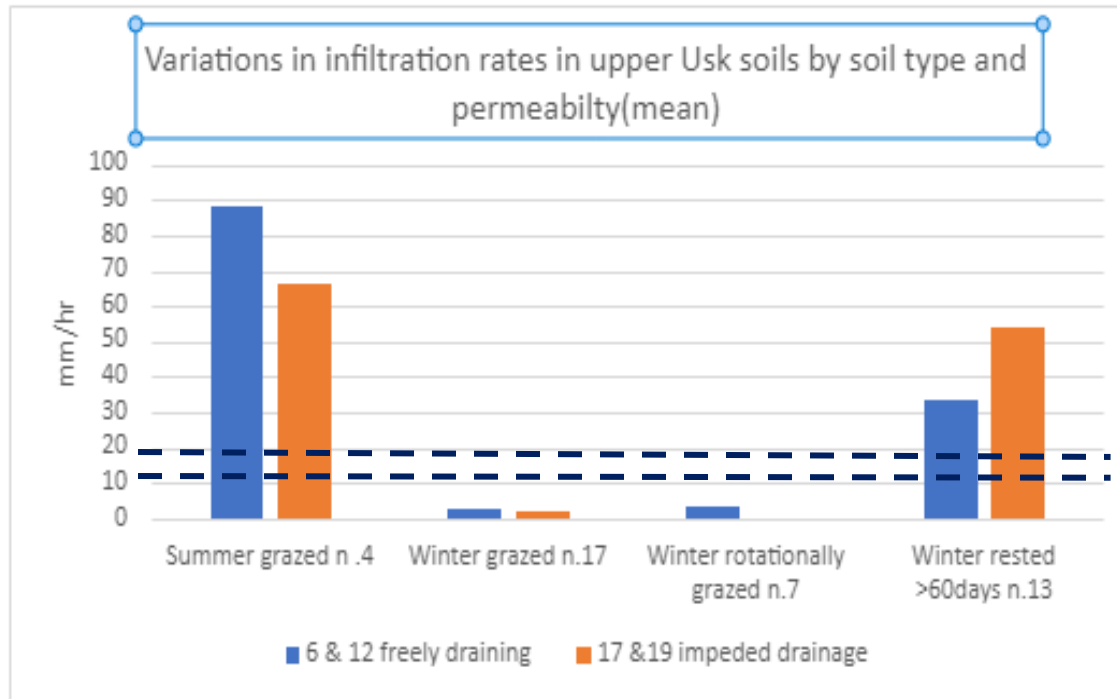
Investigate

Determine

Deliver

The importance of soil management

- Brown earths are the soils most susceptible to damage by agriculture (Palmer and Smith 2013)
- Potential to increase infiltration and restore soil function if compaction is reversed (described by external hydrologist as “staggering” potential for brown earths)
- 59% of fields** on the farms we are working with were winter grazed, rotationally grazed, arable or forage turnips in March 2024



Investigate

Determine

Deliver

Creating a Product

Overland flow from the 3 land use classes that are not prone to saturation in the winter, nor woodland and cover 72% of the Upper Usk enclosed area (below Crai and Usk dam walls)

Creating 2 new metrics

- ML/hr for high flows (NFM)
- ML/day for low flow support

| Landuse Type on freely draining fields | Overland flow during Storm Dennis | Overland flow 1 st Q 2024 |
|--|---|--------------------------------------|
| Continuously grazed | 80.3% of ppt. | 71.3% of ppt. |
| Rotationally grazed | 49.6% of ppt. | 3.8% of ppt. |
| Rested >60 days | 1.8% of ppt. | 0% of ppt. |
| Total extra overland flow (Grazed and Rotation) | 18,692ML 6,921 Olympic Pools | 55,000ML 4 Usk reservoirs |

*assumes saturated infiltration rate

Our work with landowners in the Upper Usk show that it is possible to...

- Reduce 1:200 peak flows by at least 30% (2,400ML/hr)
- Change 1:10 floods to 1:1 floods
- Increase late winter recharge of soils and aquifers by up to 55,000ML
- Which could increase base flows by C.100MLD on the 1st August (BD)
- Markedly reduce soil loss to the river (BD)
- Reduce nutrient loss to the river (TBD)



Cost of delivering System Change estimated ~£6-10M Per annum

| Reduction in overland flow | Increase in catchment storage and subsequent base flows | Co-benefits that can bring in additional buyers |
|--|---|--|
| Reduced risks to infrastructure | Increase in abstraction opportunities | SAC restoration |
| Reduced environmental harm from STW's and other assets | Reduced risk of nutrient build up in Llandegfedd | Increase in/protection of soil & tree carbon storage |
| Increased opportunities for developers | Reduced environmental harm from STW's and other assets | Increase in/protection of biodiversity |
| Reduced costs for insurers | | Improved soil heath and nutrient content of food |
| Reduced costs from sediment build up, abstractions being closed. | | Improve resilience of rural community |



Investigate

Determine

Deliver

Proposal

Landowners of agricultural land and upland in the Upper Usk be rewarded for managing land in a way that regulates water quantity and improves water quality, by land use change (& natural flood management interventions as appropriate), to:

- Reduce contribution of overland flow to defined flood peaks (reducing soil and nutrient loss) (£ per ML/hr)
- Increase infiltration rates (increase in base flow across the area tbd) (£ per ML/day)
- Temporarily store water and lag discharge from uplands (Low and High flow benefits)
- Improve/protect biodiversity and ecosystems
- Protect existing carbon stocks and sequester more.
- And?

Payments

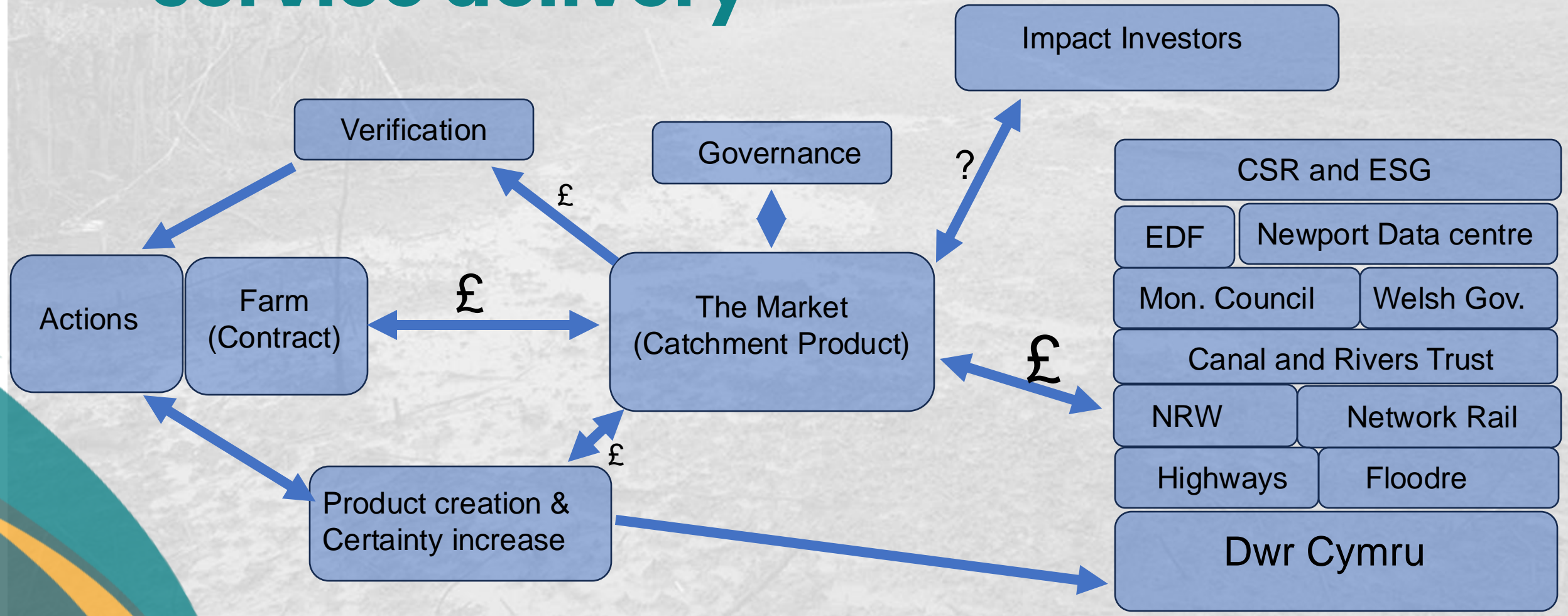
Packages built up from field and flow line (action) to farm (contract) to catchment (buyers)

Guiding principles to ensure just transition

- Linking incurred costs from multiple interests will create a deal which can't be ignored by landowners
- Operate above regulatory baseline
- Use a non-prescriptive approach based on **quantified** benefits
- Keep landowners in the landscape and allow for culture to change
- Pay for good to protect it
- Annual verification of performance



Market Creation for ecosystem service delivery



What's in it for the Rivers?

Storm Dennis: maximum 158mm in 30hrs in Crai, mostly 70-80mm
Peak flow 1,200m³/second, 4,320,000m³ hr

Cumbria 2005: 196mm in 24hrs

Cumbria 2015: 212mm in 24hrs

Germany 2021: 247mm in 30hrs

Italy 2021: 604mm in 24hrs

Italy 2023: 600mm in 72hrs

Central Europe 2024: 483mm over 4 days

Valencia 2024: 480mm in 24hrs

Unless we change the system driving land management to one that mitigates rather than exacerbates climate change, a 200mm+ rain fall event would be devastating



What's in it for the Ecology?





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Diolch yn Fawr

Let's talk

