Barrier Removal Bootcamp

RECONNECTING THE SALMON RIVERS OF WALES

Wye and Usk Foundation, Talgarth, Brecon, LD3 0BW

20 JUNE 2022

AM TALKS

10:00-10:30 Registration & Welcome
10:30-11:00 The conservation status of Atlantic salmon in Wales #Ben Wilson (NRW)
11:00-11:30 Barrier types and their impacts on Atlantic salmon #Dave Charlesworth (NRW)
11:30-12:00 Reconnecting rivers: benefits of barriers removal #Simon Evans (WUF)

12:00 COFFEE BREAK

12:15-12:45 Prioritizing barriers for removal #Carlos Garcia de Leaniz (SU)
12:45-13:15 Removing different types of barriers #Alex Lumsdon (WWRT)
13:15-13:45 Reconnecting the Salmon Rivers of Wales – other barriers to overcome #Caroline Orr (AC)

13:45 LUNCH BREAK

PM FOCUS GROUP

Overcoming Barriers to Remove Barriers

14:15-16:00 Breakaway groups
facilitators: Sara Barrento, Millie Parks, Jessica Whitney, Victoria Hurst

16:00 COFFEE BREAK

16:15-17:15 Group discussion
17:15-17:30 Conclusions

18:00 INFORMAL GATHERING AT LOCAL PUB

21 JUNE 2022

BOOTCAMP DAY

Hands-on demonstration/training near Brecon

Meet at meeting point (Wye and Usk Foundation, Talgarth, Brecon, LD3 0BW)

10:00-12:30
1. Barrier monitoring via Barrier Tracker #Carlos Garcia de Leaniz (SU)
2. Rapid barrier impact assessment #Millie Parks (SU)
3. Habitat survey #Alex Lumsdon (WWRT)

12:30 LUNCH BREAK

13:00-16:00
4. Macroinvertebrate sampling #Nathaniel James (WWRT)
5. Fish survey #Fiona Grove (WUF)
6. Sediment and diatoms assessment #Fiona Grove (WUF)
7. Collection of water samples for eDNA monitoring #Ben Overland (SU)

16:30 Online feedback forms and certificate of attendance

CELEBRATE THE WORLD FISH MIGRATION DAY

The Wye and Usk Foundation, The Right Bank, The Square, Talgarth, Brecon, LD3 0BW

Join us and learn how to:
assess barrier impacts; document the benefits of dam (barrier) removal and incorporate uncertainty on decisions related to barriers. You will also contribute to a consultation white paper on barrier removal

FACILITATORS:
Dr Sara Barrento, Millie Parks, Jessica Whitney, Victoria Hurst

SPONSERED BY THE NATURE NETWORKS FUND

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Funded by **Welsh Government**

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Natural Resources Wales

Swansea University
Prifysgol Abertawe

WEST WALES RIVERS TRUST

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Welsh Water

RECONNECTING THE SALMON RIVERS OF WALES

The Wye & Usk Foundation

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Cyfoeth Naturiol Cymru
Natural Resources Wales

Freshwater & Migratory Fisheries

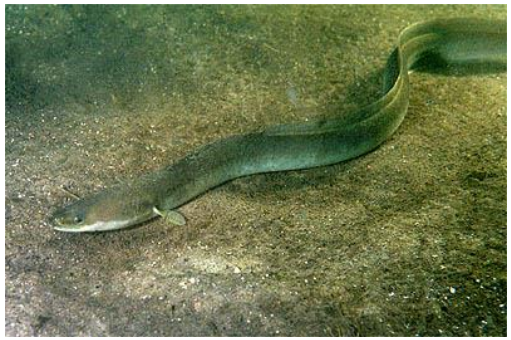
Protecting culturally, economically and ecologically important fish stocks

Ben Wilson

Principal Fisheries Advisor

“to maintain, improve and develop fisheries of salmon, trout, eels, lampreys, smelt and freshwater fish” section 6(6) of the Environment Act 1995

Cyfoeth Naturiol Cymru
Natural Resources Wales



UK & Wales Legislation

Legislation	Power
Salmon and Freshwater Fisheries Act 1975	including licensing of angling and net fishing
Eels (England and Wales) Regulations 200970	including powers to facilitate eel passage
Water Resources Act 1991	including making of byelaws to regulate fishing
Keeping and Introduction of Fish Regulations 201571 .	including regulating the movement and introduction of fish
The Environment (Wales) Act 2016	SoNaRR, SMNR, Place Planning
Wellbeing of Future Generations Act 2015	Wellbeing Plans, Partnership (PSBs)

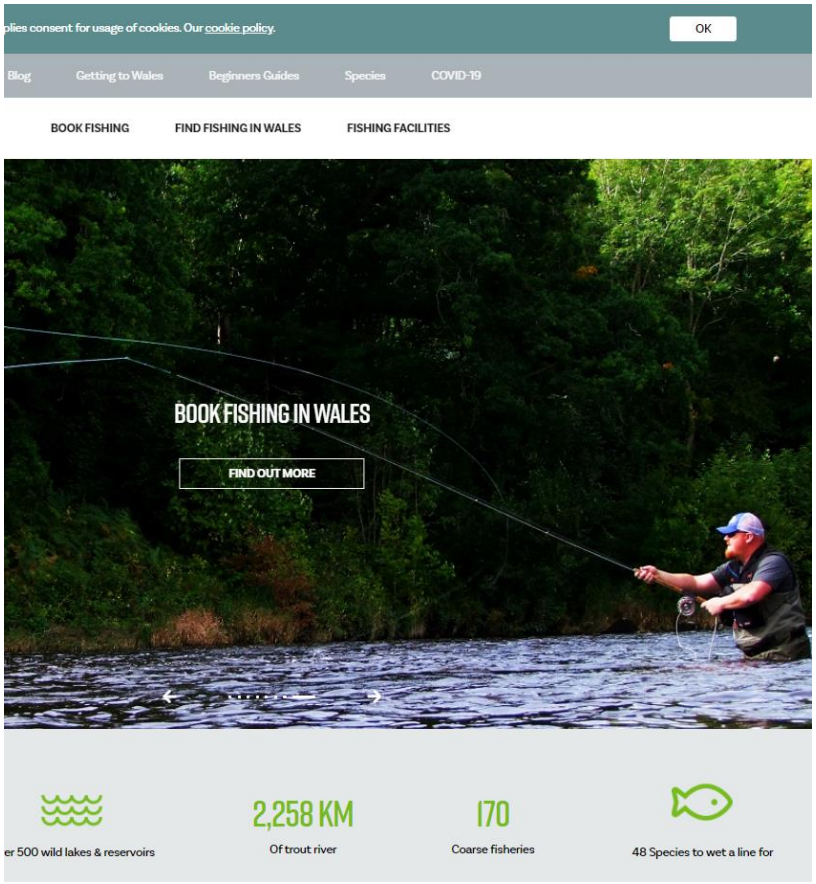
Cyfoeth Naturiol Cymru
Natural Resources Wales

Precautionary approach

- consideration of the needs of future generations;
- avoidance of changes that are not potentially reversible;
- prior identification of undesirable outcomes;
- initiation of corrective measures without delay;
- priority to be given to conserving the productive capacity of the resource;

Angling

Coarse and trout 38,901 - £839.1k
Migratory salmonid 3,854 - £195.3k



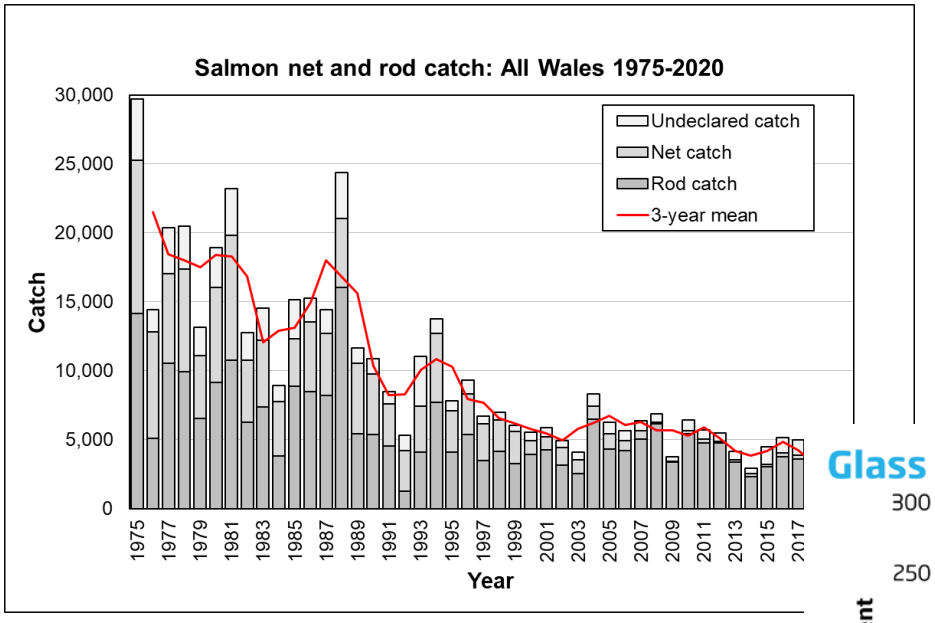
River Angling = £20m Gross Value Added per annum
700 FTE (full-time equivalent)

Nets

54 licences available.
Only 41 taken out in 2022 - £11k income

Cultural importance

In trouble


Salmon net and rod catch: All Wales 1975-2020
Undeclared catch
Net catch
Rod catch
3-year mean
Catch
Year
30,000
25,000
20,000
15,000
10,000
5,000
0
1975
1977
1979
1981
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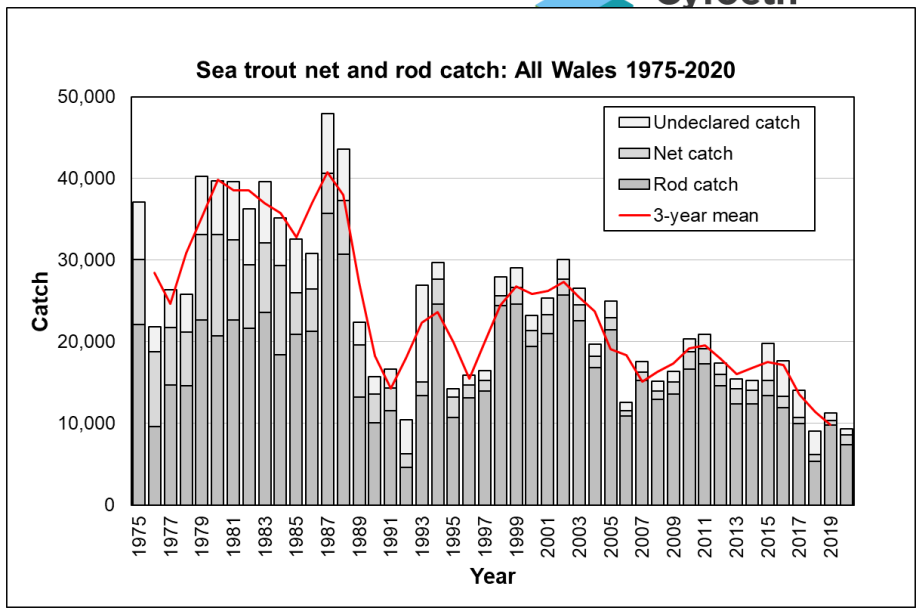
2017


Sea trout net and rod catch: All Wales 1975-2020
Undeclared catch
Net catch
Rod catch
3-year mean
Catch
Year
50,000
40,000
30,000
20,000
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0
1975
1977
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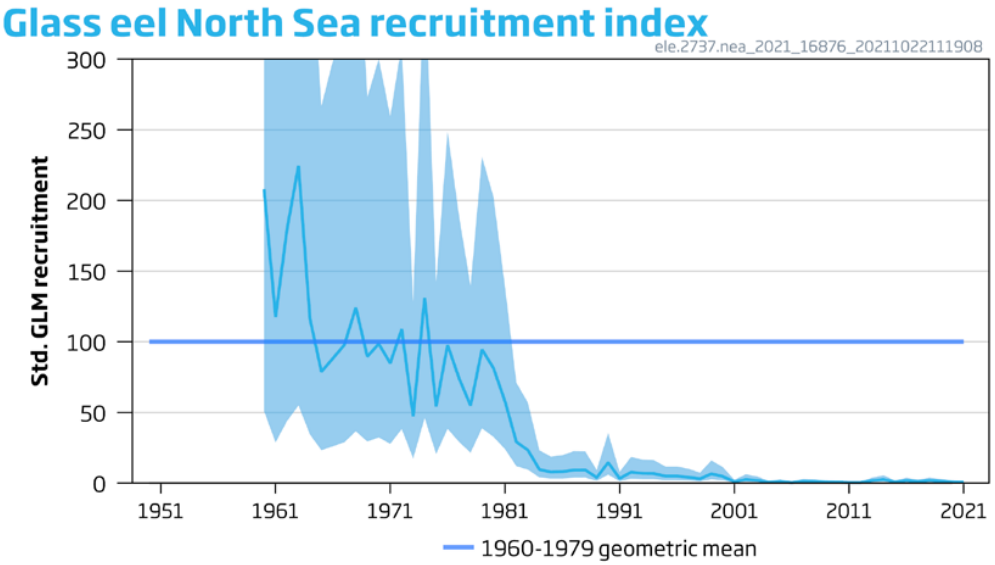
Glass eel North Sea recruitment index
ele.2737.nea_2021_16876_20211022111908
Std. GLM recruitment
300
250
200
150
100
50
0
1951
1961
1971
1981
1991
2001
2011
2021
1960-1979 geometric mean

2021 Stock assessments

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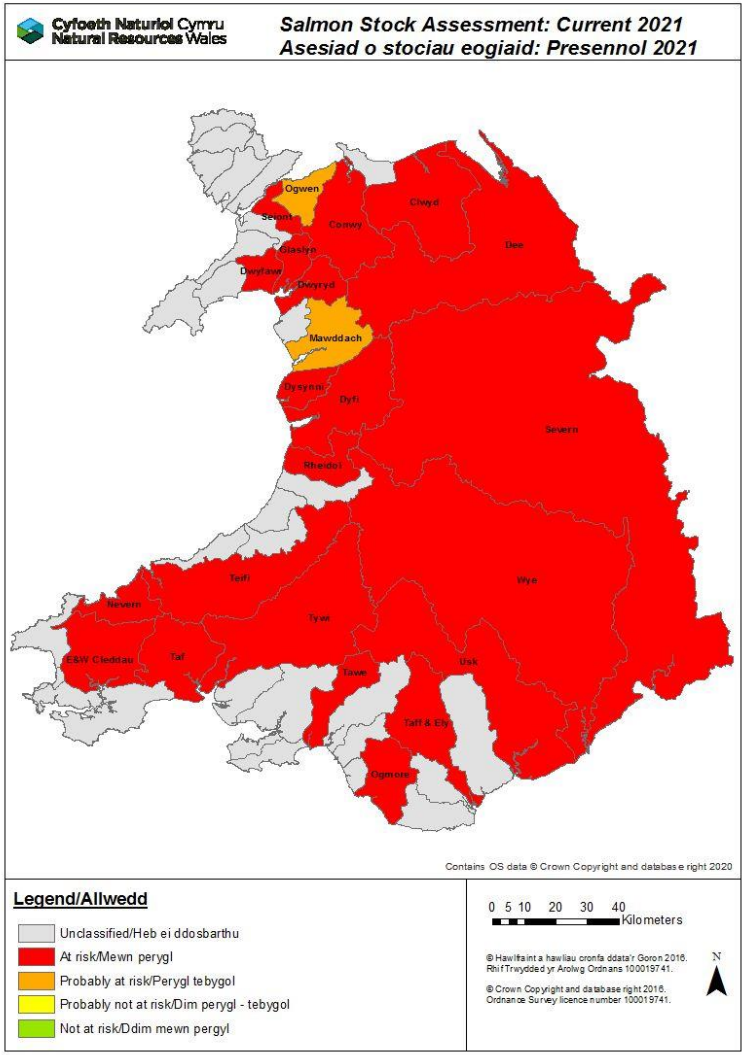

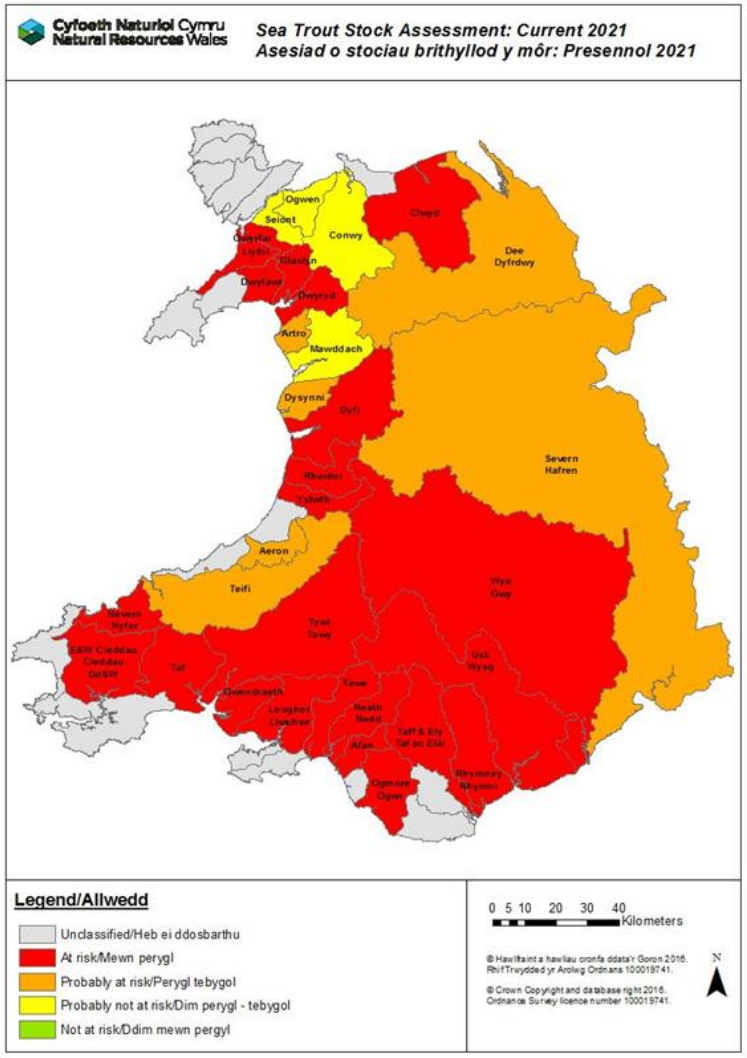

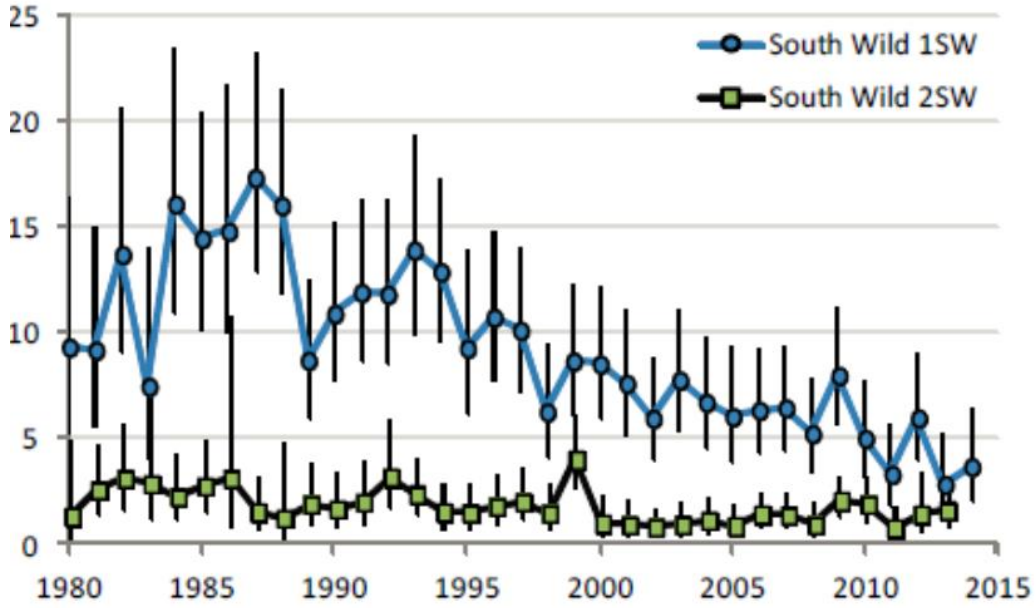

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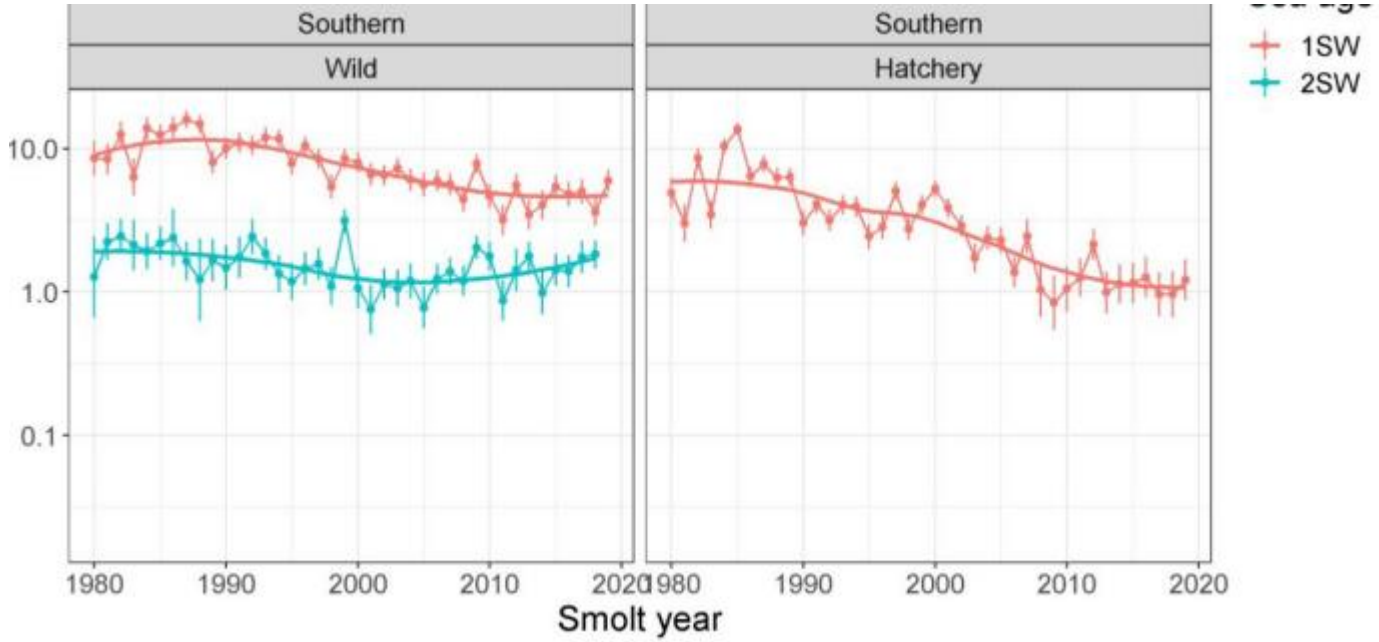
Natural Resources Wales



Pressures

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Cynllun Gweithredu Eog a Brithyll Môr

Salmon and Sea trout Plan of Action

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Produced following Ministerial direction in 2020 after the Byelaws Inquiry

Weir removals

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Fish Passes

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Habitat Restoration

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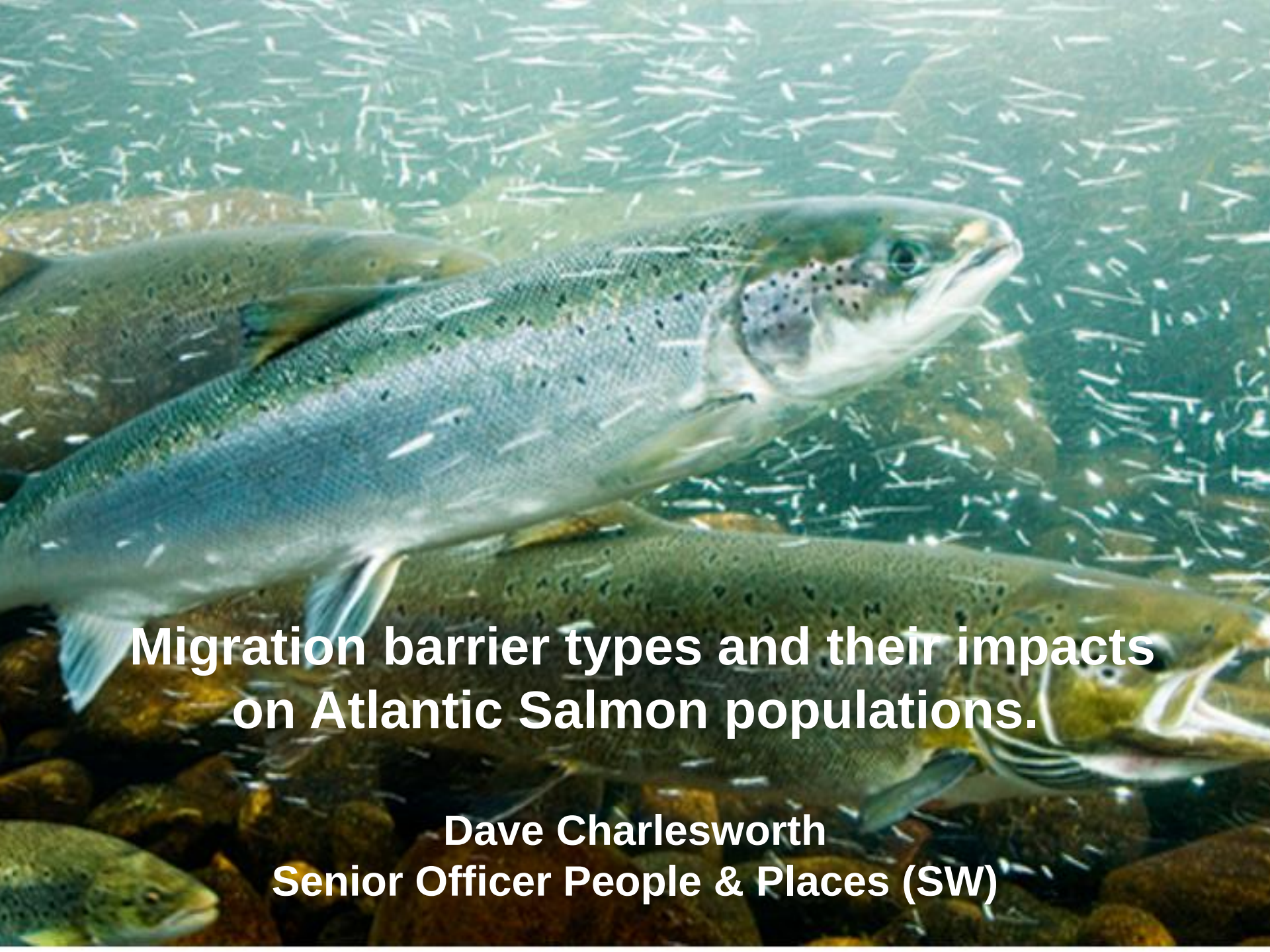
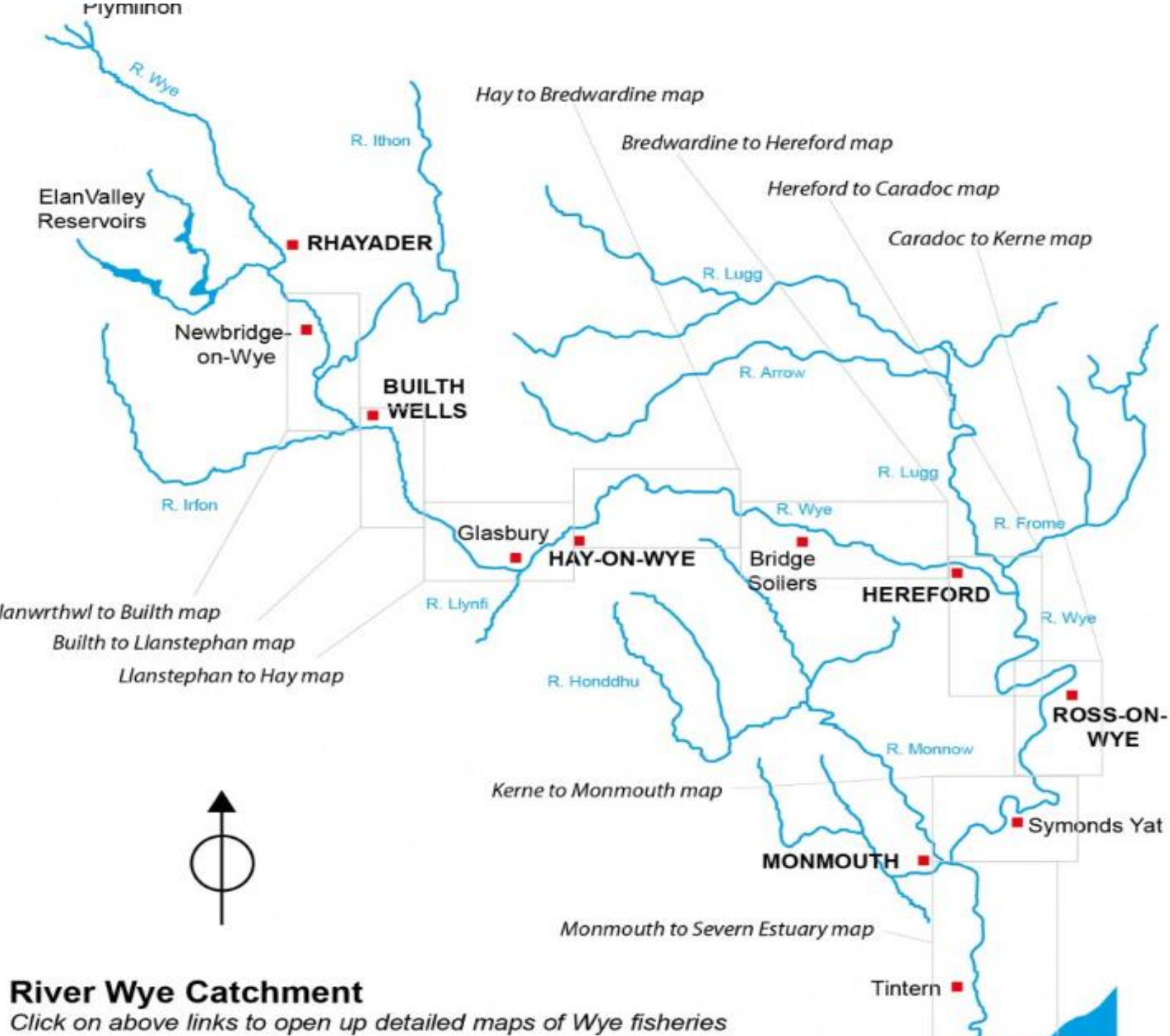
The installation, which highlights the extinction threat to wild salmon, will be shown in the Blue Zone at COP26 - where key negotiations will take place



Migration barrier types and their impacts on Atlantic Salmon populations.

Dave Charlesworth
Senior Officer People & Places (SW)



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River Wye Catchment

Click on above links to open up detailed maps of Wye fisheries

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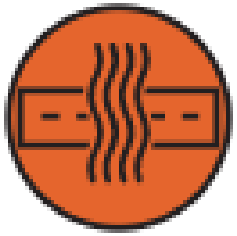
Barrier Types

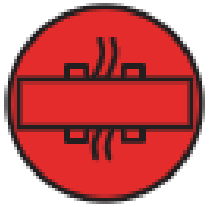


Ford

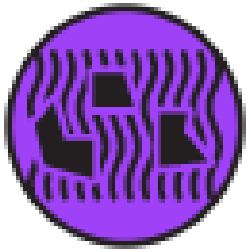
Dam

Weir

Culvert



Sluice



Ramp

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Natural

Impacts on Salmon populations:

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Natural Resources Wales

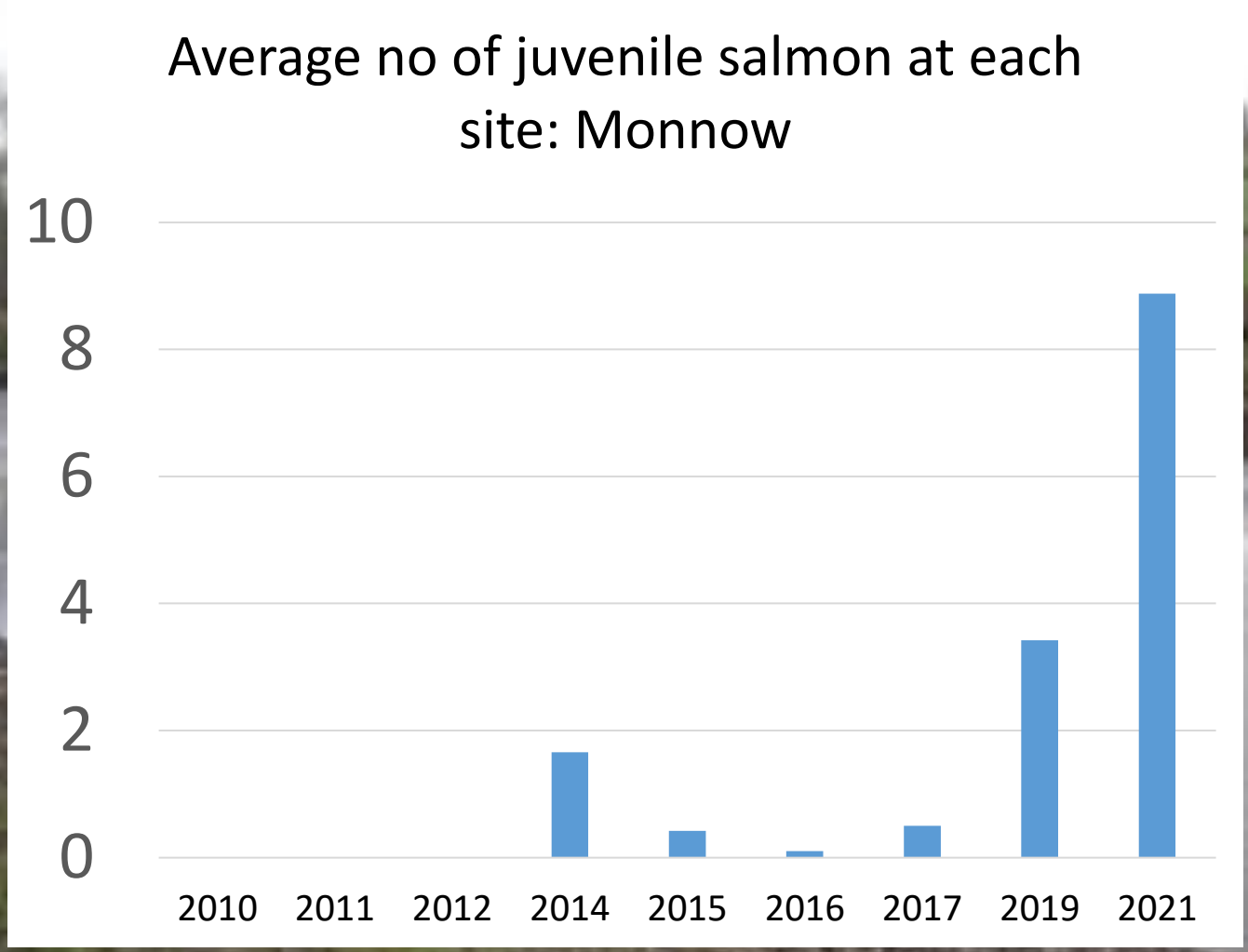
- Less available spawning sites
- Less available juvenile habitat
- Reduced habitat diversity
- Lower levels of fish production generally
- Elevated levels of juvenile (smolt) predation
- Physical damage to adult fish
- Less resilient salmon populations (Climate change)
- Less sustainable salmon populations

- Current status: ‘At Risk’
- NASCO Guidance: Act Now!

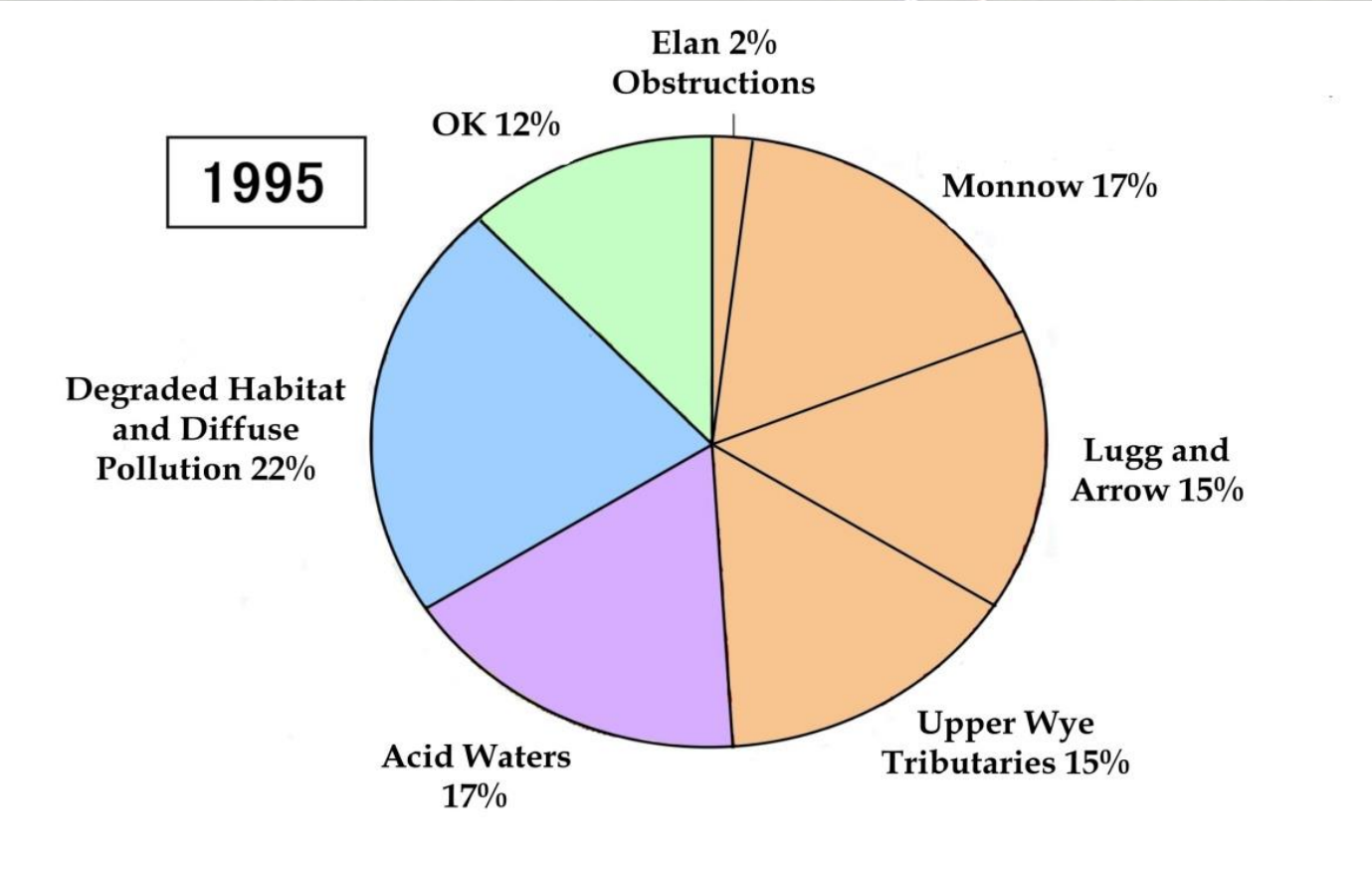
Why do we do it?

Fish, connectivity, geomorphology…and flooding, biodiversity and fish

- Fish
- Restore ecological connectivity
- Restore geomorphology and sediment transfer
- Restore natural flow
- Mitigate flooding (sometimes)
- And more fish…..

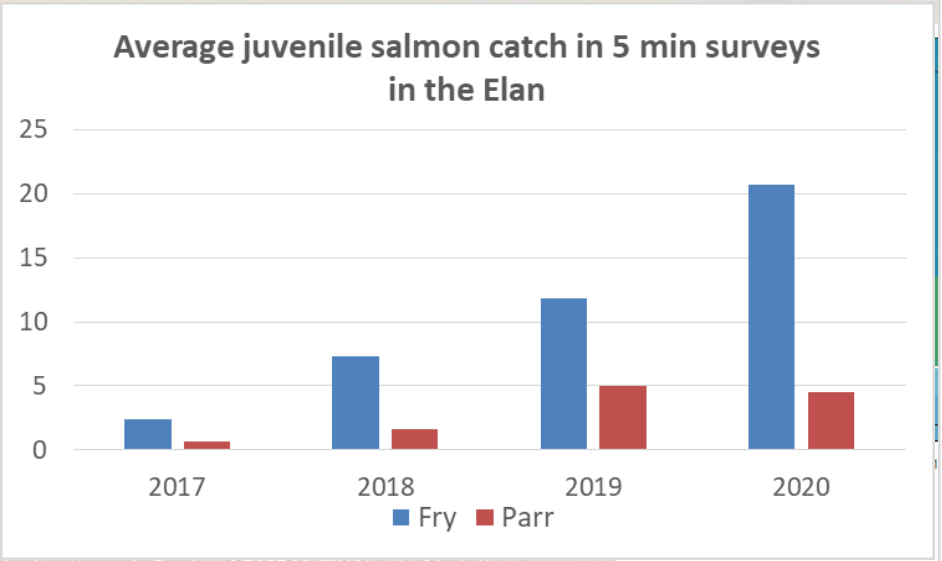

Average no of juvenile salmon at each site: Monnow
10
8
6
4
2
0
2010
2011
2012
2014
2015
2016
2017
2019
2021

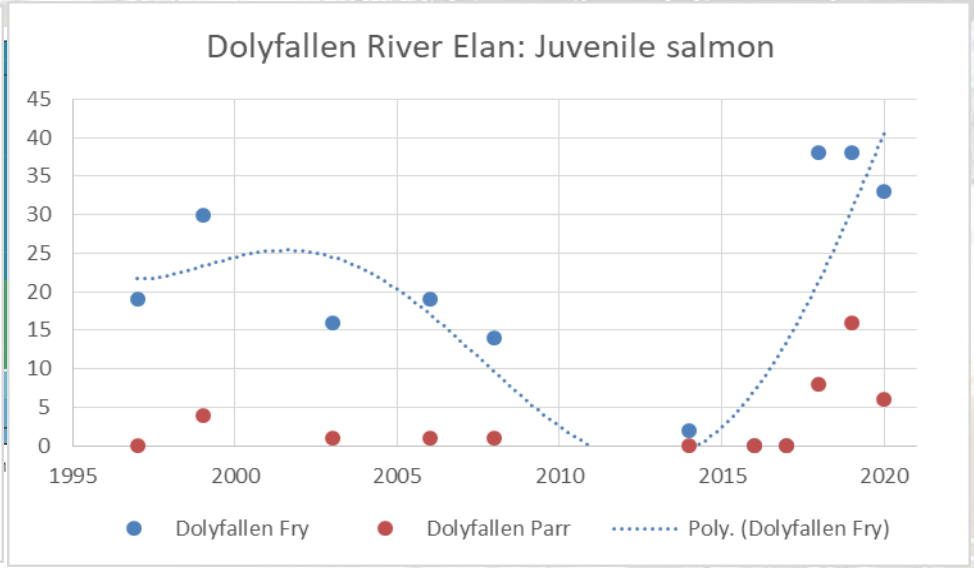
Primary limiting factor for anadromous fish



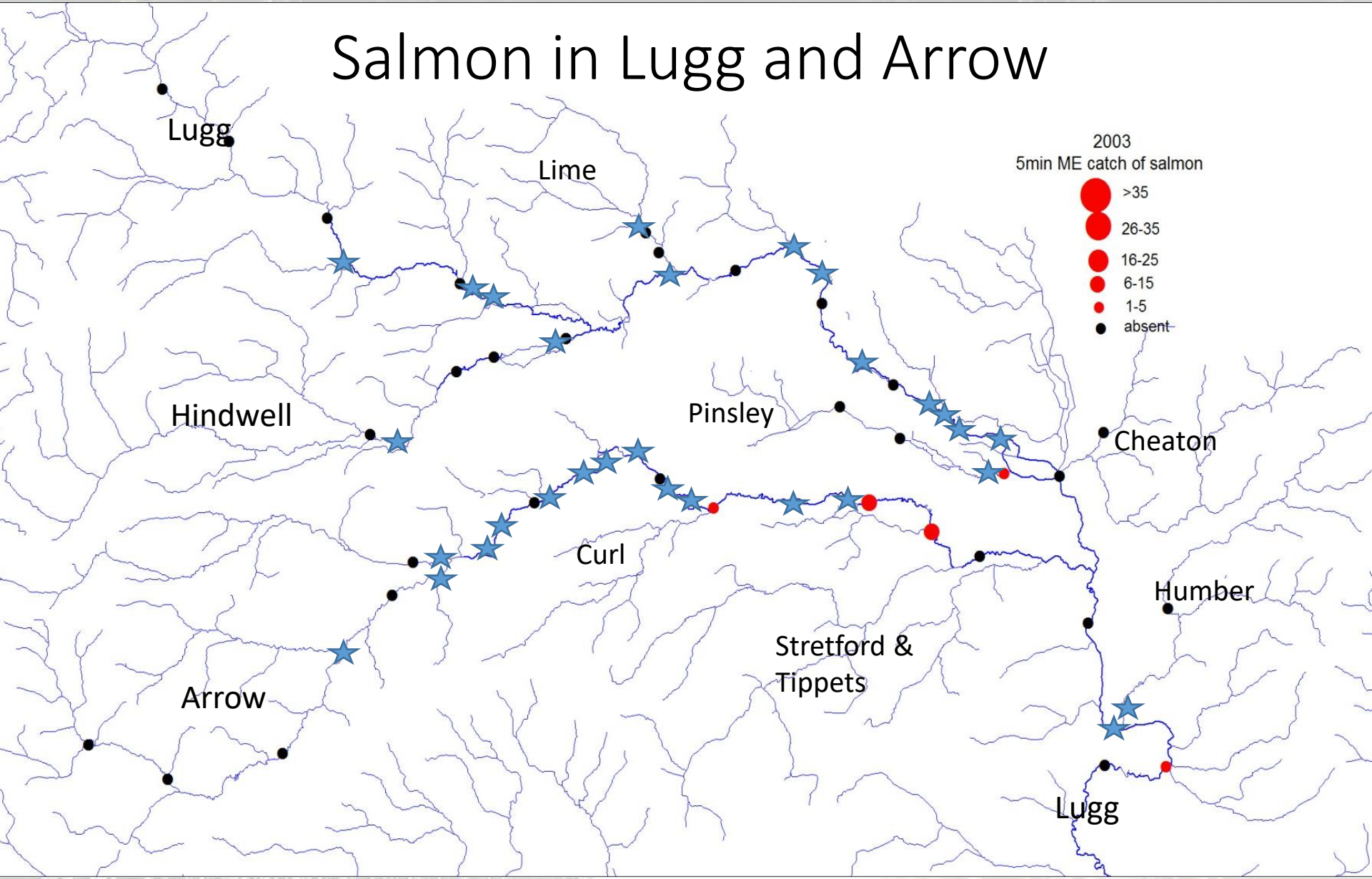
Recovery of ecology in River Elan

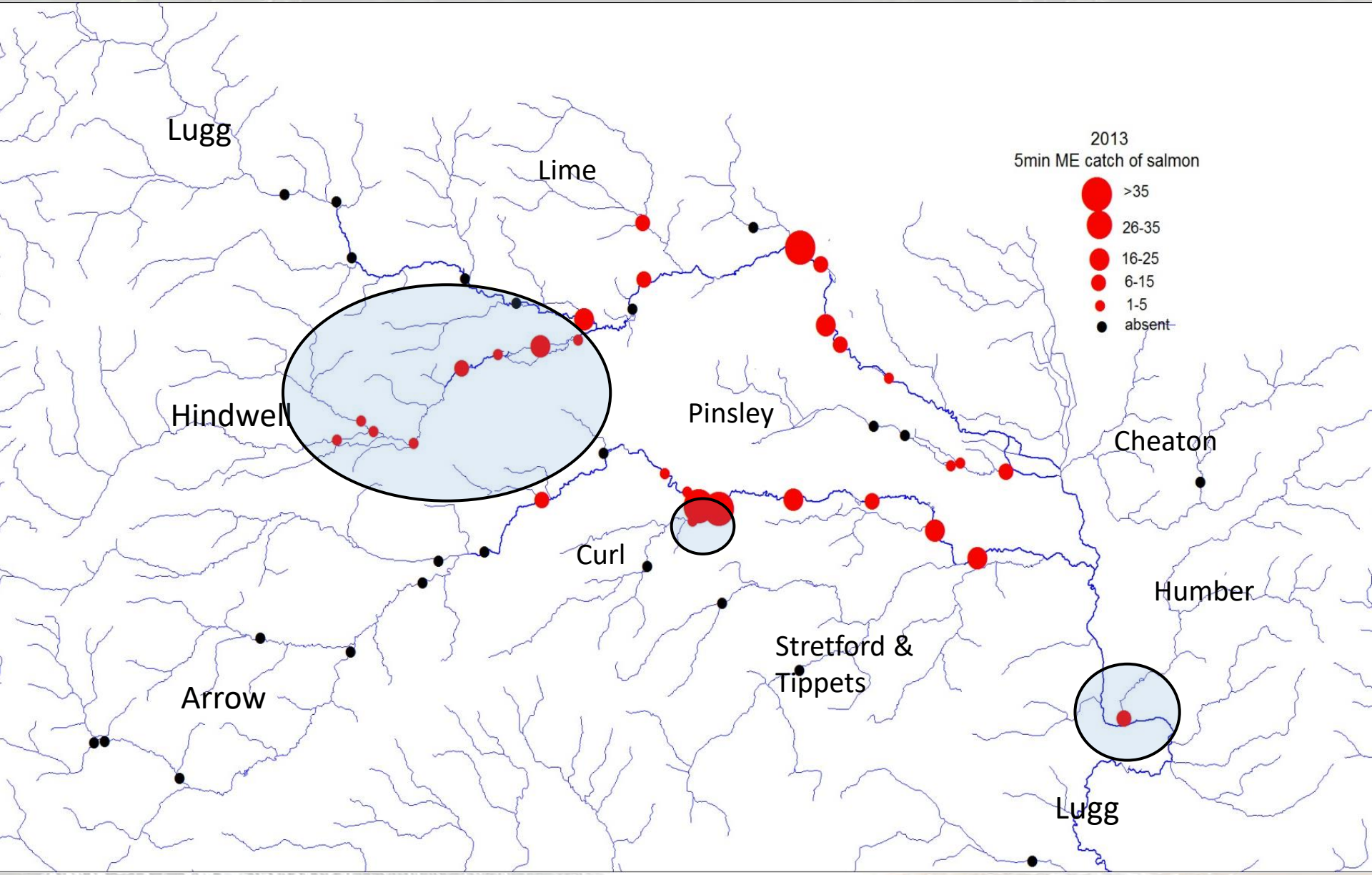
- 7% of Wye's spawning area
- Heavily 'modified' by the dams
- Gravel restoration from 2016
- Improved flow regime from 2017
- Invertebrate recovery 2017
- 2020: Salmon and trout fry found at every site below the Dam for the first time.



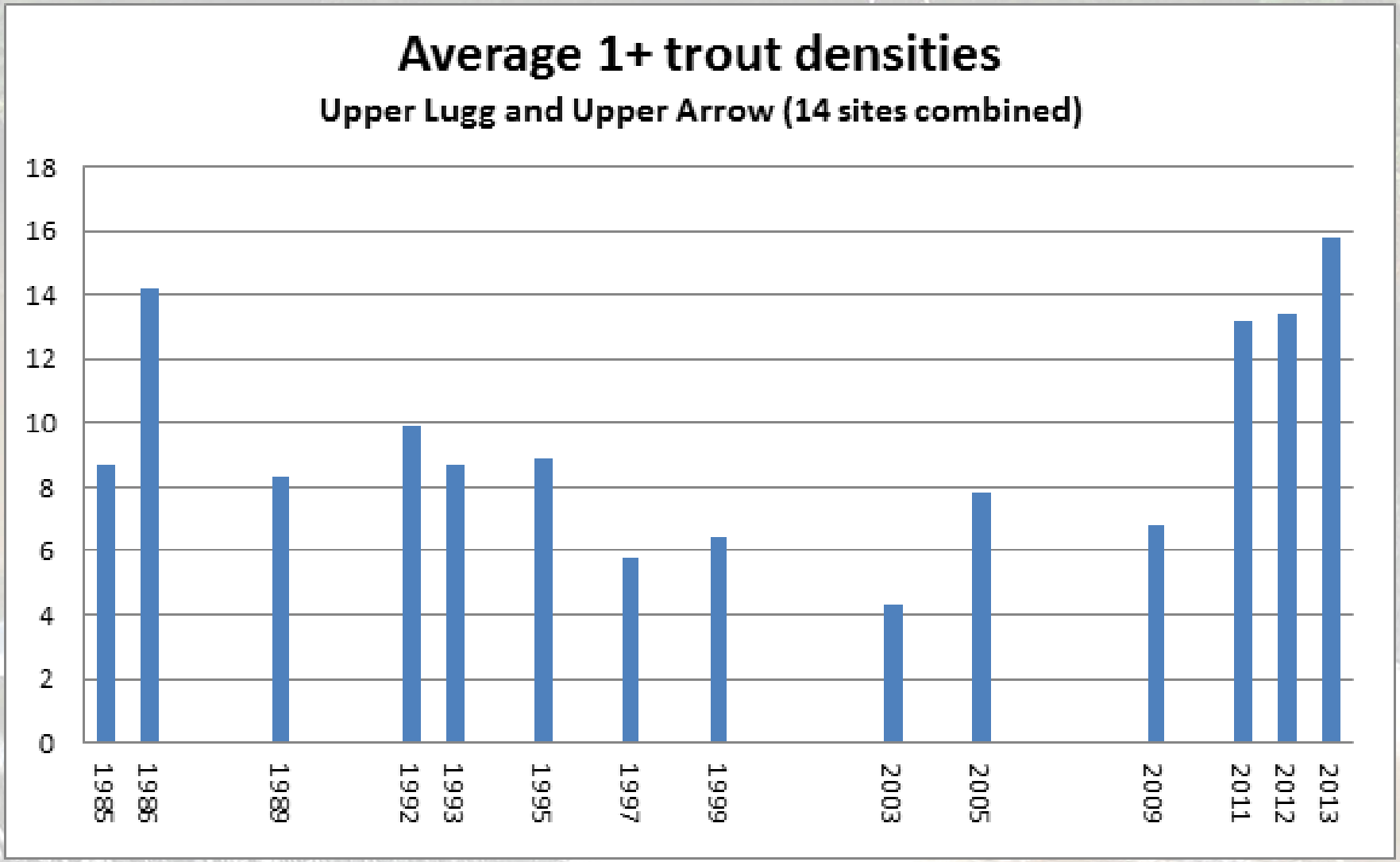


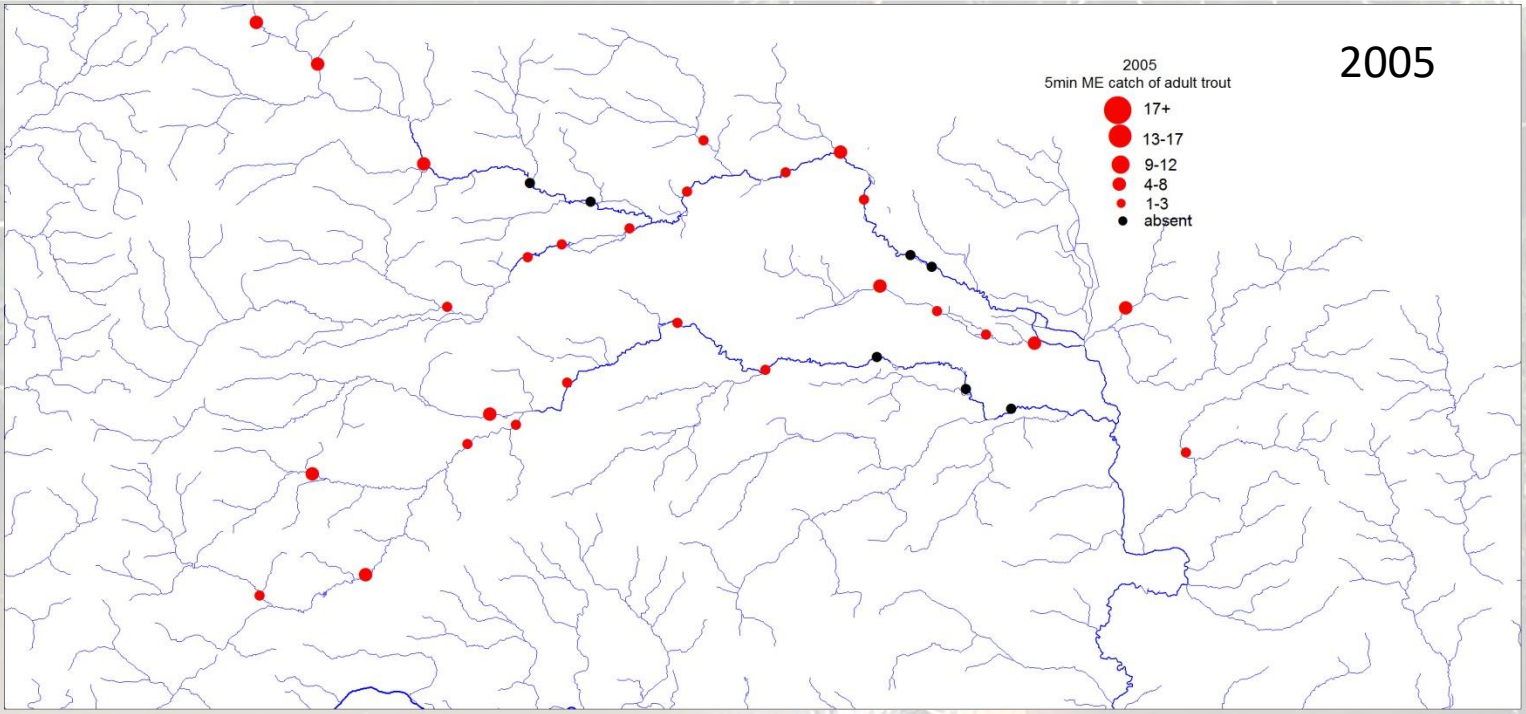
Salmon in Lugg and Arrow



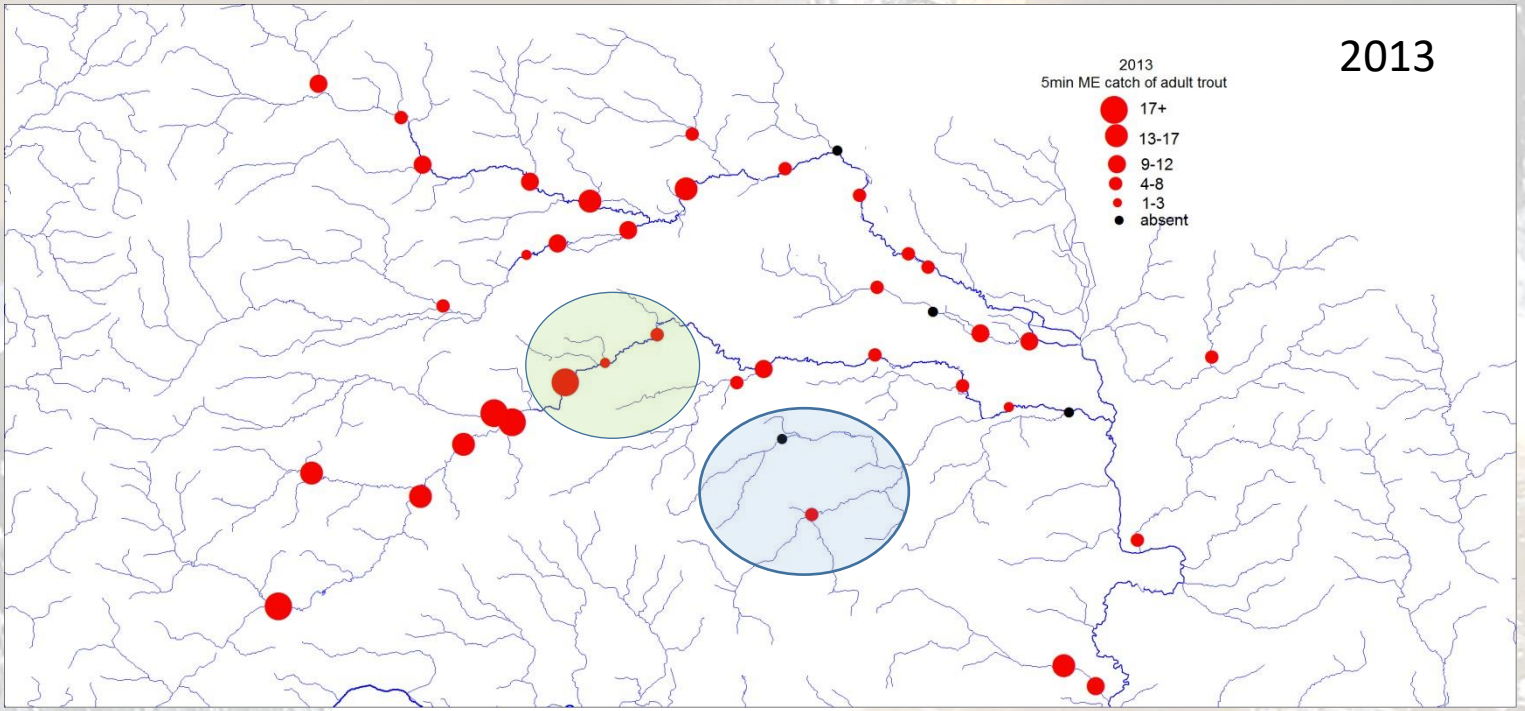

Lugg
Lime
2013
5min ME catch of salmon
>35
26-35
16-25
6-15
1-5
absent
Hindwell
Pinsley
Cheaton
Curl
Humber
Stretford &
Tippets
Arrow
Lugg

Lugg and Arrow trout




2005
5min ME catch of adult trout
17+
13-17
9-12
4-8
1-3
absent

2005


2013
5min ME catch of adult trout
17+
13-17
9-12
4-8
1-3
absent

2013

Dioch yn Fawr

Any Questions?

The Wye & Usk Foundation
ACTION FOR FISHERIES

www.wyeuskfoundation.org

Barrier Removal Bootcamp –20-21 June 2022

Prioritizing Barriers for Removal

Carlos Garcia de Leaniz

Centre for Sustainable Aquatic Research (CSAR)
Swansea University

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689682.

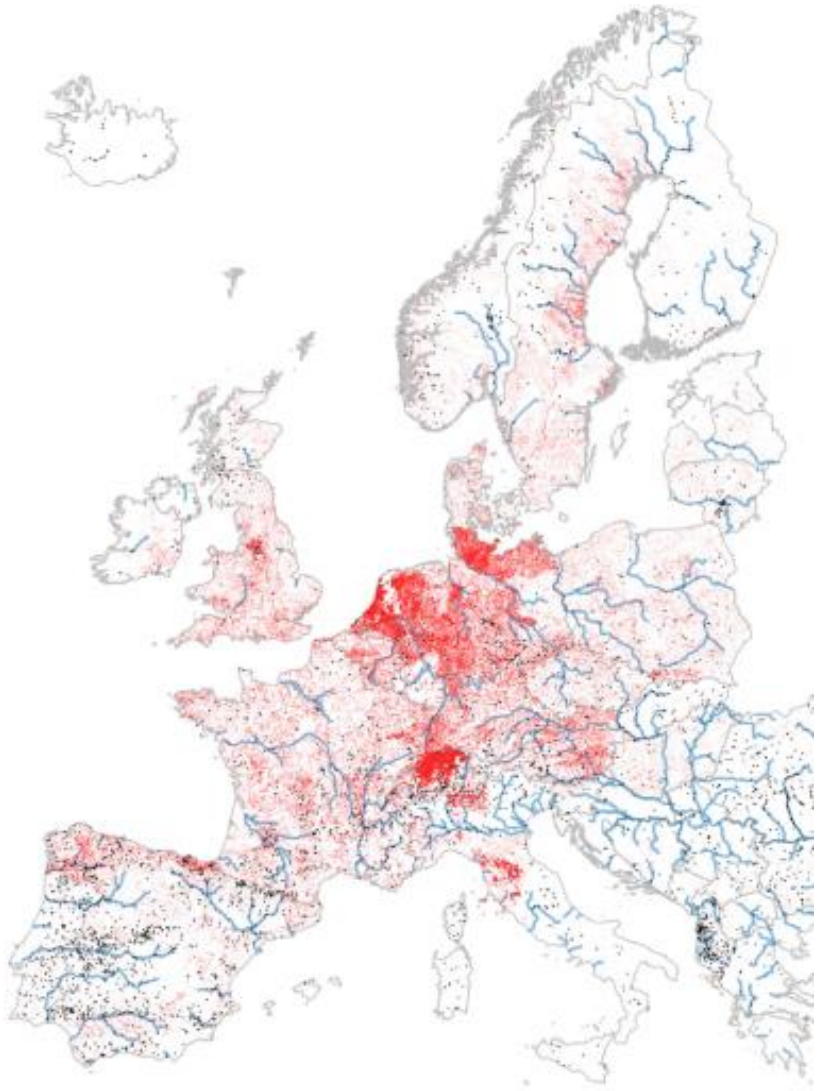
Ariennir gan Lywodraeth Cymru
Funded by Welsh Government

The Challenge

Belletti et al (2020) *Nature*

+1.2M barriers

+25K rivers free by 2030



0.74 barriers/km

What is a barrier*?

*'any built structure that interrupts or modifies the **flow of water**, the **transport of sediments**, or the **movement of organisms** and can cause longitudinal **discontinuity**'.*

Belletti et al 2020. *Nature*

Rivers as ***conveyor belts***

Paradigm shift

from ***passability*** (species–dependent)
to ***discontinuity*** *(processes)*

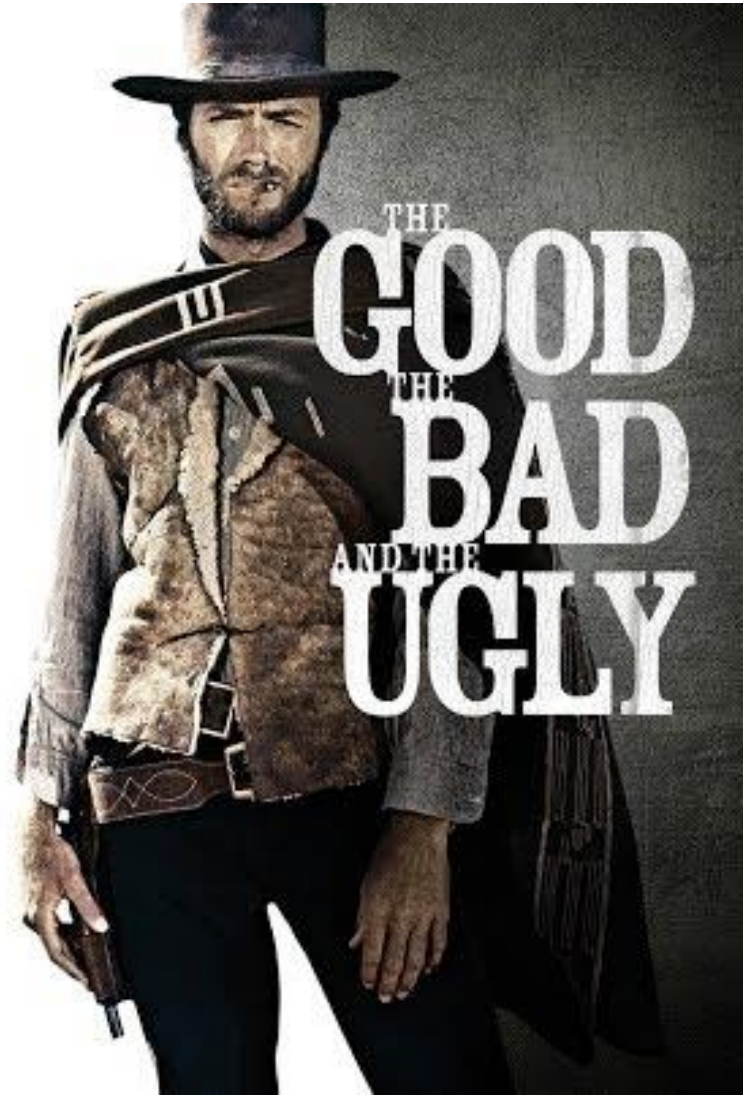
***operational definition: excludes non-physical barriers (thermal, pollution, flow, etc...) these are also v. important

Some specific challenges

Dealing with **uncertainty** & **incomplete information**

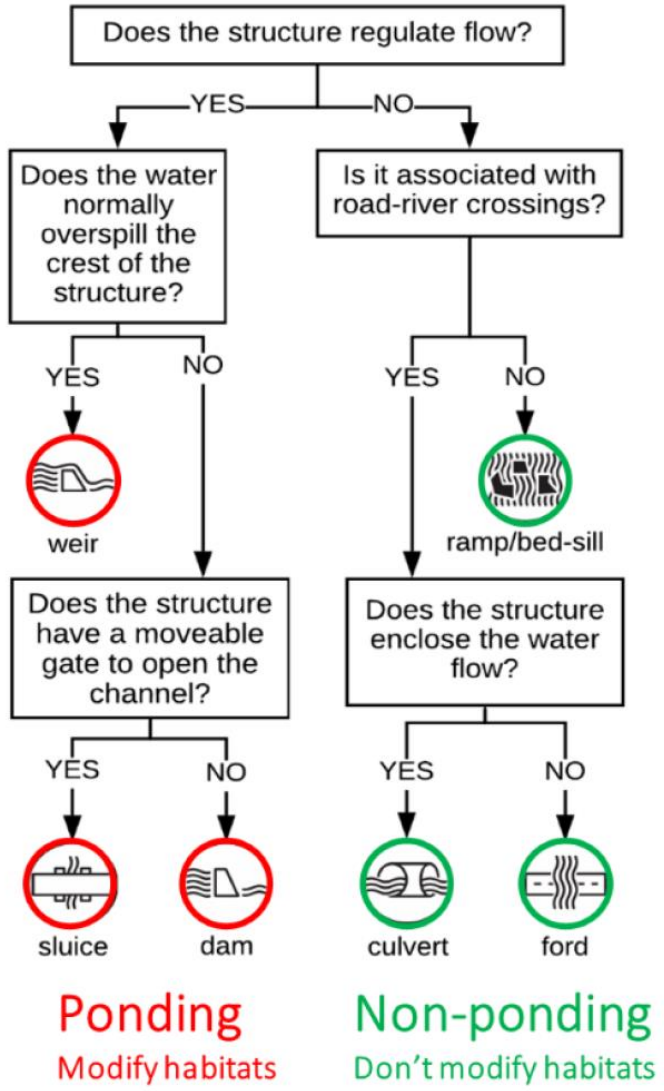
- Not clear [yet] what ***"free-flowing"*** means
  100km x 250 rivers? Or 10km x 2,500 rivers? etc.
- Number of barriers is typically underestimated
- Location of barriers is not always known precisely
- Natural barriers are missing in most cases
- River networks are generally inaccurate

Prioritizing barriers



Know thy enemy and know yourself

Barrier typology: 6 main types



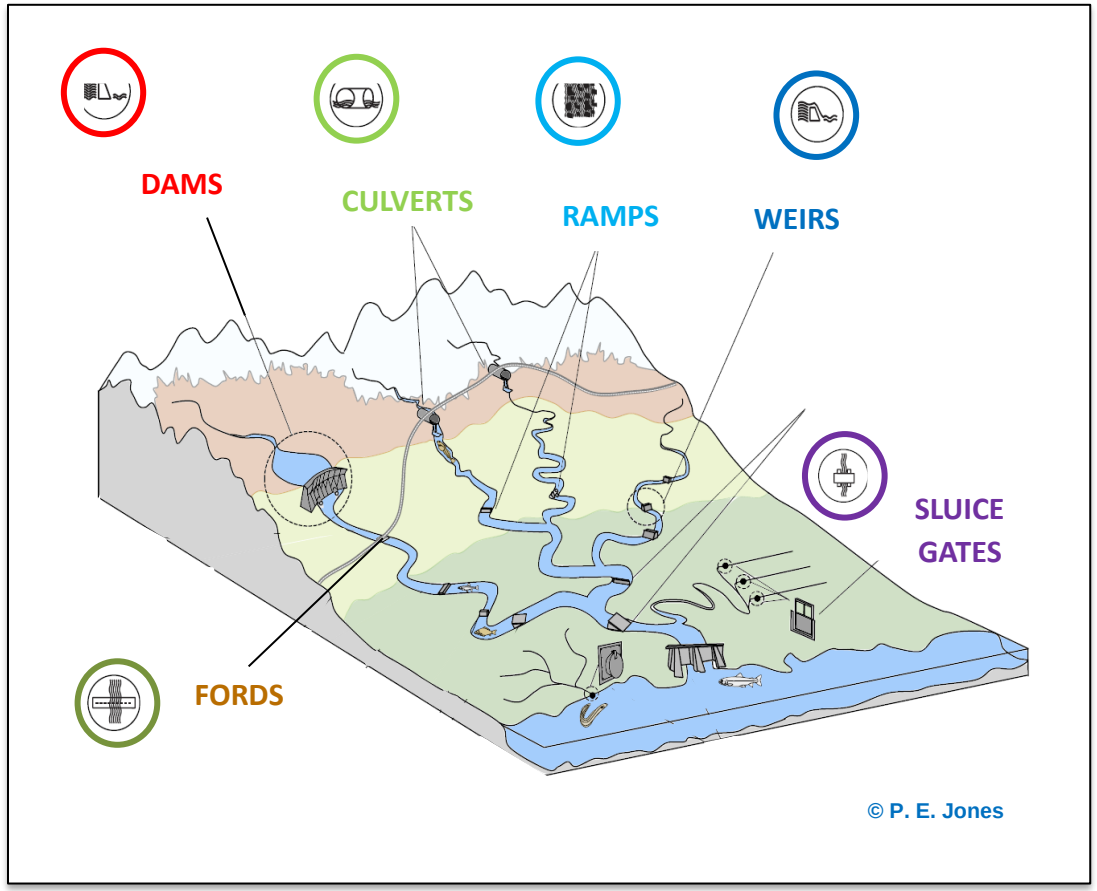


Figure 1. Classification of six main barrier types (Jones et al., 2020a).

Barrier typology: 6 main types

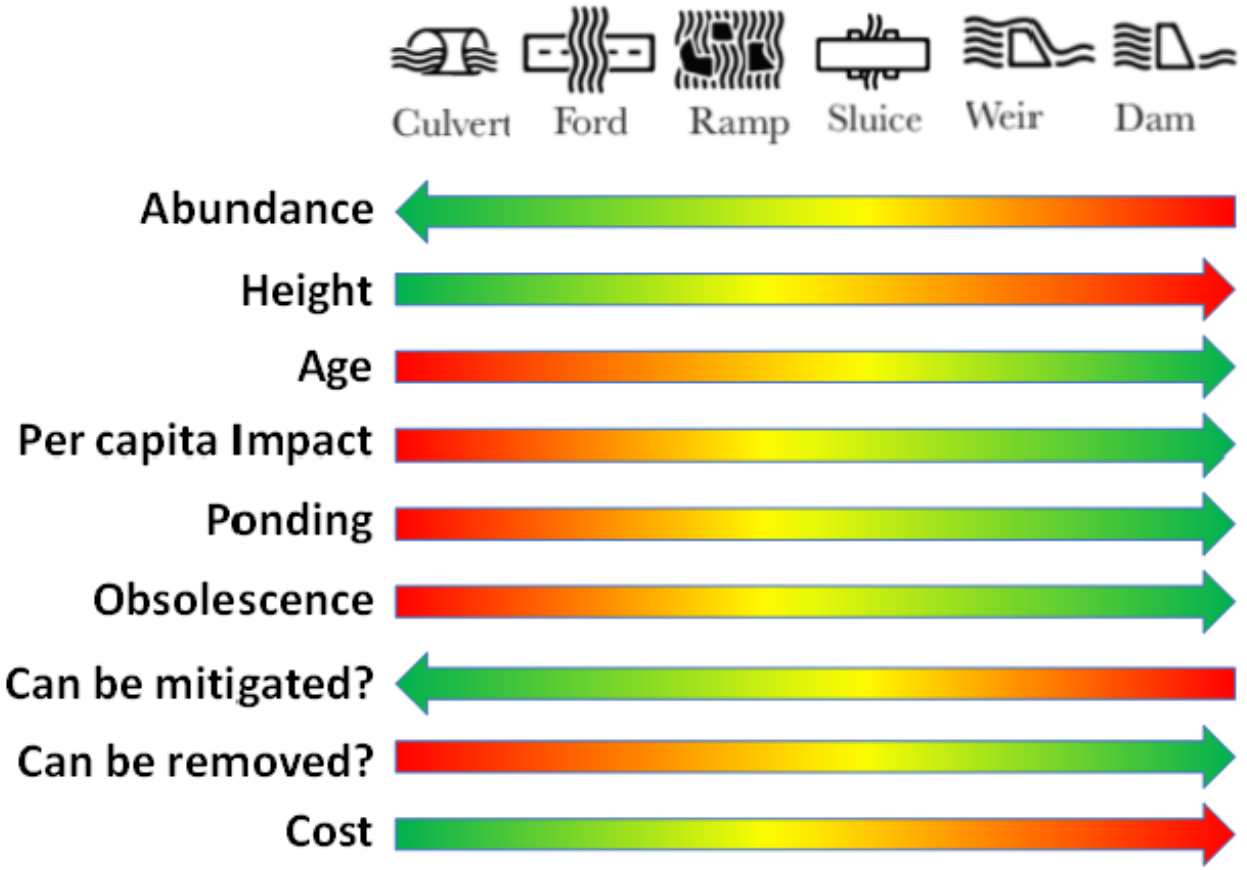


Figure 2. Characteristics of different barrier types and how these can affect decisions about barrier removal. The direction of arrows represent an increase in a given trait and the color the benefit or suitability of removal (note these are only indicative).

Barrier Prioritizing Methods

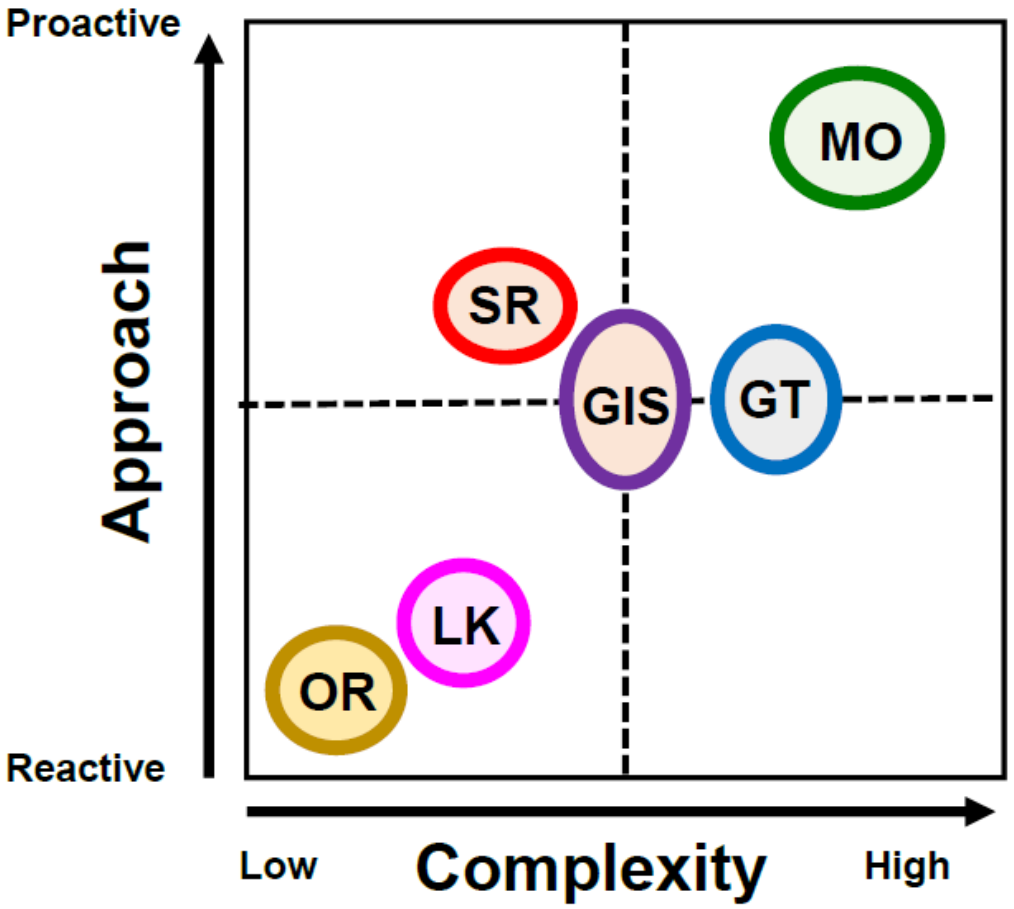


Figure 3. Classification of the main barrier prioritization methods according to their complexity and type of approach. OR - opportunistic response; LK - local knowledge & expert opinion; SR - scoring and ranking; GIS - GIS scenario analysis; GT - graph theory; MO - mathematical optimization.

- 29 habitat connectivity metrics
- 13 flow alteration metrics
- 6 main prioritization methods

OR – Opportunistic Response

- Informal method
- Reactive
- Passive
- No need for forward planning
- Easy
- Assumes all removals bring some benefits
- Can be very inefficient
- Used by American Rivers in response to owners' safety concerns

LK – Local Knowledge (Expert Opinion)

- Informal method
- Widely used
- Emphasizes impacts
- Little need for forward planning
- Easy
- Good stakeholder involvement (but only among ‘experts’)
- Assumes all removals bring some benefits
- Subjective and prone to various biases
- Low repeatability (agency– culture)
- Low transparency

SR – Scoring & Ranking

- Most popular formal method
- Typically considers habitat quantity & quality, extent of improvement & cost of fish passage
- Uses benefit-cost ratios: habitat gain / costs
- Barriers are ranked from most to least cost-effective.
- Simple, easy to communicate
- Flexible: new data can be added and barriers re-ranked
- Barriers are treated independently which leads to poor solutions
- Cannot deal with multiple barriers simultaneously
- Does not consider uncertainty

GIS – GIS + Scenario Analysis

- Formal method
- Attributes used as filters to build *what if* scenarios
- Calculates different connectivity metrics and ranks scenarios
- Visually appealing, easy to communicate
- Easy to scale up and handle multiple data layers
- Requires a GIS platform and expertise
- Limited to small spatial domains & limited number of barriers
- Stakeholder involvement and uptake is low
- Choice of attributes to consider can be subjective
- Low repeatability and transparency
- No way of knowing if particular solutions are most cost-efficient

GT – Graph Theory

- Holistic view of river network, considers dendritic river structure
- Accounts for spatial relationships of barriers
- Overcomes many of the limitations of other methods
- Considers interactive effects of barrier mitigation
- Dendritic Connectivity Index (DCI) – barrier passability
- Betweenness Centrality (BC) - barriers are passable or not
- Index of Connectivity (ICC) - barriers are passable or not
- Useful for *what-if* type analyses, but is merely descriptive
- Does not generate (on its own) any optimal solution

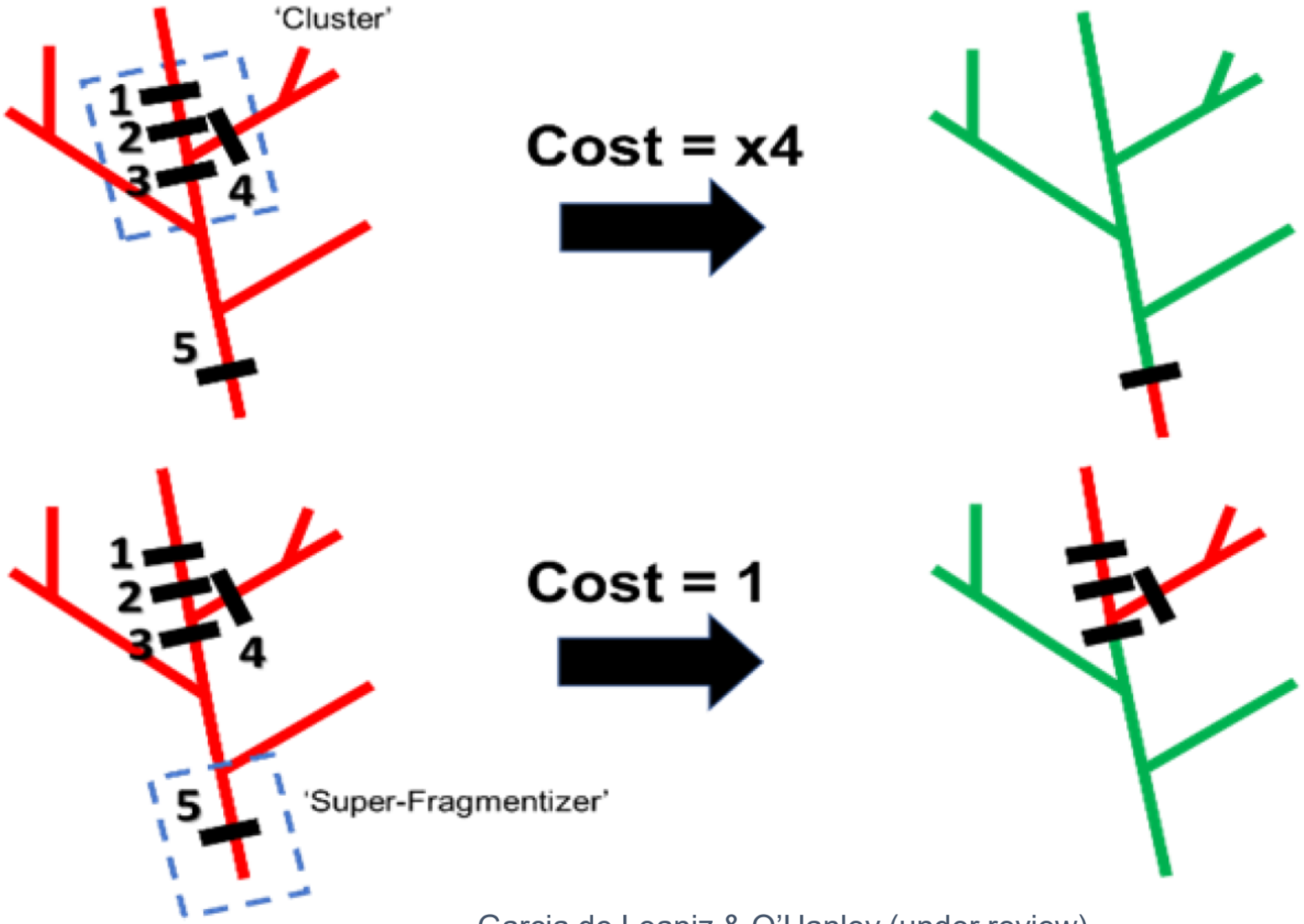
MO – Mathematical Optimization

- Most sophisticated prioritization method, gold standard
- P*rescriptive* approach, recommends a course of action
- Like GT, accounts for spatial structure and interactive effects
- Unlike GT, finds optimal or near optimal solution
- Ensures best possible use of limited resources
- Clear and objective criteria, more transparent and repeatable
- Highly flexible, can balance multiple, competing, goals (e.g. hydro)
- Uncertainty can be incorporated explicitly
- Can be excessively prescriptive and ignores local knowledge
- Difficult, requires expertise (but open source software available)
- To be practical it needs to factor uncertainties and opportunities

Table 1. Characteristics of the six main types of barrier prioritization methods benchmarked by trait (L = Low; M = moderate; H = High)

	Prioritization method					
Trait	**OR**	**LK**	**SR**	**GIS**	**GT**	**MO**
Factor uncertainty	L	L	L	L	L	H
Difficulty	L	L	M	M	M	H
Flexibility	L	M	H	M	M	H
Optimal solution	L	L	L	M	M	H
Multiple objectives	L	L	L	M	M	H
Transparency	H	L	L	M	M	H
Repeatability	L	L	H	M	M	H
Multiple barriers	L	L	L	M	M	H
Stakeholder	M	H	M	L	L	L
Examples	American Rivers (2021)	Fox et al. (2016) Sneddon et al. (2017)	Roni et al. (2002) WDFW (2000)	Barrios (2011) Martin and Apse (2011)	Cote et al. (2009) Segurado et al. (2013)	O'Hanley and Tomberlin (2005) Kuby et al. (2005)

Prioritization strategies to optimize Costs & Benefits

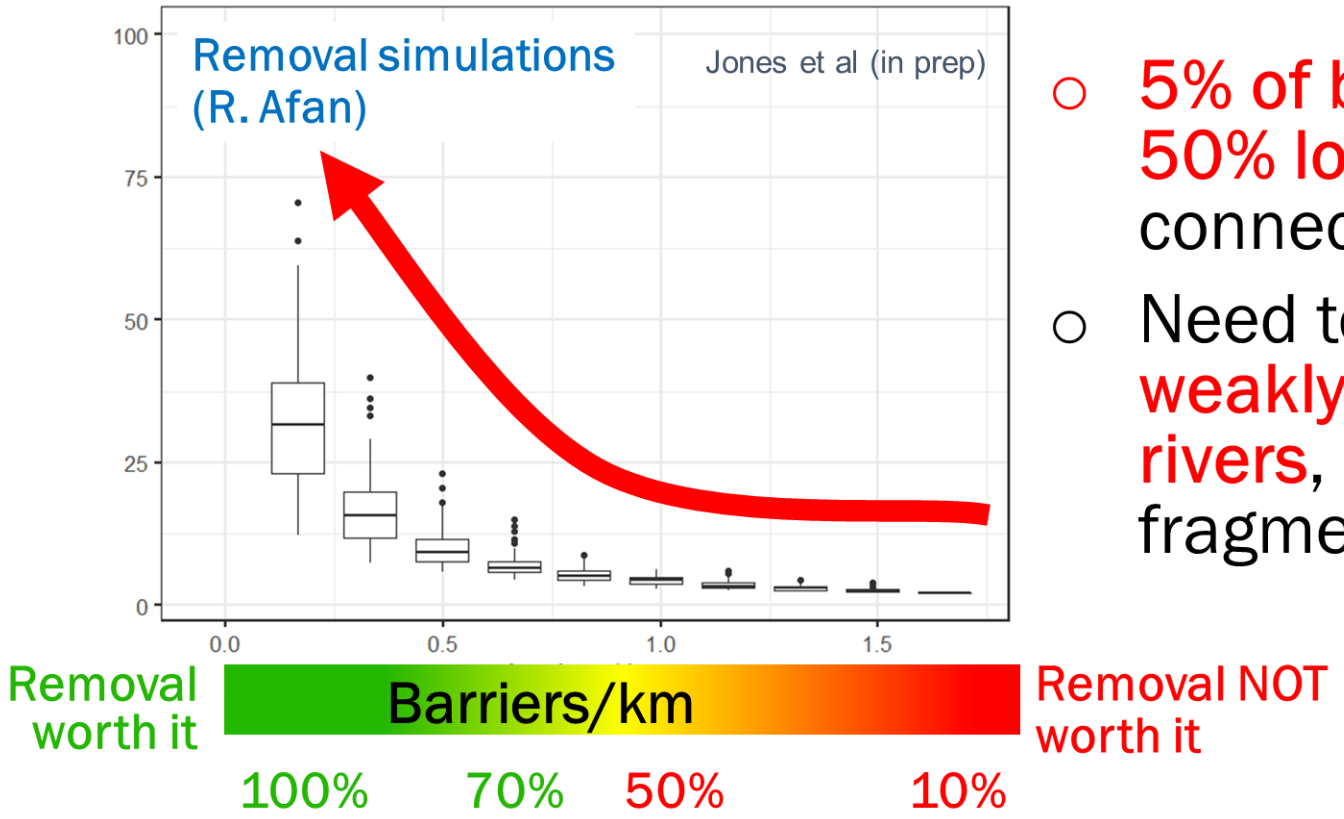


Barriers are NOT randomly distributed, they are **clustered**

"Fragmentizers" can be identified & targeted…

Garcia de Leaniz & O'Hanley (under review)

Example Mathematical Optimization: R. Afan

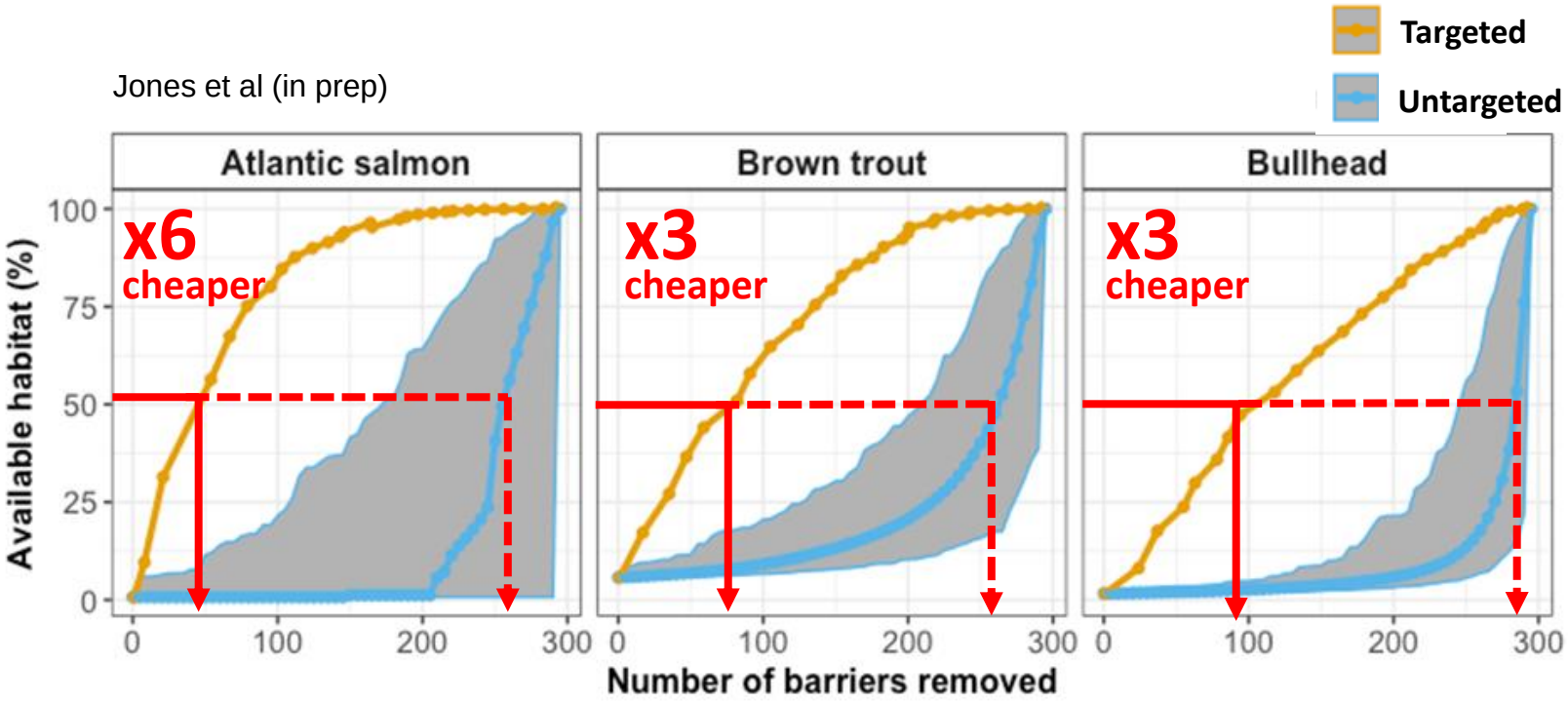


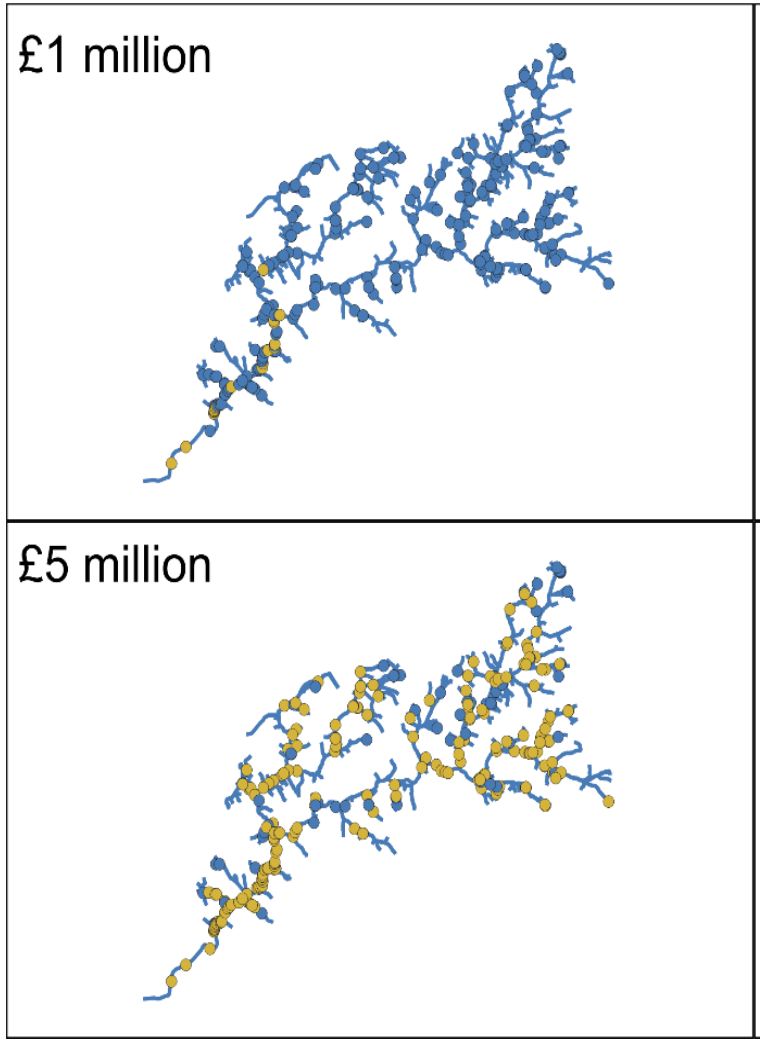
- 5% of barriers cause 50% loss of connectivity
- Need to target weakly fragmented rivers, not heavily fragmented ones

Opportunistic (~random) removals may not increase connectivity to any great extent (but may kick-start it)

Example Mathematical Optimization: R. Afan

Jones et al (in prep)

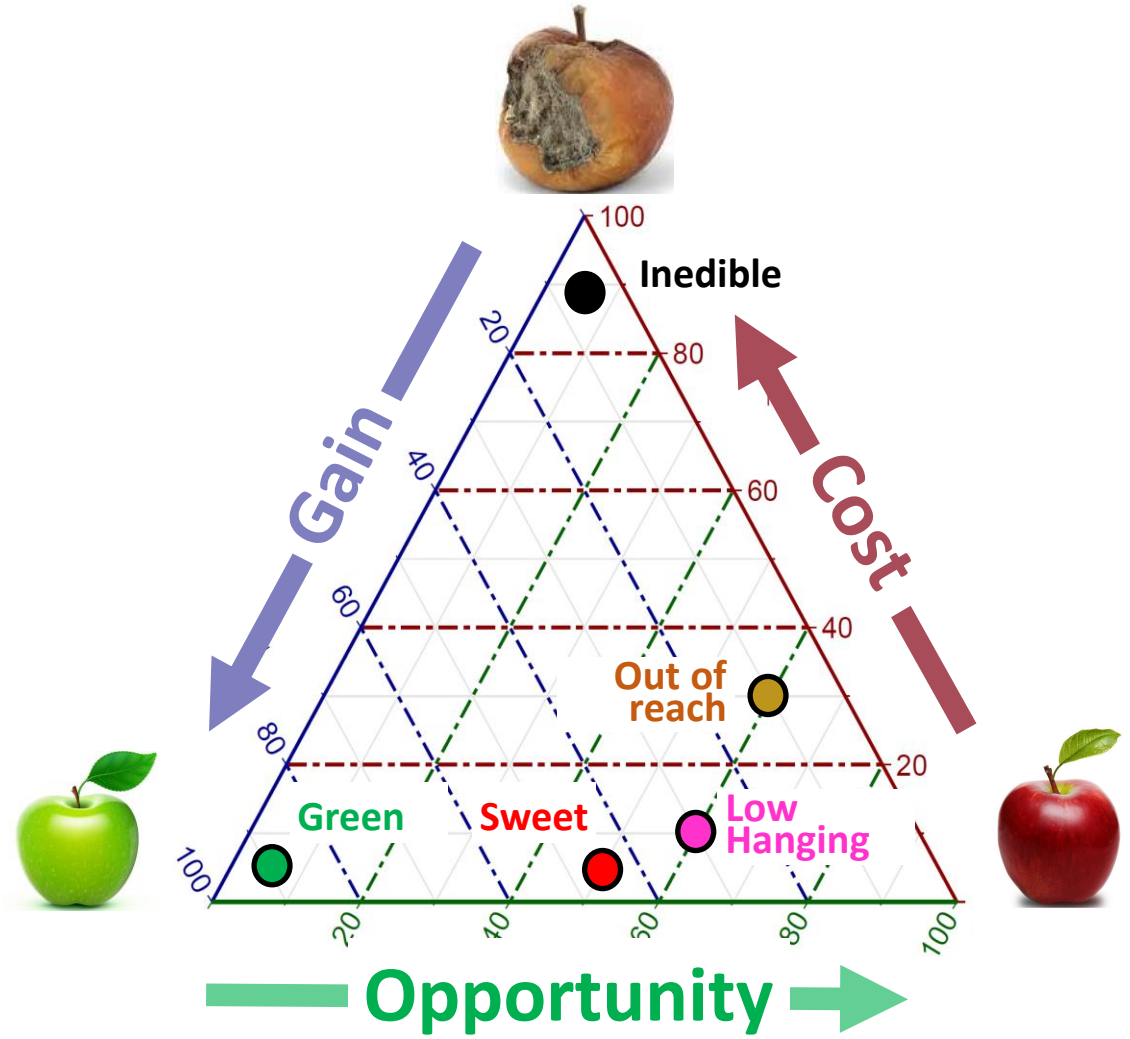




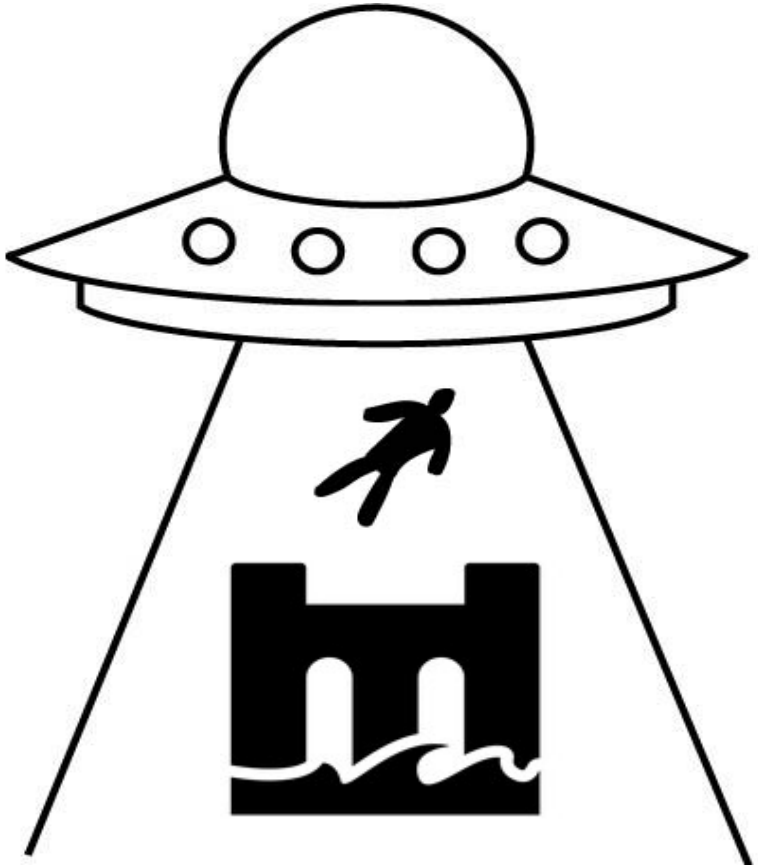
A targeted (optimized) approach is cheaper & yields benefits since 1st removal

Identifying the Low Hanging Fruit

1. Opportunity
2. Cost
3. Gain



Finding the UFOs….

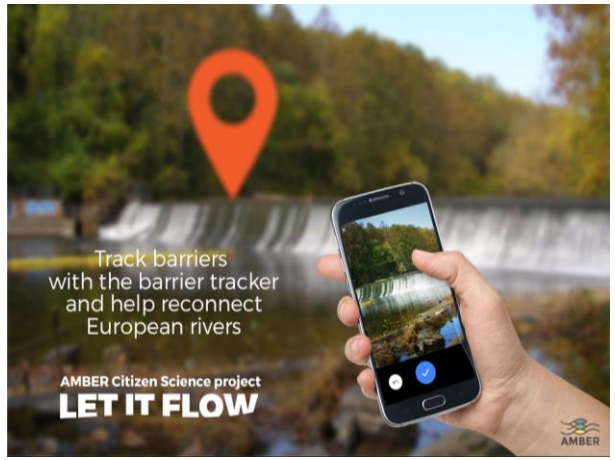


Unwanted

Fluvial

Objects

1. A phone



Barrier Tracker

2. A bottle

eDNA

AMBER Barrier Tracker https://amber.international/

Download on the App Store

GET IT ON Google Play

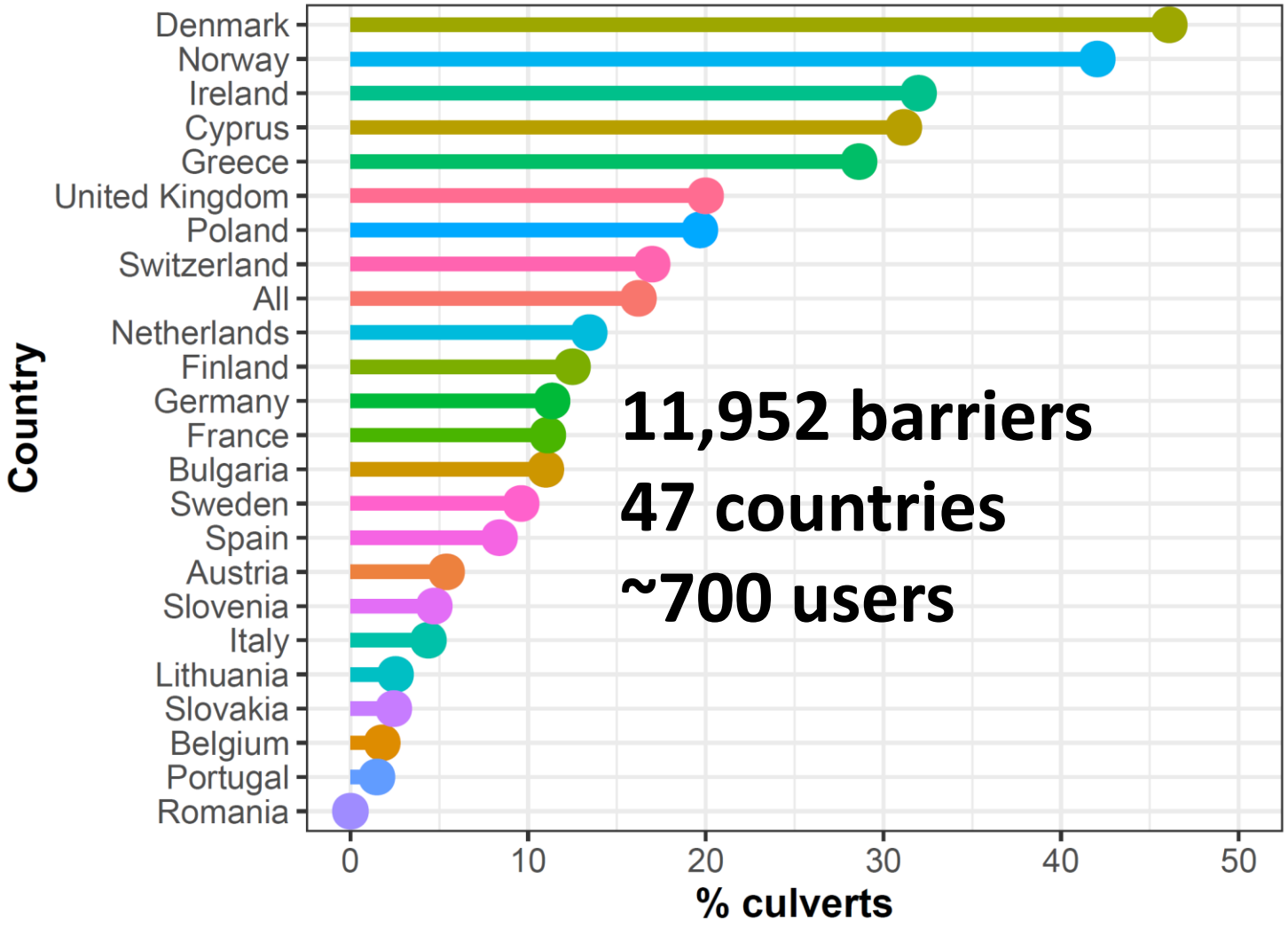
FREE, no adverts

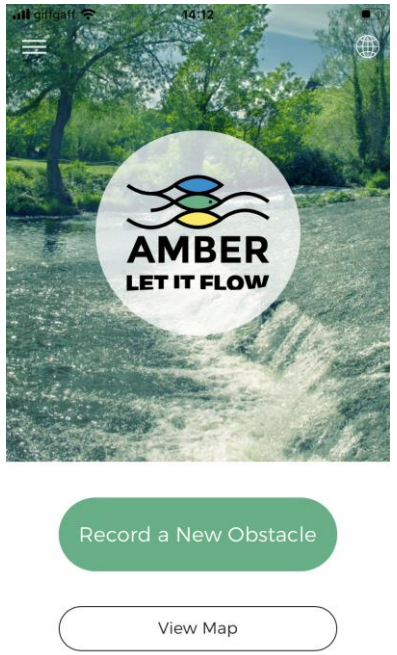
12 languages: Danish, Dutch, English, French, German, Italian, Polish, Portuguese, Spanish, Slovenian and Ukranian & Norwegian, now also in **Welsh**

All your records are downloadable…

View all **App recorded barriers** and the **Atlas data**

Citizens are finding small unmapped barriers everywhere..many are obsolete





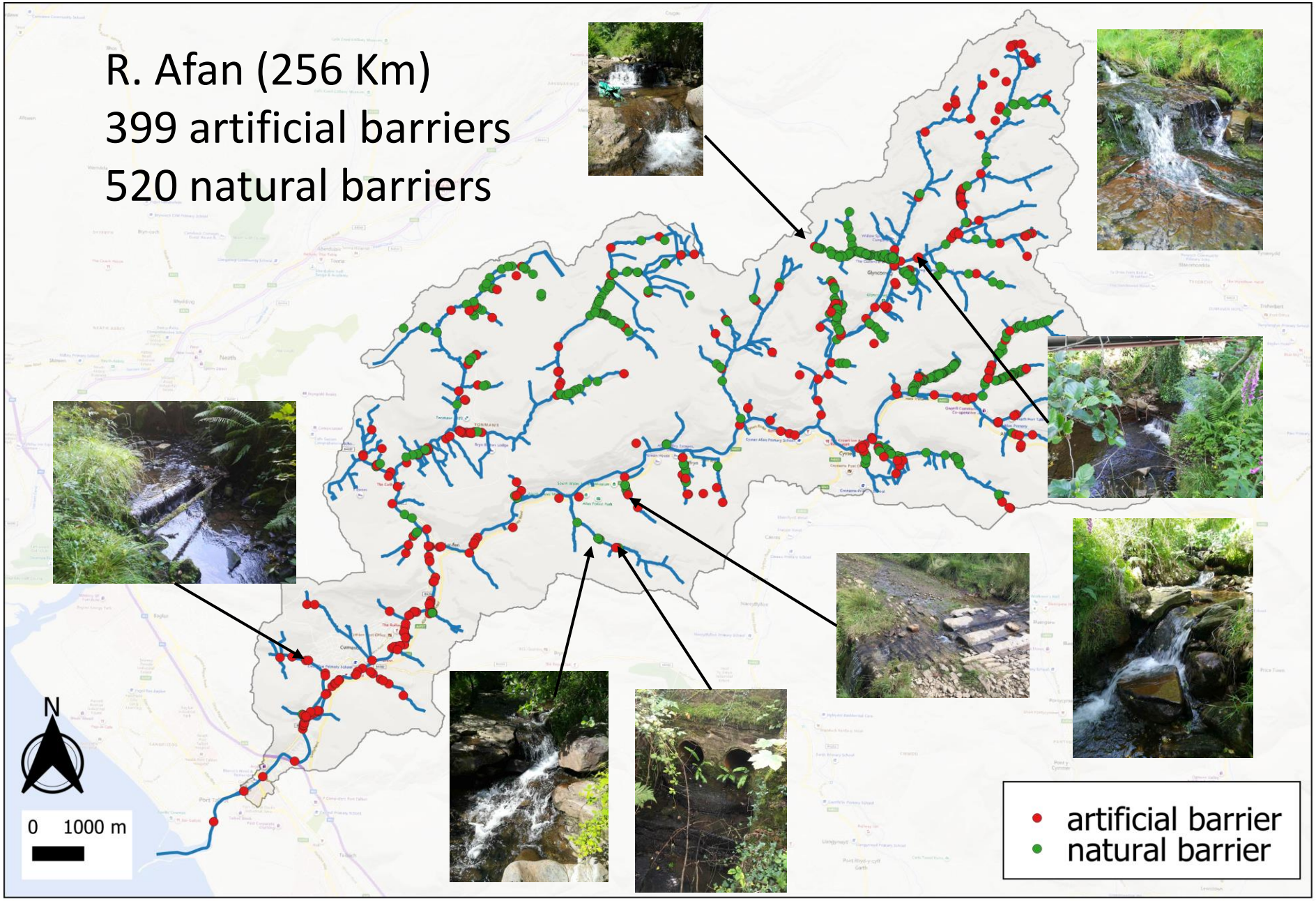
Using eDNA to identify the most limiting barriers

SPONSERED BY THE NATURE NETWORKS FUND

Ariennir gan Lywodraeth Cymru
Funded by Welsh Government

RECONNECTING THE SALMON RIVERS OF WALES

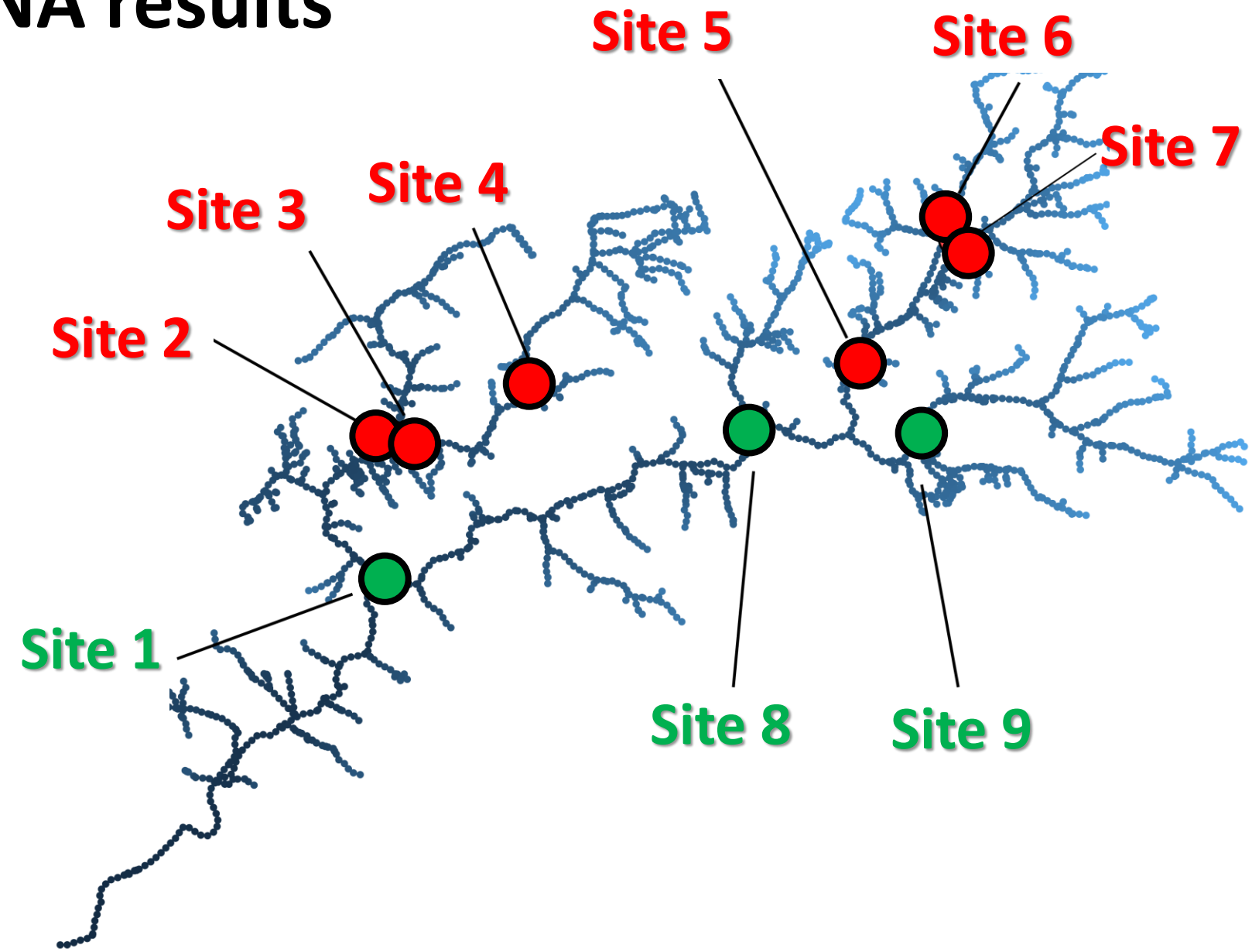
The water can tell…



Example 1

Which barriers limit salmon?

eDNA results



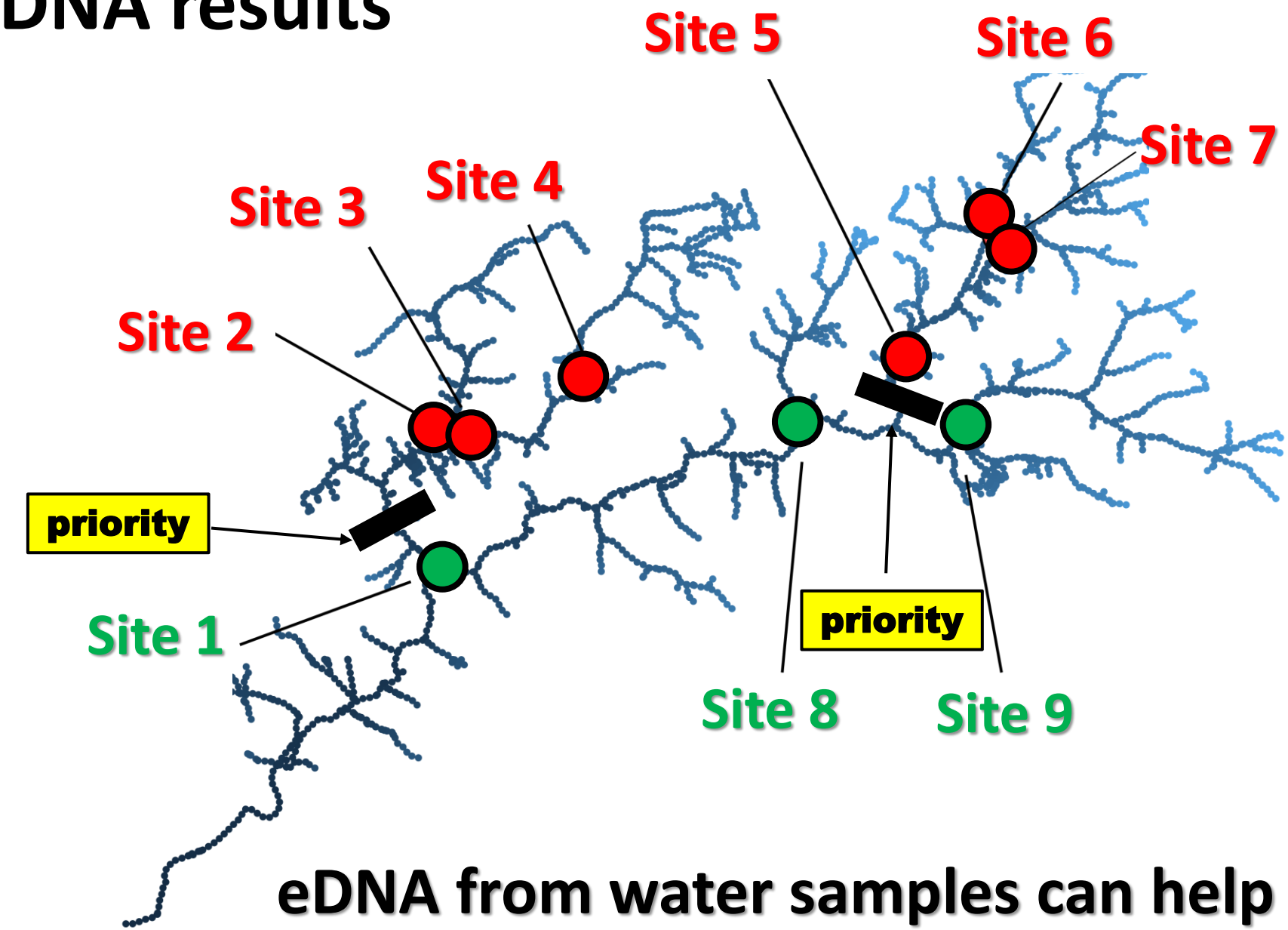
1L water samples

Salmon present

Salmon absent

Brown trout used as internal control

eDNA results



1L water samples

Salmon present

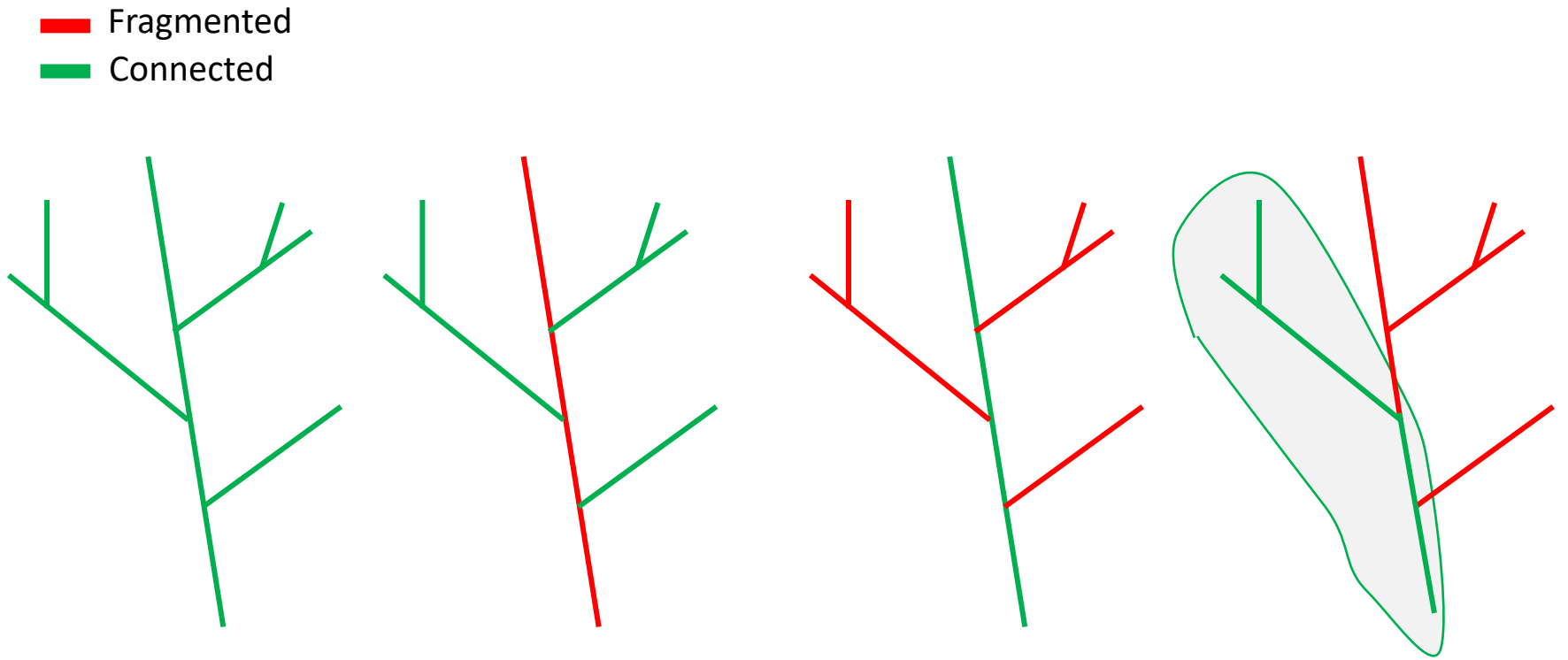
Salmon absent

Brown trout used as internal control

eDNA from water samples can help prioritize barriers!

How should we reconnect rivers? the FRU concept

Functional
River Unit



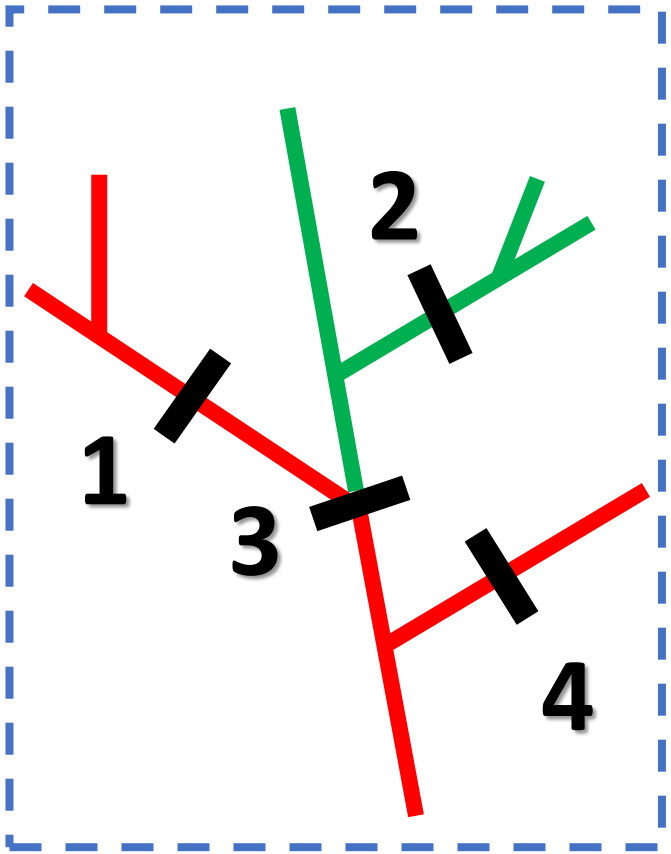
OK all catchment connected

NOT OK only tributaries connected

NOT OK only main stem connected

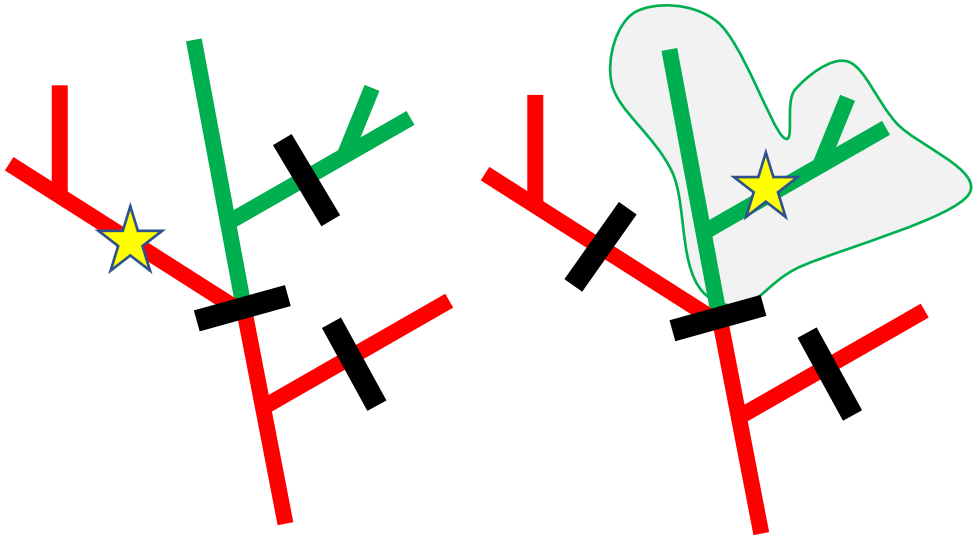
OK continuum preserved, main stem + key tributaries

Reconnecting FRUs



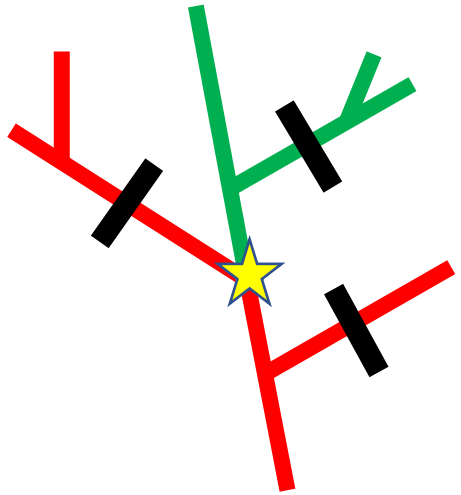
Poor quality

Good quality (GES, GEP)

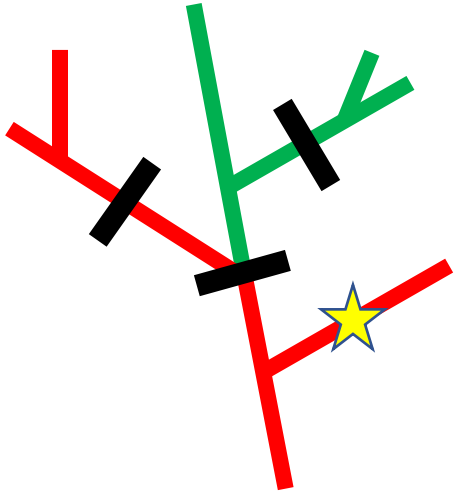


1 – No gain

2 – Gain



3 – No gain



4 – No gain

Garcia de Leaniz et al (2021). EC Guidance

Some practical guidance

1. Use a multi-stage spatial approach Long-list > Short-list
2. Ground truth pre-selected basins
3. Consider whole river continuity, not just particular taxa
4. Emphasize reconnection of good habitats (WFD)
5. Work towards 25K strategy, use EC guidance

www.amber.international


Many thanks
Any Questions?

WEST WALES RIVERS TRUST

YMDDIRIEDOLAETH AFONYDD GORLLEWIN CYMRU

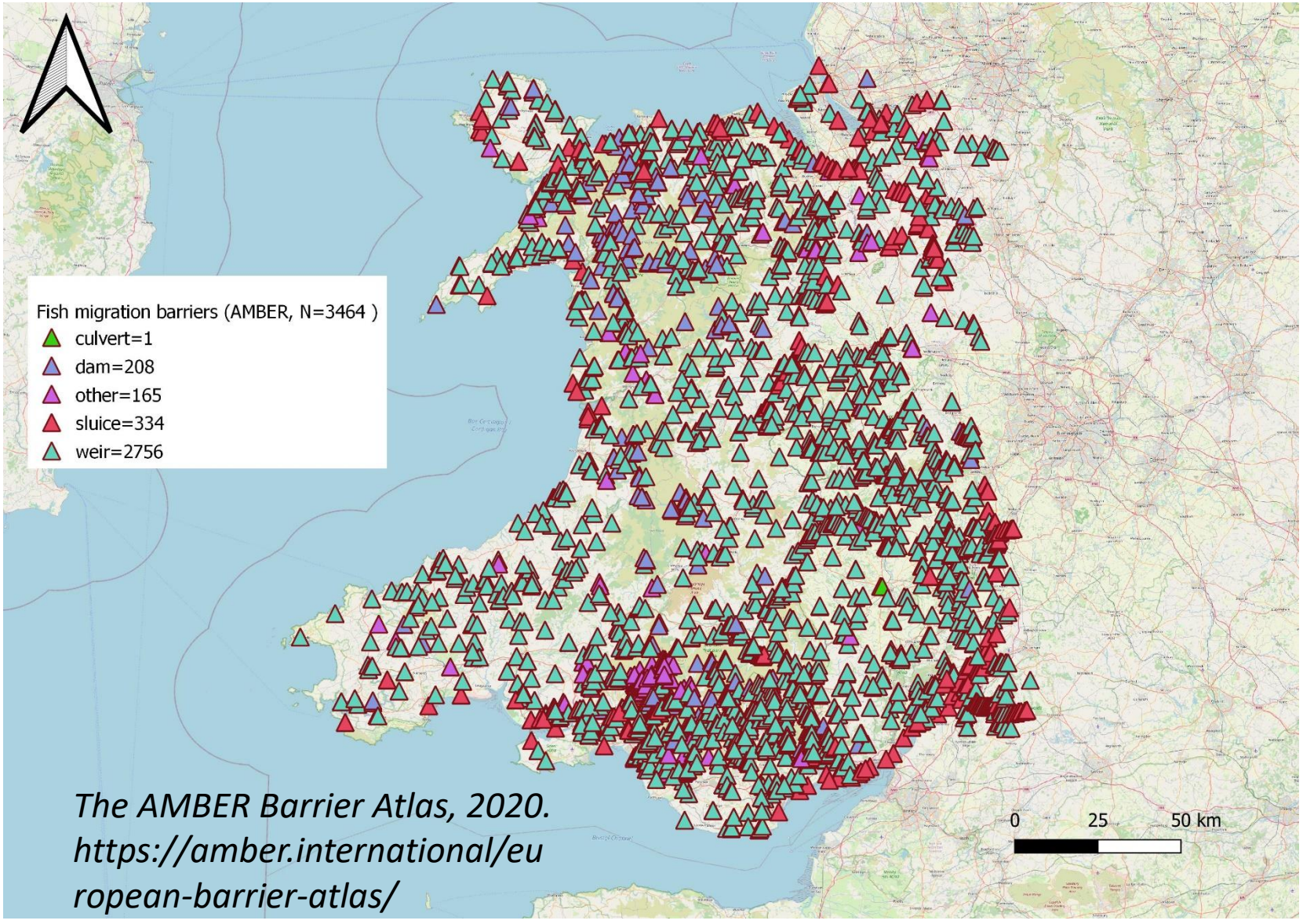
Removing different types of barriers

Alex Lumsdon

Barrier removal bootcamp 20.06.22

Removing different types of barriers

Barrier type and distribution in Wales (WFD operational Areas)



The AMBER Barrier Atlas, 2020. https://amber.international/european-barrier-atlas/

Removing different types of barriers

Physical barrier types

Culvert

Ford

Weir

Dam

Sluice

2. Practical examples: Cleddau Ddu

Removing different types of barriers

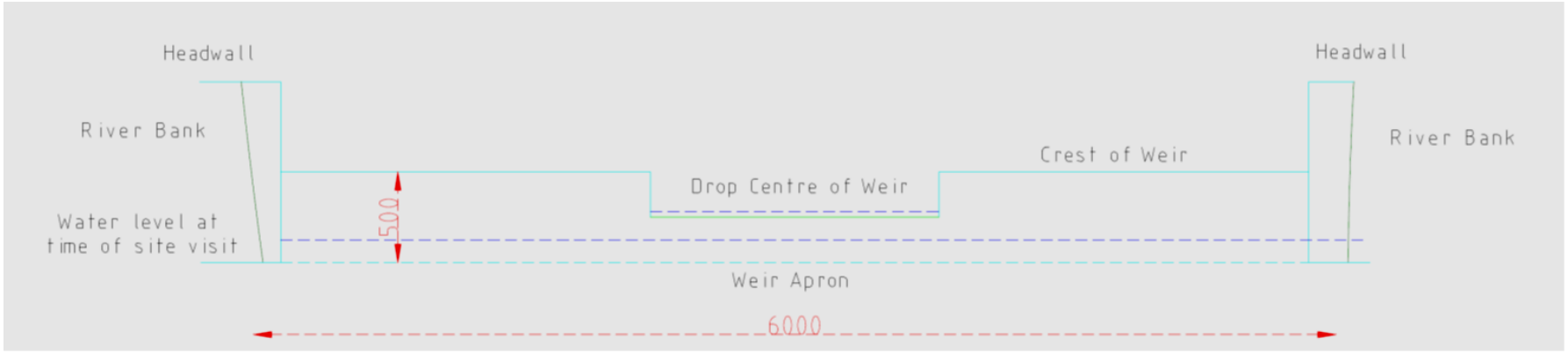
Size isn't everything

2. Practical examples: Cleddau Ddu

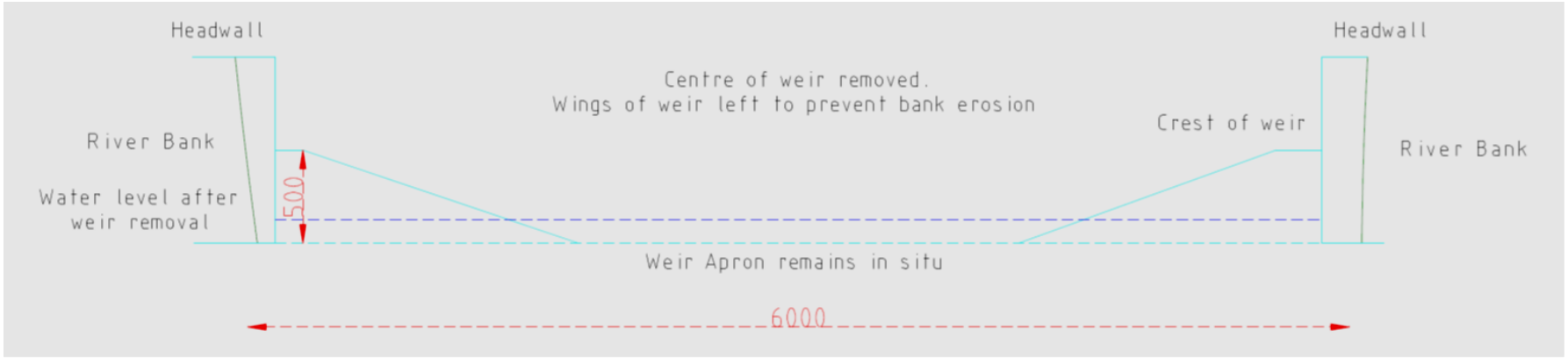
Removing different types of barriers

Basic designs

Before…



After…

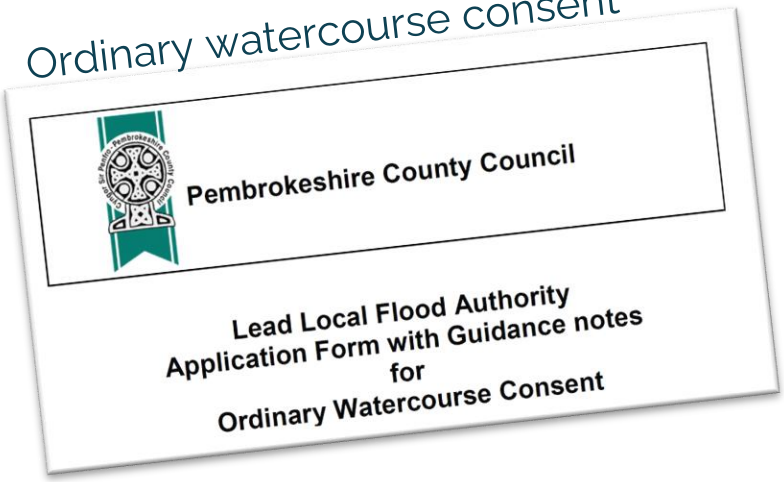


2. Practical examples: Cleddau Ddu

Removing different types of barriers

Paperwork…

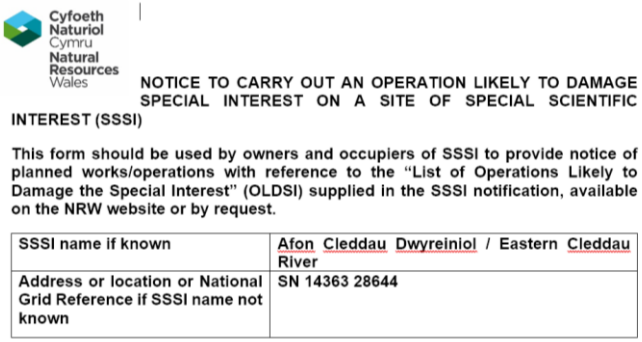
Ordinary watercourse consent



Pembrokeshire County Council

Lead Local Flood Authority
Application Form with Guidance notes
for
Ordinary Watercourse Consent

SSSI consent



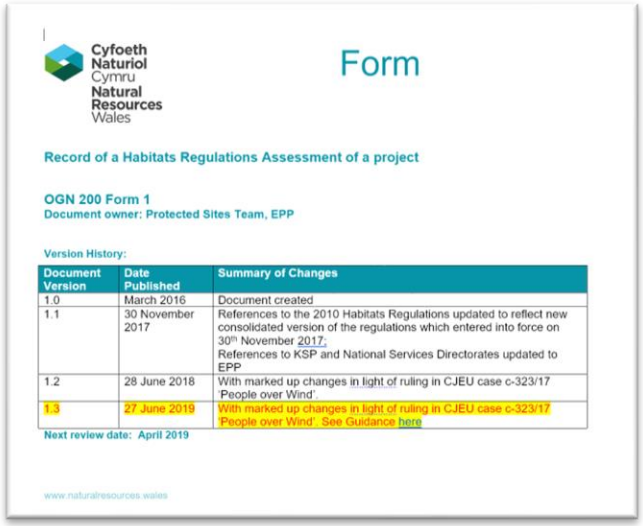
Cyfoeth Naturiol Cymru Natural Resources Wales

NOTICE TO CARRY OUT AN OPERATION LIKELY TO DAMAGE SPECIAL INTEREST ON A SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI)

This form should be used by owners and occupiers of SSSI to provide notice of planned works/operations with reference to the "List of Operations Likely to Damage the Special Interest" (OLDSI) supplied in the SSSI notification, available on the NRW website or by request.

SSSI name if known	Afon Cleddau Dwyreiniol / Eastern Cleddau River
Address or location or National Grid Reference if SSSI name not known	SN 14363 28644

Habitat regs assessment



Cyfoeth Naturiol Cymru Natural Resources Wales

Form

Record of a Habitats Regulations Assessment of a project

OGN 200 Form 1
Document owner: Protected Sites Team, EPP

Version History:

Document Version	Date Published	Summary of Changes
1.0	March 2016	Document created
1.1	30 November 2017	References to the 2010 Habitats Regulations updated to reflect new consolidated version of the regulations which entered into force on 30th November 2017; References to KSP and National Services Directorates updated to EPP
1.2	28 June 2018	With marked up changes in light of ruling in CJEU case c-323/17 'People over Wind'.
1.3	27 June 2019	With marked up changes in light of ruling in CJEU case c-323/17 'People over Wind'. See Guidance here

Next review date: April 2019

www.naturalresources.wales

Impoundment license?

Low risk impoundments

In this section

1. Impoundments which don't need a licence
2. Will your activity result in a change in the flow or level of the water?
3. Is your proposed activity low risk?
4. Examples of low risk impoundments
5. Checklist to help you decide if your impoundme is low risk
6. Emergency impoundments

By law you must have an impoundment licence before you start to construct, alter, repair or remove an impoundment structure.

Some activities have little impact on the flow or levels of water even in low flow conditions. Where these impoundments have little or no impact on the environment and other water users, you may not need a permit for these activities.

You can still apply for an impoundment licence if you prefer to have one. You may need to do this for some accreditation schemes.

If you conclude that you do not need to apply to us for a licence, you should keep a copy of your checklist and supporting evidence (for example, before and after photos and measurements) for your own records. It is evidence that you have carried out an assessment and documents your decision that you do not need to apply for an impoundment licence. We may request that you provide a copy to us.

You may still need to apply for other consents or permits. Find out about other permits and permissions.

Before you start work on an existing structure you will need to find out:

- if there is a licence already issued or going to be issued - we can help you do this
- who owns the structure and seek their permission to do the work or take over an existing licence

Impoundments which don't need a licence

There are several exemptions where an impoundment licence is not needed. These

2. Practical examples: Cleddau Ddu

Removing different types of barriers

Ready to go…

2. Practical examples: Cleddau Ddu

Removing different types of barriers

Going...

2. Practical examples: Cleddau Ddu

Removing different types of barriers

Going...

2. Practical examples: Cleddau Ddu

Removing different types of barriers

Gone…

RECONNECTING THE SALMON RIVERS OF WALES

WEST WALES RIVERS TRUST

Cyfoeth Naturiol Cymru Natural Resources Wales

Swansea University Prifysgol Abertawe

2. Practical examples: Ford on Cartlett brook

Removing different types of barriers

A bridge too far…

2. Practical examples: Ford on Cartlett brook

Removing different types of barriers

A bridge too far…

2. Practical examples: Ford on Cartlett brook

Removing different types of barriers

Connectivity restored…

2. Practical examples: Ford / Weir on Wyre at Llanrystud

Removing different types of barriers

Weir, Ford and Water-pipe in one!

2. Practical examples: Ford / Weir on Wyre at Llanrystud

Removing different types of barriers

Weir, Ford and Water-pipe in one!

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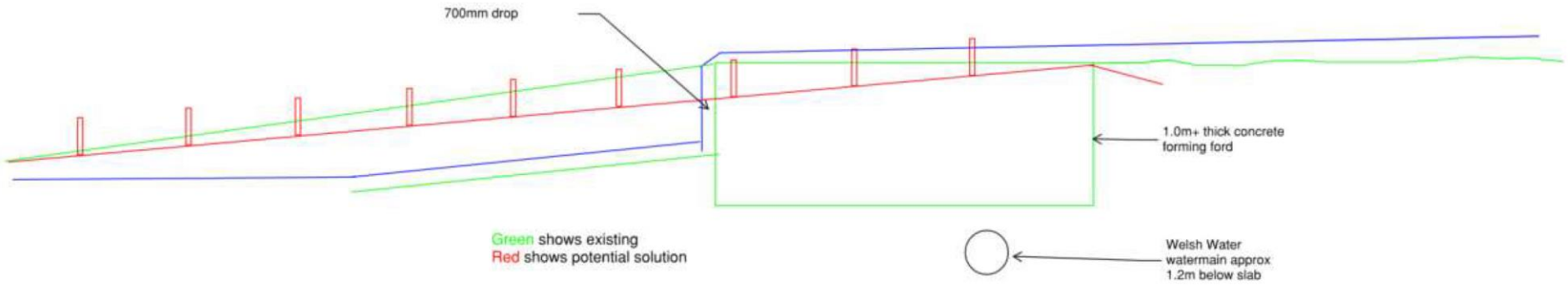
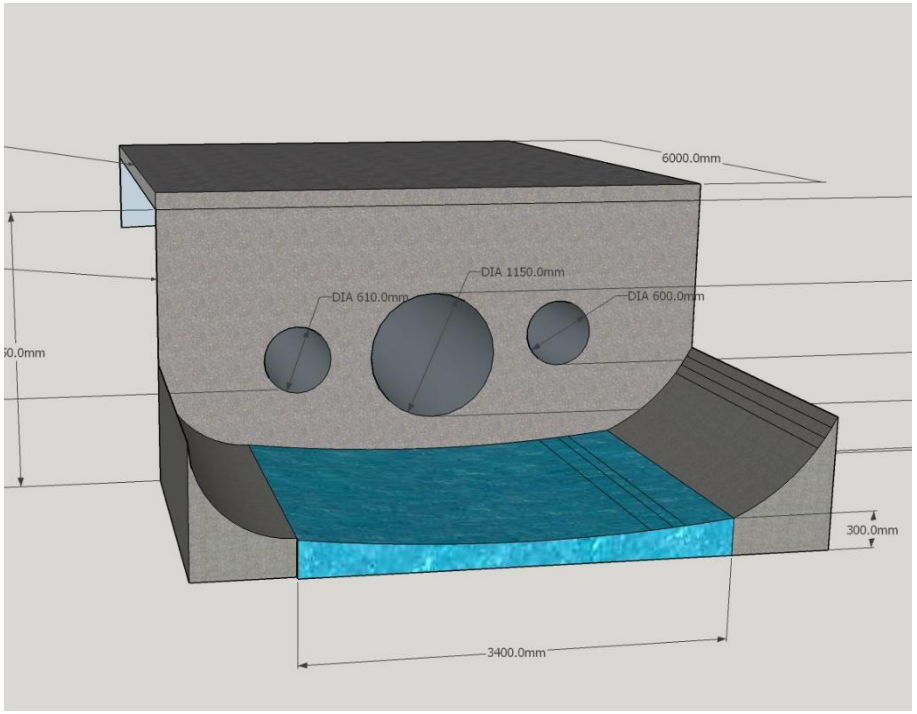
Removing different types of barriers

Weir, Ford and Water-pipe in one!



Removing different types of barriers

Proposed bottomless culvert installation



2. Practical examples: removal of culvert on Dulais tributary

Removing different types of barriers

Proposed bottomless culvert installation

Credit: Mark Weinhold, US forest service

2. Practical examples: River Dove, Derbyshire

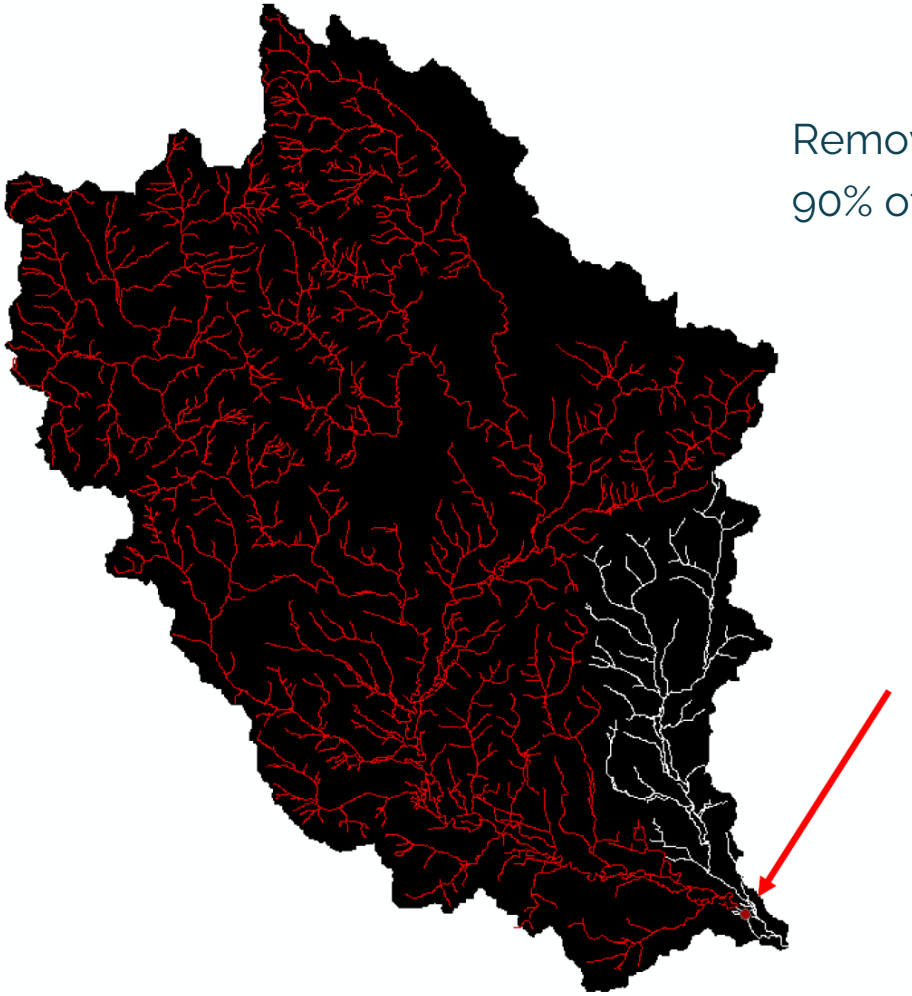
Removing different types of barriers

Dovecliff weir

Credit: Christopher Grzesiok, Environment Agency

2. Practical examples: River Dove, Derbyshire

Removing different types of barriers



Removing this weir would open up 90% of the Dove catchment

Credit: Christopher Grzesiok, Environment Agency

2. Practical examples: River Dove, Derbyshire

Removing different types of barriers

Site setup

Work began in September 2019

Credit: Christopher Grzesiok, Environment Agency

2. Practical examples: River Dove, Derbyshire

Removing different types of barriers

Archaeological discoveries

Winter 2019: medieval timbers discovered

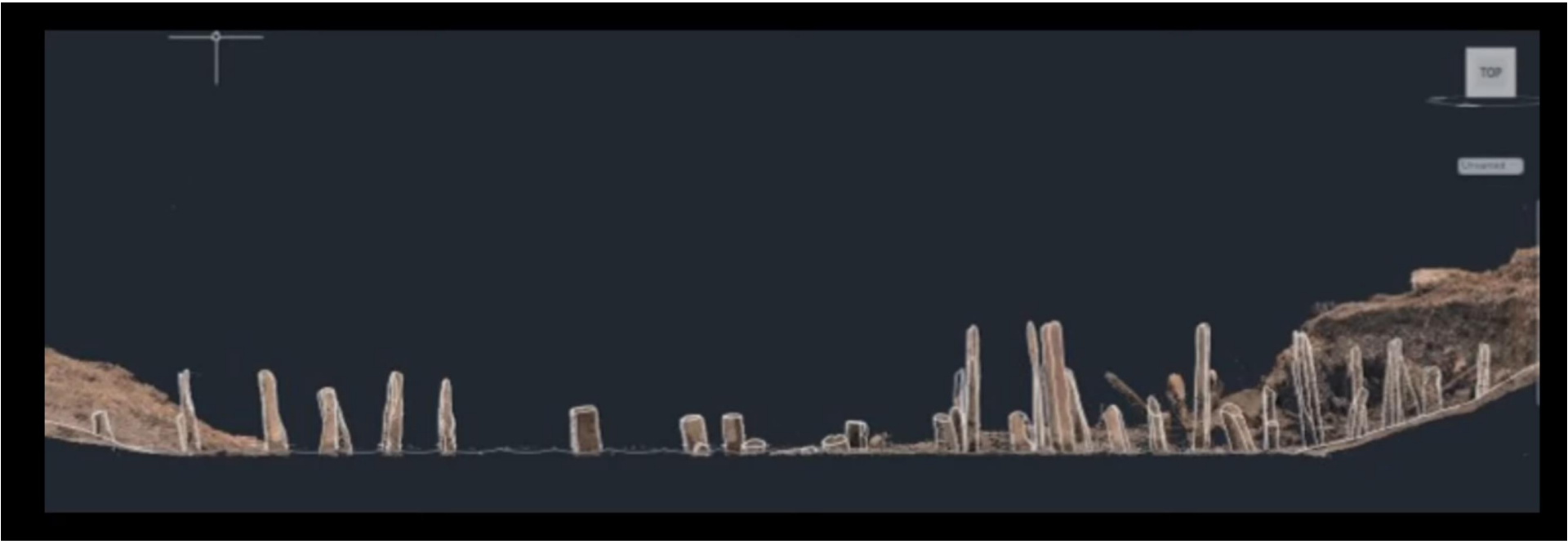
Credit: Christopher Grzesiok, Environment Agency

2. Practical examples: River Dove, Derbyshire

Removing different types of barriers

Archaeological discoveries

These were painstakingly recorded using laser scanning technology



Credit: Christopher Grzesiok, Environment Agency

2. Practical examples: River Dove, Derbyshire

Removing different types of barriers

Completed September 2021

Before

After

Credit: Christopher Grzesiok, Environment Agency

3. Summary

Removing different types of barriers

- No two barriers the same
- Greater need to monitor, report and share our findings
- Barrier removal is risky business, but ‘the biggest risk is not taking any risk. Constant experimentation is the only way to reduce risk.’

Any questions?

Please let minnow!

Thanks for listening

alex@westwalesriverstrust.org

‘West Wales Rivers Trust’

@WestWalesRT

@westwalesriverstrust

West Wales Rivers Trust

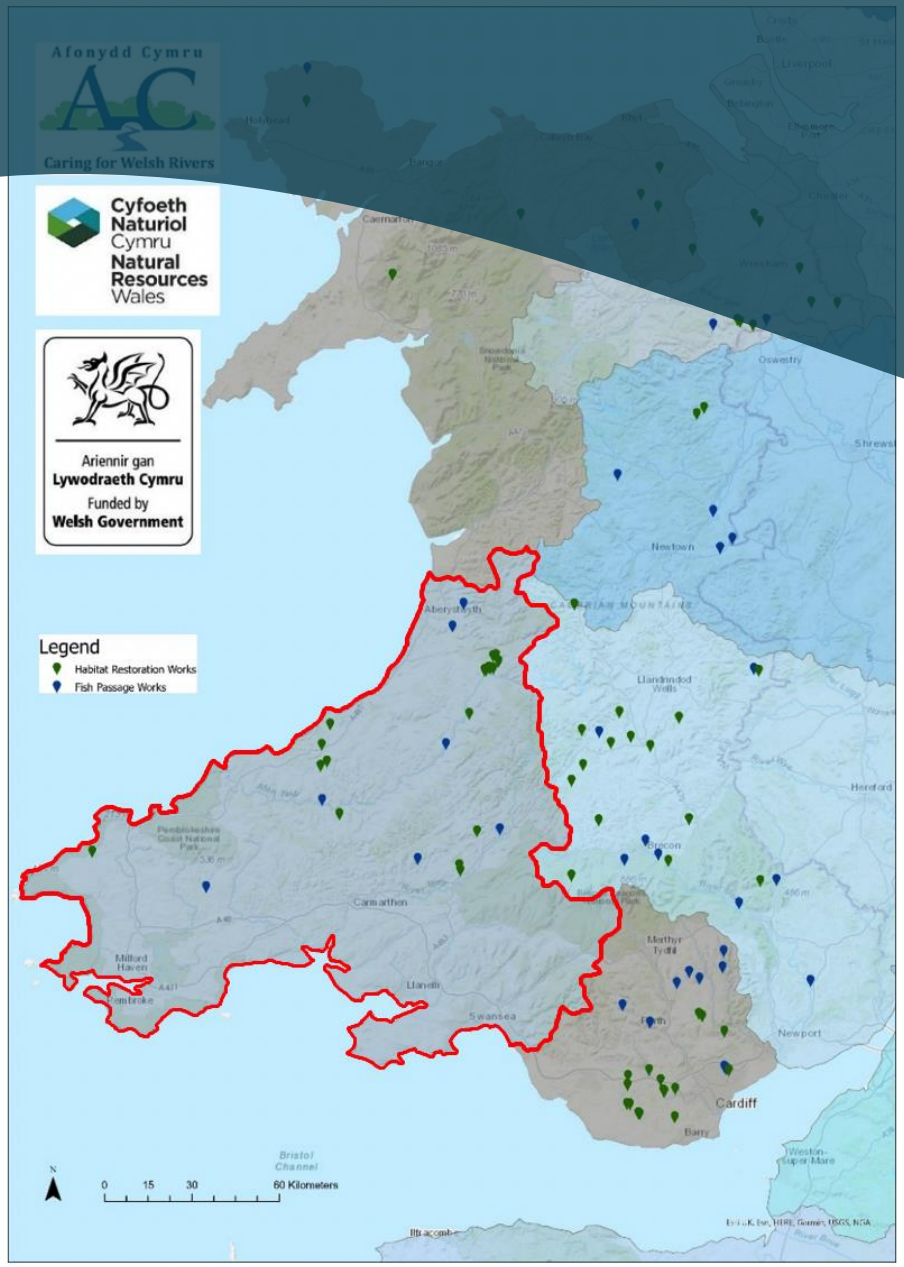


Figure 1 All Fisheries Passage Easement & Habitat Restoration Works Undertaken 2020-2021

- Formed in 2017 with the aim of restoring and safeguarding the rivers, lakes and wetlands of Pembrokeshire, Carmarthenshire and Ceredigion and Swansea.
- The objectives of the Trust are to:
- Promote awareness of environmental issues and best practice
- Promote recreational enjoyment of rivers, lakes and wetlands
- Undertake research and practical work to help restore damaged habitats

Removing different types of barriers

What is a barrier?

Removing different types of barriers

What is a barrier?

Removing different types of barriers

What is a barrier?

Afonydd Cymru
The Rivers Trusts of Wales

Caroline Orr. MSc.
Senior Project Manager
caroline@afonyddcymru.org

afonydd cymru
caring for welsh rivers

www.afonyddcymru.org @AfonyddCymru

Afonydd Cymru – The Rivers Trusts of Wales

Caring for Wales Rivers

Afonydd Cymru (AC) is the umbrella body that represents the six Rivers Trusts in Wales.

We represent the Trusts with Natural Resources Wales and Welsh Government but above all, we champion of Wales' thirty-three rivers, and the many lakes and smaller watercourses.

What's the role of Afonydd Cymru in the fight for our rivers?

- Press Welsh Government to bring the deplorable levels of agricultural pollution and other land use issues to within safe levels at the very earliest opportunity
- **Support the six Trusts and assist with their development.**
- **Seek funding to continue restoration and maintenance of our rivers, fisheries and freshwater ecosystems**
- Keep relevant information flowing
- Develop the economic and employment benefits of successful river restoration.
- Increase access and availability

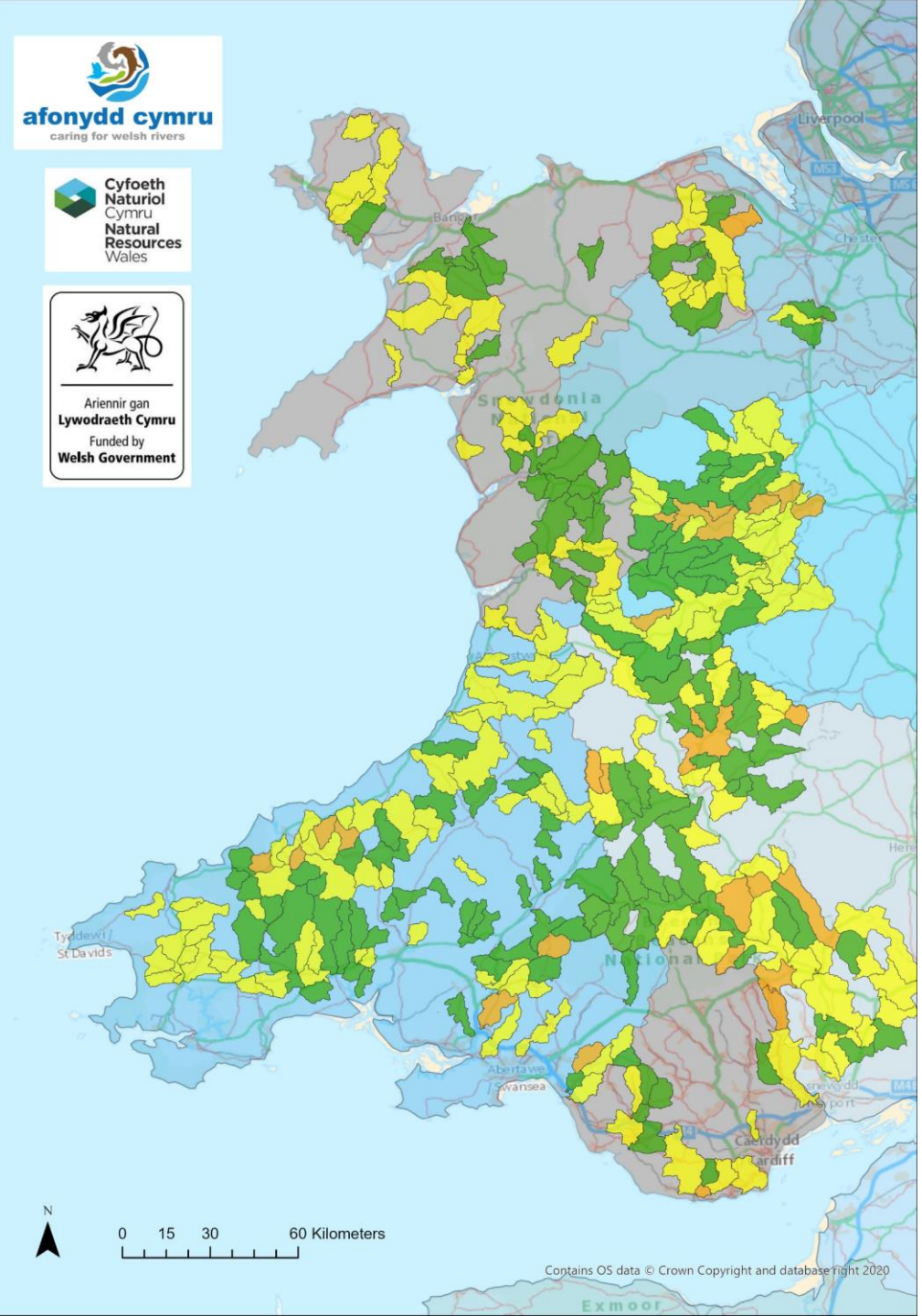
www.afonyddcymru.org

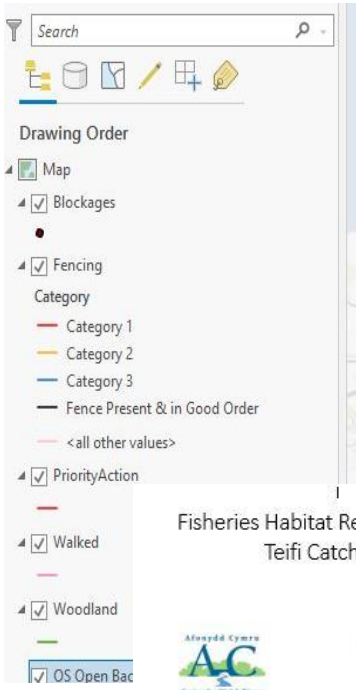
Fisheries Habitat Restoration Project (2017-Date):

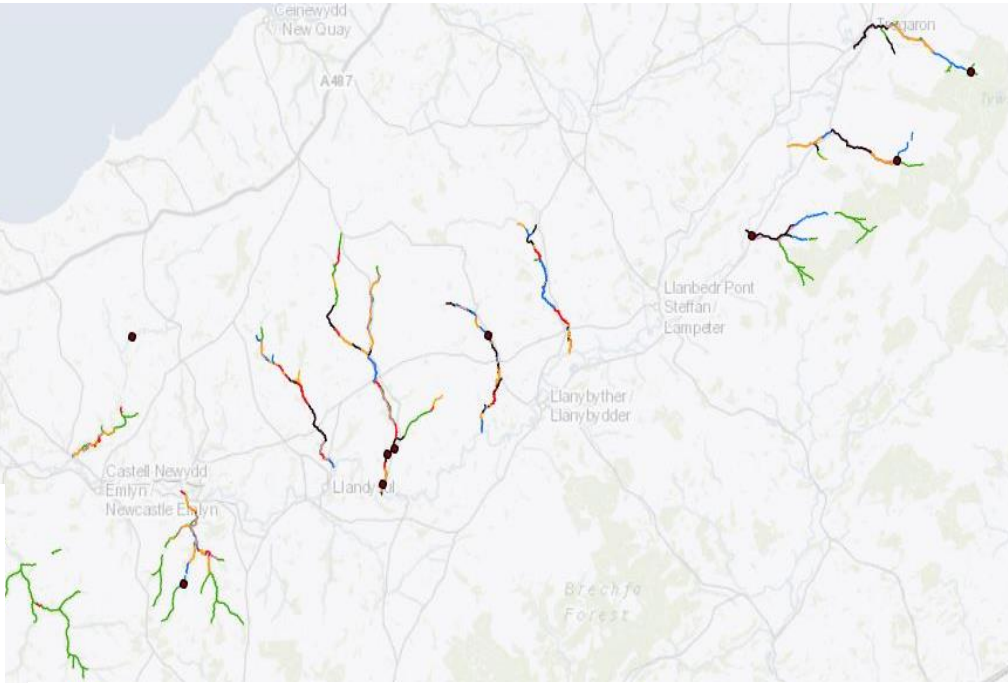
40 priority catchments surveyed. 1516 km walked in 2020. 3461.5 km walked in 2021

Comprehensive catchment reports & GIS map

Opportunities identified and prioritised.





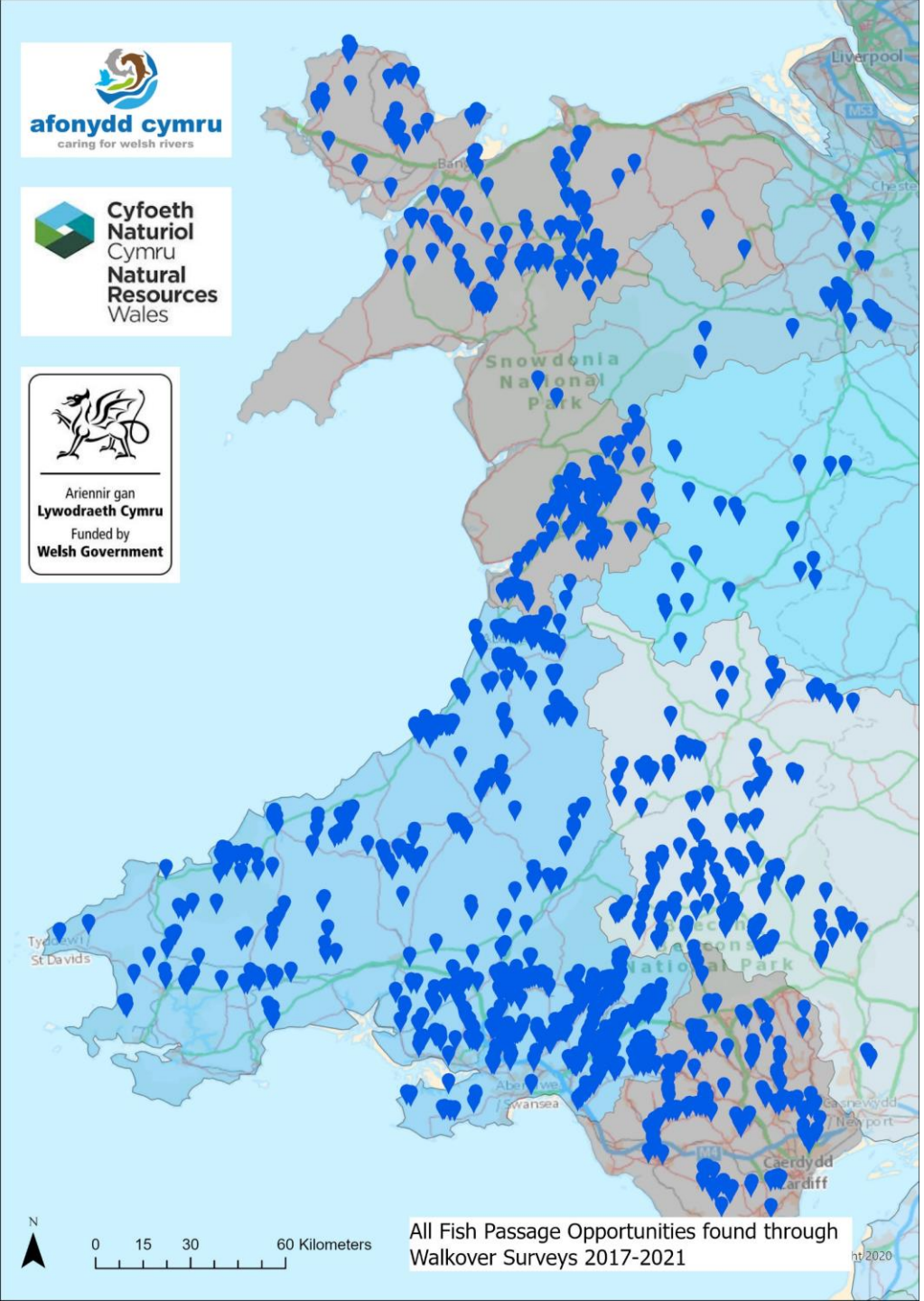


Fisheries Habitat Restoration Plan:
Teifi Catchment

October 2018

Prioritisation for action of sites identified in the Teifi Survey

Site: River and GR	Owners Name and holding	Action Proposed	Consent	Notes
Brefi, Dulas culvert SN 69392 54188	Ifan Jones Foelallt	Break up/ removal of three old culverts formerly used as bridge, now redundant	Yes	Complete barrier at present, some 'new' habitat u/s but very cost effective to achieve free passage.
Brefi SN 68091 54539 to SN 69341 54171	Ditto	Tree planting to keep river cool	Yes	Trees will need protection Keeping Rivers Cool
Brefi SN 67317 54733 to SN 68086 54565	Morlais Pugh Prysg	Do	ongoing	Fence already present but currently treeless KRC
Clywedog SN 63724 50726	Mr Horwood Glan y afon	Design and build Pool and Weir easement	Part	Substantial concrete weir used to support road bridge. Easement would be built on true LHS. No access for machine. No information about historic fish passage. Owner of adjacent garden has never seen fish get over. Downstream clear to Teifi and fenced out
Grannell n/a SN 52238 49908 to SN 51852 50569	Mr Davies	Double bank fencing	No!	Declined fencing offer. Can NRW change his mind?
Grannell SN 53526 47378 to SN 53001 47984	Mr Lyn Jones Neuadd Fawr	Fence owners lower two fields. NB his father owns the next section but declined fencing		Recent breakthrough of ox bow is causing massive erosion. May be better to leave one winter to stabilise
Grannell SN 53608 46486 to SN 53608 46742	Not known	Inappropriate revetment of eroding bank		This is a compliance issue and therefore AC has not discussed this with owner, leaving NRW a clear run.....
Cerdin SN 40589 44747	Mr Elwyn Williams Rhiwlug	Some single and double bank fencing	Yes	Continues earlier work
Clettwr	Donald Morgan	Make falls passable by clearing top of falls	Yes	Large stones c 1.5 tonnes near top of falls raising height and filling



1600 barriers to migration found so far

Inland fisheries worth more to Welsh GDP than coastal and marine fishing combined.

WG and NRW have facilitated £2 million (2020/21 & 2021/22) to the Rivers Trust movement specifically for inland fisheries restoration

Cyfoeth Naturiol Cymru
Natural Resources Wales

UNDEB EWROPEAIDD
EUROPEAN UNION

Llywodraeth Cymru
Welsh Government

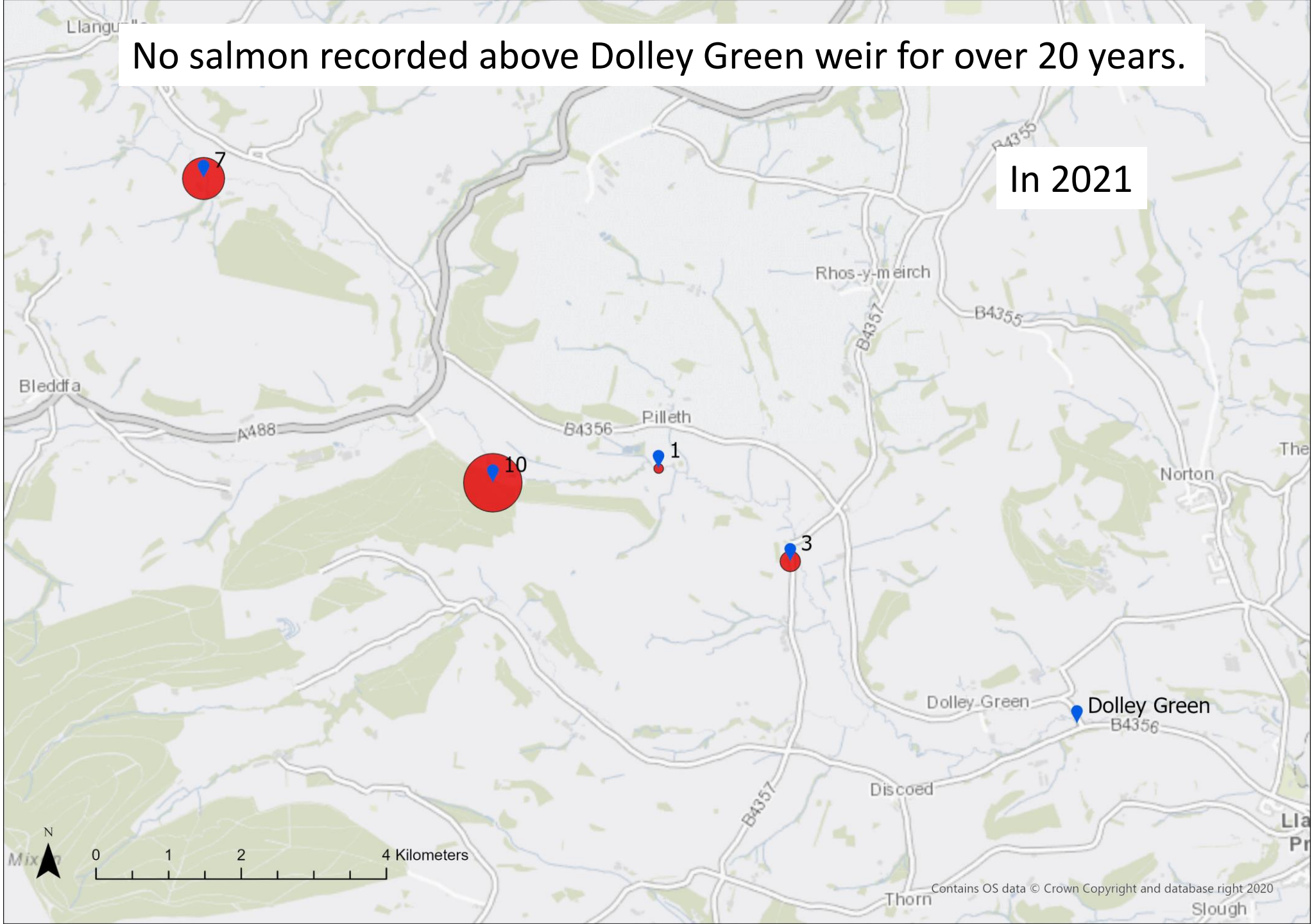
Cronfa Môr a Physgodfeydd Ewrop
European Maritime and Fisheries Fund

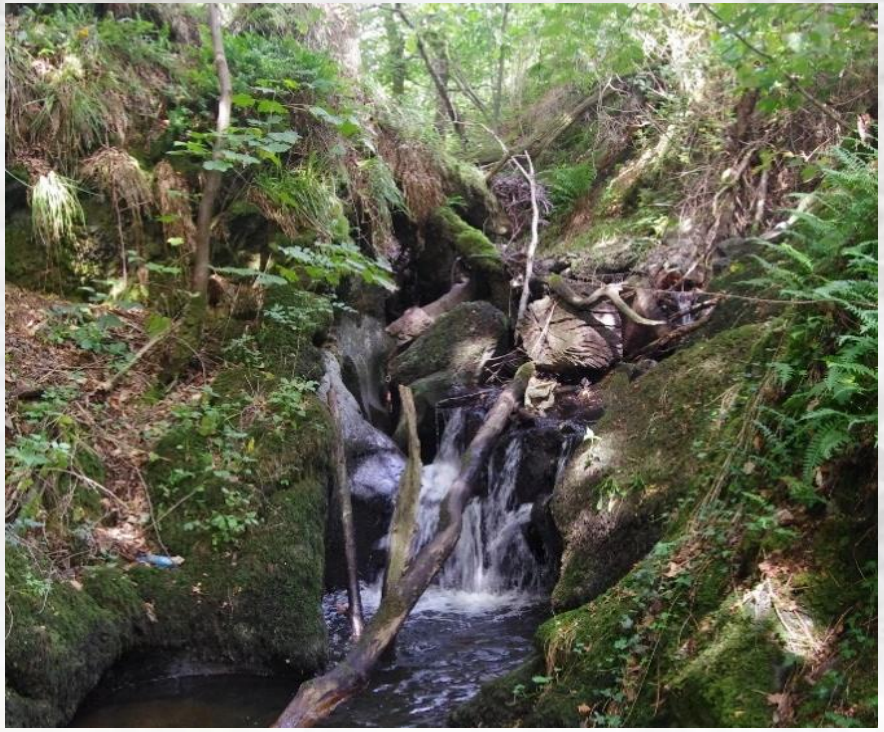
Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

- Through EMFF, Inland Fisheries Restoration Project, and working in collaboration on projects such as the Nature Networks fund, we have connected over 1000km of watercourses since 2020
- Predominantly through easements, not full removals.

Dolley Green easement (Ballsgate weir easement, loads of farm advisory work within the catchment) in 2020.

Sub_Catchment	WATERBODY_ID	WB_NAME	OverallWB_2018	OverallWB_2021
Lugg above Baulk	GB109055042010	Lugg - conf Cascob Bk to conf Norton Bk	Poor	Good


No salmon recorded above Dolley Green weir for over 20 years.
In 2021
7
10
1
3
Bleddfa
A488
B4356
Pilleth
Rhos-y-meirch
B4357
B4355
Norton
Dolley Green
Dolley Green
B4356
Discoed
B4357
Thorn
Slough
N
0
1
2
4 Kilometers
Contains OS data © Crown Copyright and database right 2020



Redds observed upstream of the fish easements in November 2020. This is significant as NRW electrofishing data shows no salmonids upstream of the project site in recent years.

Removal of Vicars Mill weir. This will improve access to more than 20kms of upstream fish habitat and restore the natural river geomorphology.

This took 6 years!!!

Reconnecting the Salmon Rivers of Wales, Other Barriers to Overcome.

- Landowner
- Ownership / Responsibility
- Funding
- Time Constraints
- Permissions processes

	FRAP (£500)	EPS Survey	Section 28	OWC	IMPOUNDMENT LICENCE (£1500)	Fishery Change alteration	OWNERS CONSENT	Consultant Geomorph (up to £10,000)	Consultant Drawings (ip to £5,000)	Heritage Query?
2	X	X			X	X	X	X	X	
4		X		X	X	X	X	X	X	
5		X		X	X	X	X	X	X	
6	X	X			X	X	X	X	X	
7		X		X	X	X	X	X	X	
8		X	X	X	X	X	X	X	X	
10		X	X	X	X	X	X	X	X	
14		X	X	X	X	?	X	X	X	

Future Funding & Projects

- Nature Networks Fund (Swansea University, Rivers Trusts)
- Open Rivers (Rivers Trusts, NRW, Swansea University)
- Gravel augmentation below reservoirs (Rivers Trusts, APEM)
- Nature based solutions (18,110 trees planted in 2021)
- Wetland creation (DCWW, Rivers Trusts)
- Nutrient – Phosphorus - offsetting (local authorities)
- Biodiversity offsetting
- Carbon offsetting (Woodland Trust)
- Longer term Restoration funding (Natural Resources Wales / Welsh Government)
- Citizen Science / Awareness (Adopt a Tributary)