The CaBA chalk stream restoration strategy, Chalk Streams First and the Colne's chalk streams

October 2021, after 12 months' work, we published the CaBA chalk stream restoration strategy

Who was involved?

- CaBA CSRG main panel
- CaBA CSRG expert panel
- CaBA CSRG stakeholders (open to all)

Consultation during 2021

- numerous meetings of all panels
- thousands of emails and phone calls
- formal consultation
- stakeholder river walks

Creating a consensus strategy with 30+ recommendations.

Launched in October 2021.
Fully timetabled implementation plan scheduled for October 2022.

This CaBA Chalk Stream Restoration Strategy was written and collated by Charles Rangeley-Wilson, chair of the CaBA chalk stream restoration group, (CSRG) in consultation with:

The CaBA CSRG Panel

Sarah Powell, Environment Agency, Chalk Stream Manager
Sophie Broadfield and Affie Panayiotou, Defra
Anne Dacey, Environment Agency
Rose O'Neill & Charlotte Rose, Natural England
Fayza Benlamkadem & Magda Styles, Ofwat
Dave Tickner, WWF
Stuart Singleton-White, Angling Trust
Ali Morse, The Wildlife Trusts
Barry Bendall, Rivers Trust
Janina Gray, Salmon & Trout Conservation
Andy Thomas, Wild Trout Trust
Richard Aylard & Yvette de Garis, Thames Water
Jake Rigg, Affinity Water
Ian Colley, Wessex Water
James Wallace, Beaver Trust
Jake Fiennes, NFU

The CaBA CSRG Expert Panel

Chris Mainstone, Natural England
David Sear, Southampton University
Kate Heppell, Queen Mary University
Geraldine Wharton, Queen Mary University
Steve Brooks, Natural History Museum
John Lawson, independent water-engineering consultant
Vaughan Lewis, independent river restoration consultant
Tim Sykes, Southampton University
Carl Sayer, University College London
Jonathan Fisher, independent environmental economist
Alan Woods, Cam Valley Forum
Owen Turpin, Environment Agency

In addition, a **wider stakeholder group** (see acknowledgements page 137) comprising individuals, academics, river keepers, fishery managers, farmers and landowners, chalk-stream associations, angling clubs and staff from numerous regulatory, independent and third-sector organisations have made contributions at the draft consultation stage and during river walks in June and August 2021 and in direct correspondence with the CaBA CSRG.

Numerous Environment Agency and Natural England staff have contributed their expertise with passion and enthusiasm, as have representatives from the water companies covering chalk catchments.

CaBA CSRG is grateful for all their valuable, expert and passionate contributions.

Why do chalk streams need this strategy?

Because they are:

- Globally unique

- Ecologically rich: the most biodiverse of all English rivers.

But also ...

- under intense pressure: they flow through the most urbanised, industrialised and farmed parts of the UK.

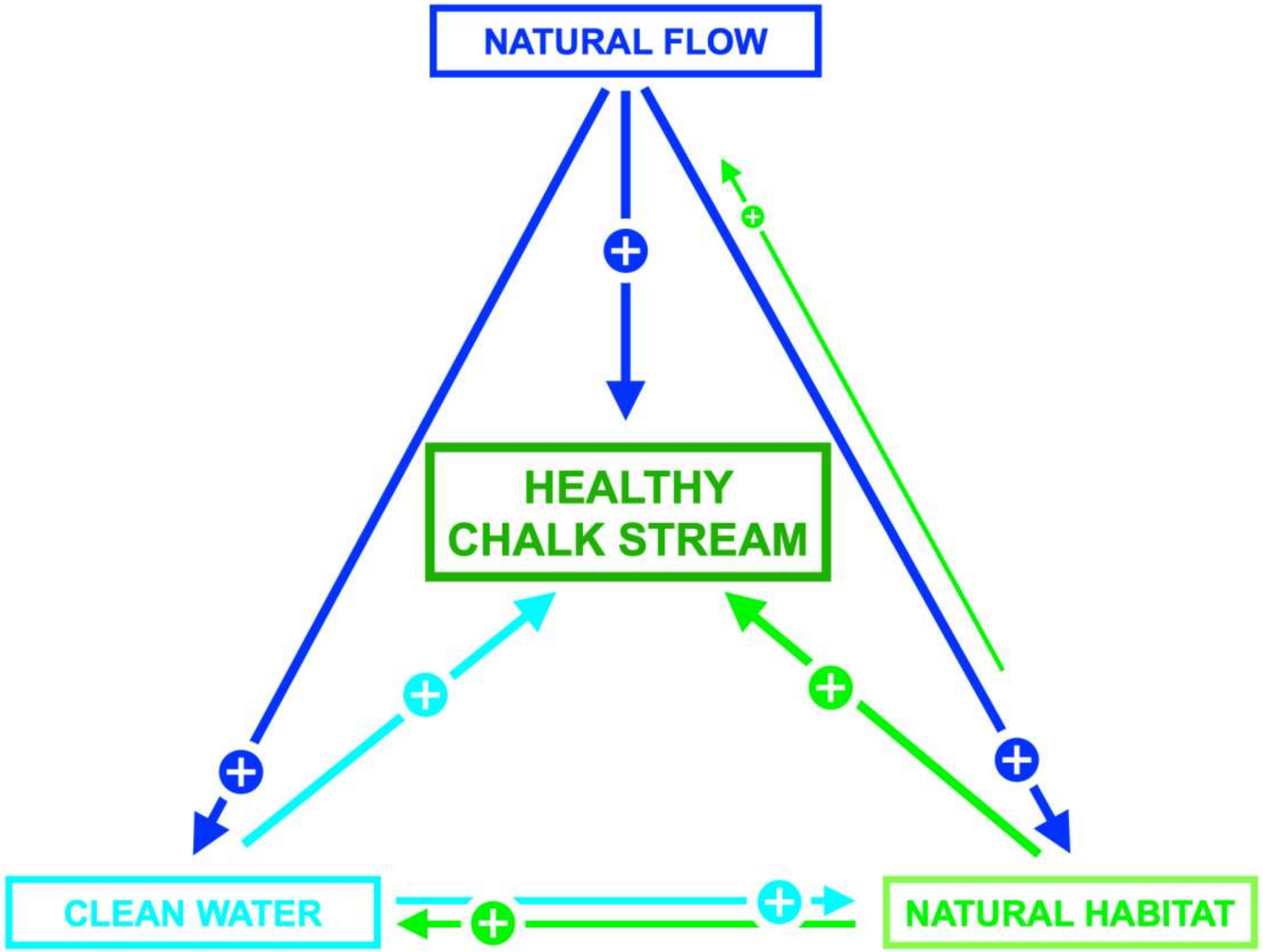
How the strategy is structured:

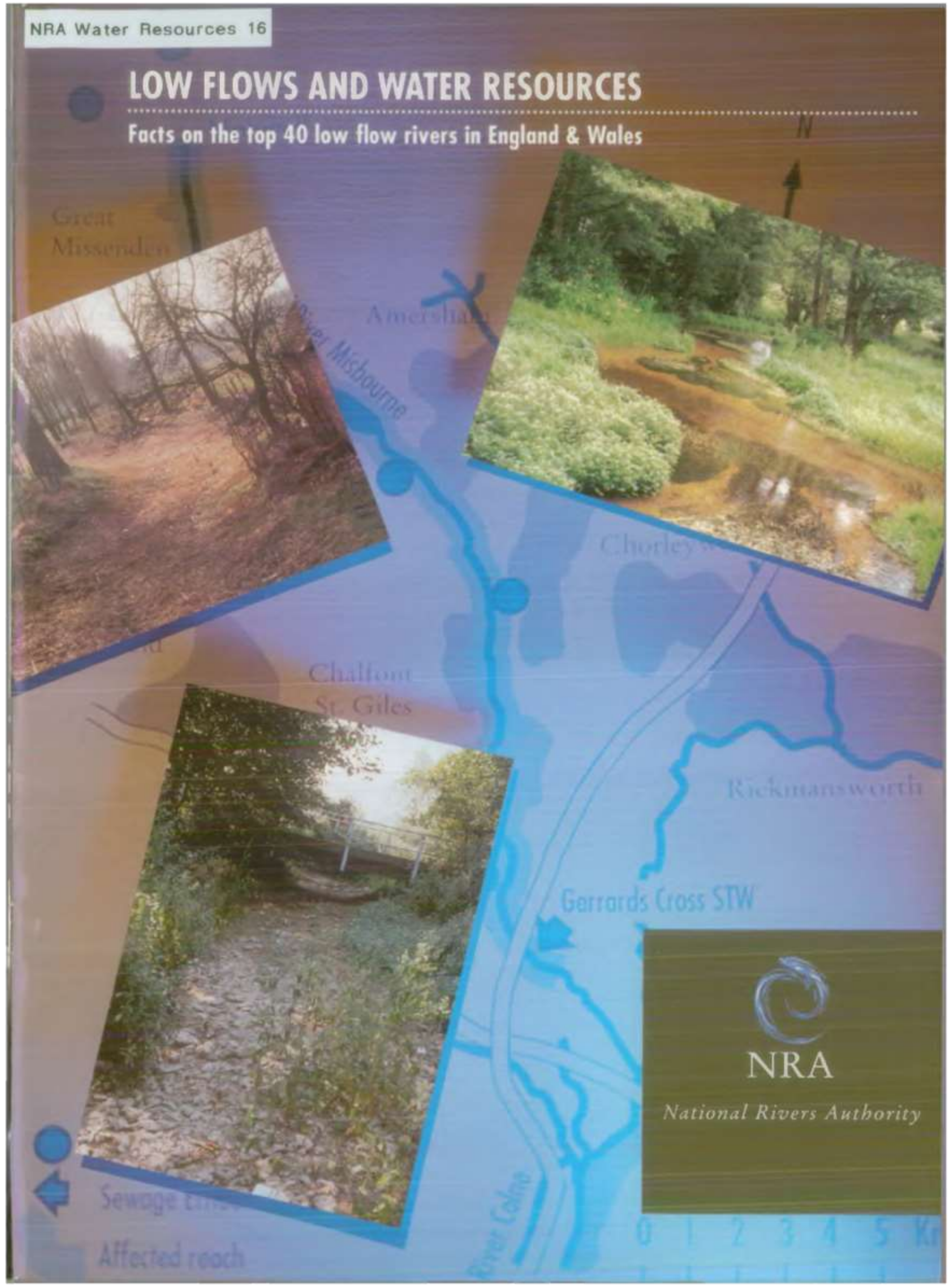
It is based around the three components of ecological health:

water quantity
water quality
physical habitat.

Improvements in one greatly magnify improvements in the other two.

The best restoration strategies address all three components.





Water Quantity - groundwater abstraction in chalk streams

Groundwater abstraction ballooned in the post-war years peaking in the mid-1980s when in some catchments over half of the water available to the river – and in dry years, all of it – was abstracted.

The scale of the impact was made all the more vivid by a drought in the late 1980s early 1990s

Of the 15 chalk streams identified by the NRA in 1991 as suffering from acute low flows, only 5 pass Water Framework Directive targets for flows in 2021, some 30 years later!

The River Wey (Dorset)
The River Piddle
The River Allen
The Wallop Brook
The Bourne Rivulet
The River Meon
The River Wey (Surrey)
The River Pang
The Letcombe Brook
The River Ver
The River Misbourne
The River Darent
The Little Stour
The River Hiz
The Hoffer Brook


In the most recent WFD assessment cycle, 75 chalk streams were assessed as not supporting good ecological status (GES) for flow.

The chronic and unnaturally low flows caused by excessive groundwater abstraction adversely impact the ecology of a chalk stream by:

• reducing velocity of the current

• reducing water depth and the spatial volume of in-channel habitat

• increasing the residence time of water in the river channel

• increasing the temperature of water in the channel

• increasing the concentration of pollutants

• reducing oxygen levels

• increasing sediment deposition

• reducing or interrupting the connectivity between the river and its marginal, riparian habitats and floodplain

• disrupting the passage of migratory fish

These pressures interact and have a spiralling, cumulative impact.

For example, reduced water velocity will limit the growth of the rheophilic (current-loving) plants like ranunculus and increase the deposition of sediment in the channel.

The sediment in turn also limits the growth of ranunculus.

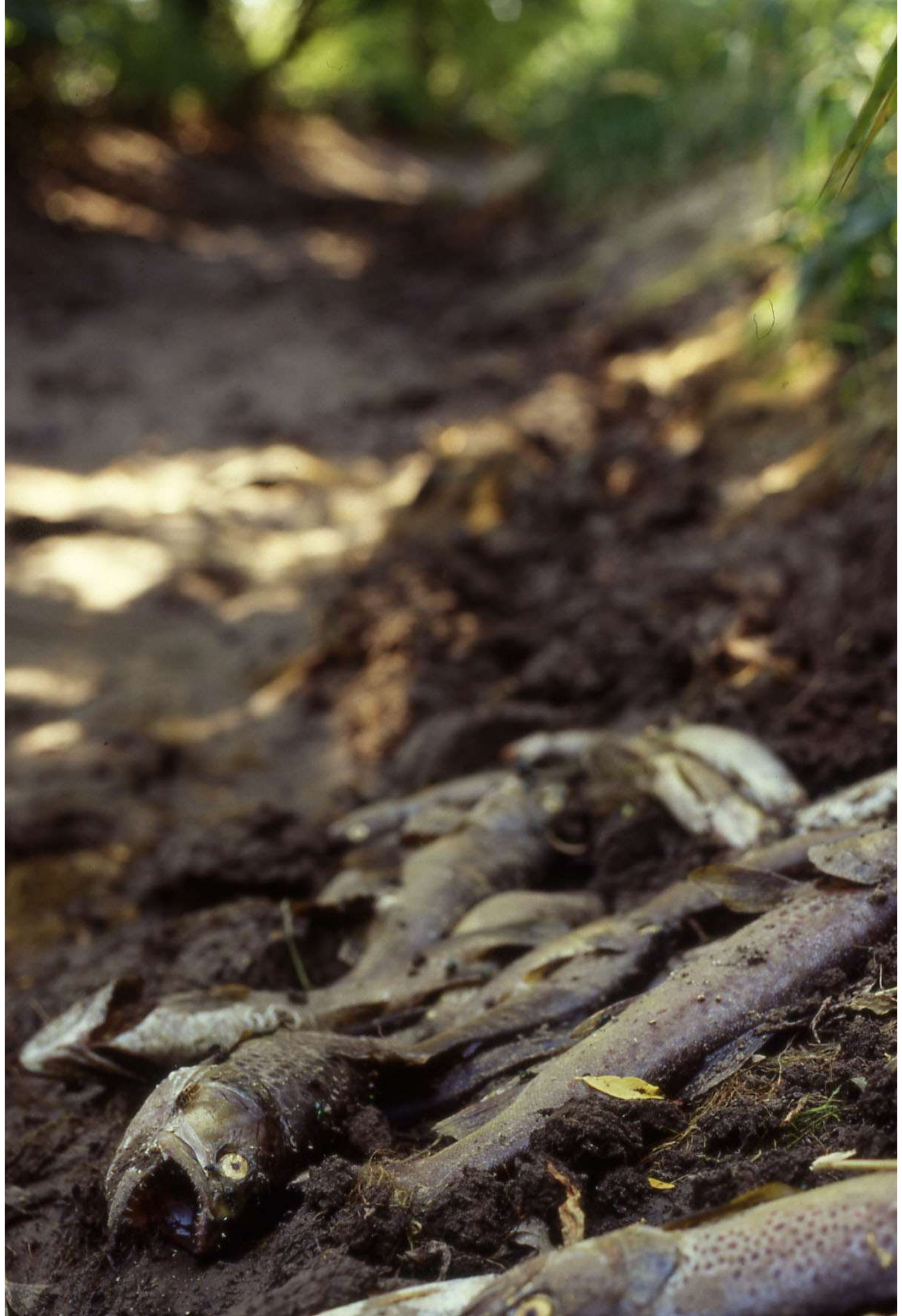
The lack of ranunculus reduces the inter-crown scour that flushes sediment.

Depleted summer flow velocities are reduced yet further because the channel is effectively bigger relative to the volume of water – because of the lack of ranunculus.

The reduced flow and the lack of ranunculus drive up water temperature, decrease oxygen levels, limit habitat for fish and insects.

And so on. The chalk stream becomes locked in a vicious circle of decline and the negative impact of every other stress exerted on the system is magnified.

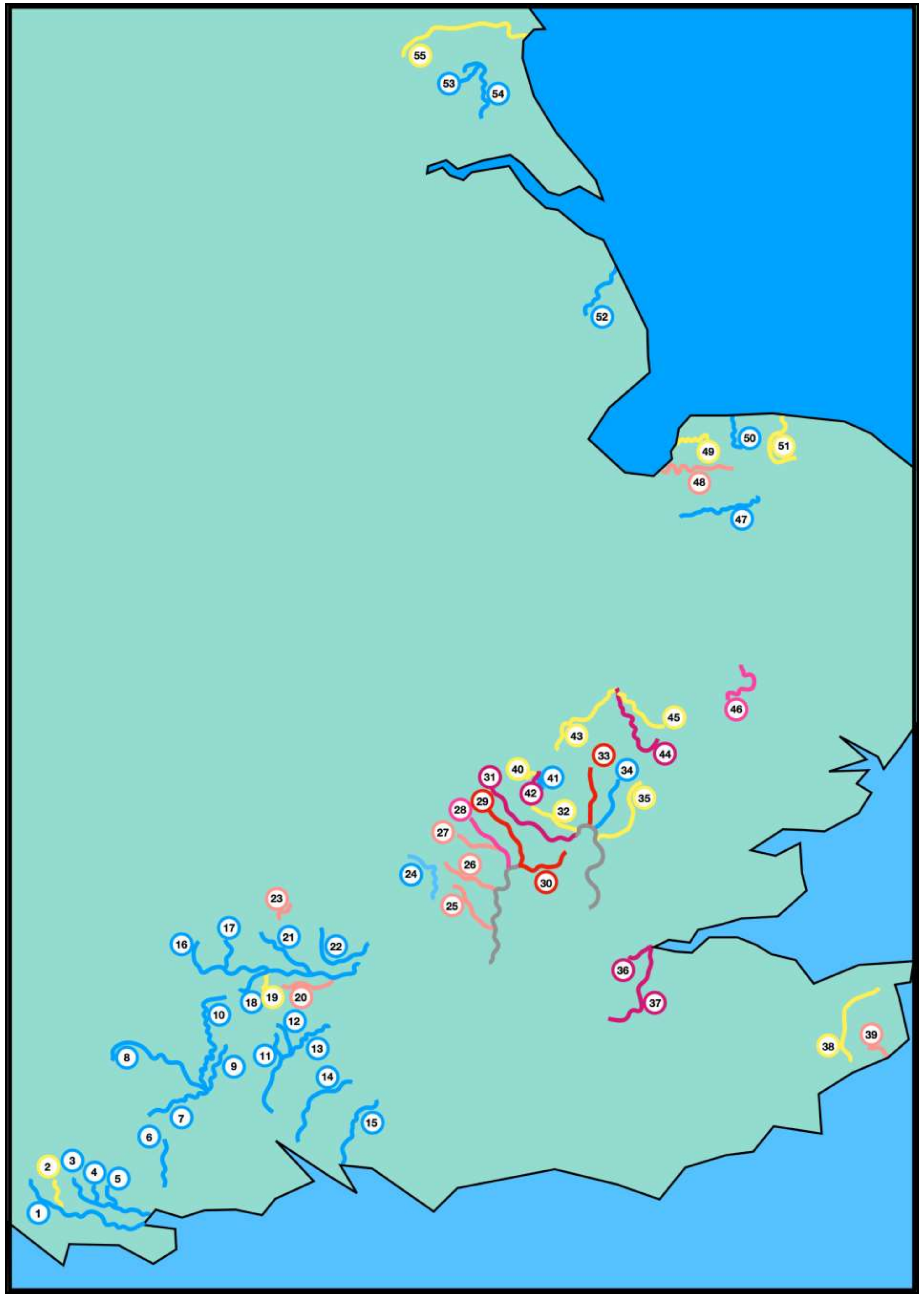
"Over abstraction of chalk streams is a very bad thing"

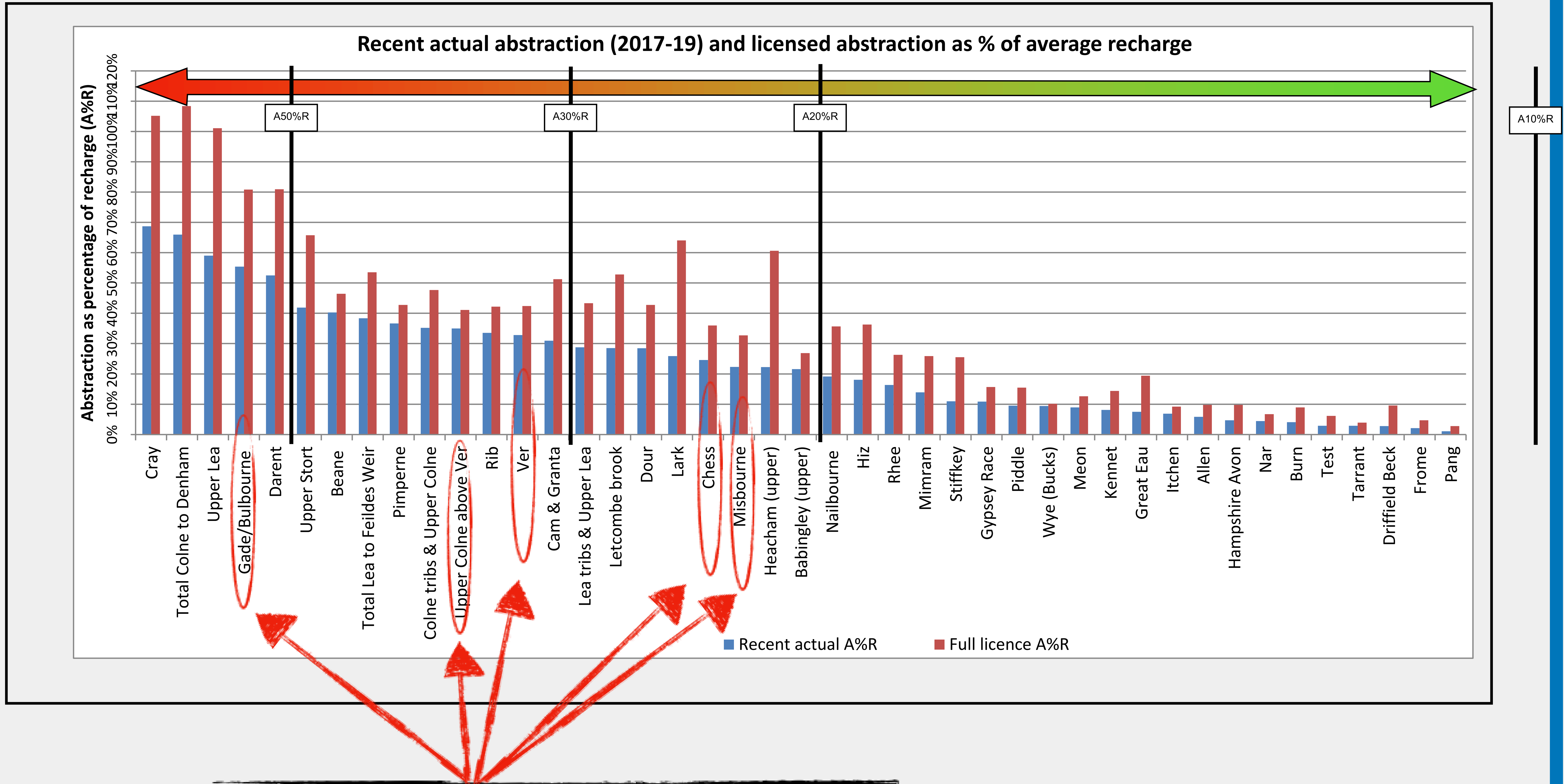


Our CaBA abstraction as a % of recharge survey shows the scale of groundwater abstraction pressure across the country.

Ranging from almost zero on the River Ebble to over 60% on rivers like the Cray, Darent, and Upper Lea.

No	Name	A%R	Deficit to A10%R
1	Frome	2.1%	0
2	Cerne	15.7%	2.8 Ml/d
3	Piddle	9.5%	0
4	Devil's Brook	8.5%	0
5	Bere	4.5%	0
6	Allen	5.8%	0
7	Ebble	0.1%	0
8	Wylye	5.8%	0
9	Bourne (Wilts)	5.4%	0
10	Avon upper	6.3%	0
11	Anton	6.8%	0
12	Bourne (Hants)	0.7%	0
13	Upper Test	2.5%	0
14	Itchen	6.9%	0
15	Meon	6%	0
16	Kennet	8.1%	0
17	Og	1.7%	0
18	Dun	2.1%	0
19	Shalbourne	11.7%	0.2 Ml/d
20	Enbourne	23.3%	11 Ml/d
21	Lambourn	3.8%	0
22	Pang	1.1%	0
23	Letcombe Brook	28.5%	2.7 Ml/d
24	Wye	9%	0
25	Misbourne	22.3%	9.6 Ml/d
26	Chess	24.6%	9.8 Ml/d
27	Bulbourne	28.2%	6.3 Ml/d
28	Gade (excl Bulbourne)	48.4%	9.7 Ml/d
29	Ver	32.8%	19.5 Ml/d
30	Colne upper	35%	29.6 Ml/d
31	Lea upper	59%	40.2 Ml/d
32	Mimram	13.9%	2.9 Ml/d
33	Rib & Quin	33.6%	16.1 Ml/d
34	Ash	3.1%	0
35	Stort	18.5%	11.5 Ml/d
36	Cray	68.7%	45.6 Ml/d
37	Darent	52.5%	64.2 Ml/d
38	Nailbourne	19.2%	7 Ml/d
39	Dour	28.5%	13 M/d
40	Oughton	18.4%	0.4 Ml/d
41	Purwell	4.1%	0
42	Hiz upper	58%	4.1 Ml/d
43	Rhee	16.4%	7.4 Ml/d
44	Cam upper	52%	12.3 Mld
45	Granta	19%	3.9 Ml/d
46	Lark upper	43.9%	8 Ml/d
47	Nar upper	4.5%	0
48	Babingley	21.9%	8.9 Ml/d
49	Heacham	15.9%	2.1 Ml/d
50	Burn	4.1%	0
51	Stiffkey	11%	1.1 Ml/d
52	Great Eau	7.5%	0
53	Driffield Beck	2.8%	0
54	Driffield Trout Stream	3.7%	0
55	Gypsey Race	10.9%	1.6 Ml/d





How do the Colne chalk streams relate to others nationally?

The CaBA group has agreed on a definition of and target for sustainable abstraction in chalk streams: one where the flows are reduced by no more than 10% at the stressed time of year Q95.

There are various ways to assess abstraction impact on flow but a very simple one is the % of aquifer recharge that is taken by groundwater abstraction: A%R.

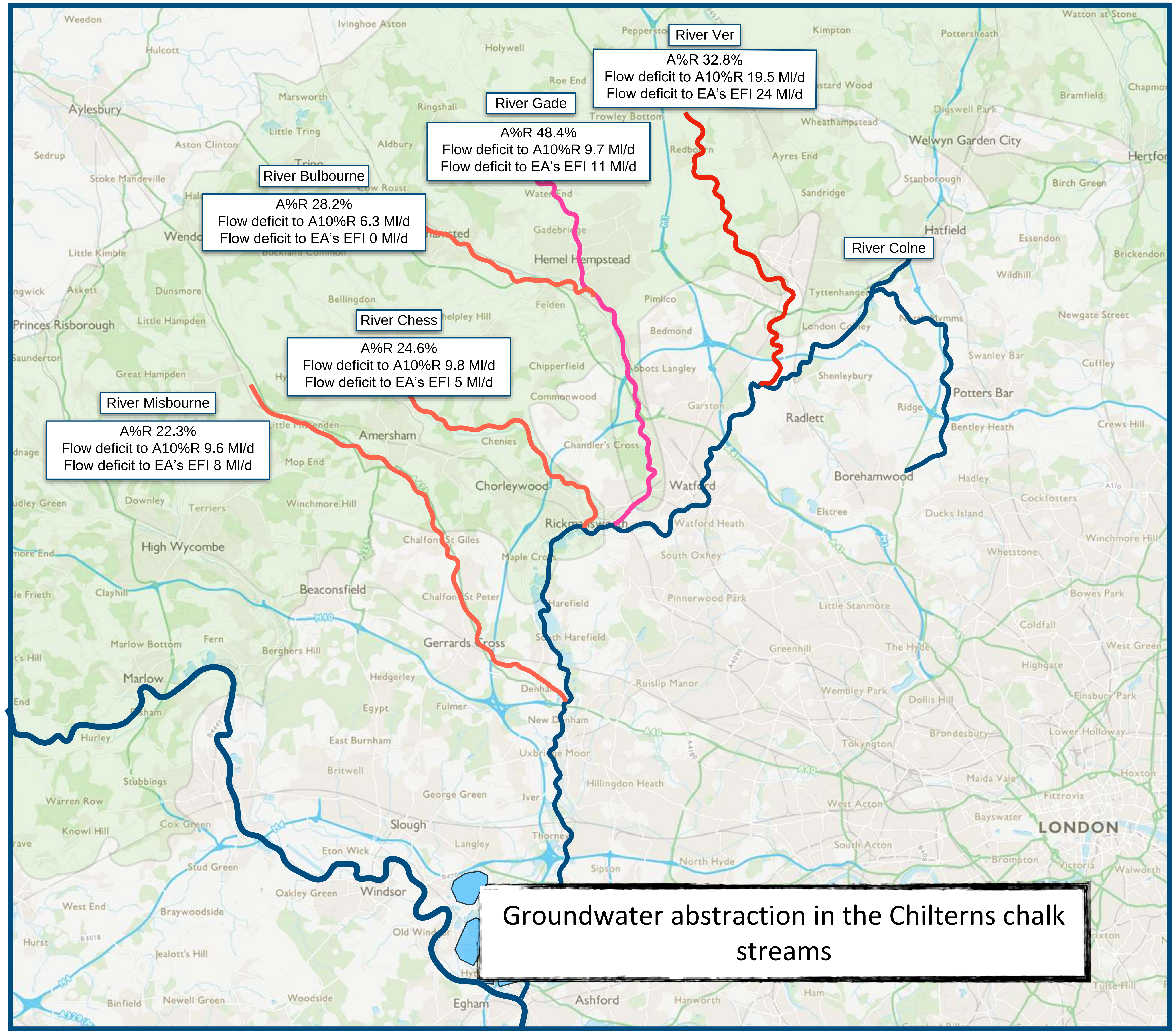
Modelling* indicates that A%R should be no more than 10% if flows are to be reduced by no more than 10%, especially in the ecologically delicate chalk-streams, tributaries.

The Colne chalk streams range from A22%R to A48%R.

The total deficits to achieving A10%R in the Colne chalk stream tributaries are:

Misbourne 10Ml/d
Chess 10 Ml/d
Bulbourne 6Ml/d
Gade 10 Ml/d
Ver 20 Mld

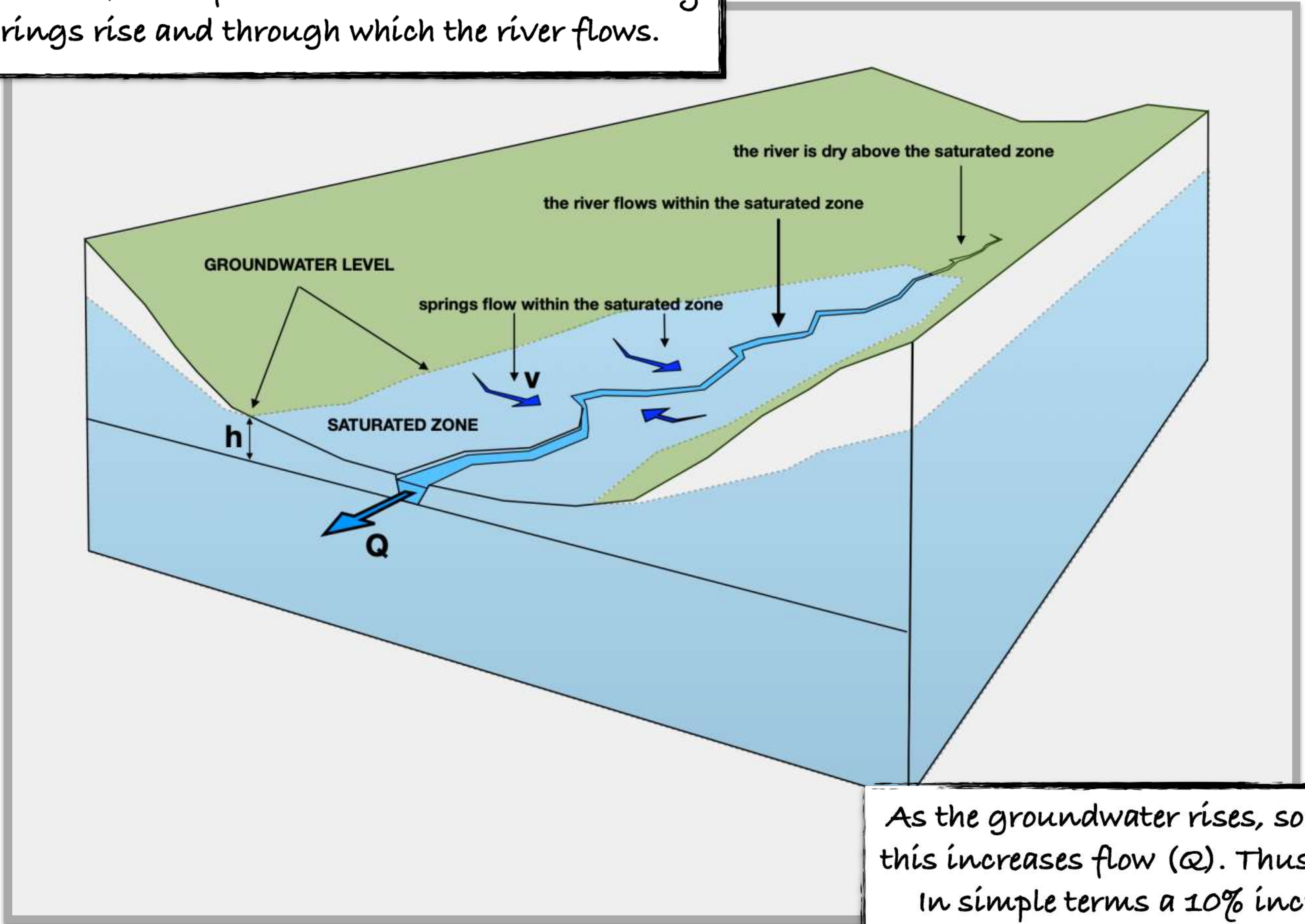
That's a total deficit of 56 Ml/d to restore all the Colne chalk streams to sustainable flows which would support good ecological health (assuming they aren't polluted, of course!).



* figures from independent modelling based on River Ver 'Friar's Wash' sustainability reduction

How a chalk stream works

A simplified diagram of a chalk-stream valley showing how the groundwater level - which generally rises in winter and falls through the summer - determines the extent of the saturated zone in the valley floor, from which springs rise and through which the river flows.



As the groundwater rises, so the hydrostatic head (pressure) rises and this increases flow (Q). Thus flow is proportional to groundwater level. In simple terms a 10% increase in groundwater level yields a 25% increase in flows.

The bucket aquifer

Hydrostatic pressure drives the water out of the "river" holes in the side of the bucket.

Flow in = flow out. The bucket aquifer is in equilibrium.

Add another from of discharge (by taking the cork out of the other hole) and if the recharge remains the same the water level in the bucket MUST go down and the flow through the 'river' holes MUST diminish.

Theis described this in 1940: the ONLY way an extra form of discharge can reduce the former discharge is by "reducing the thickness of the aquifer".

Flow Recovery is the same process in reverse: end the additional form of discharge (abstraction) and if the recharge remains the same the level in the bucket MUST go up and the flow through the river holes will inevitably return to its former rate (all other things being equal).

RIVER VER - FLOW RECOVERY

River flow in the River Ver at Hansteads relative to the Friar's Wash groundwater abstraction

	1957-1969 preceding FW abstrcation	1970-1992 during FW abstraction	1993-2017 following FW reduction	1982-1992 with abstraction	2007-2017 post abstraction	Difference
Ave. effective rain mm/year	273	278	277	262	262	0
Ave. abstraction Ml/d	29.6	40.0	30.5	43.5	29.1	-14.4
Ave. flow Ml/d	42.3	30.8	42.5	26.4	38.5	12.1

Comparing ten-year periods with identical average effective rainfall of 262 mm / year from pre- and post-abstraction reduction:
- a 14.4 Ml/d abstraction reduction saw a 12.1 Ml/d – 84% – increase in average flows

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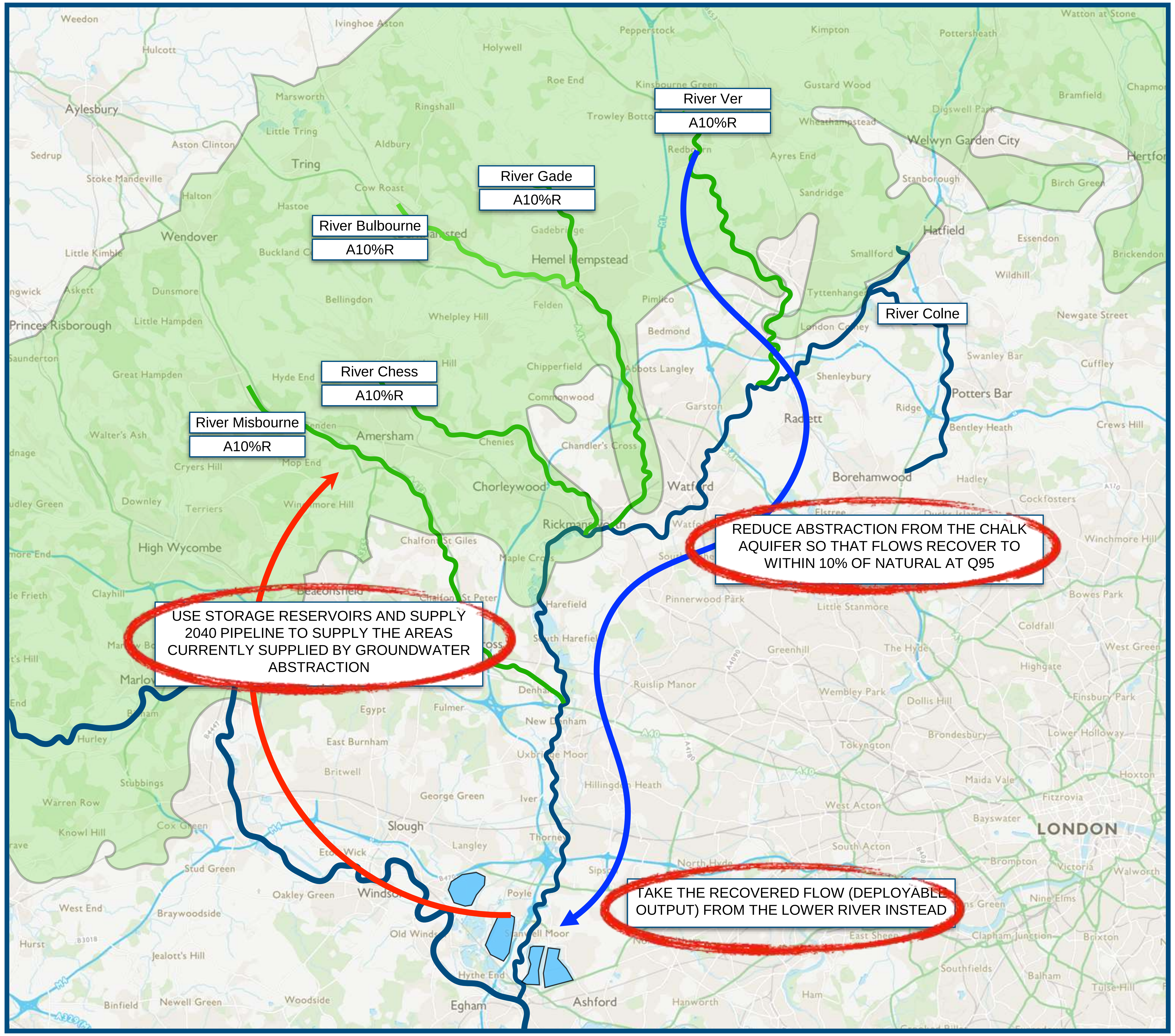
Using flow recovery to square the economic circle

Reduce abstraction in the chalk valleys to below A10%R. This "sustainable abstraction" in the chalk streams still yields 29 Ml/d.

Of the 56 Ml/d not abstracted 80% becomes available as surface flow lower down the catchment.

This water can be taken into storage in the London reservoirs, and the pipeline "Supply 2040" – already in Affinity Water's business plan – can be used to pipe the water to the places formerly supplied by groundwater abstraction.

There would be a loss to overall supply and we need to find that water from elsewhere. And there would be treatment costs. But this is exactly how we would design this use of our precious water if we were starting again from scratch.



Chalk Streams First

The proposal was launched in May 2020 by a coalition of The Rivers Trust, The Angling Trust, WWF, The Wild Trout Trust and Salmon & Trout Conservation

Our request was that the idea should receive independent assessment

as a stand-alone strategic resource option

and as part of other Thames to Affinity Transfer options which include, for example, Abingdon reservoir, Severn to Thames and Grand Union Canal transfers.

Thus far Chalk Streams First has been:

recognised and conditionally supported by regulators

made a key recommendation as a flagship flow-recovery project in the CaBA strategy

included in Ofwat's strategic resource investigations

and is being considered in Thames Water and Affinity investigations of the ‘Thames to Affinity Transfer (T2AT)

However, there was no mention of the scheme in the WRSE draft regional plan.

And there was a disclaimer:

"... it is likely that the plan will enable tangible progress to be made with respect to recovering chalk streams – depending on the environmental ambition that is selected in company WRMPs. Despite this, we recognise that the progress may not meet the expectations of all stakeholders ..."

The environmental ambition is key: but in the draft plans although vast flow deficits have been identified – greatly exceeding anything needed to restore chalk streams – there is little detail on these at a river by river level.

Without detail and prioritisation, there is a danger that environmental ambition will be reined in by financial expedience right across the map and we will have lost the best chance we've ever had to restore flows to our iconic chalk streams.

There may be uncertainty as to EXACTLY how much flow will return, but ...

we only need 56 Ml/d to re-naturalise flow in the Colne's five iconic chalk tributaries

and some of that WILL be made available by flow recovery as deployable output

Grand Union Canal transfer could offset all the uncertainty, anyway.


Chalk Streams First is the best chance we've had to undo the damage caused to our precious chalk streams by decades of over abstraction

Future generations will judge us harshly if we don't take it.