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REPORT

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The State of England's Chalk Streams

This report has been written by Rose O'Neill and Kathy Hughes on behalf of WWF-UK with help and assistance from many of the people and organisations hard at work championing England's chalk streams. In particular the authors would like to thank Charles Rangeley-Wilson, Lawrence Talks, Sarah Smith, Mike Dobson, Colin Fenn, Chris Mainstone, Chris Catling, Mike Acreman, Paul Quinn, David Bradley, Dave Tickner, Belinda Fletcher, Dominic Gogol, Conor Linsted, Caroline Juby, Allen Beechey, Haydon Bailey, Liz Lowe, Bella Davies, David Cheek, Charlie Bell, Dave Stimpson, Ellie Powers, Mark Gallant, Meyrick Gough, Janina Gray, Ali Morse, Paul Jennings, Ken Caustin, David Le Neve Foster, Shaun Leonard, Alex Inman and Fran Southgate. This is a WWF-UK report, however, and does not necessarily reflect the views of each of the contributors.

Since 2012, WWF-UK, Coca-Cola Great Britain and Coca-Cola Enterprises have been working together to secure a thriving future for English rivers. The partnership has focused on improving the health of two chalk streams directly linked to Coca-Cola operations: the Nar catchment in Norfolk (where some of the sugar beet used in Coca-Cola's drinks is grown) and the Cray in South London, near to Coca-Cola Enterprises' Sidcup manufacturing site. The partnership has promoted good water stewardship through various means including the support of the implementation of the EU Water Framework Directive.

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EXECUTIVE SUMMARY

Imagine a river. A lovely, tranquil English chalk stream. Crystal clear waters, clean gravel beds, emerald green underwater plants, a haven for wildlife: the timid water vole, the rising mayfly, the wild brown trout.

You won't find this scene anywhere else in the world, except perhaps pockets of Northern France. The wonderful English chalk streams are especially ours, a gift from England's unique layers of geology, climate and human history. They are ours to enjoy, ours alone to protect and ours to destroy.

A decade ago the Environment Agency published the first report on the state of chalk stream health, recognising the high conservation value for wildlife, water supply, recreation and culture. It set out a vision to restore and protect the nation's chalk streams. Ten years on, on the cusp of a new government publishing statutory River Basin Management Plans that will set out their ambition and action plan for the country's water ways, it seems a critical time to check in on progress and review the health of this globally significant habitat. This report presents the findings of an independent analysis to give a snap shot of current health, progress to date and the remaining pressures on England's chalk streams.

Despite very little comparative data (largely due to the significant improvement in ecological monitoring driven by the Water Framework Directive), the results are clear: England's precious chalk streams remain in a shocking state of health.

- More than three-quarters – 77% – are failing to meet the required Good status.
- Only 12 out of England's 224 chalk streams are protected and of these only 15% (by length) are classed as adequately protected and meeting conservation objectives; half are classed as unlikely to meet conservation targets without changes to management or external pressures.

- Nationally and internationally protected chalk streams, on the face of it, are not fairing much better than the rest. There is no significant difference in the proportion of water bodies meeting Good status (less than a quarter of total chalk streams and designated chalk streams).
- The chalk aquifer – the engine room of the chalk stream – is classed as in Poor Quantitative status, with phosphate and nitrates at levels that pose a significant risk to drinking water supplies.
- While all chalk streams should be capable of supporting a healthy population of brown trout, the most recent data showed observations on just a third of chalk streams.
- All six chalk streams listed as nationally important salmon rivers are categorised as 'at risk' or 'probably at risk' with little improvement being predicted by 2018.
- There is some good news: otters are making a comeback, in-line with increases observed nationally. Signs of otters were recently recorded at two-thirds of the chalk stream sites surveyed (up from just 5% in the 1980s).
- The key pressures causing failure are: physical modification (e.g. for historic land drainage and industry), over abstraction (particularly for public water supply), pollution from sewage works, septic tanks and agriculture.
- With growing pressure from climate change, population growth and new and expanding populations of invasive non-native species, ensuring no further deterioration from the current meagre baseline will be challenging without a step change in management.

Chalk streams are a quintessential part of the English countryside. They are uniquely ours to protect

There has been a lot of activity and signs of progress. The Environment Agency has a comprehensive monitoring programme and evidence base. Rivers and Wildlife Trusts, anglers, action groups and the wider community are providing hands-on river conservation and promoting campaigns to raise public and political awareness. Water companies

and regulators have made a new set of plans for improvements over the next five years. And there have been advances at policy level too (for example, the development of the Catchment Based Approach and the recent changes to the Water Act 2014 which will effectively enable water company over-abstraction to be addressed). Changing attitudes and signs of implementation are on the horizon.

THE RESULTS ARE CLEAR: ENGLAND'S CHALK STREAMS ARE IN A SHOCKING STATE OF HEALTH

Significantly, we're well aware of the problems and we know what needs to be done to reduce the huge pressures on our most vulnerable rivers and streams. The trouble is the improvements to date have been too little, too niche, too slow. What we urgently need now is an effective, determined effort to push forward the essential changes and significantly upscale the solutions already being trialled in chalk streams across the country.

The 2015 River Basin Management Plans provide the perfect opportunity for the new government to deliver a compelling vision and action plan for chalk streams, setting out all the measures needed to get chalk streams to Good status. This report therefore includes a Manifesto for Chalk Streams, setting out the actions that are essential to improving the state of England's chalk streams.

1 Government leadership to champion chalk streams

The government must:

- Give a clear indication that chalk stream protection and restoration is a national priority;
- Allocate sufficient resources, including the Catchment Restoration Fund;
- Report an indicator of chalk stream health to Parliament on an annual basis.

2 Fit-for-purpose regulation of abstraction and pollution

The government must:

Legislate for comprehensive reform of water abstraction-licensing by 2016, amending all unsustainable licences and compulsory metering across chalk stream catchments.

Review water company progress towards meeting the 2020 zero pollution incident target and require strategic wastewater plans to ensure that the sewerage system is resilient.

Ensure that on-farm regulatory measures are sufficient to support Good status, target efforts to secure compliance and increase farm advice including by enabling matched-funding from the farming and food & drink sectors.

The Environment Agency must:

Implement current powers to remove or amend in-stream structures or require management changes to enable achievement of Good status.

3 A chalk stream forum for learning and scrutiny

The Environment Agency must:

Continue to monitor and lead the analysis on chalk stream health and work with Natural England and other stakeholders to facilitate the (re)establishment of a national chalk stream forum.

4 Protected chalk streams are restored and protected

Natural England must:

Review progress for chalk stream protected areas to identify changes needed to achieve conservation targets.

The Environment Agency must:

Include in the updated River Basin Management Plans a thorough review of previous attempts to restore protected chalk streams to Good status and put in place new, improved measures that are sufficient to the task.

5 Valuing our chalk streams

The government must:

Refer chalk streams to the Natural Capital Committee and put in place a mechanism to raise the compensation needed to change unsustainable licences held by farmers, industry and other non-water company abstractors.

Ofwat and the Environment Agency must:

Work together to ensure that an effective Abstraction Incentive Mechanism is implemented from April 2015, and develop tools ahead of the next set of Water Resources Management Plans to encourage water companies to reduce abstraction from the most environmentally vulnerable chalk streams wherever possible.

There's an old saying: 'you don't miss your water till your well runs dry'. For a lot of us in the UK, chalk streams are our water-wells. But they're much more than that too. They're part of our landscape and our natural environment – our history, culture, geography and economy as well as our ecology.

We simply can't afford not to look after our chalk streams.

FOREWORD:
A TRIBUTE TO CHALK STREAMS BY CHARLES RANGELEY-WILSON

Charles Rangeley-Wilson

I grew up in London, but once a fortnight during the 1970s we drove up to Norfolk. I had no idea then as I struggled to peer out the car window that the route we took, around the edge of the Chilterns, across the Hertfordshire downs, up the ridge of the Gog Magog hills, all the way to the multi-coloured cliffs of Hunstanton, was more or less entirely across a chalk landscape.

But towards the end of the journey, when the evenings were long in summer I would ask Dad to slow down over one or other of the bridges which crossed the few rivers in our corner of Norfolk. One was over a little stream called the Ingol, where it tumbled over a small waterfall beside a bus stop. Another was by a gatehouse over an equally small stream called the Babingley. Or there was the tiny Hun, hardly a river at all, but bright-watered enough to fascinate me. I adored these miniature brooks for a reason I could never have explained. They just spoke to me and I loved to spend a few moments watching them flow.

THEY JUST SPOKE TO ME AND I LOVED TO SPEND A FEW MOMENTS WATCHING THEM FLOW

Now that childish adoration has become an adult passion I know that these little brooks were all chalk streams, that they rose as springs from the chalk hills we had driven over all the way from south-west London. I also know that we would have crossed many others on that journey: the Colne outside Heathrow, and then that river's Chilterns tributaries the Chess, Misbourne, Gade and Ver. Running north up the A1 we would have crossed the Lea and the Mimram and then, riding the ridges of those chalk hills, we threaded between the Beane, Oughton and Purwell. Turning east we narrowly missed a few more – the Cat Ditch, the Ivel, the Hiz, the Oughton – before we crossed the Cam and then the Granta. Further on we crossed the Snail and then the Fenland incarnation of the Lark. Then the Little Ouse, the Wissey, the Nar, and finally, nearing home, we crossed the Babingley, Ingol, Heacham and smallest of all, the Hun.

Those 25 names represent a good proportion of all the chalk streams that exist globally: about one-eighth of those in England, whose total of just over 200 streams – varying in size from the stately River Test in Hampshire, to diminutive little brooks you can almost hop over – make up most of the chalk streams in the world. There are a number of chalk streams over the channel in Normandy, but further afield, although there are great swathes of chalk across Kaliningrad, Bulgaria, the former Czechoslovakia, or the Ukraine, although there is chalk in Texas, Israel, Egypt and Australia, it seems that there just aren't any rivers like the English chalk streams. These appear to be almost unique.

Though houses were built with it and blackboards were written on with it, no one quite knew what exactly chalk was made of – or how it might shape a stream for that matter – until the mid 1800s when Thomas Huxley was sent samples of the porridgy Atlantic sea floor. Chalk, Huxley discovered, is the fossilised remains of billions of infinitesimally small creatures, which swarmed in warm, shallow seas millions of years ago. When these single-celled creatures died, they rained down to the ocean floor, settling and compressing over time into chalk. As the planet cooled its seas retreated and the sea beds became land. Then, for millions of years wind and rain and ice re-arranged this landscape. And now we have our chalk hills: a great belt of them in England that runs from south-west Dorset, past London, through East Anglia and up into the Yorkshire Wolds.

When rain falls on these chalk hills it sinks into the ground – as if into a sponge – through fissures and cracks, or into the body of the chalk itself, turning the hills into underground oceans of trapped rainwater. Then begins that water's hidden, journey: a drop of rain might travel five miles or 50 under the earth, it might stay down there five months or five years or five centuries. The subterranean topography that determines exactly where the water goes is immensely complex, almost unknowable. What we do know is that here and there, in a wet furrow in a meadow, or under the roots of an ancient tree, or in a rook-filled copse on the edge of a hill, that water re-emerges as springs – and that in these special places chalk streams are born.

THE UNSPOILT CHALK STREAM IS LIKE A WATERY GARDEN OF EDEN

What flows from the spring is no longer plain rainwater, however. It is chalk-water: cold and clear, and rich in minerals. Because they are spring-fed, chalk streams are naturally buffered from the immediate impact of rains and drought. This steady flow of cool, clear water in meandering, gravelly channels creates spectacularly diverse and fecund ecosystems. The unspoilt chalk stream is like a watery Garden of Eden: chequered beds of water crowfoot swaying in the marbled currents, constellations of white flowers, vibrant green beards of starwort and clouds of water-parsnip; the banks decked in marsh marigolds, water mint, and flag iris; under the surface brown trout and grayling, young salmon and sea trout, white-clawed crayfish, freshwater shrimp; in and over the plashy meadows, snipe and otters, water voles and mayflies.

CHALK STREAMS ARE LIVING, FLOWING HISTORY

But chalk streams are special not just in their geological origins, and the wonderful ecosystems this creates, but also in how these origins are manifested in what is best described as the aesthetics of the river. No river on Earth is as much a product of human as well as natural history. Again this fact has geological origins: chalk streams are such gentle, malleable rivers. They have been harnessed and lived with for thousands of years, shaping and shaped by human history in one of the most used landscapes anywhere in the world. Think of the Roman villas, the mills, the medieval priories and holy houses, the castles, the ornate Palladian parks and gardens, the fisheries, the Georgian water meadows. All these things give chalk streams a distinct beauty that is not the same as the sublime, unpeopled beauty of craggy peaks and spouting waterfalls. Chalk streams are home-spun and life-giving. Chalk streams are pastoral. Chalk streams are living, flowing history.

THE INTERSECTION OF GEOLOGY, GEOGRAPHY, CLIMATIC AND FINALLY HUMAN HISTORY THAT CREATED THE CHALK STREAM HAPPENED ALMOST EXCLUSIVELY IN ENGLAND

Of course every chalk stream, like every river, is unique. Rivers are a distillation of their landscapes, and so their characters vary as much as the valleys they flow through. Subtle variations in the hardness of the chalk, in the extent to which it is marbled with clay, or greensand, or overlain with glacial deposits of sand and mud, the distinct glacial history of a given valley – all these things mean that no chalk stream is exactly like another. And yet, they are all spring-fed, clear-watered, gentle, and pastoral rivers because of the particular way in which our chalk landscape was shaped by the glaciers of the most recent Ice Age.

This intersection of geology and geography, of climatic history and finally human history that has created the chalk stream happened almost exclusively in England. This ought to mean we should value this heritage as highly as we would any other globally unique ecosystem. Chalk streams are an English Okavango Delta, an English Great Barrier Reef, an English rainforest.

Sadly, we don't. Instead these unique rivers are abused: some to the extent that they have dried up and ceased to be rivers at all. Others are rivers in so much as they have water in them but in every other way they are changed. Some are buried underground. Most are polluted too. To our shame most of the really debilitating changes have occurred in the last 50 or 60 years. Before that time chalk streams were certainly much-used river systems, but our relationship with these rivers was to a large degree symbiotic. Since 1946 a fatal combination of dredging and water abstraction has made it parasitic. Now the range of threats is diverse and most are difficult to overcome in a busy, valuable landscape which also supports farming and industry, people and businesses.

Difficult to overcome, but surely – given the value of these rivers – not impossible?

In 1947 in a story he called The Passing of a River the author 'GKM' mourned the death of the upper Kennet after the first abstraction pump went in and his beloved river began to dry. His lament was heard by a few, but not many. It was the first tolling of a bell for the fate of our chalk-streams. Since then, many others have joined the campaign for the preservation and restoration of these iconic, globally significant rivers. For a long time these voices were ignored. More recently however, there have been signs of hope. Abstraction is being reined in here and there, particularly where the rivers have been most drastically abused. The River Piddle is flowing again when once it ran dry. The Beane will be soon. As will the Og. There is action with river restoration too. A movement which for so many years was funded only by the grassroots enthusiasm of anglers and a handful of conservationists has finally, with the growth of Rivers Trusts and support of the government's Catchment Restoration Fund, grown into a movement with real momentum.

We must build on these first steps. If chalk streams are our burning rainforest, it is up to us to put the fires out.

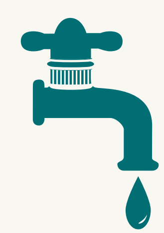
Charles Rangeley-Wilson.

INTRODUCTION

Chalk streams are a quintessential part of the English landscape. They are home to an incredibly special array of fauna and flora and much loved by people – whether they come to fish for wild trout and salmon, or are just bewitched by the twinkling crystal clear water as they take an evening stroll. Chalk streams are also crucial to our economy.

These rivers, together with the chalk aquifer from which they spring, are crucial water resources providing millions of people with water. The chalk aquifer alone makes up 70% of the public drinking water supply in the south-east of England.[1] In this respect – not counting the ecosystem services provided for farming, industry, recreation, tourism and wellbeing – chalk streams and aquifers constitute a national asset worth billions. Healthy chalk streams and healthy chalk aquifers are vital for healthy ecosystems, healthy people and a healthy economy.

A chalk stream is broadly defined as one that derives most of its flow from chalk-fed groundwater, and it exhibits – in varying degrees depending on the particular geology of a given valley – the 'classic' chalk stream characteristics of alkaline, crystal-clear water, flowing consistently and equably over clean gravel beds.



The chalk aquifer alone makes up 70% of the public drinking water supply in the south-east of England

In 2004 the Environment Agency, Natural England and the UK Biodiversity Action Plan Steering Group for Chalk Rivers published the 'State of England's Chalk Rivers' report[2]. It was the first comprehensive assessment of the health of chalk streams, looking at water quality, quantity, morphological and ecological indicators – assessing their physical state and the environmental impact.

The report showed 161 chalk rivers in varying degrees of health but all under pressure. It set out a vision, and actions needed to achieve it:

> "Chalk rivers should be protected or restored to a quality which sustains the high conservation value of their wildlife, healthy water supplies, recreation opportunities and their place in the character and cultural history of the landscape."

THROUGH THE ENERGIES OF RIVERS TRUSTS, WILDLIFE TRUSTS, AUTHORITIES, CONSERVATIONISTS AND ANGLERS, CHALK STREAM RESTORATION HAS GROWN INTO A MOVEMENT WITH REAL MOMENTUM

Since then there has been a growing view that smaller chalk streams, chalk stream headwaters and winterbournes (rivers that only flow when groundwater levels are high) should also be recognised. On this basis 224 chalk streams have been identified (Figure 1) and are listed at the end of this report. Only a handful of chalk streams are given special protections – the Itchen, the Avon, the Lambourn and the Wensum are designated as international Special Areas of Conservation (SACs), and a further eight are designated as nationally important Sites of Special Scientific Interest (SSSIs).

In the 10 years since the last State of Chalk Rivers report, there has been a wealth of efforts to restore and protect these special rivers. Through the energies of Rivers Trusts and Wildlife Trusts, the support of the Environment Agency, Natural England and the Catchment Restoration Fund, a growing body of expertise including the Wild Trout Trust and River Restoration Centre and the grassroots enthusiasm of anglers and conservationists alike, habitat restoration has grown into a movement with real momentum.

Water companies are installing meters and water-efficiency kit to reduce the amount of water demanded from chalk streams, while delivering catchment management to improve water quality. Angling clubs and river groups have upped the ante on local campaigning and, last year, national and local angling, environment and conservation groups launched the 'Chalkstream Charter'[3] to call for a range of measures, including the introduction of compulsory water metering and the end to unsustainable abstraction.

WORKING WITH THE ENVIRONMENT AGENCY, WE HAVE COMPILED THE DATA ON THE STATE OF CHALK STREAM HEALTH

In 2009, WWF-UK launched our own chalk streams project, 'Rivers on the Edge'[4], to help galvanise political support to tackle 'over-abstraction' (where water taken for public supply, farming and industrial purposes increases risk of ecological damage). Since then there has been action at policy level too. The 2011 Natural Environment and Water White Papers committed to reform the abstraction regime across England, and the Water Act (2014) removed a significant legal barrier to addressing over-abstraction – the historic requirement to pay water companies compensation when changing the terms of an abstraction licence.

But have these things made a difference? Have they helped tackle some of the fundamental issues causing the decline of our chalk streams? Are things getting better or worse?

Ten years on, WWF-UK has commissioned an independent review of the latest evidence on chalk stream health. Working with the Environment Agency, Natural England and a number of catchment groups and enthusiasts, we have pulled together the data, and a number of case studies, to illustrate the problems chalk streams face, and to showcase some of the success stories.

Next year, the new government will publish statutory River Basin Management Plans. This is the perfect opportunity for the government to deliver a compelling vision and action plan for chalk streams, setting out all the measures needed to get chalk streams to Good status. This report therefore concludes with a Manifesto for Chalk Streams, setting out the actions – highlighted through the research and analysis – that are essential to improving the state of England's chalk streams.

ENGLAND'S CHALK STREAMS

Various technical definitions of 'chalk stream' have been proposed, e.g. "streams that derive 75% of their flow from chalk groundwater and flow over a chalk geology". In reality we have a spectrum of chalk streams and chalk-influenced streams, which derive most of their flow from chalk groundwater, and exhibit – in varying degrees depending on the geology of a given valley – the 'classic' chalk stream characteristics of clear water and equable flows.

In the 2004 report the Environment Agency indexed 161 chalk streams. Our revised index, included at the end of this report, builds on this to itemise all the English chalk streams and headwaters. A river is included if it flows from or largely over chalk, is named on a map, is known locally as a chalk stream or has the characteristics of one. But the list is almost certainly not complete. Feedback would be much appreciated.

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THE STATE OF ENGLAND'S CHALK STREAMS 2014

In Spring 2014, WWF-UK commissioned aquatic research specialists APEM to pull together data, primarily from the Environment Agency and Natural England sources.

The research aimed to create an updated picture of chalk stream health, taking account of the new data collected since 2004, including information collated by the Environment Agency as part of their Water Framework Directive (WFD) assessments of England's water bodies.

APEM used a Geographical Information System (GIS) to create a map of the 161 chalk streams identified in the 2004 Environment Agency report. While we know this does not take account of every one of the 224 chalk streams in the revised index, it does provide a large representative sample to give a strong indication of chalk stream health.

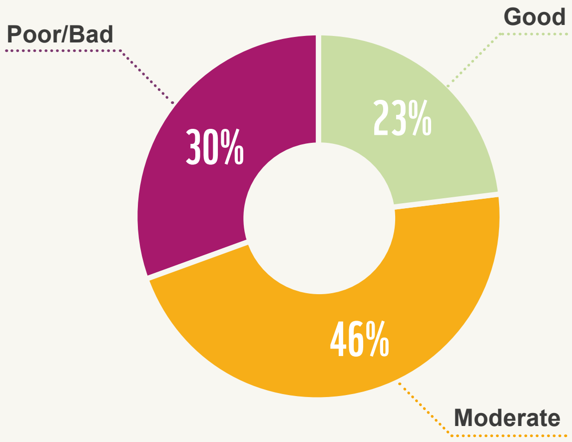
Presented below is an overview of APEM's key findings (additional materials are specifically referenced). The full APEM technical report has been published on the WWF-UK website. The overview includes:

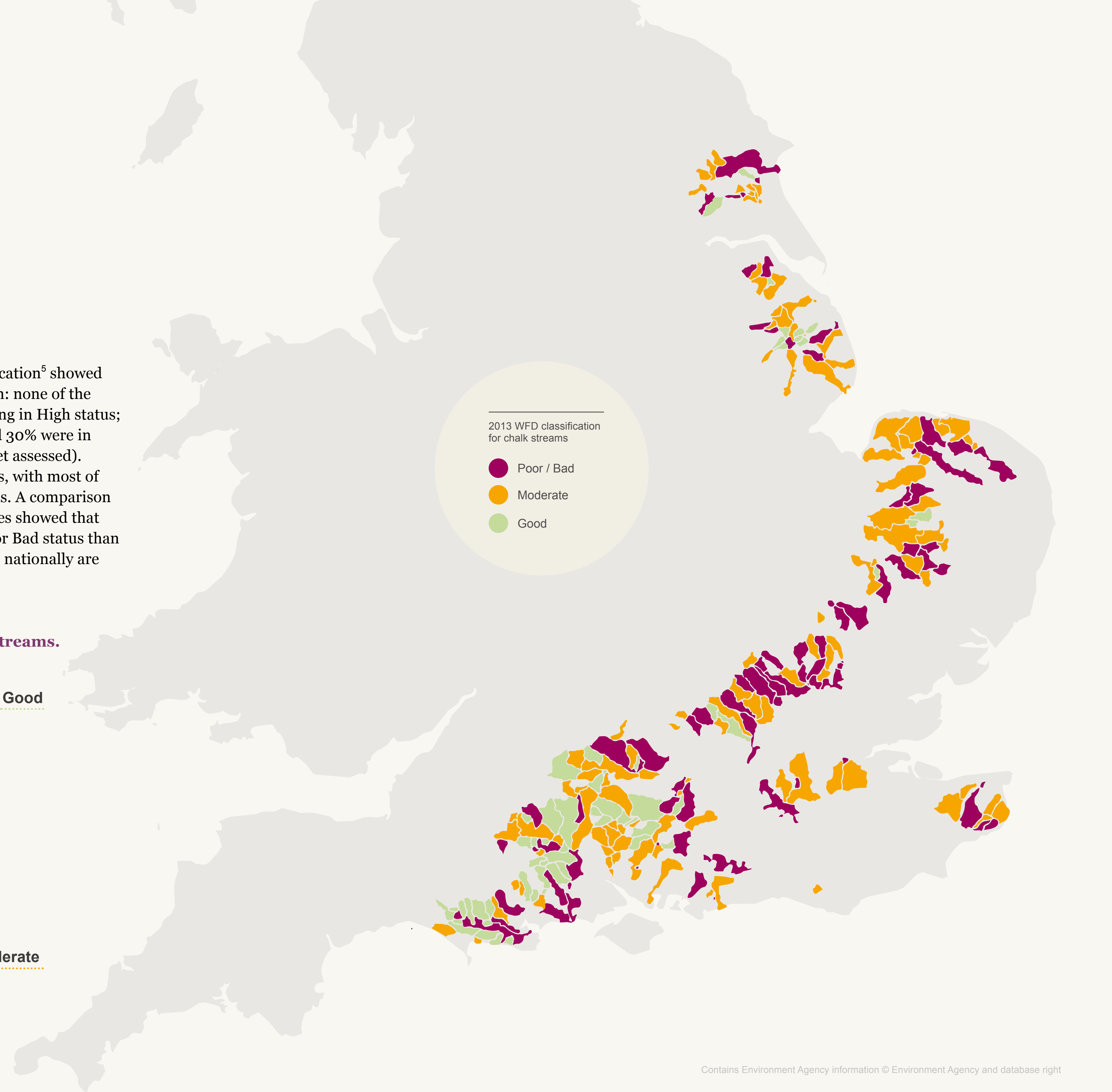
- Ecological health of chalk streams. A consideration of how chalk streams fair against the WFD requirement to ensure all water bodies achieve Good or High status by 2015. The WFD assessments are crucial as they have ecology at their heart. They were not available for the 2004 report.
- Protected chalk streams. A consideration of how chalk streams fair against conservation targets set for the small number of chalk streams protected by being designated as national SSSIs or European SACs.
- Chalk stream species. A review of population data for some of England's most iconic freshwater species. While these species aren't restricted to chalk streams, these rivers provide an important refuge.
- Pressures on chalk streams. A review of some of the key pressures on chalk stream health, focusing on abstraction, channel modifications, pollution and invasive species.

ECOLOGICAL HEALTH OF CHALK STREAMS

The Environment Agency's 2013 WFD classification[5] showed that most chalk streams are not in good health: none of the chalk stream water bodies were classed as being in High status; only 23% were Good; 46% were Moderate and 30% were in Poor or Bad status (1% of chalk streams not yet assessed). There are some important regional differences, with most of the Good chalk streams in south-western areas. A comparison with all water bodies across England and Wales showed that chalk streams were more likely to be in Poor or Bad status than the average river (19% of surface water bodies nationally are classed as Poor or Bad).

The 2013 WFD classification for chalk streams.





CASE STUDY: THE KENNET, THE MIMRAM AND THE BEANE

These chalk streams will directly benefit from the recent changes to abstraction legislation in the Water Act (2014).

In 1947, after the first abstraction borehole went in, the upper Kennet in Wiltshire began to dry. The Mimram and the Beane in Hertfordshire suffered similar fates after boreholes were sunk to supply the new towns of Welwyn Garden City and Stevenage. For decades the water boards and then the privatised water companies ignored the warnings. Local action groups such as Action for the River Kennet, The Friends of the Mimram and the River Beane Restoration Association were set up in the 1980s and 1990s to campaign, alongside NGOs including Herts & Middlesex Wildlife Trust, for reductions in abstraction.In the 1990s the Environment Agency recognised the damage abstraction was doing to the wildlife and, after working with the water companies to complete investigations, agreed a plan to reduce abstraction.

But there was a major flaw in the plan: the law required the Environment Agency to pay the companies millions of pounds in compensation in exchange for changes to their abstraction licences. With a funding pot significantly short of what was needed, the plans had to be put on hold.

The hard-won amendments to the Water Act removed the water company right to compensation. This change effectively enabled water companies to fund development of alternative resources through their normal business planning process, financed by customers. Affinity Water has included in its business plan significant abstraction reductions for seven chalk stream catchments, including the Mimram and Beane, underpinned by widespread metering, leakage reduction and water efficiency; likewise Thames Water for the Kennet and the Og tributary. Plans have been approved by Ofwat and are expected to be implemented from 2018.

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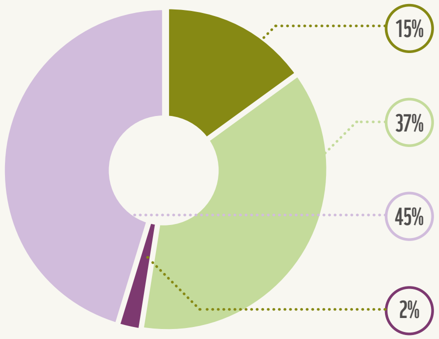
Whilst there is no wildlife endemic to chalk streams, these rivers provide optimal habitat for a number of England's iconic species.

PROTECTED CHALK STREAMS

Only 12 chalk streams are protected as SSSIs – this represents just 15% of our national chalk stream asset base, in terms of total chalk stream length. The government's Biodiversity Strategy[6] set a target for at least half of SSSIs to be in favourable condition by 2020 (while maintaining at least 95% in favourable or recovering condition).

Conservation status of the SSSI chalk streams



15% of the combined length of SSSI chalk streams were in 'favourable condition' – defined as 'adequately protected and meeting conservation objectives'

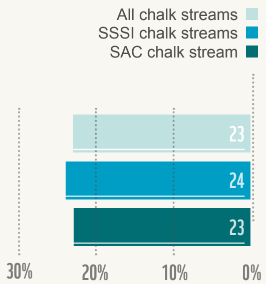
37% 'unfavourable recovering' – defined as 'not yet conserved but the plans are in place to improve things, given time'

45% 'unfavourable no change' – not being conserved and won't reach favourable condition without changes to site management or external pressures

2% 'unfavourable declining' – not being conserved and becoming progressively worse.

Of the 12 SSSIs, four have been additionally designated as SACs under the European Habitats Directive. A comparison of the WFD classifications for water bodies protected under the two designations was made. Conservation status of SSSIs looks at the condition of the features for which the site was designated; the WFD status looks at ecological and chemical parameters of the water body. Achieving Good status as defined by the WFD could be seen as an interim step towards attainment of more stringent Conservation objectives for SSSIs and SACs.

Proportion of chalk stream water bodies at Good status



The chart on the left shows the proportion of SAC, SSSI and all chalk stream water bodies at Good status. It shows that there is not a significant difference between the different designations. Note that this headline data may not necessarily reflect some important localised successes (such as driving down phosphate levels and delivering physical restoration on SSSIs) and the significant benefits associated with preventing damage from new developments.

AQUIFER HEALTH

The relationship between a chalk stream and the underground aquifer is dynamic and vulnerable to human interventions: abstraction from the aquifer has a knock-on impact on stream flow, and pollutants from the stream (and those spread on the land above) can infiltrate the groundwaters. So the health of the aquifer is a good indicator of the health of the chalk stream (and vice versa).

The WFD requires achievement of Good status in groundwaters, assessed using quantitative and chemical indicators. Groundwaters are classified as either at Good or Poor status[7]. The Environment Agency has classified the chalk aquifer as a whole as being in Poor Quantitative status[8]. There are also challenges related to chemical status, with phosphate and nitrates, derived from agricultural sources, at levels that pose a significant risk to drinking water supplies (above the minimum standard set to protect public health), with the majority of chalk Groundwater Drinking Water Protected Areas at risk[9].

CHALK STREAM SPECIES

While there are no species which are endemic to chalk streams, these rivers provide optimal habitat for a number of England's iconic and indicator species. In their healthy state, chalk stream flows are:

- clean – excellent for trout and salmon;
- alkaline and high in calcium carbonate – excellent for invertebrates;
- cool and well oxygenated – excellent for fish fry;
- consistently strong – excellent for macrophytes such as water crowfoot

In turn, the aquatic plants are the 'hedgerows' of the river, providing the in-stream habitat on which everything else depends. The fish fry and invertebrates are excellent food sources for insectivorous and piscivorous birds, mammals and amphibians. The chalk also acts as a buffer against floods and droughts, which means that they provide good refuge for flow vulnerable species such as water vole.

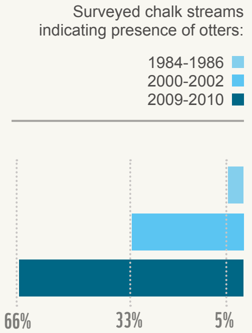
Here, mainly due to limited data availability, the populations of four species within chalk stream catchments were considered: the European otter, brown trout, Atlantic salmon and white-clawed crayfish.

CASE STUDY: THE ITCHEN

This Hampshire chalk stream is failing to achieve SAC conservation targets. There have been some good steps forward to tackle pressures, but delayed action means the river remains at risk.

Riparian owners in the upper river have reported algal growth that at one time was never seen and significant reductions in gammarus (freshwater shrimp). Data collected by the Salmon & Trout Association, the Hampshire Wildlife Trust and Southampton University showed the river suffers from nutrient enrichment, caused by pollutants high in phosphorous. This data contributed to an Environment Agency review, which in 2014, resulted in new phosphate standards. While this is a major step forward, watercress and trout farms have until 2016 to comply.Environment Agency investigations proved abstraction was damaging the ecology in the lower Itchen during the driest periods, so, in 2007, they proposed new monthly abstraction totals and a 'Hands-off Flow' condition to stop all abstraction when river flows drop to a critical level (likely once in 50 years). A plan was agreed by Southern Water and the regulators to reduce demand through metering and to source water from the neighbouring River Test instead (on the condition that increased abstraction would not adversely impact the Test). Five years on, however, implementing the proposed licence conditions is a distant prospect. While good progress has been made on the demand side (78% of local households now have a meter), new investigations have highlighted potential wider catchment issues associated with abstracting from the Test. Discussions about the Itchen solutions remain ongoing.

European otter *(Lutra lutra)*



Otter populations underwent a dramatic decline in England between the 1950s and 1970s, and were effectively wiped out from south-east England, the Midlands and East Anglia. National Otter Surveys are carried out to look for the presence of otters, such as spraints (dung) and footprints. 42% of chalk streams were included in the most recent National Otter Survey (2009-10). Signs of otters were recorded at two-thirds of the chalk stream sites surveyed (noting that there could be several sites on a single stream) (Figure 5). This is a significant increase compared to 2000-02 (which found signs at a third of sites) and 1984-86 (signs at just 5% of sites) and in-line with increases observed nationally. The Environment Agency has suggested that the significant recovery of the otter population is due to: the ban on certain pesticides that caused extinction of otters from many parts of England in the 1960s and early 1970s, legal protection and a ban on hunting, and significant improvements in water quality in relation to sewage and industrial discharges[10].

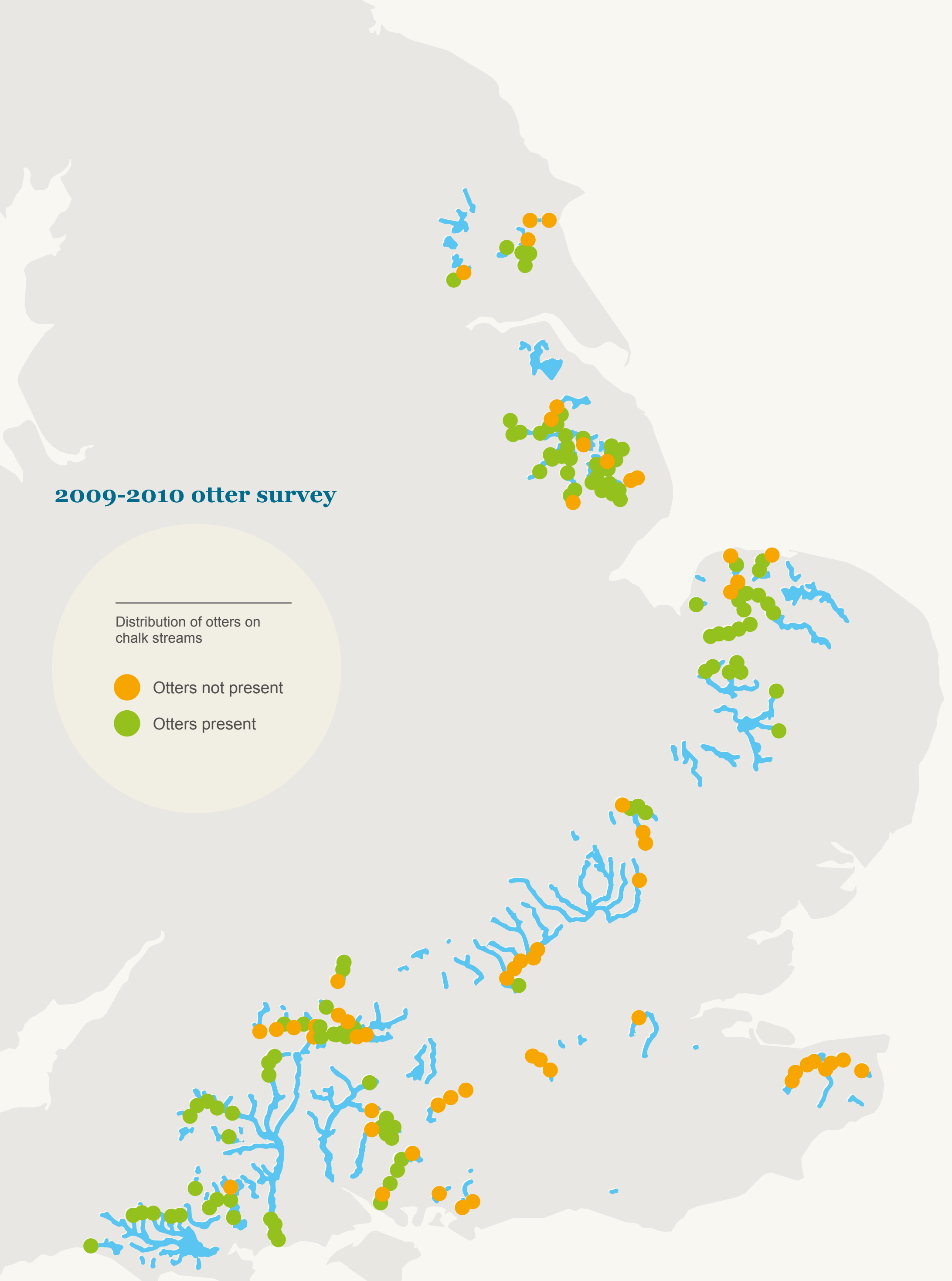
Brown trout *(Salmo trutta)* and Atlantic salmon *(Salmo salar)*.

All chalk streams should be capable of supporting a healthy population of brown trout. Assessing data from 2005-2009, brown trout were observed on 38% of chalk streams. Atlantic salmon on 12% – largely the chalk streams of Hampshire, Wiltshire and Dorset. (Note that absence of observations does not indicate absence of a species, and some rivers may not have been surveyed.)

Six chalk streams – Itchen, Test, Avon, Frome, Stour and Piddle – are listed as nationally important principal salmon rivers. The 2013 assessment of salmon stocks and fisheries categorised these as 'at risk' or 'probably at risk' with little improvement being predicted by 2018. This is consistent with national trends – just 11% of England and Wales' principal rivers have been classified 'not at risk'. The 2013 assessment also showed that adult salmon counts and returning stock were below the average for the last five years, with the rivers of Hampshire and Dorset being the poorest of those monitored.

White-clawed crayfish *(Austropotamobius pallipes)*.

White-clawed crayfish data was limited, but it showed a presence on just 5% of chalk streams. Signal crayfish *(Pacifastacus leniusculus)* which carry a fungal disease fatal to the native crayfish are now endemic across large swaths of chalk catchments. Their spread is resulting in localised extinctions of native populations across large parts of England. If no remedy can be found it is likely that this may be the last generation of children to find native crayfish in their local chalk rivers.



CASE STUDY: THE WANDLE

As it winds through the streets of south London, underground drainage pipes carry rainwater from the streets directly to the river, carrying contaminants – from vehicle exhausts, tyre wear and oil. So when it rains, the usually 'gin clear' Wandle runs black. Analysis of the river bed showed heavy metals and other toxics at levels damaging to aquatic life.

The South East Rivers Trust in partnership with Thames Water, the Environment Agency, London Borough of Sutton and private companies, has developed a suite of technical solutions to tackle the issue. First, the primary inputs of road run-off were identified. Next, huge 'hydrodynamic vortex chambers' (devices to catch the particulates) were specially designed and fitted to the drainage pipes to treat the run-off before it enters the Wandle. Other sustainable solutions were trialled too, such as 'mycofiltration' which uses fungi to remove contaminants. The Trust is also working with the local community to monitor minor pollution incidents, reporting directly to the Environment Agency's National Incident Reporting System.

PRESSURES ON CHALK STREAMS

Of the chalk stream water bodies assessed, 77% did not meet the statutory requirement of Good status, and so can be considered as 'failing'.

The Environment Agency's 'Reason For Failure' database (2013)[11] was reviewed analysing the data for the failing chalk stream water bodies. It can be incredibly difficult to confirm the Reason for Failure, particularly in relation to diffuse pressures; data on Reasons for Failure was available for three-quarters of chalk stream water bodies.

Analysis of the primary Reason for Failure for each chalk stream water body showed the main pressures to be (figures rounded to nearest whole %):

- Physical modifications – including barriers to fish passage, urban and rural structures, and land drainage were recorded as the primary reason for failure for 34% of failing chalk streams.
- Groundwater and surface water abstraction – 24%
- Sewage pollution – 14%
- Agricultural pollution caused by run-off of sediment, pesticides, manure and fertilisers – 10%
- Urban diffuse pollution – 6%
- Invasive species – 2%
- Other – 9%.

77%
DID NOT MEET THE STATUTORY REQUIREMENT OF GOOD STATUS, AND SO CAN BE CONSIDERED AS 'FAILING'

It is important to note that water bodies can fail because of multiple pressures and a higher proportion of chalk streams may be affected by each of the pressures listed above when all reasons for failure for a water body are considered. Many pressures also have compound effects (e.g. low flows from abstraction can concentrate pollutants; physical modifications can reduce natural resilience to low flows). In order to achieve Good status, all reasons for failure must be addressed.

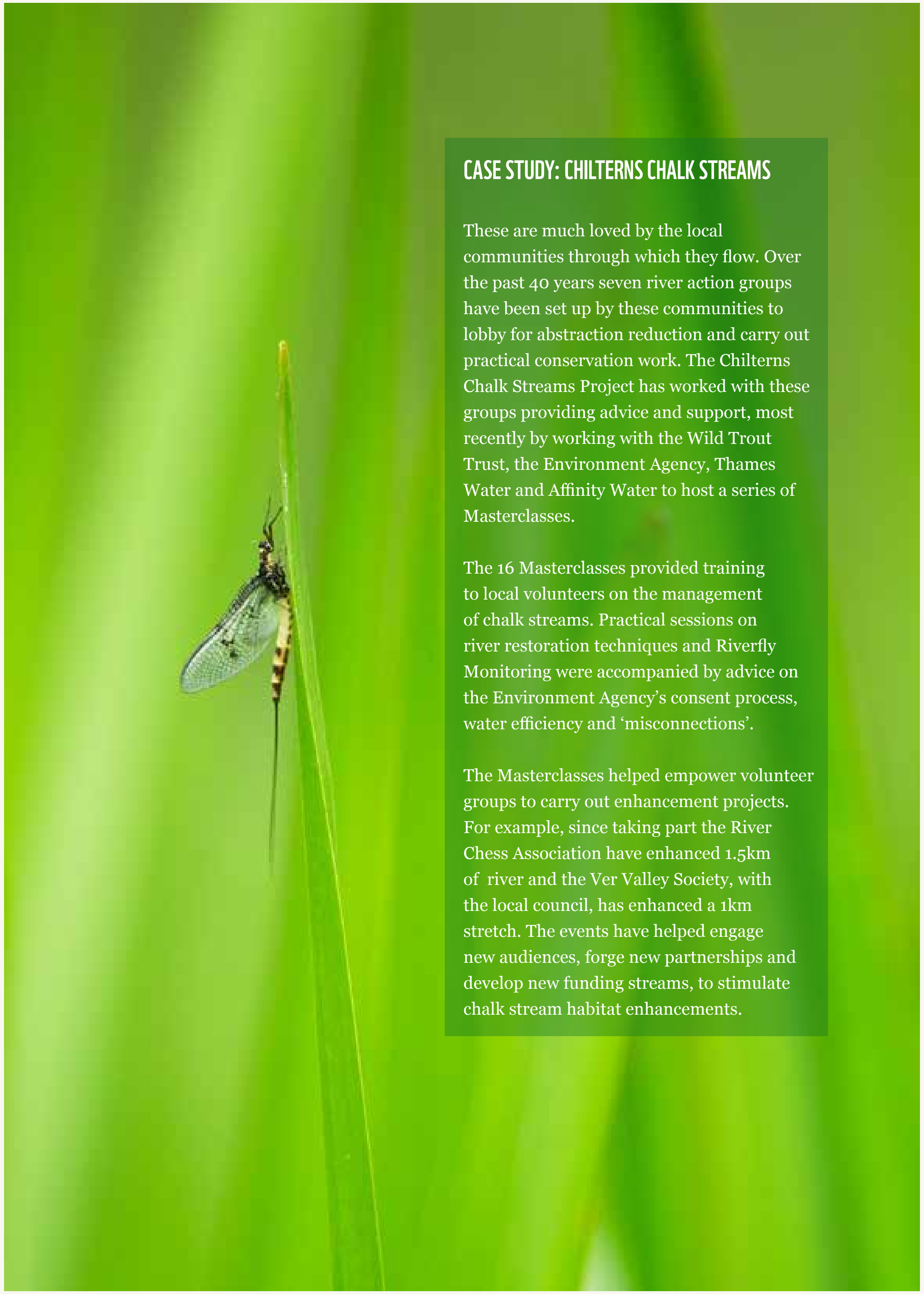
Modified chalk streams

More or less every metre of every chalk stream has been modified to a degree, often many times. Chalk streams are very low-energy systems and are mostly incapable of erasing a modification once it has occurred. So the modifications accumulate.

The Environment Agency's 'Reasons for Failure' database (2013)[12] showed that physical modification is the primary reason for a third of failing chalk streams not meeting Good status. Many more have physical modification as a secondary reason for failure. Under the Water Framework Directive, two-fifths of chalk streams are classified as 'Heavily Modified Water Bodies' and 2% as 'Artificial Water Bodies'. Environment Agency River Habitat Surveys (2008-2012) showed three-quarters of chalk streams as significantly modified from their natural state.

75%
OF CHALK STREAMS HAVE BEEN SIGNIFICANTLY MODIFIED FROM THEIR NATURAL STATE

A chalk stream's shape and form and connectivity – its 'geomorphology' – is the backbone of its biodiversity. A physically intact, natural and stable river is far more able to tolerate pollution and abstraction than a heavily modified one. The confined, straightened, impounded chalk stream cannot cope with floods and droughts in the same way a natural river can. Pollutants can more easily get into a modified system without its natural buffers, and once there tend to become trapped in a river that lacks its natural physical function (meandering and flooding). In-stream structures, such as weirs and sluices, also do damage as they prevent re-colonisation of wildlife after extreme events, and prevent inappropriate sediment being removed from the river. Connections with man-made waterways can also bring a problematic influx of warm, silty, nutrient-rich water.



CASE STUDY: CHILTERNS CHALK STREAMS

These are much loved by the local communities through which they flow. Over the past 40 years seven river action groups have been set up by these communities to lobby for abstraction reduction and carry out practical conservation work. The Chilterns Chalk Streams Project has worked with these groups providing advice and support, most recently by working with the Wild Trout Trust, the Environment Agency, Thames Water and Affinity Water to host a series of Masterclasses.

The 16 Masterclasses provided training to local volunteers on the management of chalk streams. Practical sessions on river restoration techniques and Riverfly Monitoring were accompanied by advice on the Environment Agency's consent process, water efficiency and 'misconnections'.

The Masterclasses helped empower volunteer groups to carry out enhancement projects. For example, since taking part the River Chess Association have enhanced 1.5km of river and the Ver Valley Society, with the local council, has enhanced a 1km stretch. The events have helped engage new audiences, forge new partnerships and develop new funding streams, to stimulate chalk stream habitat enhancements.

Abstraction

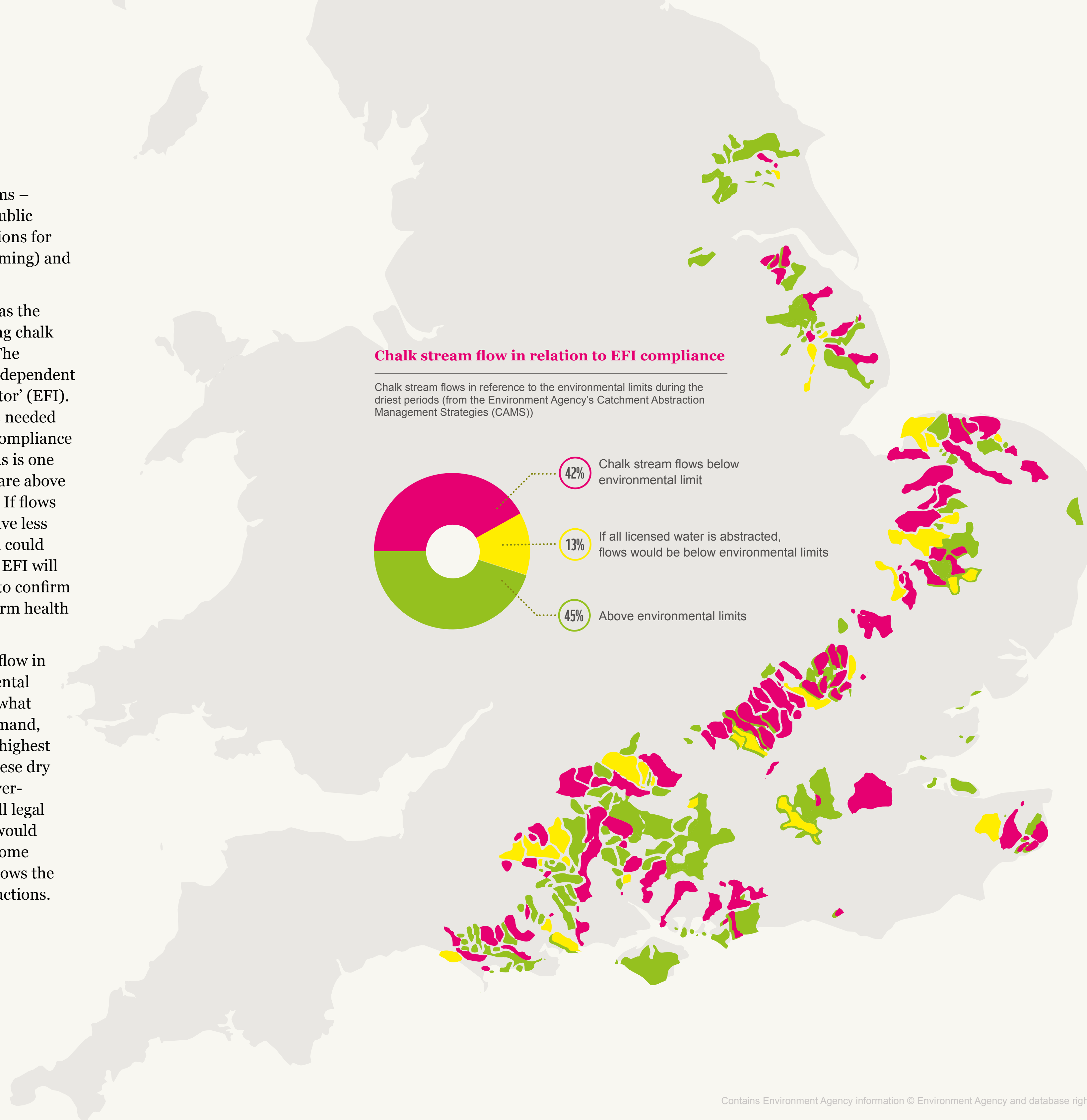
The majority of abstraction from chalks streams – or the aquifer on which they depend – is for public water supply, although there are also abstractions for agriculture (irrigation, watercress and fish farming) and other industry.

Groundwater and surface water abstraction was the primary reason for failure in a quarter of failing chalk streams[13]. More are affected to some degree. The Environment Agency, based on advice from independent experts, has set an 'environmental flow indicator' (EFI). This is the flow volume of water believed to be needed in the river in order to support Good status. Compliance with the EFI under different rainfall conditions is one measure of chalk stream health: if river flows are above the EFI then they can be described as healthy. If flows fall below the EFI, then the river is likely to have less water in it than the environment needs, which could result in ecological damage. (A flow below the EFI will trigger an Environment Agency investigation to confirm whether abstraction is threatening the long-term health of the river ecology.)

55%

OF CHALK STREAMS AT RISK FROM OVER-ABSTRACTION

The diagram on the right shows chalk stream flow in relation to EFI compliance (i.e. the environmental limits) during the naturally driest periods (at what is termed the 'Q95'). This is the time when demand, and therefore abstraction, is most likely to be highest (normally during summer months). During these dry periods, 42% of chalk streams are routinely over-abstracted, and, if all abstractors took their full legal entitlement, more than half of chalk streams would be. Even during much wetter periods (Q30), some 20% of chalk streams remain at risk, which shows the magnitude and impact of some licensed abstractions.



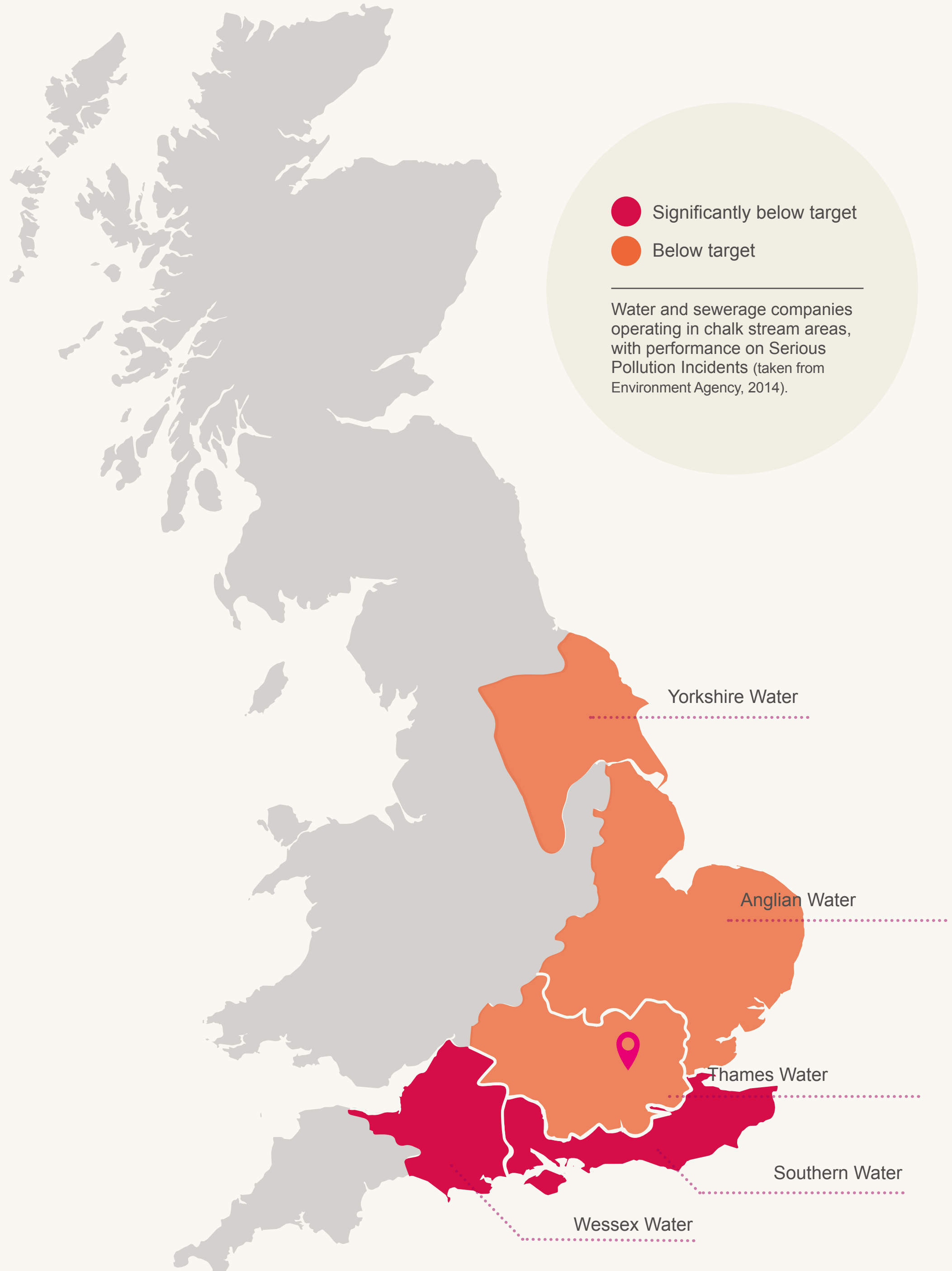
CASE STUDY: THE CRAY

Rising in the London Borough of Bromley before making its way to join the Darent and then the Thames on the north-west Kent marshes. In the 1970s the Cray was home to a population of wild brown trout, but thanks in part to over-abstraction, heavy industrialisation and urban pollution, trout are now locally extinct. The river is still much loved by locals and home for native species including dace, pike and eels.

The Cray runs directly behind Coca-Cola Enterprises' Sidcup factory, which is one of the reasons WWF-UK, Coca-Cola Great Britain and Coca-Cola Enterprises have joined forces with the North West Kent Countryside Partnership to help improve the river.

With help from an army of volunteers, improvements to 4km of river have been completed (installation of flow deflectors, fish refuges and native planting) and over 2,000 members of the local community have been involved in events and river walks. Water voles have returned and anglers are reporting improved fish catches.

In many places the water is just a few inches deep across an over-widened channel. Investigations have confirmed that Thames Water's abstraction – 10 million litres a day at peak – from the groundwater beneath the Cray is damaging. The Environment Agency has recommended that it be reduced to zero. Yet Thames Water has not included this in their business plans because it's not considered "cost beneficial".



Water and sewerage companies covering chalk stream areas

Sewage pollution

Sewage discharge – whether it's nutrient-rich treated effluent, permitted raw sewage overflows or unregulated, illegal pollution from sanitary waste or other toxic substances – is the primary reason for failure on a sixth of failing chalk streams[14].

Many of the biggest water company continuous wastewater discharges have mostly been addressed (for example by including phosphate-stripping as part of the water treatment). The residual issues relate to raw sewage overflows from inundated treatment works during wet weather (both those that are 'permitted' and illegal pollution incidents) and, particularly in rural areas, from countless, unregulated small discharges from septic tanks.

The diagram on the left shows the water and sewerage companies covering chalk stream areas and their performance in relation to serious pollution incidents (which have had an extensive or persistent impact on the environment and can result in a large number of fish deaths)[15].

RIVER CHESS

In 2014, high groundwater levels overwhelmed Thames Water's Chesham Sewage Treatment Works, and for four months (February to June 2014) raw sewage mixed with groundwater continuously entered the river. The impact of this pollution is not fully known but the River Chess Association volunteers have observed dead fish, significant amounts of sewer fungus and fewer riverfly downstream of the sewage outfall pipe. They have also had to cancel school trips and planned river restoration works due to risks to human health. While the water company has few choices in the circumstances in order to prevent sewage flooding homes, the problem is a result of years of underinvestment. Even in normal conditions, the plant is working close to capacity and the slightest stress can cause failures.

Agricultural pollution

The Environment Agency ‘Reasons for Failure’ database attributes agriculture and rural land use – including pollution from fertilisers, manures, pesticides and soils washing into streams when it rains or percolating into the groundwater – as the primary pressure on 1 in 10 failing chalk streams[16]. Other pressures from agriculture include deepening, widening or re-routing of streams for land drainage, gravel removal and bankside erosion.

Defra’s ‘Water and Agriculture’ maps[17] derived from the Environment Agency’s ‘Reason for Failure’ database show that all four chalk stream SACs (the Lambourn, Itchen, Avon and Wensum) are at risk due to agricultural pollution – predominantly fertilisers and sediment.

All four chalk stream Special Areas of Conservation are at risk from agricultural pollution

Research commissioned by WWF-UK[18] used expert opinion to estimate the proportion of farmers who comply with key regulations and other requirements that are compulsory on receipt of government subsidies. It found that average compliance rates ranged from 70% to 80%. It also found that the inspection process by the government’s Rural Payments Agency (RPA) failed to identify the full extent of breaches of the regulations, a finding backed up by Environment Agency catchment walkover surveys[19], which identified thousands of soil and erosion problems linked to farming.

Invasive species

While the primary reason for failure for 2% of failing chalk streams was invasive non-native species, many more chalk streams are affected. River Habitat Surveys recorded occurrence and population trends of invasive non-native species between 2008 and 2012. In 2012:

- Himalayan balsam *(Impatiens glandulifera)* was observed on 14% of chalk streams surveyed, an increase of 5% since 2008.
- Japanese knotweed *(Fallopia japonica)* was observed on 6% of chalk streams surveyed (double the number in 2008).

Data was not available for other species (e.g. non-native crayfish, American mink), which are known by local Environment Agency and Wildlife Trust staff to have significant and growing impacts on chalk streams. New invasive non-native species, such as the Quagga mussel *(Dreissena bugensis)* have not yet been shown in the survey records on chalk streams but could have a significant impact.

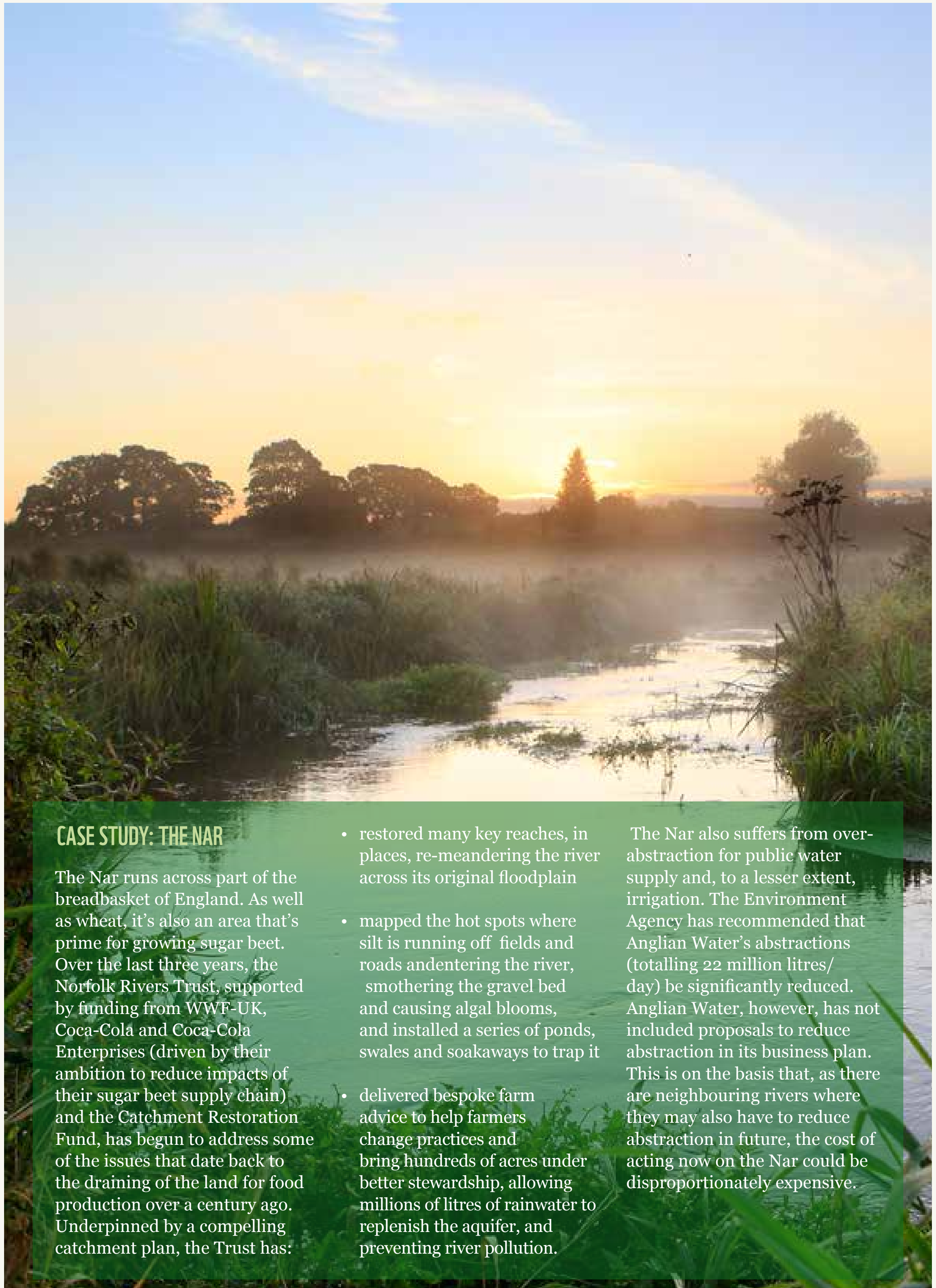
CONCLUSIONS

In the decade since the first State of England's Chalk Streams was published there has been widespread agreement about the importance of these rivers, and recognition of the need for action to protect them.

There has been a lot of activity and a few glimmers of progress: otters are slowly making a comeback, communities are galvanising support, and the Environment Agency's monitoring of river health is one of the most comprehensive in the world. There have been positive advances at policy level too (for example, the development of the Catchment Based Approach and the recent changes to abstraction regime in the Water Act 2014); changing attitudes and signs of implementation are on the horizon.

While there was very little comparative data with 2004, the evidence presented in this report is clear: England's unique and precious chalk streams are in a shocking state of health. Only 23% are classed as having attained Good status and a third are classed as Poor or Bad. Although only 2% of chalk streams designated as SSSIs are deteriorating, 85% are in unfavourable condition and half will not reach favourable condition unless there are changes to management or external pressures. Judging by the headline data alone, there is no distinguishable difference between the 'protected' chalk streams and the rest.

With growing pressure from climate change, population growth and new and expanding populations of invasive non-native species, ensuring no further deterioration from the current meagre baseline will be challenging without a step change in management.



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CASE STUDY: THE NAR

The Nar runs across part of the breadbasket of England. As well as wheat, it's also an area that's prime for growing sugar beet. Over the last three years, the Norfolk Rivers Trust, supported by funding from WWF-UK, Coca-Cola and Coca-Cola Enterprises (driven by their ambition to reduce impacts of their sugar beet supply chain) and the Catchment Restoration Fund, has begun to address some of the issues that date back to the draining of the land for food production over a century ago. Underpinned by a compelling catchment plan, the Trust has:

- restored many key reaches, in places, re-meandering the river across its original floodplain
- mapped the hot spots where silt is running off fields and roads andentering the river, smothering the gravel bed and causing algal blooms, and installed a series of ponds, swales and soakaways to trap it
- delivered bespoke farm advice to help farmers change practices and bring hundreds of acres under better stewardship, allowing millions of litres of rainwater to replenish the aquifer, and preventing river pollution.

The Nar also suffers from over-abstraction for public water supply and, to a lesser extent, irrigation. The Environment Agency has recommended that Anglian Water's abstractions (totalling 22 million litres/day) be significantly reduced. Anglian Water, however, has not included proposals to reduce abstraction in its business plan. This is on the basis that, as there are neighbouring rivers where they may also have to reduce abstraction in future, the cost of acting now on the Nar could be disproportionately expensive.

A MANIFESTO FOR CHALK STREAMS

Crucially, we now know what needs to be done to safeguard our chalk streams and restore them to good health – we need to do four things, which on the face of it all seem quite straightforward:

- **Reduce abstraction**
- **Decrease pollution**
- **Revive natural river processes and improve habitat**
- **Promote better river management.**

There are some great examples already of how this can be done. But too often these are isolated examples – efforts aren't big enough or widespread enough or implemented fast enough to make a real difference to all of our chalk streams.

CRITICALLY, WE KNOW HOW TO LOOK AFTER OUR CHALK STREAMS. BUT WE NEED A SIGNIFICANT INCREASE IN EFFORTS TO UPSCALE LOCALISED SUCCESS

In short, we need a critical shift in the way we look after, use and value our chalk streams. Such changes should build on the momentum of recent years, but much more will be needed from government, regulators, private and third sectors to ensure that the state of chalk streams in another decade is substantially improved.

In 2015, the new government will publish statutory River Basin Management Plans. This is the perfect opportunity for the government to deliver an ambitious and compelling vision and action plan for chalk streams, setting out all the measures needed to get chalk streams up to Good status. This should include:

1 Government leadership to champion chalk streams

Delivering the wholesale changes needed will take real leadership.

At the time of the 2004 report, the Environment Agency played a leading role. Since then there have been a couple of significant changes:

- *government has made it clear that the Environment Agency has no role in policy making*

- *the new Biodiversity Strategy for England has effectively deprioritised the protection of chalk streams. In 2004, chalk streams were a priority habitat of the UK Biodiversity Action Plan overseen by a national steering group. This has now been disbanded and replaced with a rivers priority habitat. While WWF UK agrees that all rivers are a priority, the interpretation of this new priority seems to place emphasis on protecting the few, most natural and pristine rivers from deterioration, rather than prioritising the protection of valuable rivers that have been degraded and need to be restored.*

GOVERNMENT MUST MAKE CLEAR THAT CHALK STREAMS ARE A PRIORITY AND ALLOCATE SUFFICIENT RESOURCES TO PROTECT THEM

While all rivers are special, WWF-UK believes that the combination of the biodiversity, cultural and historical value of chalk streams, together with their uniqueness to the UK, is reason enough to make chalk stream protection a priority. There is a real need for government to make this clear and to empower a nominated lead department or agency to develop, advocate and lead implementation of the policy changes required.

The government must:

Give a clear indication that chalk stream protection and restoration is a national priority.

Allocate sufficient resources, including through ongoing support of the Catchment Restoration Fund, to restore and protect our chalk streams.

Report an indicator of chalk stream health (such as the proportion of chalk streams meeting Good status) to parliament on an annual basis to enable independent scrutiny of progress.

2 Fit-for-purpose regulation of abstraction and pollution

Looking at the key pressures on chalk streams – abstraction and pollution – it's hard to conclude that the current suite of regulation is effective. It seems that the law of the land still allows (and even encourages) our precious chalk streams to be treated as cheap water sources and open sewers.

The main changes in regulation needed are:

Abstraction licences

OVER-ABSTRACTION MUST BE ADDRESSED BEFORE DEFRA START THE TRANSITION TO A REFORMED REGIME

All unsustainable licences must be reviewed and conditions applied by 2020, reducing the amount of water available for abstraction when and where the environment needs it most. There's been much discussion about how to do this (e.g. WWF-UK's Itchen Initiative[21]). The most significant thing is rapid implementation. Despite the hugely significant changes from the Water Act, just a handful of water company abstractions will be reduced by 2020, in part because a number of problems have yet to be officially 'confirmed'. There also remains a real issue related to the unsustainable abstractions caused by other sectors. The law currently requires the Environment Agency to compensate all abstractors (except for water companies) when making a change to a licence. However, for all but a few protected sites, there is no fiscal mechanism to raise compensation.

Aside from these issues of uncertainty and inadequate financial mechanisms, there are also some real institutional issues affecting the pace of implementation, not least resourcing within the Environment Agency. It is critical that unsustainable abstraction is addressed before transition to a new abstraction management regime. That's why it is essential that Defra oversees the delivery of the programme to tackle current over-abstraction.

With increasing water demand and likelihood of droughts due to climate change, sustainable water supplies that do not damage chalk streams are imperative.

The government must, by 2016, legislate for:

Comprehensive reform of water abstraction-licensing, making provisions for all unsustainable licences to be amended

Compulsory metering across chalk stream catchments to reduce water demand

Addressing sewage pollution

The sheer number of pollution incidents suggests that a step change in the water industry is needed to deliver the Environment Agency's target of zero serious pollution incidents by 2020. New measures such as water company investment over the 2015-2020 business plan period, changes to court fines, and Ofwat regulatory incentives and penalties are welcome. It's not apparent yet whether they are enough to deliver the significant improvement needed on water company pollution. Defra recently announced deregulation of small sewage discharges (septic tanks)[22]; it's hard to see how this is going to help tackle pollution caused by septic tanks in rural areas.

The government must:

By 2016, review water company progress towards meeting the 2020 zero pollution incident target and the progress tackling pollution from small sewage discharges under the new regulations, suggesting any policy changes needed to ensure that sewage pollution is significantly reduced.

Require water companies to produce 25-year Wastewater Plans (similar to Water Resource Management Plans) to ensure that the sewerage system is resilient to future pressures of climate change and population growth, while not causing damage to property and the environment.

Addressing agricultural pollution

EXISTING REGULATIONS MUST BE FAILING WHEN THE PUREST CHALK STREAMS DEVELOP ALGAL BLOOMS AT THE FIRST HINT OF SUNSHINE

Diffuse pollution from agriculture remains a significant issue. Existing legislation, or its enforcement, is clearly failing when countless thousands of tonnes of nutrient-rich material are washed from farmland and roadsides with every passing weather front, causing the purest of chalk streams to develop algal blooms at the first hint of spring sunshine. It's crucial that farmers are supported to make the changes needed. This must be interpreted at the local scale, with targeted advice and, where appropriate, incentives. Catchment Sensitive Farming and the Rivers Trust Pinpoint initiative have been working with farmers to improve agricultural practices and reduce diffuse pollution along with private sector water stewardship initiatives (such as the WWF-UK, Coca-Cola and Coca-Cola

ADVICE AND INCENTIVES CAN ONLY WORK WHEN THEY'RE ON TOP OF A FAIR FOUNDATION OF LEGAL COMPLIANCE

Enterprises partnerships on the Rivers Nar and Cray). These efforts are resulting in localised reductions in agricultural pollution but they need to be significantly up-scaled to achieve the step change needed for all chalk streams. Water stewardship needs to be on the agenda for all companies whose operations and supply chains impact chalk stream health.

To be effective, all voluntary programmes must be built on a strong and fair foundation of compliance with baseline legislation and regulation.

The government must:

Target efforts to secure compliance to ensure that public subsidies are delivering the public goods intended.

Ensure that water and agriculture policies reflect the polluter pays principle and basic regulatory measures are sufficient to support Good status.

Where appropriate, provide targeted agri-environment incentives to deliver improvements in the water environment (including through the New Environmental Land Management Scheme).

Continue support and resourcing for farm advice, such as Catchment Sensitive Farming, including enabling knowledge exchange with private and third sector schemes.

Develop the means to enable and promote matched-funding from the farming and food & drink sectors for water stewardship voluntary initiatives to maximise impact and promote corporate leadership.

Removal and control of in-stream structures

Weirs, sluices, hatches and other barriers to fish passage are a major limiting factor on chalk streams. Tackling this issue, by removing structures, making them passable for fish and/or changing management regime is imperative to ensure our chalk streams are healthy and resilient to drought, pollution and climate change.

The Environment Agency must:

REMOVING REDUNDANT WEIRS, HATCHES AND BARRIERS IS CRUCIAL TO ENSURING CHALK STREAMS ARE RESILIENT TO CLIMATE CHANGE

Ensure that all the structures under Environment Agency ownership and control are not contributing to failures to meet Good status.

Use its current powers to remove or amend structures owned or managed by third parties or require mandatory operational or management changes to make sure chalk streams meet Good status.

3 A chalk stream forum for learning and scrutiny

Restoring our chalk streams is such a significant task, it is going to require an adaptive strategy, with capacity to monitor and evaluate and share experiences to enable us to learn and modify as we go along.

Events such as the Chilterns Chalk Streams Masterclasses and the Vitacress Chalk Stream Headwaters Forum show that there is appetite for coming together. An important step will be to build on these efforts and (re)establish a national chalk stream forum to discuss and develop policies and practices. This group would benefit from a formal link (and resourcing) to the England Biodiversity Strategy, with statutory, conservation and fishery bodies represented. The forum should allow a dialogue between those involved in delivery of catchment improvements and those tackling the regulatory issues. Live issues for discussion include: what exactly is meant by river restoration on chalk streams?; what are the best techniques to restore channel morphology and connectivity and encourage the chalk streams to function dynamically?

The most significant step forward since 2004 has been investment in monitoring chalk stream health, driven by the Water Framework Directive. But it is essential that the monitoring data is periodically analysed and evaluated to understand progress to improving the state of chalk streams. Work is also needed to develop the chalk stream index, taking account of the headwaters and winterbournes that may need bespoke monitoring and restoration, as they are not necessarily included under the Environment Agency's Water Framework Directive programme.

The Environment Agency must:

A CHALK STREAM FORUM COULD ENABLE DEBATE ON HOW BEST TO RESTORE CHALK STREAMS

Continue to monitor chalk stream health including the smaller streams and headwaters which are not included in the Water Framework Directive classification.

Lead the chalk stream data analysis, in consultation with stakeholders, publishing the results on an annual basis.

Work with Natural England and other stakeholders to facilitate the (re)establishment of a chalk stream forum.

4 Protected chalk streams are restored and well-managed

Protected areas – our SAC and SSSI chalk streams – are incredibly important for national and international biodiversity. In the Chalkstream Charter, WWF-UK, along with the Angling Trust and other environmental groups, called for all chalk streams to be given enhanced protected status. And there is a groundswell of interest among fisheries and conservationists to have local chalk streams designated. But, as the data in this report suggests, on the face of things, increased protection has not yet significantly accelerated restoration.

The key issue remains with the timely implementation of the management plans drawn up by the authorities to meet the statutory targets for these vitally important protected sites. The Environment Agency has now confirmed that it will fall short of the 2015 target to get protected areas to Good status[23], and it is very concerning that the four SAC chalk streams, with the highest level of conservation protection currently available, are still under significant pressure.

Natural England must:

In consultation with a new Chalk Stream Forum, review and confirm progress for chalk stream SSSIs and SACs to identify what changes in policies, priorities and behaviours are needed to achieve conservation targets.

The Environment Agency must include in the updated River Basin Management Plans:

A thorough review of the measures set out in the 2009 plans for chalk stream protected areas, including the nature and extent of measures put in place and an explanation as to their effectiveness.

New, improved measures that are sufficient to deliver the step change needed to ensure protected chalk streams achieve Good status as soon after 2015 as possible.

5 Valuing our chalk streams

Chalk streams need strong, clean flows to thrive, but chalk water is cheap. The chalk aquifer is an asset that provides millions of people with water yet, despite this, it does not appear on any asset register and there is only limited investment in its maintenance. Chalk stream economics is fundamentally flawed and our accounting systems are driving all sorts of perverse outcomes.

THE CHALK AQUIFER IS AN ASSET WORTH BILLIONS YET THERE'S VERY LITTLE INVESTED IN ITS MAINTENANCE

The Water Framework Directive requires that EU member states take full account of the 'polluter pays' principle and devise a water-charging system that recovers costs and incentivises efficient use. A government-led strategy to deliver fair, sustainable and affordable water-charging is needed to ensure that all households in chalk stream areas are on a meter by 2020 – crucially underpinned by tariffs to support households on low incomes, and to encourage efficient water use.

But valuing chalk streams must go further than household metering. Government, regulators and the water companies must collectively acknowledge the conservation value of the chalk streams, giving every litre of chalk water abstracted its due value.

GOVERNMENT, REGULATORS AND THE WATER COMPANIES MUST COLLECTIVELY ACKNOWLEDGE THE CONSERVATION VALUE OF THE CHALK STREAMS, GIVING EVERY LITRE OF CHALK WATER ABSTRACTED ITS DUE VALUE

The government must:

Set the Environment Improvement Unit Charge on abstraction licences at a level that will raise sufficient funds to enable all unsustainable licences (held by farmers, industry and other non-water company abstractors) to be changed in order to support Good status.

Ask the Natural Capital Committee to specifically look at the natural capital currently lost due to unsustainable water resource management and over-abstraction.

Ofwat and the Environment Agency must:

Work together to ensure that an effective Abstraction Incentive Mechanism is implemented from April 2015, encouraging water companies to reduce abstraction from the most environmentally vulnerable sites wherever possible.

Develop tools such as shadow scarcity charges for the next Water Resources Management Plans guidelines to encourage companies to place greater value on chalk stream water.

WWF-UK is committed to improving our precious chalk streams. In this report we have set out clear, up-to-date evidence of their current health (or lack of it) and the reasons behind this. Getting our chalk streams to good health is possible – the solutions are already being implemented in places.

With commitment and leadership we can make considerable progress towards protecting these precious habitats for wildlife and for our future generations.

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AN INDEX OF ENGLISH CHALK STREAMS

Various technical definitions of 'chalk stream' have been proposed, e.g. *"streams that derive 75% of their flow from chalk groundwater and flow over a chalk geology"*[23].

In reality we have a spectrum of chalk streams and chalk-influenced streams, which derive most of their flow from chalk groundwater, and exhibit – in varying degrees depending on the geology of a given valley – the 'classic' chalk stream characteristics of clear water and equable flows. These might be categorised as follows:

1. Streams rising directly from the chalk and subsequently flow over younger Tertiary (sand and clay) deposits. This group would include the majority of the Hampshire streams and those which flow into the Thames Basin. Most of the iconic chalk streams like the Itchen or Test or Kennet are in this group.

2. Streams which rise beyond the chalk and subsequently flow over/through the chalk – a minority of streams but the Great Stour in Kent is a good example, rising on the Gault Clay/Greensand and then flowing through the chalk. The Nadder is another example, as is the Hampshire/Wiltshire Avon and the Dorset Frome. These streams will have less equable flow regimes and are subtly more deeply incised in the landscape than the previous group, will tend to colour after heavy rain and take longer to clear too.

3. Streams rising from chalk which was directly impacted by major glacial action during the Pleistocene Ice Age. This would include some northern Chiltern streams and the East Anglian, Lincolnshire and Yorkshire streams.

4. The 'scarp slope' streams, which all tend to run for a very short distance over older (clay-rich) chalk and then flow out onto the underlying Gault Clay and Greensand beds. The Fontmell brook and Iwerne stream in Dorset are scarp-slope streams, as are the streams north of the Chilterns, the westward-flowing streams in north-west Norfolk, and all the streams east of the Yorkshire Wolds.

In the 2004 report the Environment Agency indexed 161 chalk streams. Our new index builds on this to itemise all English chalk streams according to the definitions above. It was compiled, by Charles Rangeley-Wilson with the help of Haydon Bailey, using high-detail geological maps available online via the British Geological Survey Map viewer, in conjunction with online satellite maps and local knowledge. It would be almost impossible to list every single distinct rivulet in any given catchment (many are no more than occasionally wet furrows, and on the scarp slopes there are often hundreds of springs along the spring-line that never quite amount to a river). So, on the whole, whether or not to count a given stream as a distinct chalk stream is based on a common-sense call according to whether the river flows from or largely over chalk, is named on a map (the complete 1946 series has been used for reference as it precedes the distortions of post-war land drainage), and is known as a chalk stream or has the characteristics of one.

But the list is almost certainly not complete. Feedback would be much appreciated.

Key: * = SSSI Chalk stream
† = SAC Chalk stream

Bedfordshire - Beds
Berkshire - Berks
Buckinghamshire - Bucks
Cambridgeshire - Cambs
Dorset - Dor
Hampshire - Hants
Hertfordshire - Herts
Lincolnshire - Lincs
Middlesex - Middx, Mddx
Norfolk - Norf
Oxfordshire - Oxon
Suffolk - Suff
Surrey - Sy
Sussex - Sx
Wiltshire - Wilts
Yorkshire - Yorks

Wessex – all the chalk streams that flow south into the English Channel (Dorset)

River Bride
Litton Cheney brook

River Wey

River Jordan

Wessex – all the chalk streams that flow south into Bournemouth Harbour (Dorset)

River Frome*
Wraxall brook
River Hooke
Compton Valence stream
West Compton stream
Sydling Water
River Cerne
South Winterboure
Tadnoll brook
River Wyn

River Piddle
Devil's brook
Cheselbourne
Bere stream*

Wessex – all the chalk-streams that flow south into Christchurch Harbour (Dorset)

Shreen Water
Fontmell brook
Iwerne stream
Charlton Marshall stream
River Tarrant
North Winterbourne
River Allen
Crichel stream
Gussage stream
River Crane*

River Avon*†
Eastern Avon (Wilts)
Nine Mile river (Wilts)
River Wylye (Wilts)
Heytesbury Bourne (Wilts)
Chitterne brook (Wilts)
*River Till** (Wilts)

West Fonthill or Fonthill
Bishop stream (Wilts)
Ansty stream (Wilts)
Swallowcliffe stream (Wilts)
Chilmark stream (Wilts)
Teffont stream (Wilts)
Fovant stream (Wilts)
River Bourne (Wilts)
River Ebble (Wilts)
Chalke Water (Wilts)
Allen river also known as Ashford Water (Hants)
Bullhill stream (Hants)
Sweatfords Water also known as Rockbourne stream (Hants)

Wessex – all the chalk-streams that flow south into the Solent (Hampshire)

River Test*: flows into Southampton Water
Bourne Rivulet
River Swift
River Dever
River Anton
Pilhill brook
Wallop brook
Somborne stream
River Dun

River Itchen*†**:** flows into Southampton Water
Tichborne
River Alre
Candover brook

River Meon: flows directly into the Solent
Whitewool stream

River Ems:flows into Chichester Harbour (Sx)

River Lavant: flows into Chichester Harbour (Sx)

Isle of Wight

Caul Bourne

Thames: all the chalk streams that flow into the Thames and Thames Estuary

Letcombe brook (Oxfordshire)

Lockinge brook or West & East Hendred brook (Oxon)

Horsenden stream (Oxon)

River Chalgrove (Oxon)

River Ewelme (Oxon)

River Pang (Berks)
The Bourne (Berks)

River Kennet* (Berks)
River Og (Berks)
Aldbourne (Berks)
River Dun (Berks)
Shalbourne (Berks)
Lambourn† (Berks)*

River Loddon (Hants)
River Lyde (Hants)
River Whitewater (Hants)

Hambledon stream (Berks)

River Wye (Berks)
Hughenden stream (Berks)

River Colne (Herts, Bucks & Greater London)
The Brook (Herts)
River Ver (Herts)
River Gade (Herts)
Bulbourne (Herts)
River Chess (Herts & Bucks)
River Misbourne (Bucks)

River Wey
Tillingbourne (Sy)

Hogsmill (Sy)
River Wandle
(Greater London)
River Lea (or Lee) (Herts)
River Mimram (Herts)
River Beane (Herts)
Old Bourne or Dane
End tributary (Herts)
River Rib (Herts)
River Quin (Herts)
River Ash (Herts)
River Stort (Herts)
Bourne brook (Herts)
River Darent
(or Darenth) (Kent)
River Cray (Greater
London / Kent)

Thames – all the chalk streams that flow into the English Channel

Great Stour (Kent)
Little Stour (Kent)
Nail Bourne (Kent)
Wingham river (Kent)
North Bourne or
North stream (Kent)

River Dour

East Anglia – all the chalk streams that flow into the River Ouse

River Ivel (Herts and Beds)
Cat Ditch (Herts)
River Purwell or Hiz
(Herts and Beds)
River Oughton (Herts)

River Cam (also known as Granta, not to be confused with the Granta tributary - Essex and Cambridgeshire)
Debden Water (Essex)
Wicken Water (Essex)
Fulfen Slade (Essex)
The Slade (Essex)
River Granta (Cambs)
River Bourne (Cambs)
River Rhee (also known as Cam, not to be confused with the main Cam to the east - Hertfordshire and Cambridgeshire)
Cheney Water becomes
Mill river becomes ***North***
Ditch (Cambs)
Bassingbourne (Cambs)
Kneeswell stream
(Cambs)
Melbourne (Cambs)
River Shep (Cambs)
Hoffer brook (Cambs)

Hobson's brook (Cambs)

Cherry Hinton brook
(Cambs)

Quy Water (Cambs)
Little Wilbraham river
(Cambs)
Fulbourne (Cambs)

Mill stream (Cambs)

New river (Cambs)

Snail river (Cambs)

River Lark (Suff)
River Linnett (Suff)
River Kennett (Suff
and Norf)
Tuddenham Mill stream

Little Ouse (Suff and Norf)
Black Bourne or Sapiston
brook (Suff)
Pakenham Fen (Suff)
Walsham stream (Suff)
River Thet (Norf)

River Wissey
River Gadder (Norf)
Beachamwell stream
(Norf)

River Nar* (Norf)

East Anglia – all the Norfolk chalk streams that flow into The Wash

River Babingley
River Ingol
River Heacham
River Hun

East Anglia – all the Norfolk chalk streams that flow from the North Sea

River Burn

River Stiffkey
Binham stream

River Glaven

East Anglia – all the chalk streams that flow into the Norfolk Broads

River Bure
The Black Water
Craymere Beck

River Yare
River Wensum*†
River Tat
Whitewater
Blackwater
River Tud
River Tiffey
River Tas

Eastern Wolds – all the Lincolnshire chalk streams that flow into The Wash

River Bain

River Lymn

Eastern Wolds chalk streams that flow into the North Sea

Burland's Beck (Lincs)
Hog's Beck

Great Eau or **Calceby Beck** in headwaters: flows into the North Sea (Lincs)
Long Eau or The Beck in headwaters

River Lud: flows into the North Sea via a system of dykes (Lincs)
Welton Beck
Hallington stream

Waithe Beck: flows into the North Sea via a system of dykes (Lincs)
Thoresway Beck

Eastern Wolds – all the Lincolnshire chalk streams that flow into the Humber

Laceby Beck (Lincs)

Keelby Beck (Lincs)

Skitter Beck becomes **East Halton Beck** (Lincs)

Barrow Beck or Butforth Drain or The Beck (Lincs)
River Rase (Lincs)
Brimmer Back (Lincs)
Otby Beck (Lincs)
Nettleton Beck (Lincs)

Eastern Wolds – all the Yorkshire chalk streams that flow into the Humber

East Beck (Yorks)
West Beck (Yorks)

Wintringham Beck (Yorks)
Blakey Beck (Yorks)

Settrington Beck (Yorks)
Whitestone Beck (Yorks)

Rowmire Beck becomes
Mill Beck (Yorks)
Clombe Beck (Yorks)
Whitecarr Beck (Yorks)
Moor Beck (Yorks)
Leppington Beck (Yorks)
Bughtorpe Beck (Yorks)
Salamanca Beck (Yorks)
Gilder Beck (Yorks)

Gowthorpe Beck
(Yorks)
Bishop's Wilton Beck
Pocklington Beck (Yorks)
Ridings Beck or
Whitekeld Beck (Yorks)
Millington Beck (Yorks)
Hayton Beck (or Burnby or Nunburnholme Beck) (Yorks)

Goodmanham Beck (Yorks)
East Bec (Yorks)

Drewton Beck (Yorks)
Ings Beck (Yorks)
Church Beck (Yorks)

River Hull or West Beck*
*Driffield Trout stream**
*Driffield Beck**
*Elmswell Beck**
*Little Driffield Beck**
The Beck
Nafferton Beck
Skerne Beck
Kelk Beck becomes
Foston Beck becomes
Frodingham Beck

Eastern Wolds – all the Yorkshire chalk streams that flow into the North Sea

The Gypsey Race

GLOSSARY

Abstraction – taking water from rivers to supply homes, farms or industry.

Abstraction Incentive Mechanism – a regulatory mechanism devised by Ofwat and WWF-UK to incentivise water companies to abstract less water from environmentally valuable sources when other sources are available.

Aquifer – underground source of water (in this case chalk).

Artificial Water Bodies – surface water bodies which have been created in a location where no water body existed before and which have not been created by the direct physical alteration, movement or realignment of an existing water body.

CAMS – the Environment Agency's Catchment Abstraction Management Strategies.

Catchment – the area of land that feeds rainwater into a river or its tributaries.

Ecological status – a WFD classification which takes into account specific aspects of the biological quality elements, for example the "composition and abundance of aquatic flora" or "composition, abundance and age structure of fish fauna".

Ecosystem services – the (often undervalued) benefits we get from natural sources, for example fresh water for drinking, farming, industry and leisure activities.

Favourable Status or Condition – can only be achieved when all the component designated features within the SSSI/SAC are being adequately conserved.

Good status – a requirement of the Water Framework Directive for all water bodies to achieve, comprising ecological, chemical and morphological conditions associated with minimal human pressure.

Groundwater – water usually present underground, having soaked through soil and into rock, which is gradually released to feed streams and rivers: the amount and level of this water is sometimes called the water table.

High status – the biological, chemical and morphological conditions associated with no or very low human pressure. This is called the 'reference condition' as it is the best status achievable – the benchmark. These reference conditions are type-specific, so they are different for different types of rivers, lakes or coastal waters.

Highly Modified Water Bodies – bodies of water that have been substantially changed in character and form by human activity, which precludes meeting Good Ecological Status. In this context physical alterations mean changes to the size, slope, discharge, form and shape of river bed of a water body.

Morphology – a study of the form and structure of rivers and their specific structural features.

Over-abstraction – taking more water from a river more quickly than can be naturally replaced.

Q95 – the flow equalled or exceeded 95% of the time, and hence not attained only 5% of the time.

Q30 – the flow attained 70% of the time, and exceeded only 30% of the time.

Run-off – soil, sediment, fertilisers or chemical residues that can be washed into rivers off the land by rain or weathering.

SAC – EU-designated Special Area of Conservation.

SSSI – national Site of Special Scientific Interest.

Water stewardship – a progression of actions taken by corporates to increasingly improve water use and reduce water-related impacts of internal and supply chain operations. More importantly, it is a commitment to the sustainable management of shared water resources in the public interest through collective action with other businesses, governments, NGOs and communities.

Winterbourne – river that only flows when groundwater levels are high, typically in winter.

WFD – EU Water Framework Directive.

WFD Classification Status – under the WFD the health of water bodies is classified on a scale of High, Good, Moderate, Poor and Bad.

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Natural England

Norfolk Rivers Trust

North West Kent Countryside Partnership

River Chess Association

Salmon and Trout Association

Southern Water

South East Rivers Trust

Wild Trout Trust

ENGLAND'S CHALK STREAMS IN NUMBERS

100%
RECYCLED

224

Chalk streams in England

4

Chalk streams under international protection

23%

Chalk streams in good ecological health

10 YEARS

Since the last State of Chalk Streams report

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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