Chalk Streams in Crisis

A call for drought action now

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Executive Summary

England has 85 per cent of the world's chalk streams. These precious and unique freshwater ecosystems are at risk. They are, quite simply dying from a lack of water. This country, and the world, is facing a climate crisis: our chalk streams are our front line. If we cannot save what we have, what we hold in trust for the world and future generations, we cannot lecture others on what they should be doing to protect their environment. If government is serious about protecting our environment, our "green and pleasant land", the fate of England's chalk streams is the litmus test.

There are a host of reasons why our chalk streams, and other rivers, are at risk. Agricultural pollution, a decline in native species and particularly invertebrates, the introduction of non-native invasive species, development and population growth in the South East of England, and the fact that we simply use, and waste too much water. On average, in Britain we use more water per-head, per-day, than anywhere else in Europe.

River Quinn, Hertfordshire. Photo credit: Charles Rangeley-Wilson

But most pressing of all are low flows and chronic over abstraction. We have simply not had enough rain to support the level of abstraction still taking place. There has been insufficient recharge of groundwater supplies to maintain an acceptable flow in our rivers over the summer period. Rainfall data from the Thames Water area show below average totals for nine of the last 12 months - the worst two being June 2018 (50.2 per cent below the average for the month) and January 2019 (40.7 per cent below average). Other river catchments in the region show similar patterns of low rainfall and depleted river flows.

The Environment Agency acknowledges the serious situation. Its April 2019 monthly water situation report states:

"Soils got drier across much of England during April and by the end of the month soils were significantly drier than average across most of east and south-east England. Groundwater levels fell during April at over half of the sites we report on. Total reservoir stocks for England were at 90% of capacity at the end of April.

"At almost two-thirds of indicator sites monthly mean flows were classed as either below normal, or notably low for the time of year. Flows were particularly low in east, south-east and north-east England. Monthly mean flows on the River Ely, Ouse [and] on the River Cam were classed as exceptionally low for the time of year. The monthly mean flow on the River Cam was the lowest April flow on record (records start in 1949)."

There is no doubt that we are on the verge of a water shortage crisis in the South and East of England, which is already impacting our chalk streams and other rivers. Many of these globally rare habitats already have long dry sections and some of the chalk streams in the Chilterns and Hertfordshire have been dry for years.

This dossier sets out the crisis we face. Its case studies show how across the East and South East of England our rivers are, quite simply, drying up. And we recommend a series of actions the government, the Environment Agency, Ofwat and the Water Companies must take, now.

In short, water companies must implement water restrictions and temporary use bans now on a precautionary basis and not wait until further damage is done to rivers already experiencing dangerously low flows.

We challenge some of the messages the Environment Agency have sent to MPs in the Chilterns which are at odds with their own published data e.g. '*Despite this long dry period there are currently no water supply concerns'.*

We must not see our rivers sacrificed to avoid restrictions on either agriculture or domestic customers for the sake of nothing more than political expediency.

Looking further ahead, we clearly require a more robust infrastructure, which can deal with the strain of an unpredictable climate and a rising population. For years we have been calling for investment in additional storage capacity and government support for demand management measures such as compulsory water metering but until recently neither Ofwat nor Defra have shown little appetite for this approach.

Chalk streams in Crisis highlights the situation facing our rivers by outlining just how desperate the situation is becoming right now.

Recommendations and actions

We have come together as a group of concerned organisations representing fishery, environmental and wildlife interests on rivers and chalk streams in the South East to call for the following urgent actions to be taken to mitigate this crisis:

With support from both the Environment Agency and Government, water companies should, on a precautionary basis, begin the regional introduction of Temporary Use Bans (TUBs) including demand management measures such as hosepipe bans and the roll out of water saving advice to consumers and business.

The public needs to be made fully aware of the consequences for both water supplies and the environment of three consecutive dry years.

There needs to be far greater ambition in the current water company drought management plans and better medium-term planning in light of the impacts of the climate emergency and the reality of the South East being a drought risk region of the UK.

The introduction of universal compulsory water metering is long overdue and would signal a proactive approach to demand management.

A reassessment of the drought classification criteria to ensure action can be taken and drought declared, not only when there is a direct threat to supply, but to include the environmental aspects of chalk streams and rivers that must be protected.

Implementation of the promised changes to the abstraction regime, including: new powers for the Secretary of State to be able to direct water companies to plan on a regional and inter-regional basis; for the Secretary of State to be able to direct water companies to take account of other abstractors' needs; recognition of the *Water Resource Management Plan* (WRMP) process in legislation to deliver environmental objectives; make *Drainage and Wastewater Plans* a statutory requirement; allow the Environment Agency to vary or revoke abstraction licences that are causing unsustainable abstraction without paying compensation; and allow the Environment Agency to vary under-used abstraction licences in the case of unsustainable abstraction to remove the under-used portion.

A new and more holistic approach to water regulation by Ofwat, giving equal emphasis to the importance; economically, socially and environmentally of retaining water in the environment as well as providing it for consumption purposes.

New water storage infrastructure such as the South East strategic reservoir needs to be built as a matter of urgency.

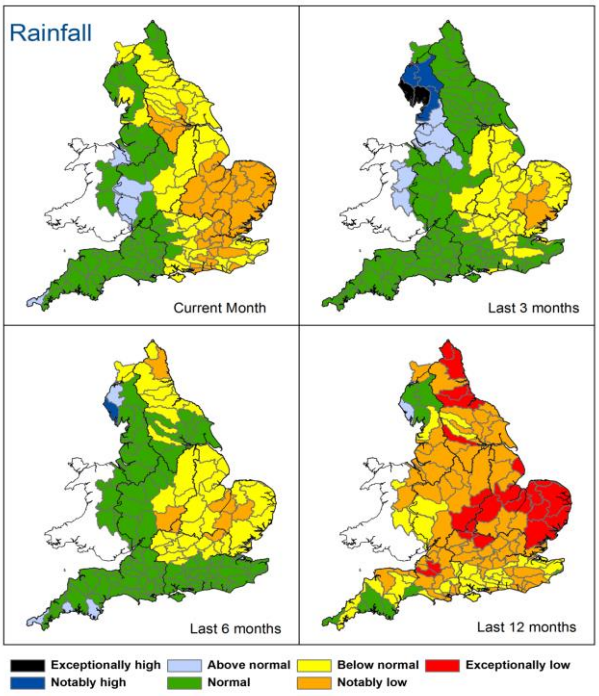
Given the unique status and global importance of England's chalk streams, they should have their own classification targets within the Water Framework Directive, and bespoke invertebrate targets to help support an increased level of protection for these iconic rivers.

This is a crisis!

Eastern and South Eastern England is heading for a drought. Rainfall in many parts of the region is either "notably low" or "exceptionally low" when compared to the long-term average (LTA) according to the Environment Agency's own data (April 2019), see *figure one*. This follows on from the hot dry summer of 2018. Some called the 2018 summer exceptional. With the climate emergency upon us, as agreed by the UK Parliament, it's not. The summer of 2018 will become a more common occurrence in the years to come.

Adding to the pressure on the availablity and supply of water in the Eastern and South Eastern Regions, the medium term forecast is for the early part of the 2019 summer to remain largely dry and warm. The level of rainfall will remain below the LTA.

Figure one: Rainfall patterns for the last 12 months (source: EA)



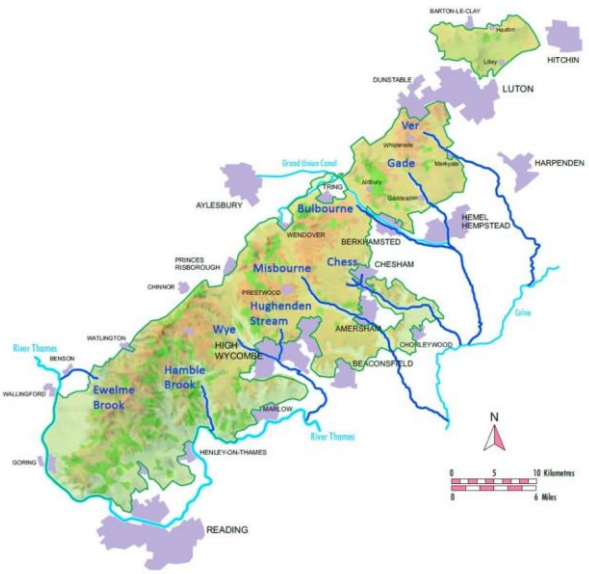
Despite this, the government and the Environment Agency have been and are being complacent in highlighting the crisis, preparing consumers and business for the potential water shortages to come, and ensuring there is the right balance between continuing to supply and protecting our internationally important aquatic environments. They need to act.

England is home to 85 per cent of the world's chalk streams. They are one of England's most important habitats. Rare ecosystems of global significance. It could be argued that chalk streams are our rainforests, they are that important. Like rainforests, they suffer from huge pressures, with the impacts of a changing climate, over abstraction to meet society's demand for water, pollution, a decline in species (both in diversity and abundance) and invasive non-native species such as mink and Japanese knotweed. Our chalk streams are in crisis.

Chalk streams can be found across the East and South East of England, from Dorest, Wiltshire and Hampshire in the south, through the Chilterns, to Lincolnshire and Yorkshire. The Chilterns AONB (Area of Outstanding Natural Beauty) is home to nine significant chalk streams, see *Figure two*. Easing their way between its hills, these natural ancient water courses define the Chilterns, define its history and are home to much of its biodiversity.

Due to the pressures and the impacts of the climate emergency, many of these globally rare habitats are dry for much of the year along long sections of their course. Both in the Chilterns and Hertfordshire, many rivers have been dry for years.

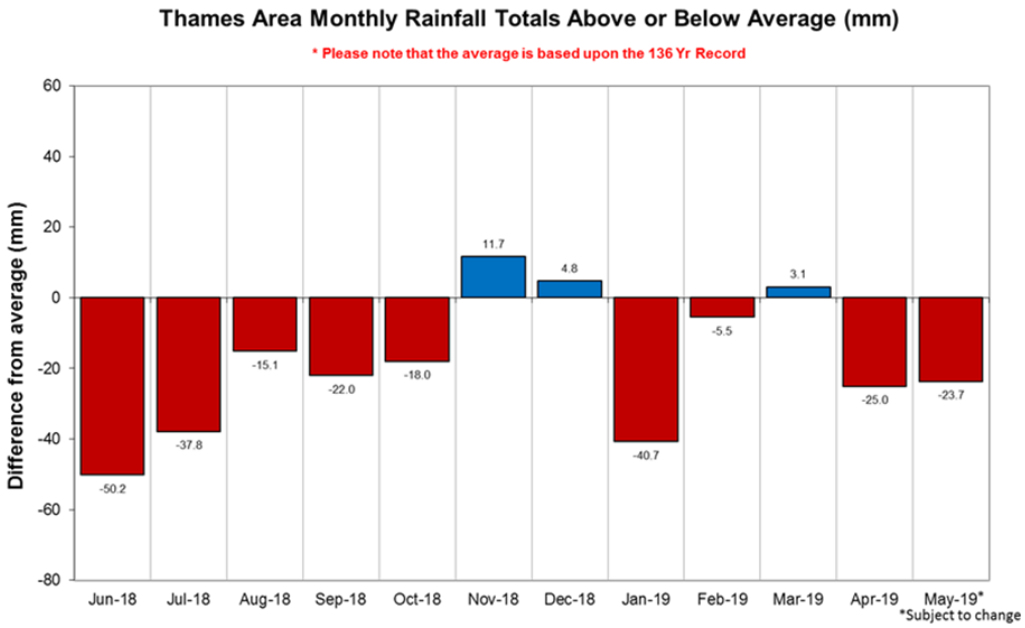
Figure two: The Chiltern Chalk streams



And this is not a problem unique to the Chilterns. Many of the chalk streams to the West, North and South of London are suffering the same fate, as the case studies below show.

Beyond chalk streams, all our rivers are under threat from a range of different sources. Low flows and over abstraction are the two most urgent issues that need to be addressed. The catchment of the River Thames, our longest and most famous river, has suffered from below average rainfall in nine of the last 12 months. The two worst months being June 2018, when rainfall was 50.2 per cent below average, and January 2019 when it was 40.7 per cent below average, see *Figure three*.

Figure three: source Thames Water



Only 14 per cent of the rivers in England and Wales are considered to be in good ecological condition, as defined by the Water Framework Directive (WFD). The impacts of low flows on aquatic invertebrates and fish may mean that we are close to or have breached the 'no deterioration' requirements for water bodies under the WFD.

Biodiversity in our rivers is in decline. Fundamental to the river health is the invertebrate population. The recent *Riverfly Census* by Salmon and Trout Conservation UK showed that mayfly numbers were down by between 37 and 58 per cent when compared to 1998 data. In chalk streams, the loss was 44 per cent. The *Riverfly Census* confirmed that chalk streams are biologically distinct, exhibiting different dominant groups of invertebrate communities compared to other rivers. With low rainfall, over abstraction and a lack of action by government, these distinct communities are under severe threat.

Our disappearing rivers

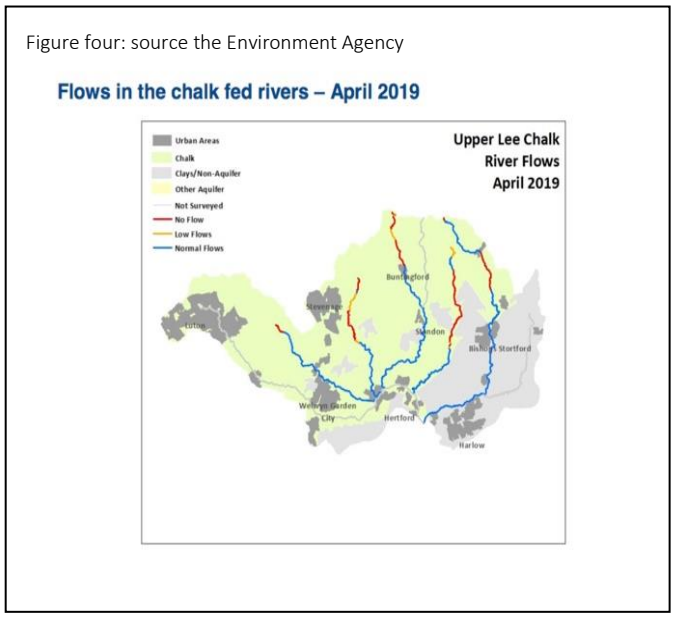
We are naturally drawn to water. It's importance in our lives cannot be over-stated. It provides us with leisure opportunities, with relaxation, and for many with spiritual solace and renewal. Rivers have held a special place in our culture and history, they're present in our folk-lore, and in our literature. Rivers are nature's highways, home to a variety of wildlife, along their banks and under their surface. But many rivers are disappearing from our landscape. Being turned from clear, majestic, flowing wonders, stacked with wildlife, into dried up ditches many people would not even recognise as a place where once a river flowed.

The April 2019 Water Situation Report from the Environment Agency shows just how serious the situation has become. Many of our chalk streams in the Upper Lea catchment to the north of London are already dry or suffering low flows along great stretches of their course, see *figure four*.

In the South East corner of England all our rivers were reported as being "below normal" of "notably low" for the time of year.

In April, Kent's River Darent, was 55 per cent of its long-term average flow. The Ver in Hertfordshire, 45 per cent, and the Berkshire Kennet 69 per cent. The figures for May will be even worse given the lack of recent rainfall.

Figure four: source the Environment Agency



The same Environment Agency report also notes that nine of the 15 sites measured indicate that 60 per cent of groundwater levels are "below normal" or "notably low". There is simply not the water there to recharge our chalk streams and other rivers.

For both river flows and groundwater levels, two thirds of the sites modelled by the Environment Agency have a "greater than expected chance" of being below normal or worse come March 2020.

A combination of rising demand, increasing population and the effects of climate change are causing our rivers to whither and shrink, and in some areas, disappear completely for much of their natural length.

River Darent – Kent

The River Darent was below its ecological flow target level for 30 per cent of the time in 2018. At the end of the 2018 summer it became very close to stopping flowing altogether. The Darent dried up completely in 1976 and through the droughts of the 1990s. Given the dry weather we've experienced in the last twelve months and the possibility of a second hot summer, the Darent is likely to be in a worse situation in 2019 than it was in 2018. Like the 1990s, it could stop flowing altogether.

Historic Flow in the River Hogsmill – South London

The Doomsday Book records five working mills within the first 3km of the River Hogsmill, indicating that the flow, which is now no more than a trickle, use to be sufficient to power a significant industry.

Between 1850 and 1900, abstraction began and the flow in the Hogsmill dropped to such an extent that the mills had to start supplementing their water driven operation with gas power. By 1950, the milling industry on the Hogsmill was no more.

Low flow on the River Hogsmill.

Between 1879 and 1885, records show a flow at Low Mill on the river to be 27.5Ml/d (source: *Nonsuch Antiquarian Society*). Between 1988 and 2010 the average flow in the river had dropped to 4.17Ml/d (source: *National River Flow Archive*). This is six and a half times less flow in 2010 than was found in 1879. Today, it is difficult to say exactly what the flow is in the River Hogsmill. It has become so low that measuring instruments are not able to record such small amounts of water.

River Lea Catchment

In April 2019 the River Lea at Waterhall was flowing at just 37 per cent of the long-term average for this section of the Lea. Waterhall is about halfway between Welwyn Garden City and Hertford, around 26 miles downstream from its source. Worse, the 37 per cent of flow present is only there due to the output of the Luton Sewage Treatment Works and not from the natural groundwater recharge of the river.

River Beane at Whitehall, Aston (2018. Affinity Water reduced abstraction by 90% down to 2 mega litres per day, but still water has not returned to the river – the springs may be irreversibly damaged form 20+ years of neglect!

Eight km of the River Beane between Walkern and Watton-at-Stone, around half its length, is seriously impacted by chronic low flows and dried out completely as recently as 2017. In May 2019, water levels in the River Beane were on average 55 per cent lower than six years ago in 2013, when the Chalk Stream Charter was launched from the banks of the Beane, highlighting the plight of chalk streams at risk from over-abstraction. The river level at Watton-at-Stone was 0.15m in May 2013, by May 2019 it had dropped to 0.07m.

The River Mimran had 80 per cent less flow, measured at Whitwell, in May 2019 when compared to the flow 20 years previously, and 75 per cent less than in May 2013 (source: *Herts and Middlesex Wildlife Trust*).

"Fine words butter no parsnips"

From government, the Environment Agency and the regulator, Ofwat, we have had warm words, promises of abstraction reform, visits by ministers to the affected rivers, and commitments in various White Papers.

The government's 25-year Environment Plan has talked about the need to have "clean and plentiful water" setting out the aim of "Improving at least three quarters of our waters to be close to their natural state as soon as is practicable by:

- Reducing the damaging abstraction of water from rivers and groundwater, ensuring that by 2021 the proportion of water bodies with enough water to support environmental standards increases from 82% to 90% for surface water bodies and from 72% to 77% for groundwater bodies.
- Reaching or exceeding objectives for rivers, lakes, coastal and ground waters that are specially protected, whether for biodiversity or drinking water as per our River Basin Management Plans.
- Supporting OFWAT's ambitions on leakage, minimising the amount of water lost through leakage year on year, with water companies expected to reduce leakage by at least an average of 15% by 2025.
- Minimising by 2030 the harmful bacteria in our designated bathing waters and continuing to improve the cleanliness of our waters. We will make sure that potential bathers are warned of any short-term pollution risks."

The same Plan (goal three) has a commitment to restore 75 per cent of our one million hectares of terrestrial and freshwater protected sites to favourable condition, ensuring their wildlife value for the long-term.

In chapter two of the Plan, *Recovering nature and enhancing natural beauty*, the government talks of respecting nature in how we use water and focuses on the need for abstraction reform and efficient water use.

And chapter three of the Plan is concerned with *Connecting People with the Environment and Improving Health and Wellbeing*. The deep connection many people have with rivers is broken if all they see is a dried-up river bed.

Our freshwater environment is facing a bleak future from two fronts. Alongside the threat of a changing climate, for which drastic action is needed if the government is to address the concerns raised by Parliament when they passed the world-leading motion to declare a climate emergency, comes the threat of biodiversity loss as set out in the recent report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which stated, "*In freshwater ecosystems, a series of combined threats that include land-use change, including water extraction, exploitation, pollution, climate change and invasive species, are prevalent.*"

The Environment Agency knows there is a problem. This is clearly set out in their Monthly Water Situation Report for England (April 2019), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/801643/Water_situation_April_2019.pdf

The Agency's CEO, Sir James Bevan, has acknowledged we are facing a crisis. In a recent speech to the Waterwise Conference (March 2019) he described how the impact of climate change, combined with population growth, means the country is facing an "existential threat". Calling for water to be used more efficiently and making the wasting of water, "as socially unacceptable as blowing smoke in the face of a baby" he went on to say that in 20 to 25 years England would reach the "jaws of death - the point at which, unless we take action to change things, we will not have enough water to supply our needs". Bevan possibly had the need to supply water to homes and businesses in mind when he made these comments. When it comes to rivers, and chalk streams in particular, those "jaws of death" are with us already.

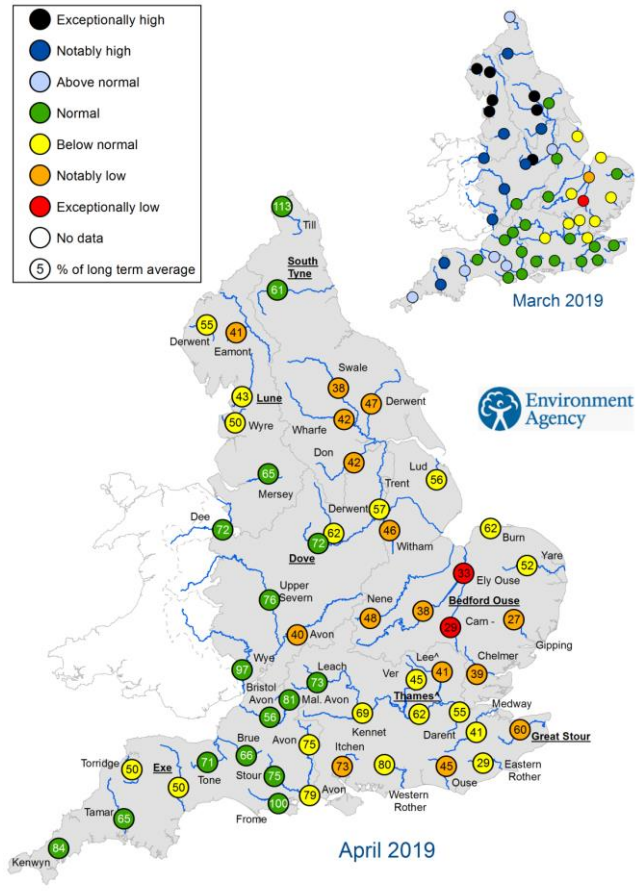
The Chilterns community needs to be supported to help reduce their use of water by becoming more efficient. The Chilterns has the highest per-person use of water in the UK at 173 litres per-day. This is 32 litres per-day above the national average. Added to this, the UK average of 141 litres per-day is among the highest in Europe. Denmark, for example, has an average consumption of just 80 litres per-day.

The water companies must play their part too. Affinity Water supplies customers to the north and west of London and is dependent on groundwater for its supply. Currently, it has no water storage facilities to hold water for future use. Jake Rigg, Affinity Water's Director of Communications, Communities and Corporate Affairs, said: "We must act now to avert a crisis. We need to increase the supply of water through new options and by moving water between areas and by reducing demand. The most effective way of doing this is by introducing a mandatory water efficiency labelling scheme and without it, we will have a crisis on our hands. It is clear that if we do not rise to this challenge, we will not be ready for

drought which the National Infrastructure Commission estimates could cost up to £40 billion. We need to work in collaboration with Government, the water companies, and civil society but with fierce urgency."

Water companies like Affinity and Thames have put forward plans, both to increase water storage and reduce demand. But these are long-term and have been thwarted by Ofwat who have taken too narrow a view on the need to cut bills rather than secure supply for the future. This must change, not only for customers, but to ensure a healthy and resilient environment too.

Figure five: River flows (source: the Environment Agency)



All of these are good intentions and fine words, but, "fine words butter no parsnips". We need to see urgent action from both government, the Environment Agency, and water companies. Without it, they risk turning a crisis into a catastrophe.

Chalk streams are in the front line. But all the rivers of the East and South East of England are at risk. The April monthly update from the Environment Agency, see *Figure five*, shows the dire state of many of our rives. Nearly all have flows below the seasonal average. The River Cam, for example, is (April 2019) at only 20 per cent of the average flow for this time of year. This dire situation cannot be allowed to continue. Radical action is needed if we are going to protect some of our most precious environments for wildlife, for our economy and for the health and wellbeing of us all.

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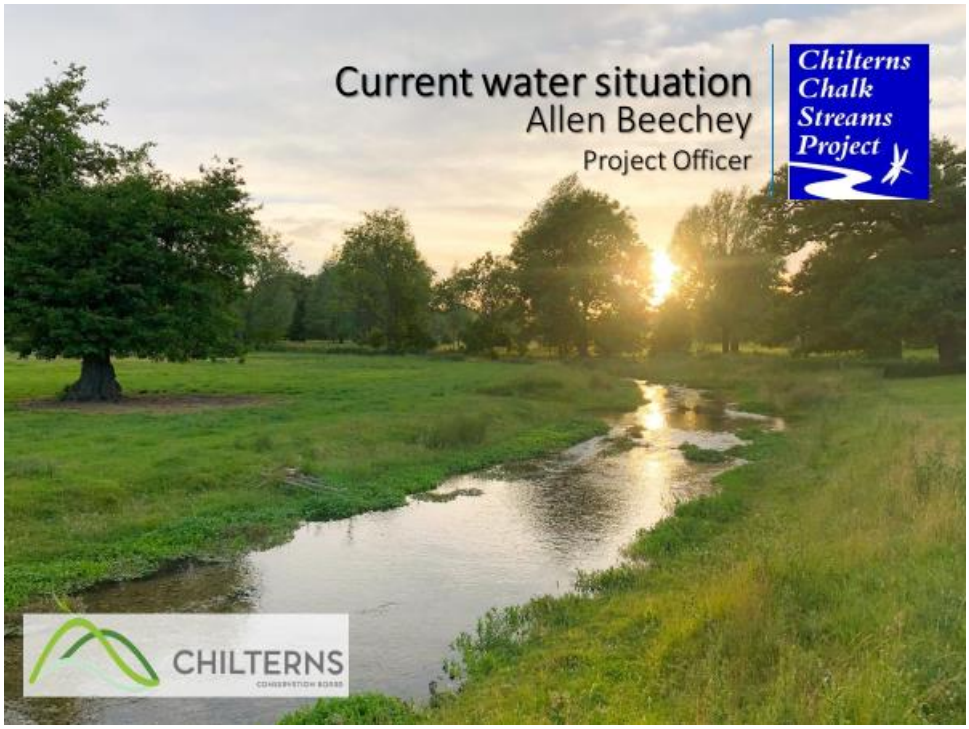
Case Study One – Chilterns Chalk Streams Project

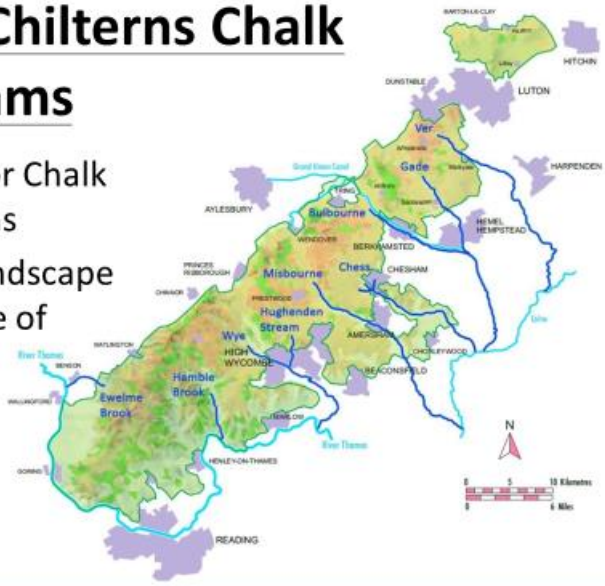


Chilterns Chalk Streams Project

- Created in 1997
- Prompted by low flows in the 1990's
- Partnership Project
- Expanded in 2000 to include all rivers
- Led by Chilterns Conservation Board

The Chilterns Chalk Streams

- 9 major Chalk streams
- Key landscape feature of AONB



CHILTERNS

Chilterns Chalk Streams Project

Rivers under Siege

- Chronic low flows
- Climate Change
- Abstraction as far back as the 1840's
- Ver and Misbourne: impacted for >50years
- 8/9 rivers suffer low flows
- Abstraction implicated in 7
- Parts of the Ver, Bulbourne, Gade and Wye no longer on the map!

CHILTERNS

Chilterns Chalk Streams Project

Climate Change

- Increasing climatic volatility
  - more droughts
  - more flooding
  - higher river temperatures
  - declining water quality
- Recharge window contracting
  - Low flows
- Ecology changing
  - species declines
  - INNS problems
  - some species adapting to change

CHILTERNS

Chilterns Chalk Streams Project

Abstraction

- Chilterns – has highest PCC in UK – 173L/p/d*
- 32 litres above national average
- Our demand is highest when the rivers needs it most
- Development driving up demand

CHILTERNS

Chilterns Chalk Streams Project

Effects

- Reduces water available to river
- Reduces tolerance to drought
- Increased dry down of headwaters
- Complete loss of flow in tributaries
- Habitat degraded
- Species lost*

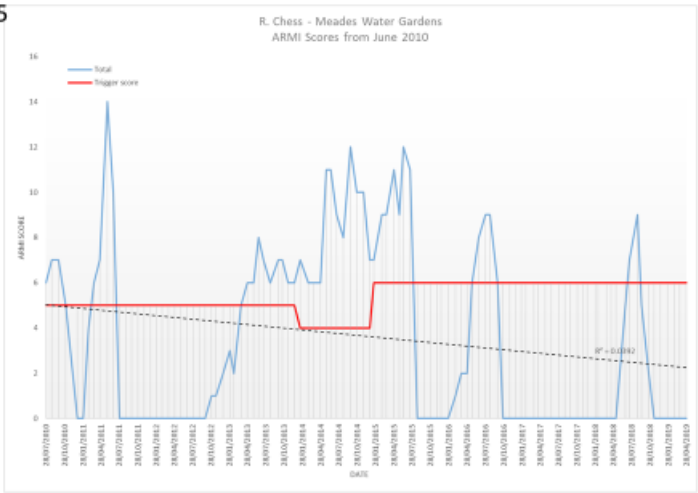
R. Chess in Chesham

CHILTERNS

Chilterns Chalk Streams Project

Effects – R. Chess, Riverfly monitoring

- last 10 years - 5 dry down events in the upper Chess
- In the previous 20 years there were 3!
- Since 2009, the diversity and abundance of riverflies in the headwaters of the Chess has declined significantly

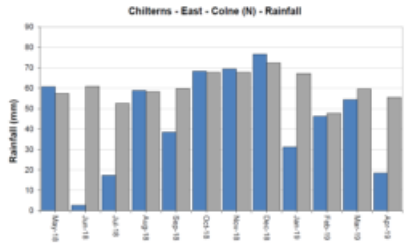


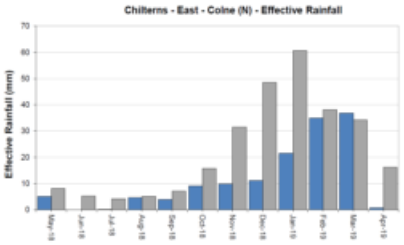
CHILTERNS

Chilterns Chalk Streams Project

Chilterns water resources situation – May 2019

- Winter rainfall – 92% of LTA
- Effective rainfall – 49% of LTA
- GW levels below normal to exceptionally low
- Legacy of hot dry summer in 2018
- Very little flow recovery
- 52% of total length of Chalk Stream habitat in the AONB is currently dry*
- Environmental drought since 2017

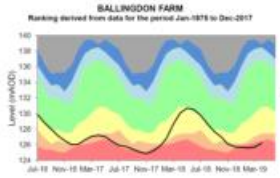


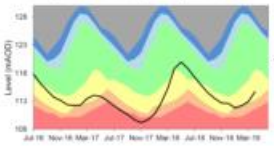


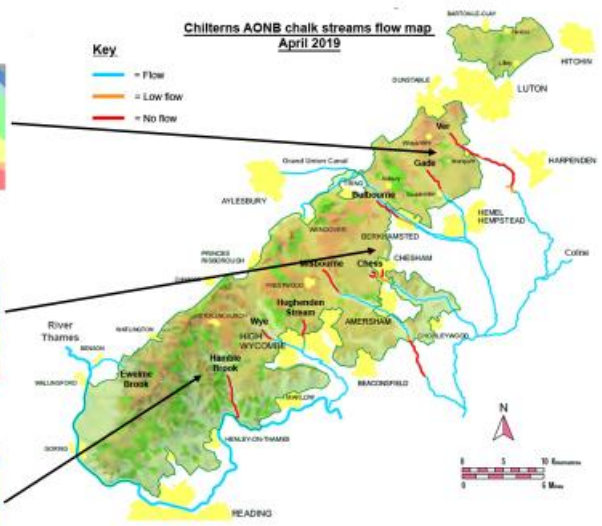
CHILTERNS

Chilterns Chalk Streams Project

Groundwater levels







CHILTERNS

Chilterns Chalk Streams Project

Ver at Verlam End, 7km from source. Nov 2018

R. Misbourne at Chalfont St Giles, Jan 2019

Chess at Pednormead End Jan 2019

Bulbourne in Berkhamsted Dec 2018

Hamble Brook at Hambleden, Jan 2019

CHILTERNS

Chilterns Chalk Streams Project

Effects – R. Chess, Riverfly monitoring

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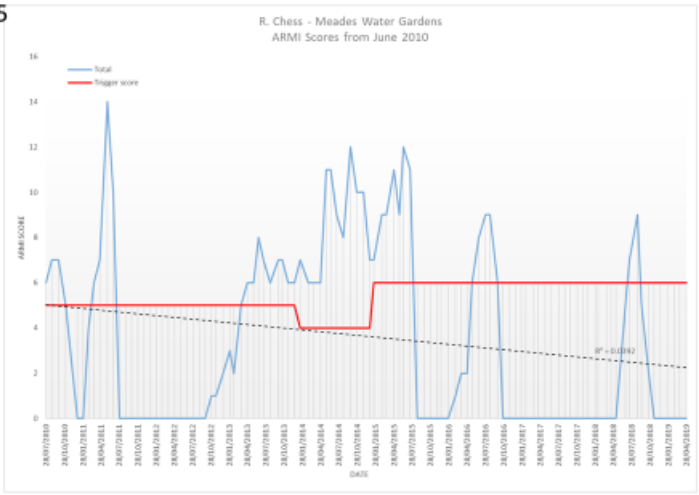


CHILTERNS

Chilterns Chalk Streams Project

Case Study Two – River Chess Association

River Chess: a Chilterns Chalk Stream

The River Chess is a chalk stream that rises in Chesham in Buckinghamshire and runs for 16km through the Chess Valley to Rickmansworth, where it becomes a tributary of the Colne, that flows into the Thames at Runnymede.

The Chess Valley is part of the Chilterns Area of Outstanding Natural Beauty, of which chalk streams are a characteristic feature. The Chess is home to a variety of important wildlife, such as water voles, brown trout and stream water crowfoot. The scenic river is enjoyed by walkers, fishermen, photographers and wildlife enthusiasts. The river is an important educational asset, school field trips and university data gathering are a regular feature with thousands of student visits every year.

History tells us that Chesham was built on reliable flows in the Chess, three water mills (Amy Mill, Canada Mill and Lords Mill) plus two water-powered saw mills and countless watercress beds were all productive thanks to the river. This would not be possible today. Weather has an impact on flows and groundwater and in recent years the climate has become drier but interspersed with some extremely wet periods.

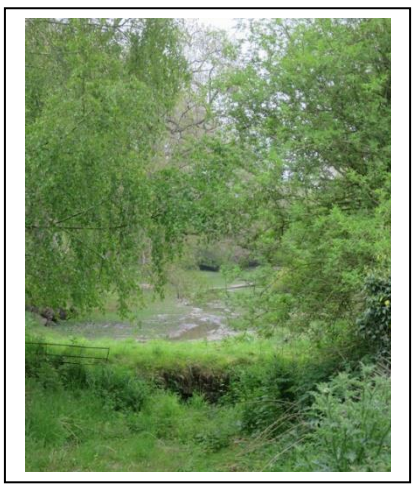
The Chess faces many threats, including low flows caused by abstraction for the public water supply, pollution, and invasive species such as mink and Japanese knotweed.

The Water Industry in the South East faces many challenges, maintaining low water prices, climate change bringing more extremes in rainfall both high and low, increasing demand, aging infrastructure, inadequate capacity, especially storage and dry chalk streams. Affinity Water abstract 16mld from the Chess Catchment to supply locally, in addition Thames Water abstracts 6mld supplying outside the catchment. Affinity sits in the middle of this quandary, heavily dependent on groundwater from the chalk aquifer to meet up to 60% of demand, which competes with our chalk streams. During the extremely hot summer of 2018 we saw unprecedented weekend water demand with Affinity only just managing to meet supply. Many of the chalk streams in the Affinity Central Region have been suffering for years with large stretches frequently drying, some such as the Ver and Misbourne have been permanently dry since 2014. In 2017 we saw record low groundwater levels in the Affinity Central Region; this is set to be repeated in 2019.

Recently we have seen highly variable weather events including frequent drying events in the Chess Catchment.

- The Upper Chess was dry from April 2011 until November 2012
- December 2013 the Upper Chess was again dry despite a very wet summer and winter in 2012 and wet spring in 2013.
- In 2014 we experienced the wettest winter in 250 years with extensive groundwater flooding.
- September 2015 the Chess dried up in Chesham, flows came back February 2016. Major fish kill in Duck Alley.
- October 2016 the Chess dried up again in Chesham, flows did not return until April 2018, no fish in the river to kill this time.
- Flows outside the Queen's Head in Chesham are dry again in Sept 2018, a trickle of flow returned in late spring 2019 but will dry again shortly.
- The impacts on aquatic invertebrates and fish may mean that we are close to or have breached the 'no deterioration' requirements for water bodies.

What follows are pictures showing the current position on the Chess in an around Chesham.
Out and about in the Old Town yesterday 17 May 2019, as our friends at Impress the Chess and the Chiltern Society were checking on the riverside bird boxes. It is clear that unless we have a very drastic change in the weather, the Chess is going to be in for a long, dry summer in Chesham.



The channel leading into the Chesham 1879 Tennis Club; dry as a bone.

Bucks County Council and the Chilterns Chalk Streams Project did some great river restoration work at the 1879 Tennis Club. Now it just needs some water…

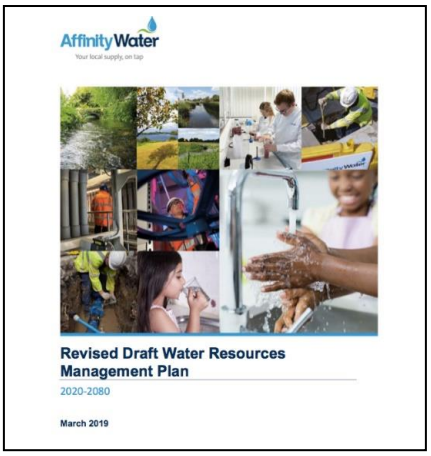
River Chess, Town Bridge, Chesham April 2017

Queen's Head February 2014

Queen's Head September 2018

While reviewing the Affinity Water Water Resources Management Plan we noticed that the cover included some fast flowing chalkrivers. Two pictures were of the River Misbourne. We thought you might want see what these rivers look like today. The pictures were taken at the same locations.

When it comes to the environment we wonder if Affinity are deluding themselves when we see some of the pictures of the River Misbourne used in recent promotional material and the Revised Draft Water Resources Management Plan.



River Misbourne Chalfont St Peter

River Misbourne Chalfont St Giles

From the cover of the Affinity Revised Draft Water Resources Management Plan

The Misbourne today, pictures taken from the same location 15th April 2019

River Misbourne Chalfont St Peter April 2019

River Misbourne Chalfont St Giles April 2019

New Reservoir Capacity

We are pleased to see that Thames Water and Affinity Water are planning to work together on a new reservoir project near Oxford. It now features strongly in both their new Water Resource Management Plans and in Thames Water's revised Business Plan 2020-2025. The South East

Region of the UK is the driest and most populated corner of the country with the highest demand for water. It has been in need of this new reservoir capacity for years and it cannot come too soon. The scheme will allow water to be taken from the River Thames at times of high flows and stored to be used when supply from other sources particularly the aquifer that supplies our struggling iconic chalk streams is short.

Above: The dry River Chess in Chesham

In our area, domestic supply comes from Affinity Water, of which over 60% is sourced from the aquifer. The aquifer also supplies the flow to our chalk streams such as the Rivers Misbourne, Chess, Ver, Gade and Wye, all of which have long dry sections and very low flows. We are in the Affinity Central Region and their current estimate of supply and demand reveals that we already have greater demand for water than supply. This is why this joint project between Thames Water and Affinity Water to build a new reservoir is so important to ensure water security for the future in times of population growth and climate change and reduces our dependence on groundwater for domestic water supply, saving our chalk rivers. This supports the stated aims of Thames Water and Affinity Water to protect these chalk rivers.

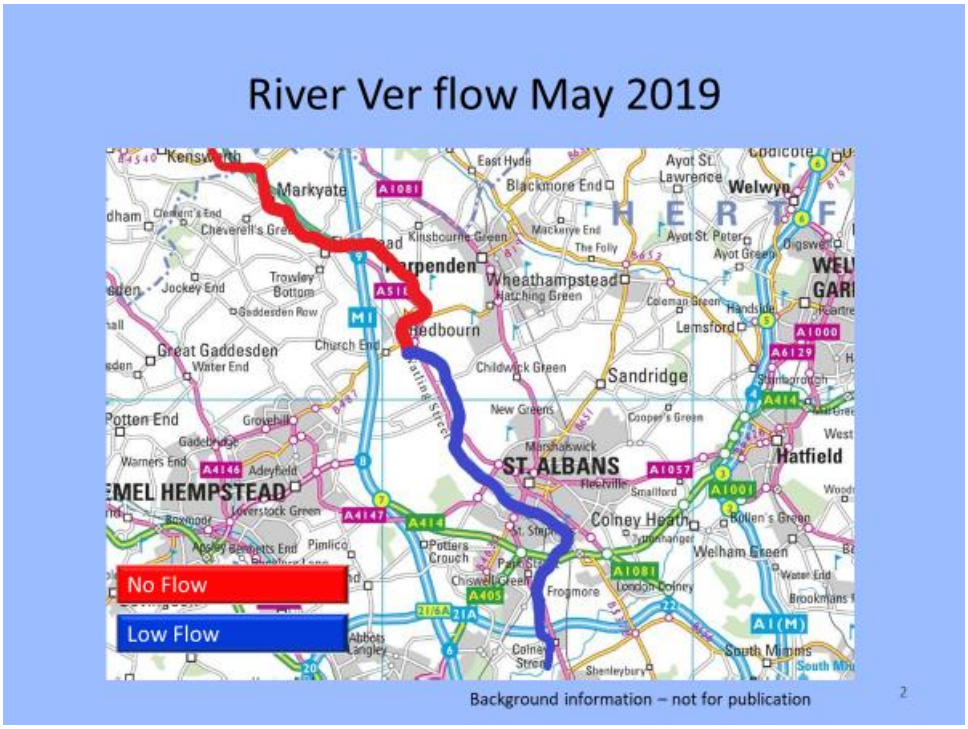
The River Chess Association is urging DEFRA, OFWAT and the Environment Agency to provide support for this project. There is a concerted message coming from the Angling Trust, Rivers Trust, Wild Trout Trust, Salmon and Trout Conservation Trust and various local pressure groups all working together supporting this project.

We could be heading for a crisis this year. Low winter rainfall has meant minimal recharge of the aquifer and our already struggling chalk rivers will further dry up. Less than two years ago we were seeing pictures of a dried up River Colne and it is likely to happen again this year. In Chesham, the River Chess has been dry since September 2018; this is the 5th time the river has dried up since 2011. This is why this reservoir project is so important.

We would encourage both Thames and Affinity Water to accelerate this project, if this reservoir had be in operation today there would have been two opportunities this winter when large volumes of water could have been harvested from the Thames and stored for use later this summer when we fear we will need it most. With this in mind please look at both the Business Plan 2020-2025 and Water Resource Management Plan 2019 and see if there are ways of shortening the lead-time for this critical project. We have looked at other proposals for water transfer from other areas and are concerned by the environmental risk they carry resulting from invasive species and water quality.

Case Study Three – The Ver Valley Society

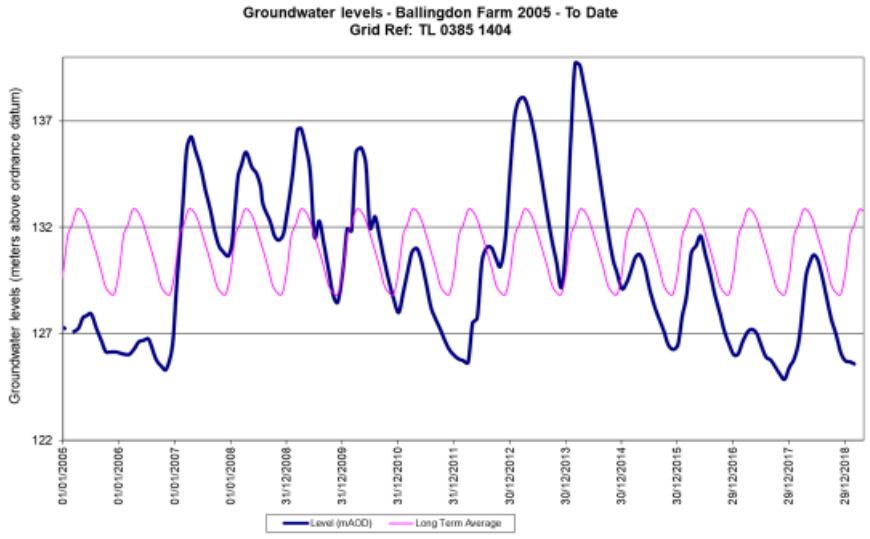
The River Ver



Ballingdon Farm Groundwater Level

- The Society supports the call for consumer water saving messages to begin immediately and in earnest. The facts and figures suggest it should have started months ago.
- All the signs point to a terrible summer for the River Ver, a chalk stream that historically flowed for 28km and in May 2019 is only 17km long
- Ballingdon Farm is a monitoring borehole at the head of the Ver Valley in the Chilterns.
- Groundwater levels there have been below the Long Term Average (LTA) for the past 4.5 years, since November 2016 (see p4)
- The groundwater level is now over 8 metres below LTA, the greatest variance since we began receiving stats from the EA in 2004 (see p5)
- Ballingdon Farm is at the lowest level 'exceptionally low' and has been there for 4 of the past 5 months (see p6)
- April rainfall was just 13.2mm, 25% of LTA, so the aquifer is not likely to get a recharge from the last of the 'winter' months. Source: Rothamsted Research (see www.riverver.co.uk/rainfall)
- The Society's river bailiffs' measurements show river flow in May 19 is 20% down on May 2018

3



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Ballingdon Farm Groundwater Levels

Month 2019	Actual Aquifer (Metres)	Average Aquifer (Metres)	Difference Aquifer (Metres)
January	125.74	131.36	-5.62
February	125.69	132.38	-6.69
March	125.58	132.79	-7.21
April	125.82	133.60	-7.78
May	126.00	134.10	-8.10

©Environment Agency

Figures provided by EA and taken from VVS website:
https://www.riverver.co.uk/aquifer/

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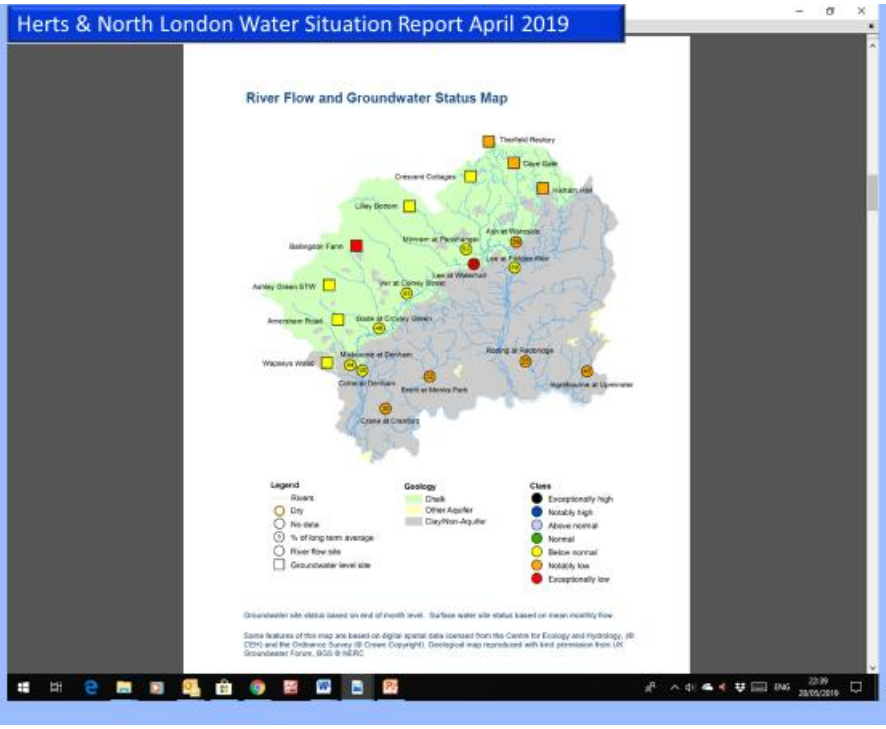


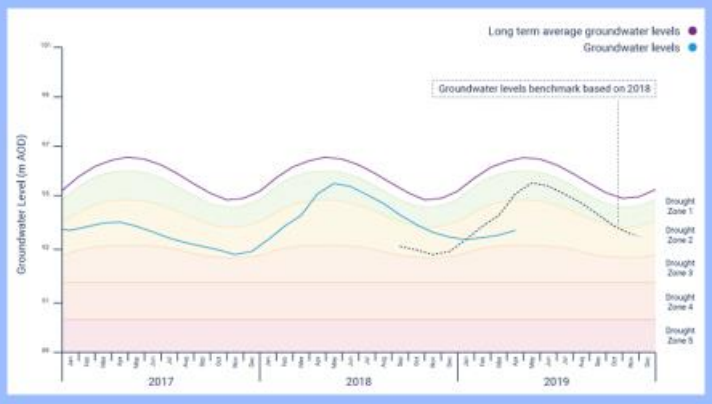
6

Drought Zone 2

- Affinity Water's groundwater levels for the Central Region (Lee/Colne catchments) show that we have been in DZ2 (Drought Zone 2) since Autumn 2018 (see p8)
- The agreed Drought Management Plan Nov 2018 (p9) indicates Demand Side Actions at DZ2 should be
  - Initiate media campaign
  - Increase water efficiency messaging
  - Prepare for possible implementation of Temporary Use Ban
- We haven't seen evidence of these actions or mention of the word 'drought', indeed Affinity's current activity revolves around a medium to long term campaign encouraging consumers to lobby govt. to introduce water labelling, give tenants rights to water efficient homes etc

7

Affinity Water Central Region Groundwater



Source: Affinity Water website
https://www.affinitywater.co.uk/groundwater-central.aspx

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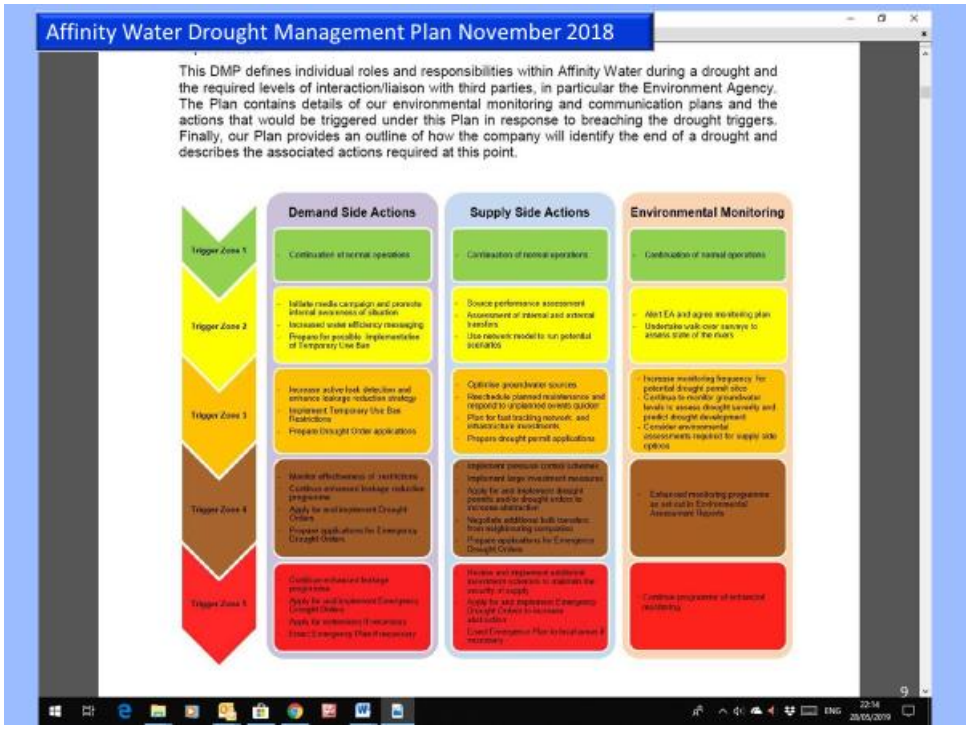

Affinity Water Drought Management Plan November 2018
This DMP defines individual roles and responsibilities within Affinity Water during a drought and the required levels of interaction/liaison with third parties, in particular the Environment Agency. The Plan contains details of our environmental monitoring and communication plans and the actions that would be triggered under this Plan in response to breaching the drought triggers. Finally, our Plan provides an outline of how the company will identify the end of a drought and describes the associated actions required at this point.
Demand Side Actions
Supply Side Actions
Environmental Monitoring


North of Redbourn
South of Redbourn
River Red 'flowing' into the Ver
Redbournbury – weak flow
St Albans – ankle deep
South of St Albans – low flow

Case Study Four – South East Rivers Trust

South London chalk streams: the sticking plaster

The state of chalk streams in the south of London, such as the Wandle and Hogsmill, is as dire as in North London but the lack of water is not as apparent due to a 'sticking plaster' solution which covers up the real situation.

Both the Hogsmill and Wandle are artificially augmented by water companies. In the case of the Wandle, the river water is abstracted and pumped up to the spring line in Carshalton where it is let go to keep the top of the Wandle flowing. Unfortunately, the pumps on this river recirculation system failed three years in a row at the critical time of trout spawning, wiping out several year classes of trout which had only recently been restored to the river by local school children through the Wandle Trust's Trout in the Classroom programme.

On the Hogsmill, groundwater is pumped up from the aquifer and ceremoniously released to the Hogsmill through a fountain in Bourne Hall lake – or it was until recently, when cracks in the series of ponds downstream between the Bourne Hall and the start of the river itself, meant that the source of the river sunk back into the ground, and so the headwaters began to run dry up. In a very good example of partnership working, as well as the partners swiftly recognising the severity and importance what happened, different organisations worked together to reroute the groundwater augmentation to the top of the river, with a sweetener flow remaining at the fountain to ensure the amenity value it provided would continue.

So, whilst both of these chalk-fed rivers enjoy some flow in their headwaters, this is often entirely artificial and covers up the truly dire state faced by our rivers today.

The following four images are taken of the rivers Wandle (winter 2017/18) and Hogsmill (2019) when the augmentation system was not working and thus the "sticking plaster" mentioned in this case study is removed.

R.Wandle: *Photos: copyright South East Rivers Trust*

R.Wandle (above): *Photos: copyright South East Rivers Trust*

Hogsmill river: *Photos: copyright South East Rivers Trust*

Hogsmill river: *Photos: copyright South East Rivers Trust*

Case Study Five – Rivers Darent and Cray

Evidence of persisting low flow issues in the Darent and Cray catchment: South East Rivers Trust

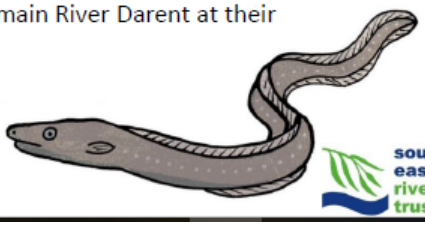
Evidence for still existing low flow impacts

1. Currently both the Darent and Cray are classified in the Environment Agency 'Darent and Cray Abstraction licensing strategy' (EA, 2013) as '*Water not available for licensing*';

2. Recent low flows have been below the Ecological Flow Indicator (EFI);

3. 'Groundwater Abstraction' is cited as Water Framework Directive 'Reasons for Not Achieving Good' for three waterbodies:
    1. Upper Cray [2 element failures],
    2. Middle and Lower Darent [2 element failures]; and
    3. Upper Darent [3 element failures]);

4. Historic records and memories from 1950s suggest the river had substantially more water in it before abstraction pressure increased through 1960s; *e.g.* the river used to support 29 watermills; Trevor Carmen (DRiPS, DDAPS, ex NRA/EA) remembers:
    - Devon Mill Stream supported watercress farms in the 1950s and 60s, it is now a tiny watercourse;
    - St Johns loop supported watercress farms in the 1950s and 60s, it is now dry;
    - Burtenshaw Brook has reduced significantly in size;
    - Honeypot Stream used to be approx. the same size as the main River Darent at their confluence, Honeypot Stream is now much smaller.



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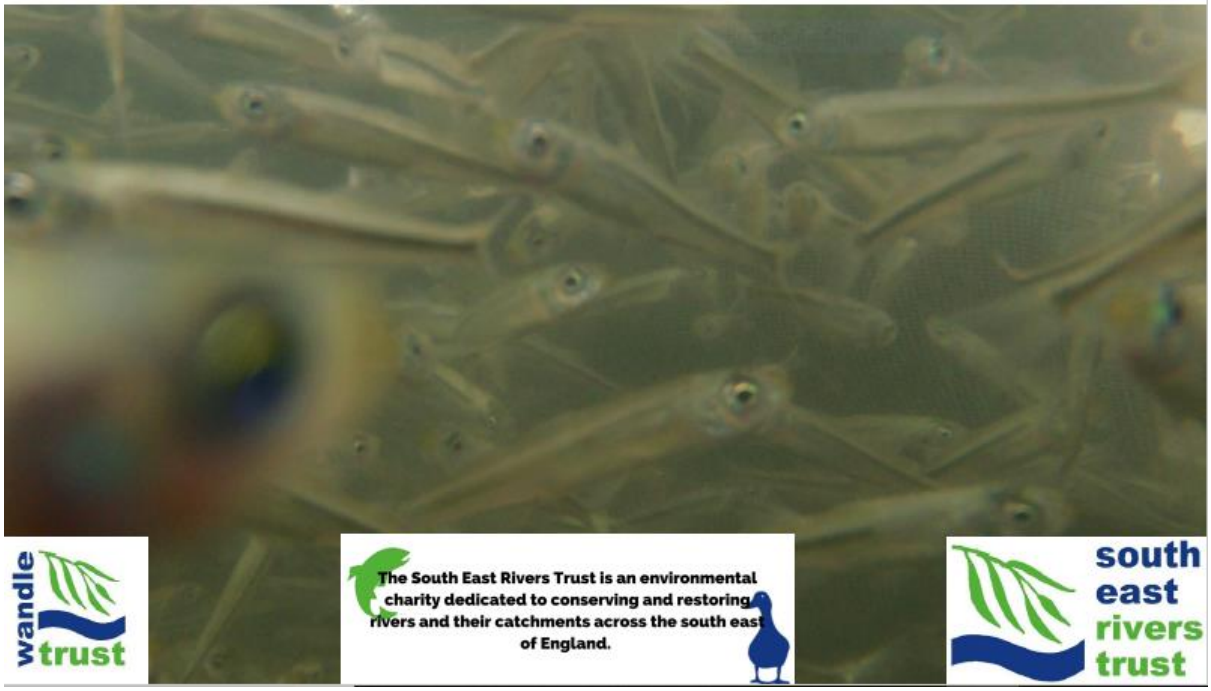
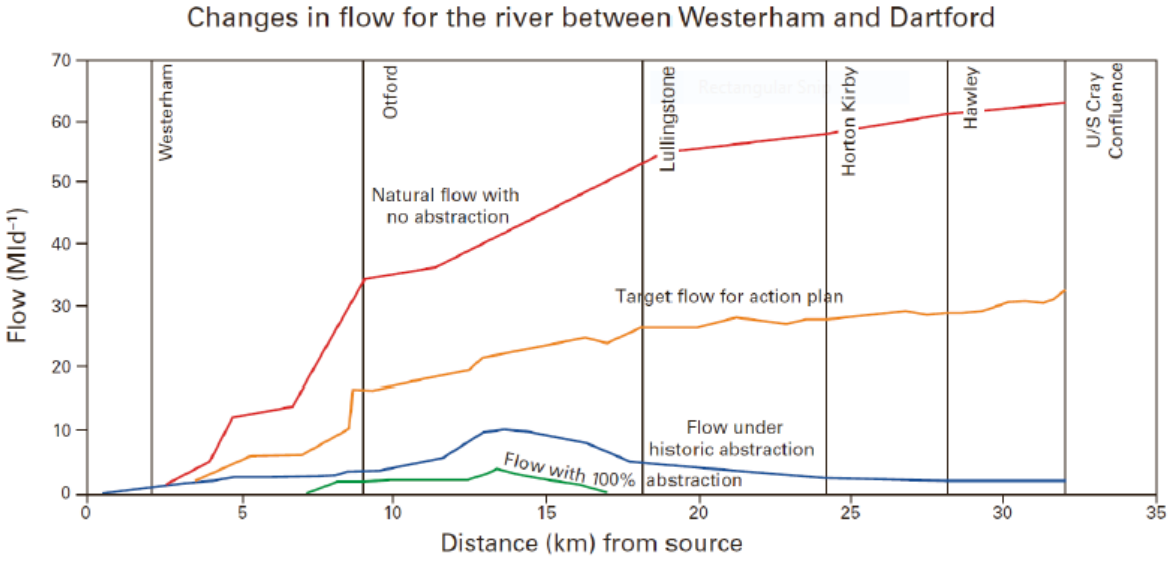
Original Ambition of 'Darent Action Plan'



Darent Action Plan - Ambition.

The Chalk Aquifer of the North Downs (British Geological Society, 2008).



The figure illustrates the scheme [Darent Action Plan] by a comparison of actual and target flow accretion profiles for August, the former being based on 1976 and 1989/92 observations and, therefore, representing a late summer drought condition. (British Geological Society, 2008)

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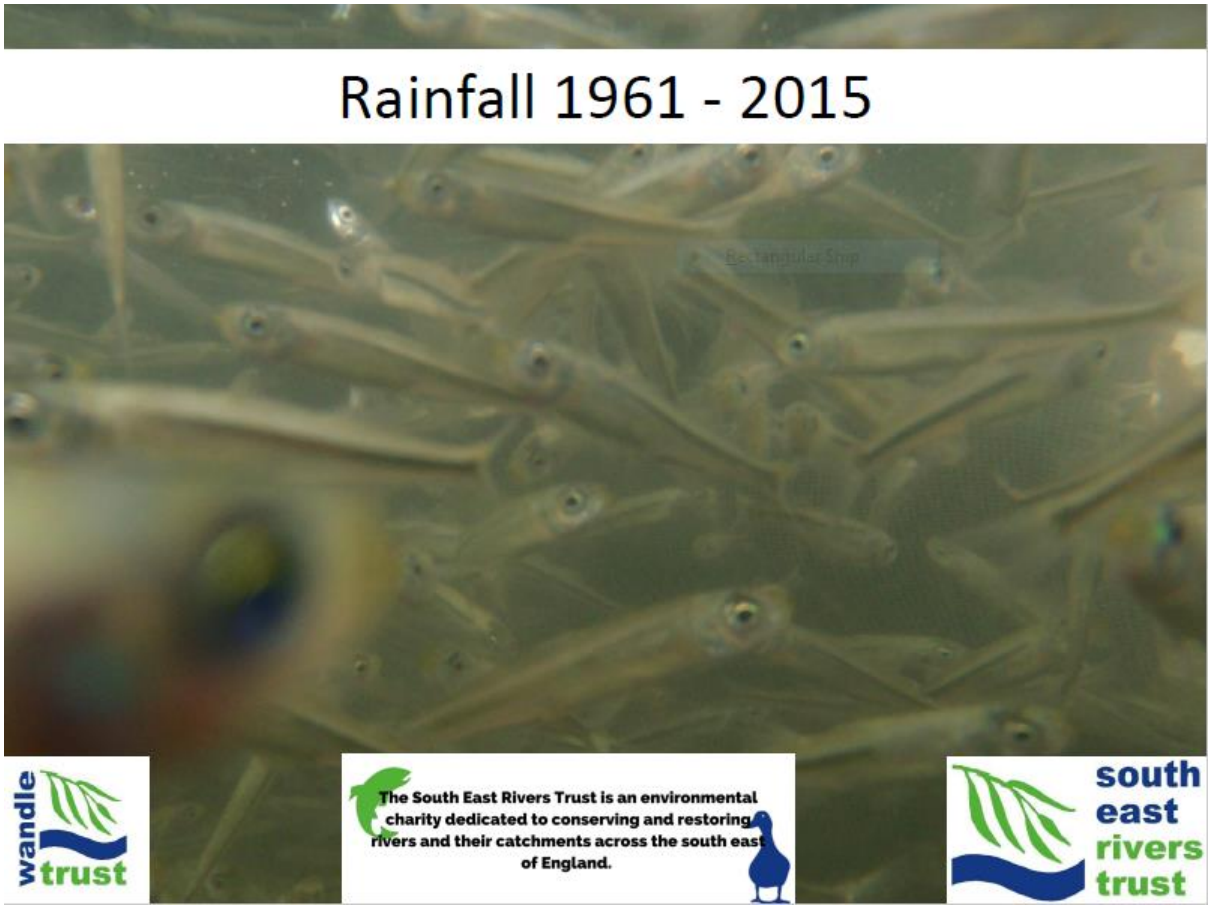
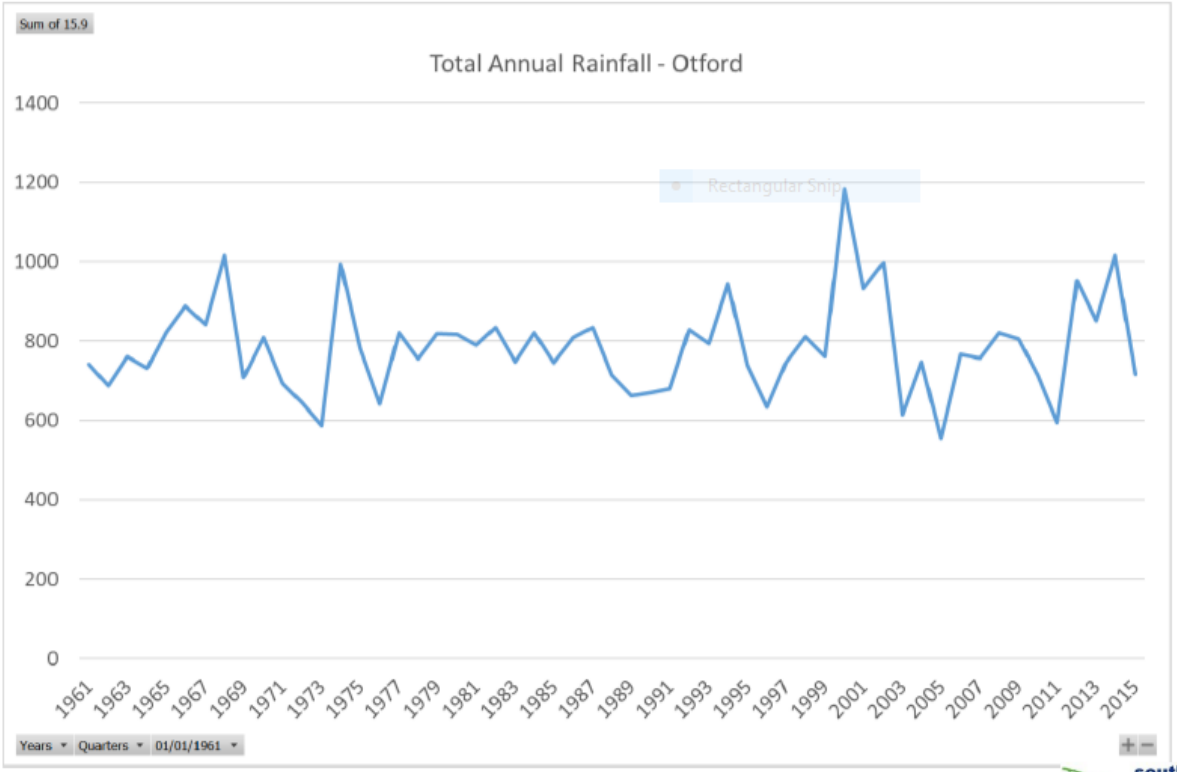
Rainfall 1961 - 2015



Long-term Rainfall



Maybe some evidence for more frequent droughts in recent years?
- 1961-1990 (~30yrs) = 1 yr <600mm, 1990-2015 (25yrs) = 4 yrs <600mm.

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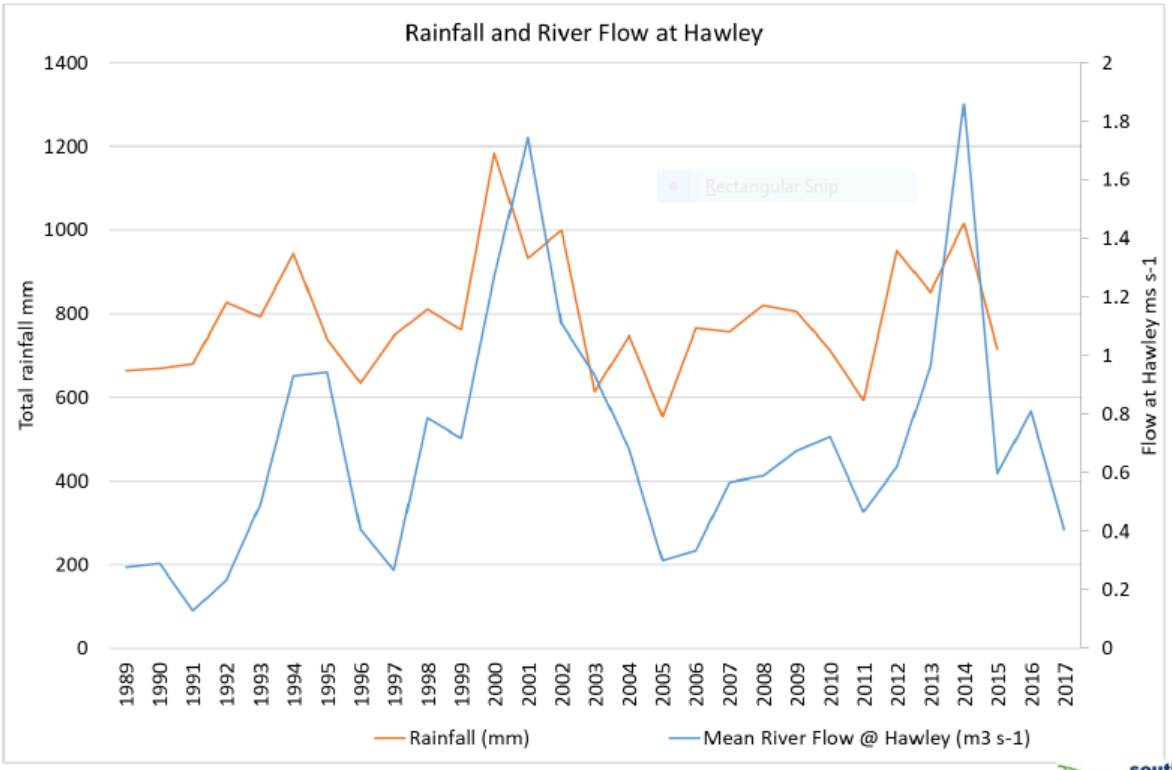
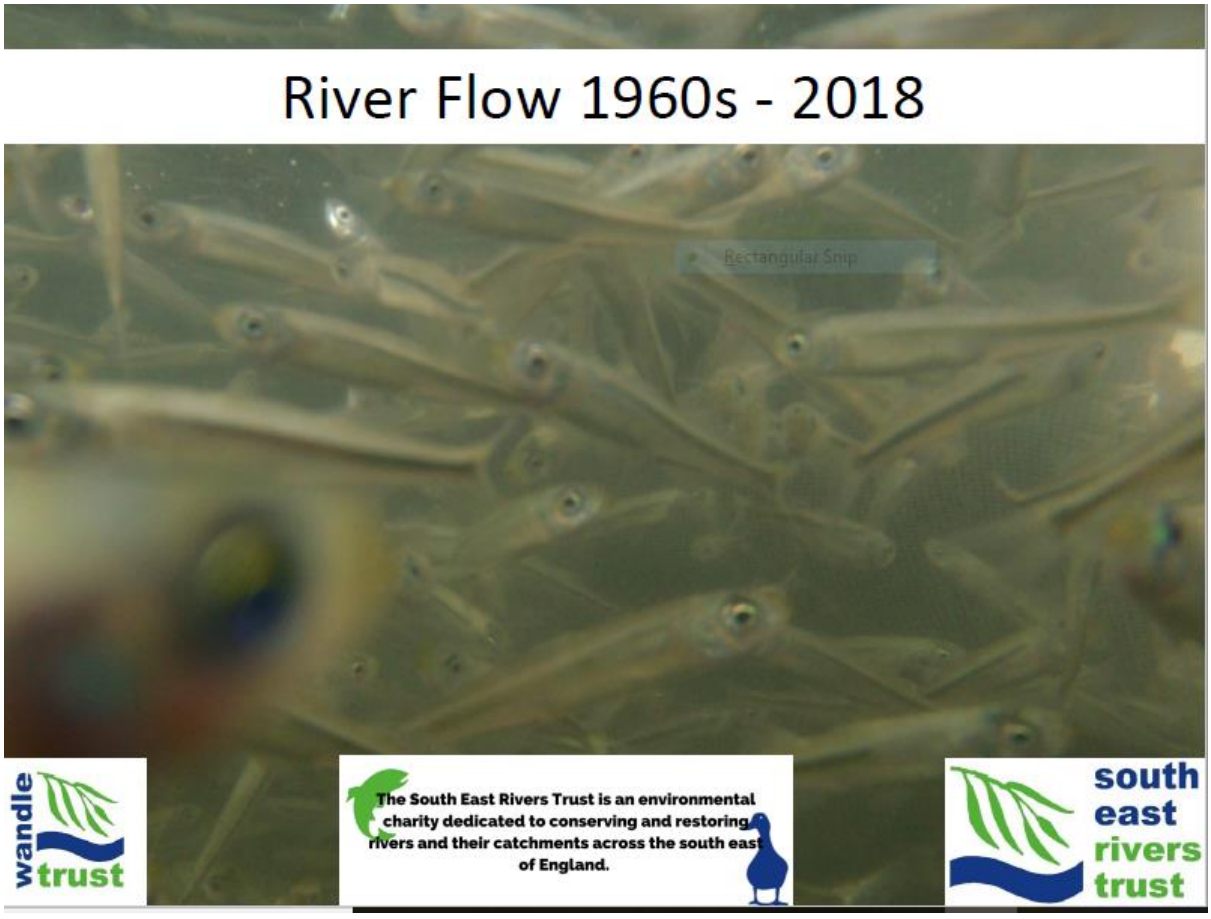
Mean annual River Flow vs Total annual Rainfall



River flow closely related to rainfall.



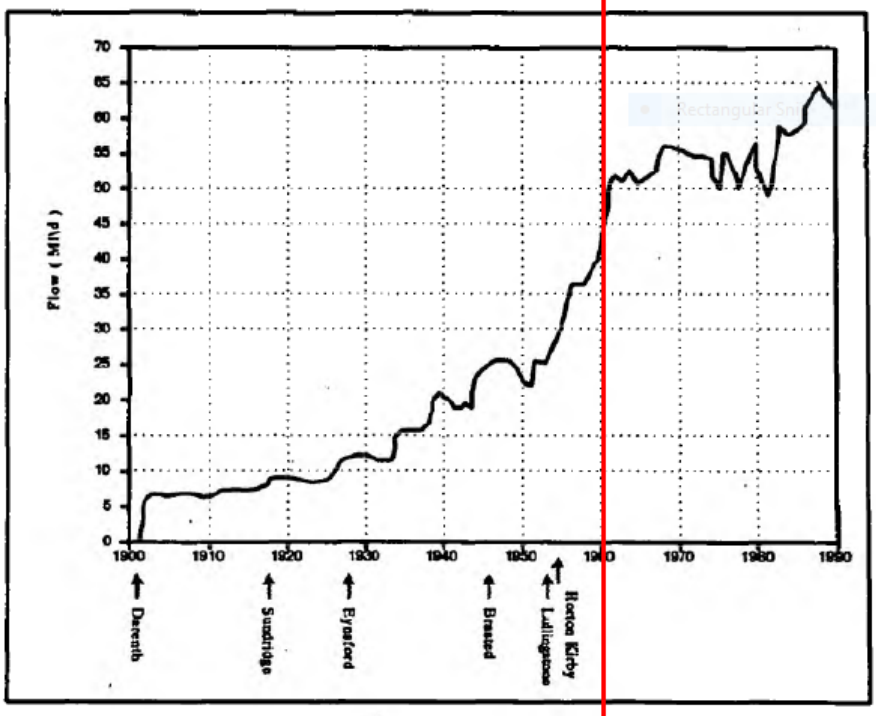
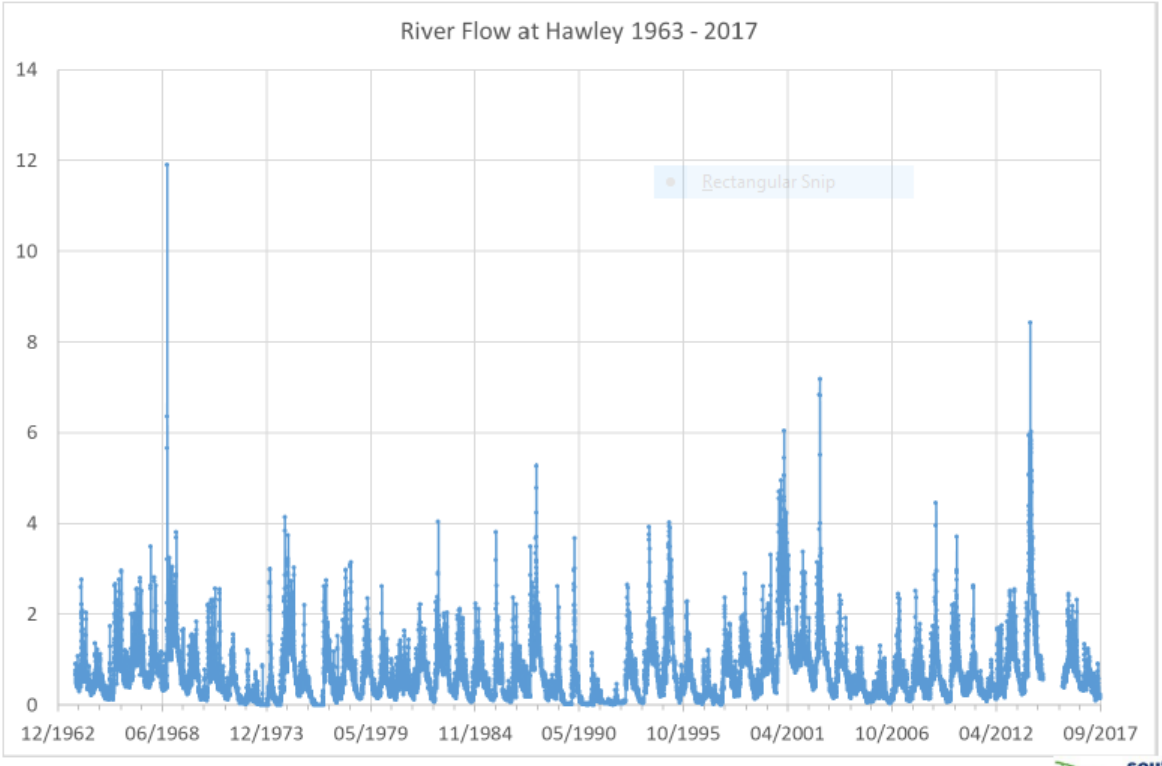


Figure 1.2 of 'River Darent Low Flow Alleviation Report' (NRA, 1994)

Flow data only starts in early 1960s, when abstraction is ~70% peak abstraction.

River Flow has been gauged since the early 1960s at three locations: Otford, Lullingstone and Hawley.



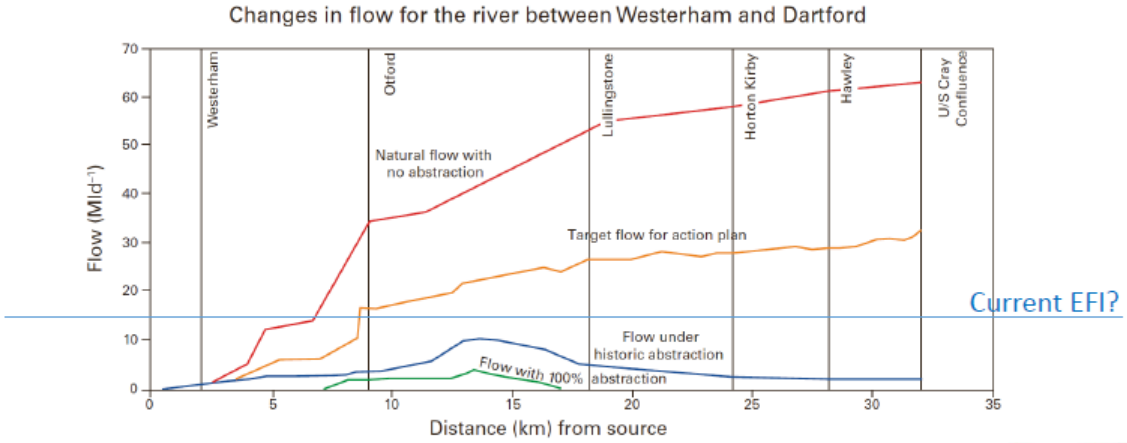
Environmental Flow Indicators (EFI)

EFIs have been calculated for 2 assessment points on the Darent for the 2 Surface waterbodies: Upper Darent (Otford) and Middle and Lower Darent (Hawley).

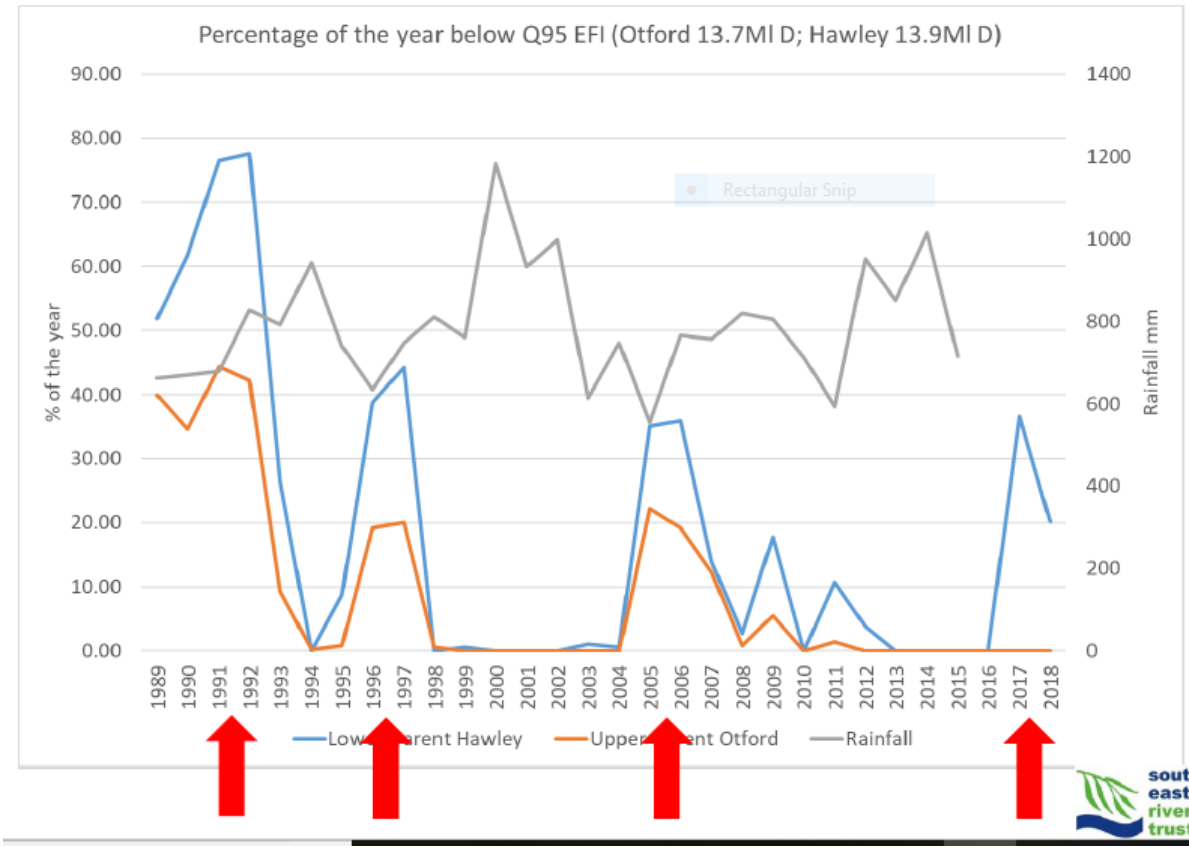
EFI is "*a resource allocation for the environment defined as a proportion of natural flow*" (Darent & Cray Abstraction licensing strategy, Environment Agency 2013).

1. Otford (Upper Darent WB)
62.5 Ml/d @ Q30, 40.6 Ml/d @ Q50, 28.5 Ml/d @ Q70 and **13.7 Ml/d @ Q95**.

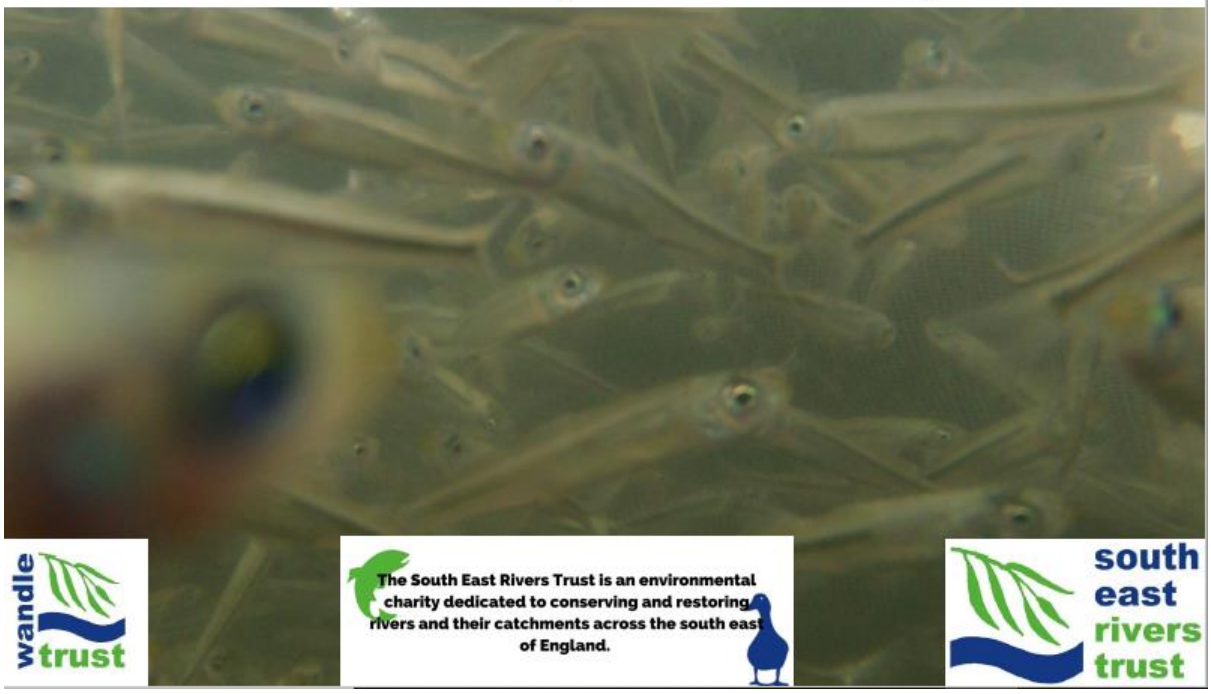
2. Hawley (Middle Darent WB)
88.9 Ml/d @ Q30, 52.0 Ml/d @ Q50, 28.6 Ml/d @ Q70 and **13.9 Ml/d @ Q95**.

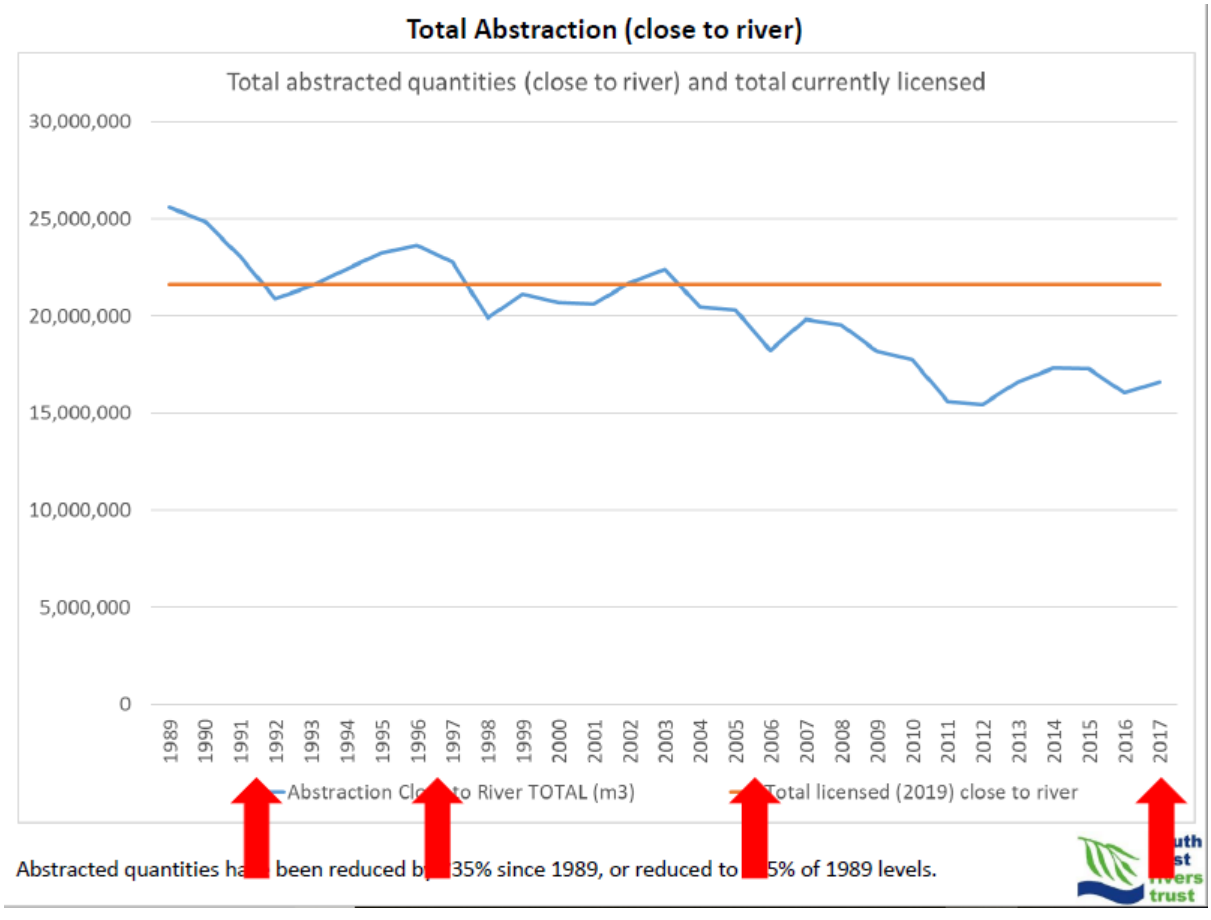


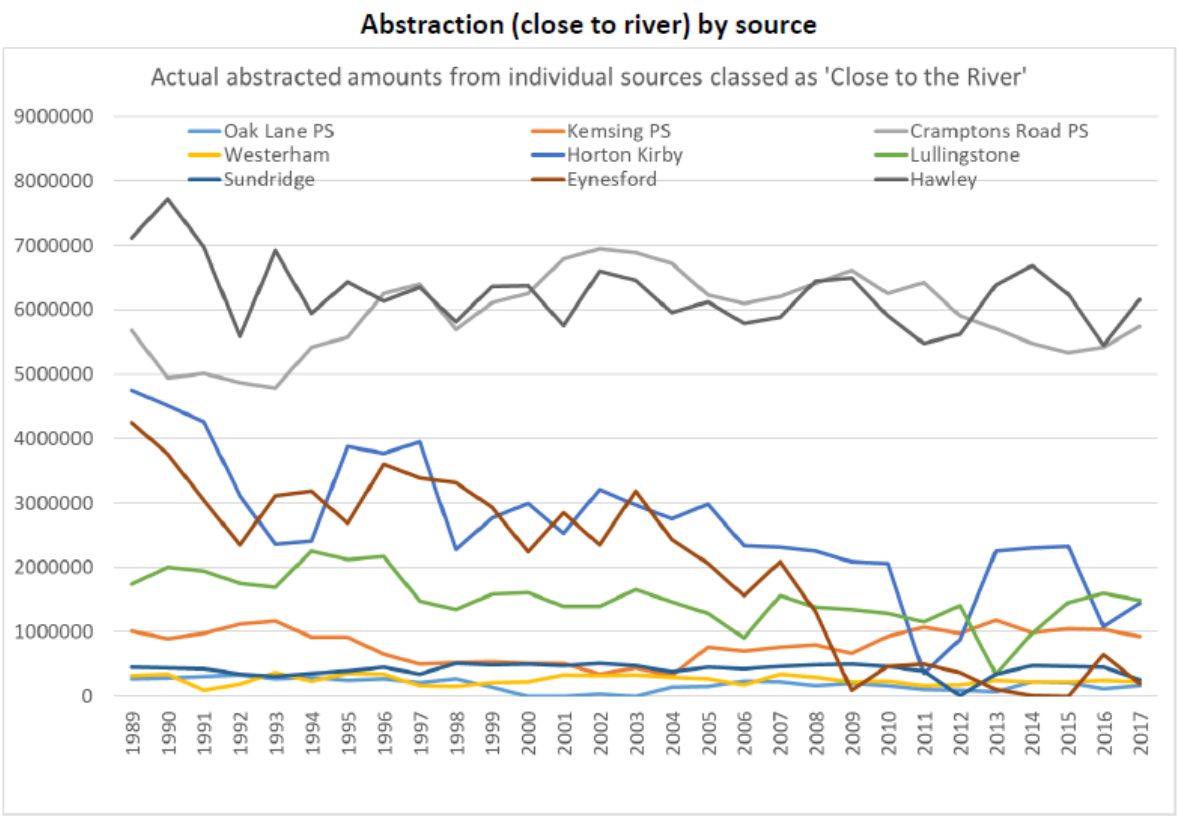
The figure illustrates the scheme by a comparison of actual and target flow accretion profiles for August, the former being based on 1976 and 1989/92 observations and, therefore, representing a late summer drought condition. (British Geological Society, 2008)



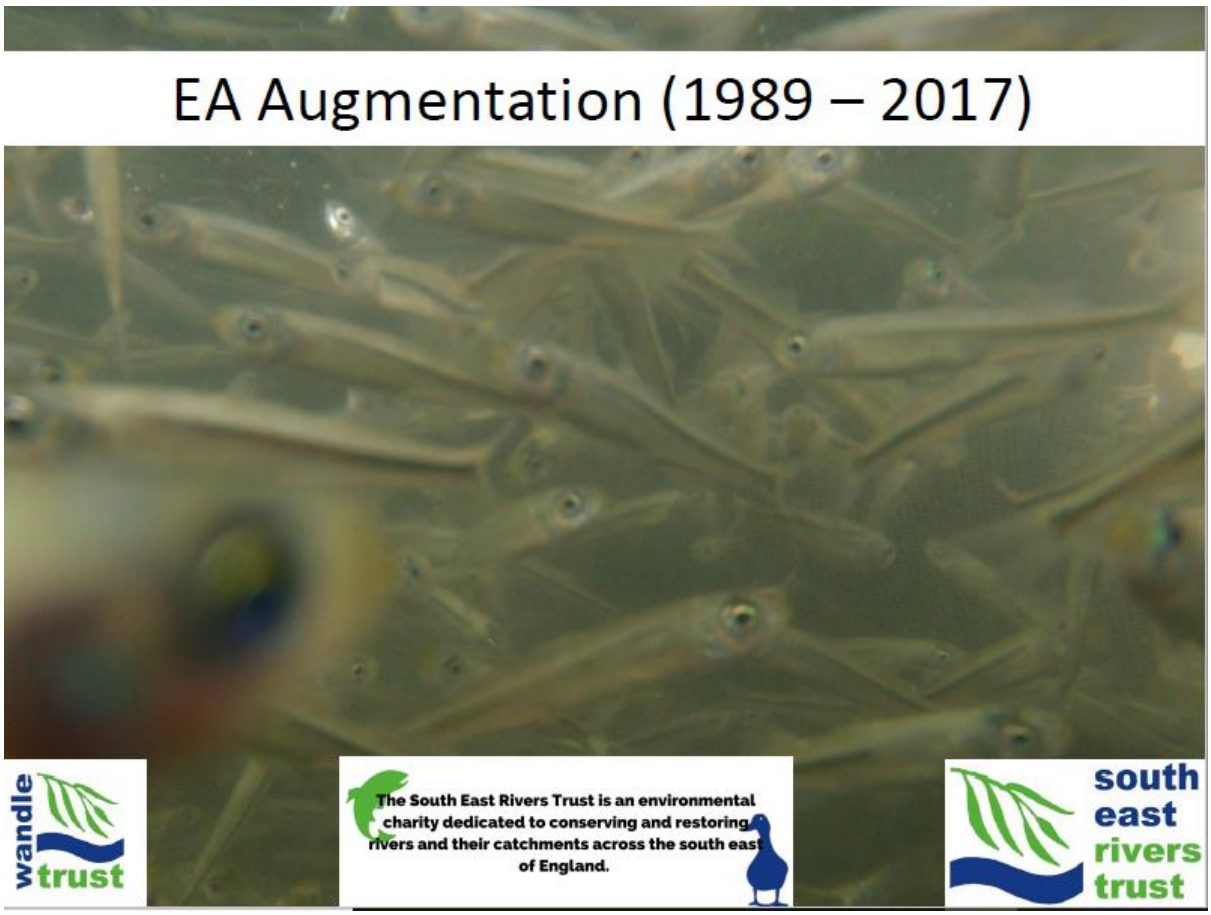
Actual Abstracted Quantities (1989 – 2017);



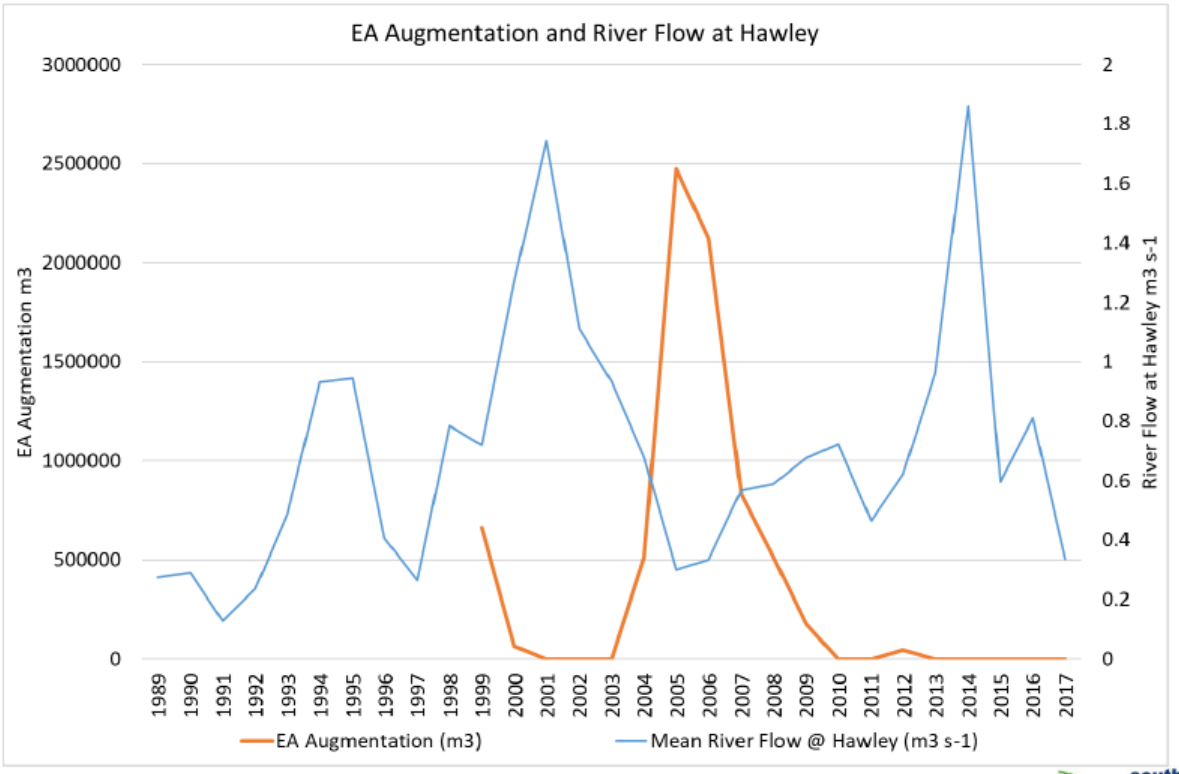




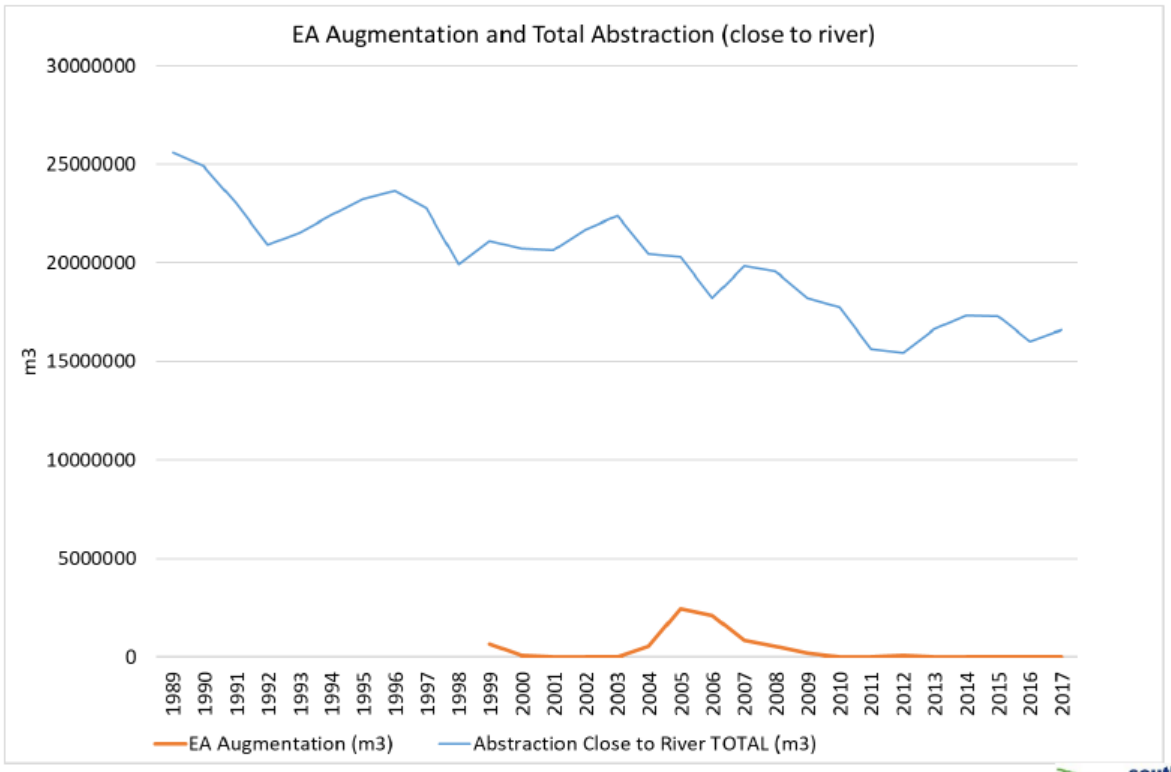
Thames Water have reduced Horton Kirby and Eynesford significantly and reduced others, while other sources have actually increased! *e.g.* South East Water: Cramptons Road.



EA Augmentation vs Total abstraction (close to river)



Total abstraction (close to river) vs Total EA Augmentation



When augmentation used in 2005 & 2006 = ~10% of total being abstracted for drinking water supply.

Conclusions:

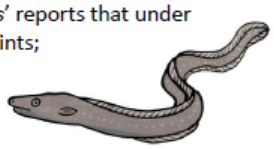
a. There still appears to be evidence that the River Darent suffers from low flow issues;

b. No baseline flow data exists before significant abstraction pressures pre-1960s;

c. Hydrological targets of the 'Darent Action Plan' appear to have been reduced by approx. half to current EFIs of ~13 Ml D, the rational for this isn't clear in the literature I have;

d. Rainfall data suggests more frequent occurrences of drought in the last 15 years;

e. EFIs for Otford (13.7 Ml D) and Hawley (13.9 Ml D) are very similar, again the rational for this isn't clear;
   a. British Geological Society (2008) report '*The Chalk Aquifer of the North Downs*' reports that under natural flow conditions the river should double in flow between these two points;
   b. However, even with this 'reduced' EFI, the river is be below EFI:
      a. ~35% of the year in 2005 and 2006; and
      b. 20-35% in 2017 and 2018;



f. Abstraction has been reduced by ~35% since 1989. However, there is still sufficient headroom in the licenses to return to late 1990s level of abstraction (when the river was below it's 'reduced' EFI ~40% of the year). Which presents a risk to the rivers ecology.

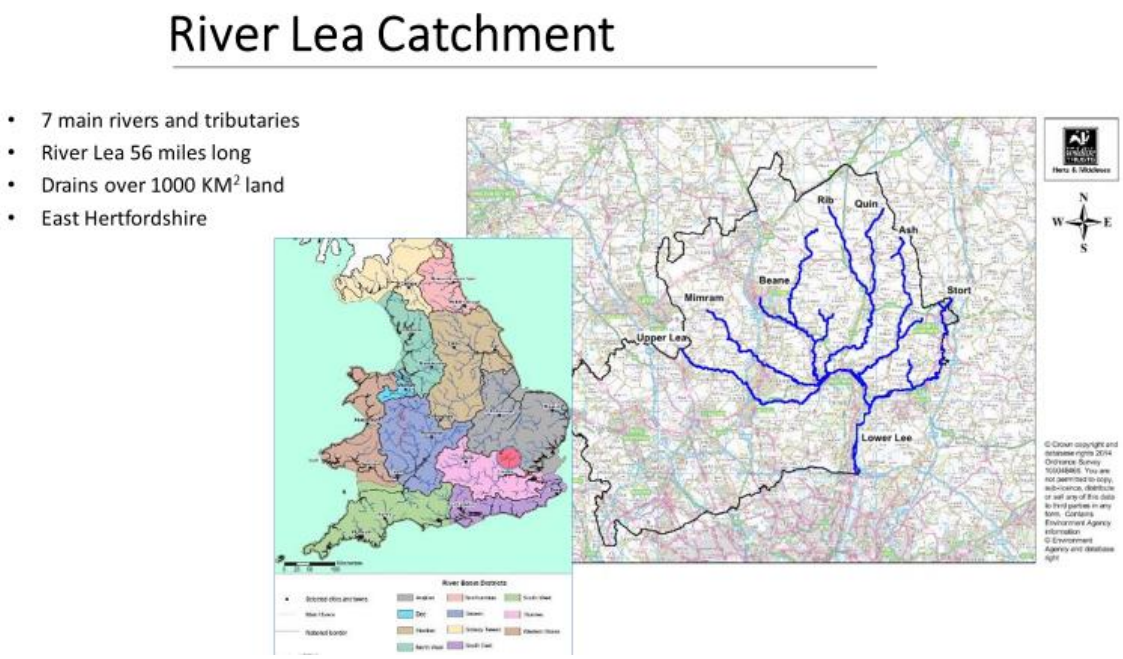
g. While Thames Water reduced it's abstractions through the 1990s and 2000s, another water company increased it's abstraction at the same time. This doesn't appear very joined up;

h. EA Augmentation has not been used since the 2000s (EA decision as unsustainable), it's purpose is to '*safeguard the river during drought conditions*', the facility was installed at significant cost and operates at a level of ~10% of DWA (which is ongoing despite conditions). This scheme was part of the 'Darent Action Plan' solution to the issues facing the river in the 1990s. If this is no longer to be used, a replacement solution is required.

south east rivers trust

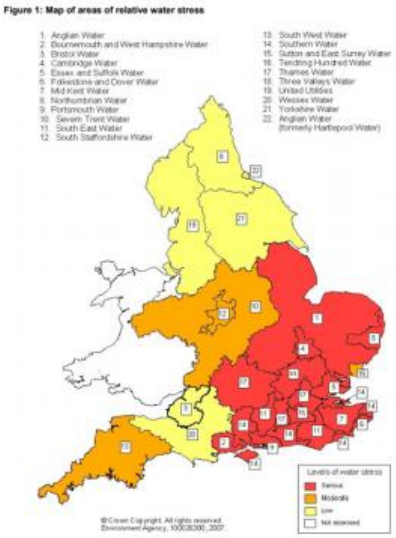
Case Study Six – River Lea - Herts & Middx Wildlife Trust

River Lea catchment



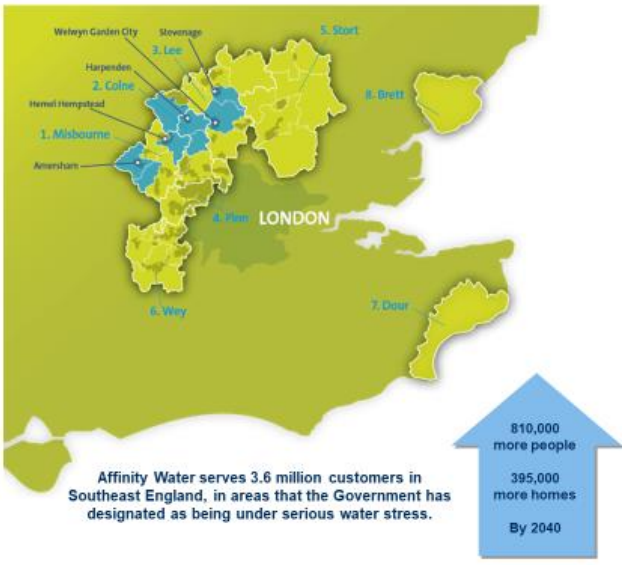
Water Use & Abstraction

- Hertfordshire water consumption 8% above national average
- 152L per person per day versus,
  140L per person per day national average
- Lea Catchment consumption is 146.7L per person per day
- Herts classified by Environment Agency in 2007 as "severely water stressed region"



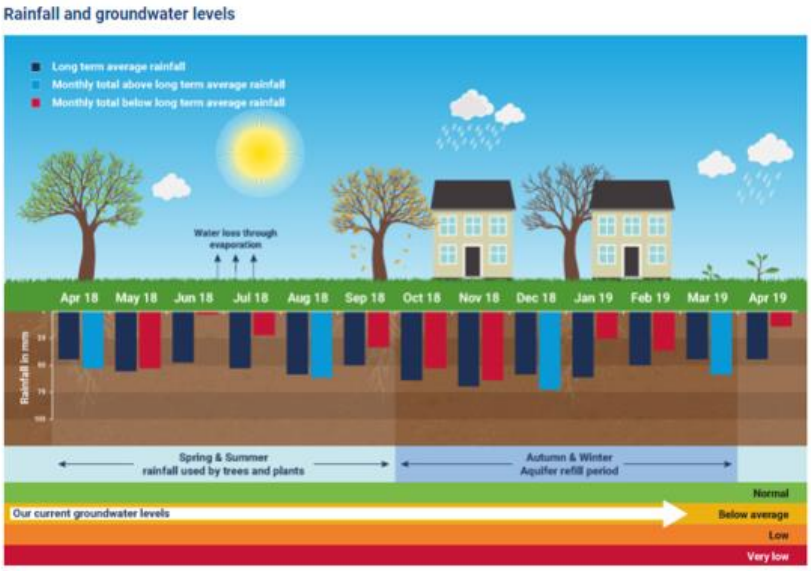
Water Use & Abstraction

- Population rise, increasing water consumption and development are putting extra pressure on the balance between water supply for people versus rivers and environment
- Affinity currently serve 3.6 million people in Central Region (covering Herts)
- An extra 895,000 people predicted to be living in Affinity Water supply region by 2040
- This will add extra pressure to a currently severely-stressed catchment area



Water Levels in 2018 / 2019

- April 2019 – Summary of Water Situation Report by Affinity
- Overall, winter rainfall levels below average. Any further recovery of groundwater levels is unlikely.
- Groundwater levels in Lea & Colne Catchments have declined since mid-April and this is likely to continue until the autumn.
- Currently we are in drought zone 2.
- Levels are currently lower than those observed during the drought period of 2017.
- Even if we receive 100% of the LTA rainfall over summer, we are likely to be in drought zone 3 by autumn.



Environmental Drought - ongoing

- Environmental drought becoming regular; 2006, 2012, 2017, 2018 … and 2019?
- 80% of flow in River Lea is due to discharge at East Hyde Sewage Works, treating Luton.
- Chalk stream tributaries are dry or with severely reduced flows almost constantly

For example:

8 km of the River Beane (about half) is seriously impacted by chronic low flows and regularly dries out for months e.g. drought of 2017.

- Wetlands now beginning to dry out too, due to drops in groundwater levels and lack of winter re-charge

Kingsmead Wetlands, Hertford 2019. These wetlands are fed by springs which also serve the New River taking water to London.

There is a licence to abstract water to keep the New River flowing. It is a relic of times when there were no other means of transporting freshwater into the Capital. It is competing for groundwater with nearby rare wetlands and chalk streams, despite these continuing to suffer and dry out, year on year.

Environmental Drought – Lea Facts & Figures

River levels

Comparison of river levels in May 2013 versus May 2019 (six year period after release of 2013 Chalk Stream Charter)

- **River Mimram – at Whitwell = 75% drop in average river level for month of May in 2019 vs. 2013**
  "During May 2019, average water levels in the River Mimram were 75% less than in May 2013."
  May 2013 - average month river level = 0.12m
  May 2019 - average month river level = 0.03m

- **River Beane – at Watton = 55% drop in average river level for month of May 2019 vs. 2013**
  "During May 2019, water levels in the River Beane were on average 55% lower than six years ago in 2013, when the Chalk Stream Charter was launched from the banks of the Beane, highlighting the plight of chalk streams at risk from over-abstraction!"
  May 2013 – average month river level = 0.15m
  May 2019 – average month river level = 0.07m

River flow

Comparison of flow rate across a 20 year period, May 1999 versus May 2019

- **Mimram – at Whitwell = 81% drop in flow rate (m^3/second)**
  "In May 2019 the River Mimram had >80% less average daily flow, compared to 20 years ago"
  May 1999 - average month flow rate = 0.108 m^3/s
  May 2019 – average month flow rate = 0.021 m^3/s

Photos of dry rivers & wetlands

River Beane at Whitehall, Aston – 2018
Close to Whitehall Pumping Station operated by Affinity Water. As a result of local lobbying for 20 years, in 2018 abstraction was reduced by 90% to 2 mega litres per day. But still water has not returned to the river; is it possible the aquifer may be irreversibly damaged from 20+ years of neglect?!

Dry Pond at Stanborough Reed Marsh, Local Nature Reserve on the River Mimram – Welwyn Garden City 2019

Dry wetlands at Tewinbury SSSI on the River Mimram at Tewin, 2019.

The SSSI is notified for its flora and a species extremely rare in Herts - Blunt Flowered Rush - listed as present in the wetlands 20 years ago is now not recorded, possibly due to continual drying up of the wetlands.

Dry ponds at Panshanger Park on the River Mimram – Hertford 2019

Dry ponds at The Grove in Watford, April 2019

Even in spring – when groundwater & thus wetland levels should be at their highest after the winter re-charge period – wetlands and ponds across the region are already dry!

River Rib at Buntingford, May 2019

A culvert under the high street, with nothing more than a trickle topping it.

River Rib at Buntingford, May 2019

Water is abstracted in the upper part of the Rib Valley to serve Buntingford and surrounding rural areas.

Results in severely low flows through the town. Recharge of the river only occurs at southern extent of the town, on reaching the Sewage Treatment Works (operated by Thames Water), where an outfall located.

Approx. 1000 extra homes planned for Buntingford in the near future, which will make the situation even worse.