



ChessWatch:
Classroom
resources

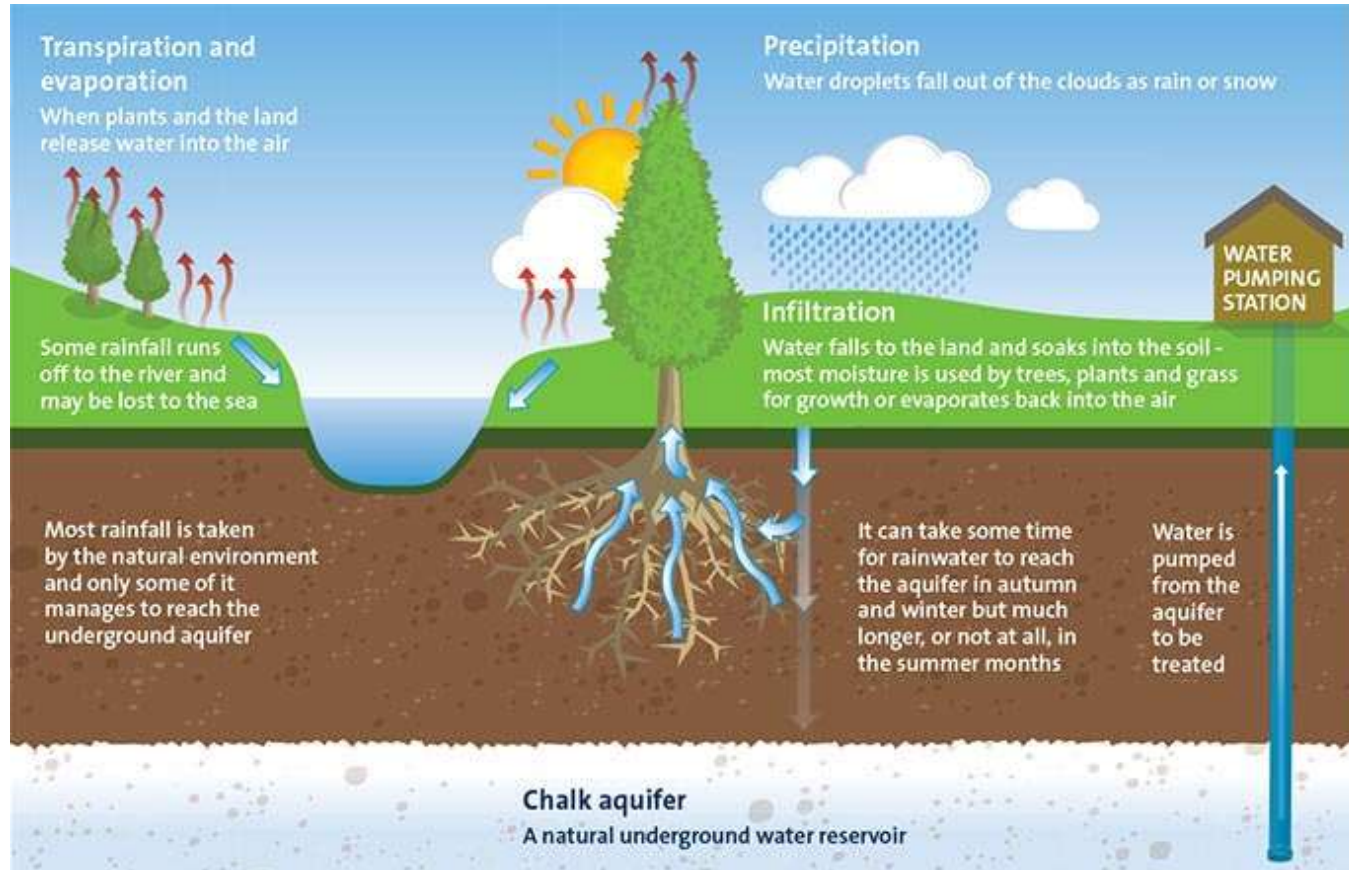


Chalk Streams are a globally rare, confined to England and North West Europe, and are priority habitats in the UK. They are also a defining feature of the Chilterns landscape.

Chalk Streams like the Chess are noted for their lush vegetated margins, clean gravel bed and crystal clear oxygenated waters. Plants like the white flowered crowfoot grow abundantly in the fast flow and fish such as brown trout lay their eggs in the gravels of the stream. The river supports an abundance of insect life from green drake mayfly to the truly spectacular banded demoiselle. Bird species such as heron, kingfisher and water rail abound and the river is an important winter ground for sandpiper, jack snipe, teal and gadwall.

The Chess also supports one of the last two natural populations of water vole in Buckinghamshire and is home to the secretive water shrew.

The hydrological cycle in chalk drainage basins



This image is from Affinity Water website: <https://www.affinitywater.co.uk/water-cycle.aspx>

The River Chess in Chesham: where does the flow go?

Source of river has migrated downstream



Source of river has migrated upstream



The chalk rock beneath our feet is known as an aquifer as it can hold water in its structure. This water is called groundwater. The level of the groundwater rises and falls during the year in response to rainfall.

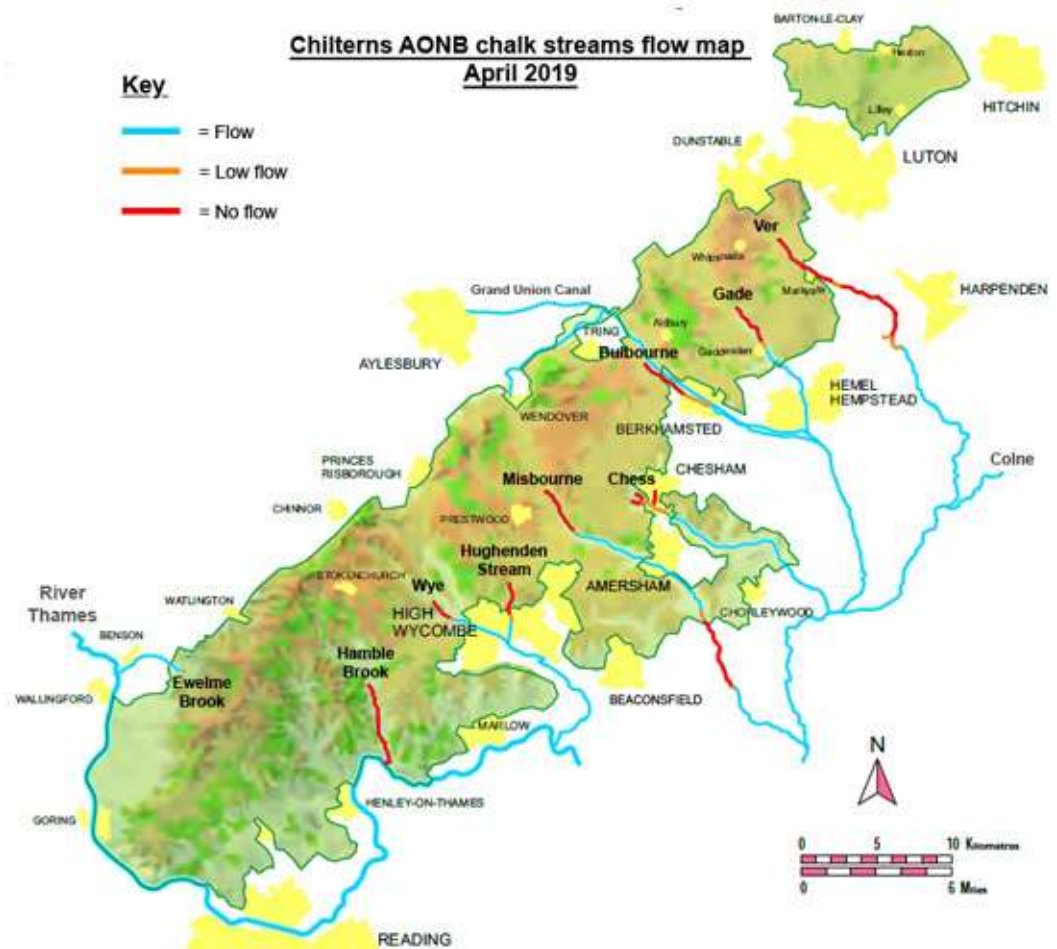
Chalk streams like the River Chess flow wherever the groundwater meets the surface of the land. They have intermittently flowing upper reaches, known as 'winterbournes' that flow after winter rains refill the aquifer, and dry up during the summer as the groundwater level declines.

When we have a dry winter the groundwater store does not refill very much and this can cause the river to dry up for longer and further down the valley than normal the following year.

River flows in the Chilterns



<https://www.chilternsaonb.org/explore-enjoy/getting-here.html>



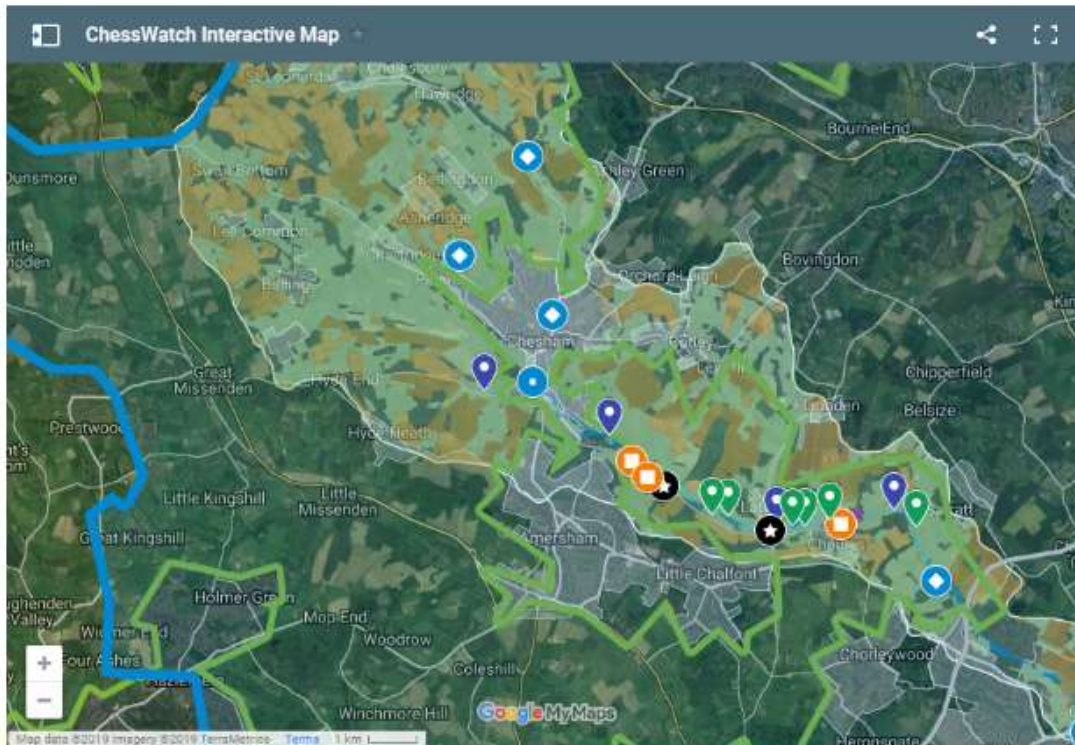
The River Chess



Interactive map of River Chess

Explore the River Chess in the interactive map below. The layers can be made visible or hidden by ticking the boxes in the legend on the right.

The map includes information on water quality and quantity, ecology, land use, designated sites and points of interest along the river and within the catchment area.



On Googlemaps the date slider bar lets you compare the view over the past 10 years



The chalk aquatic ecosystem



Credit: Chilterns Chalk Streams Project

What do we look for in an aquatic ecosystem?

Animals
Fish
Insects
Plants

How does each element link and interact as a system?

How do these species indicate river health?

Which is the odd one out?



How do we measure the health of a river?

We can measure river health using both chemical and biological indicators

Using water quality monitoring...

pH

Dissolved
Oxygen

Turbidity

Water Level

Electrical
conductivity

Tryptophan

Chlorophyll -a

Click on each of the indicators to go to the webpage with further detail about what the sensors are measuring



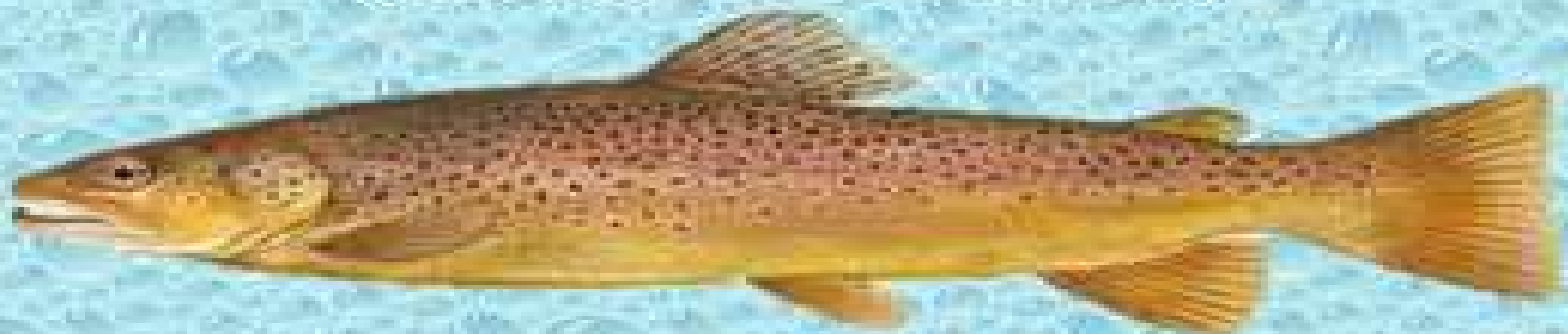
Using riverfly monitoring...



The River Chess Association has a team of trained volunteers monitoring fly life on the River Chess:

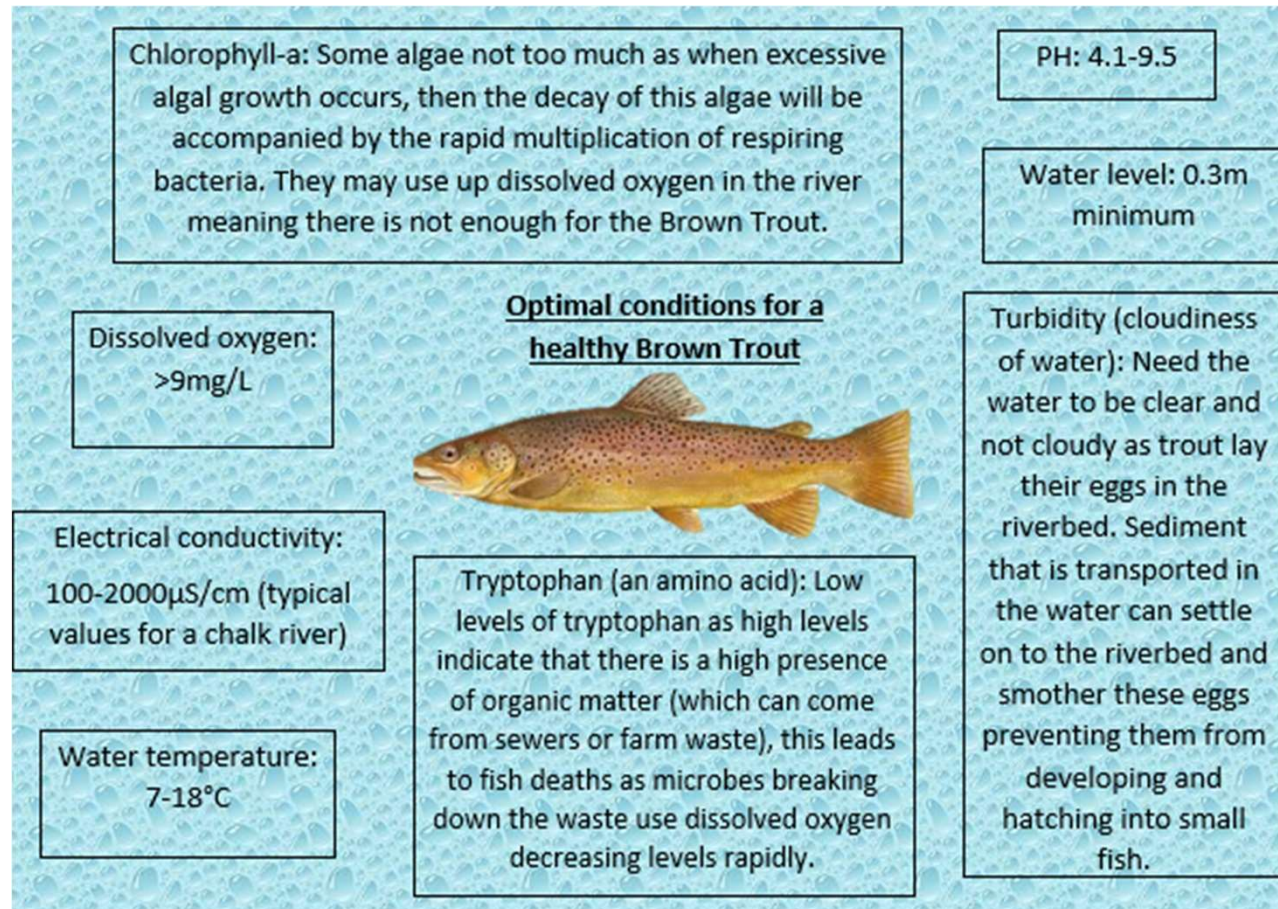
<http://www.riverchessassociation.co.uk/fly-monitoring.html>

**Optimal conditions for a
healthy Brown Trout**



Tryptophan (an amino acid associated with presence of organic matter):

Water quality requirements to support a healthy population of brown trout




Chlorophyll-a: Some algae not too much as when excessive algal growth occurs, then the decay of this algae will be accompanied by the rapid multiplication of respiring bacteria. They may use up dissolved oxygen in the river meaning there is not enough for the Brown Trout.

PH: 4.1-9.5

Water level: 0.3m minimum

Dissolved oxygen: >9mg/L

Optimal conditions for a healthy Brown Trout



Electrical conductivity: 100-2000 μ S/cm (typical values for a chalk river)

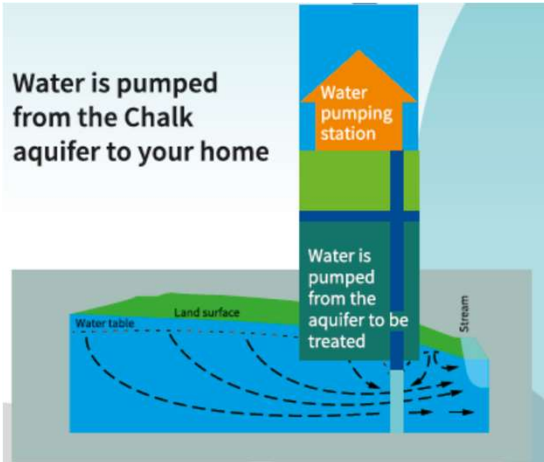
Tryptophan (an amino acid): Low levels of tryptophan as high levels indicate that there is a high presence of organic matter (which can come from sewers or farm waste), this leads to fish deaths as microbes breaking down the waste use dissolved oxygen decreasing levels rapidly.

Turbidity (cloudiness of water): Need the water to be clear and not cloudy as trout lay their eggs in the riverbed. Sediment that is transported in the water can settle on to the riverbed and smother these eggs preventing them from developing and hatching into small fish.

Water temperature: 7-18°C

It's not all about water quality. What other factors might you need to support a healthy population of brown trout?

Human disruption to the drainage basin



Abstraction for drinking water



River channelisation



Road runoff



Agricultural runoff



Domestic water use



Plastic litter

Factors changing water supply and demand



Climate change?



Storage capacity



Water infrastructure



Water use

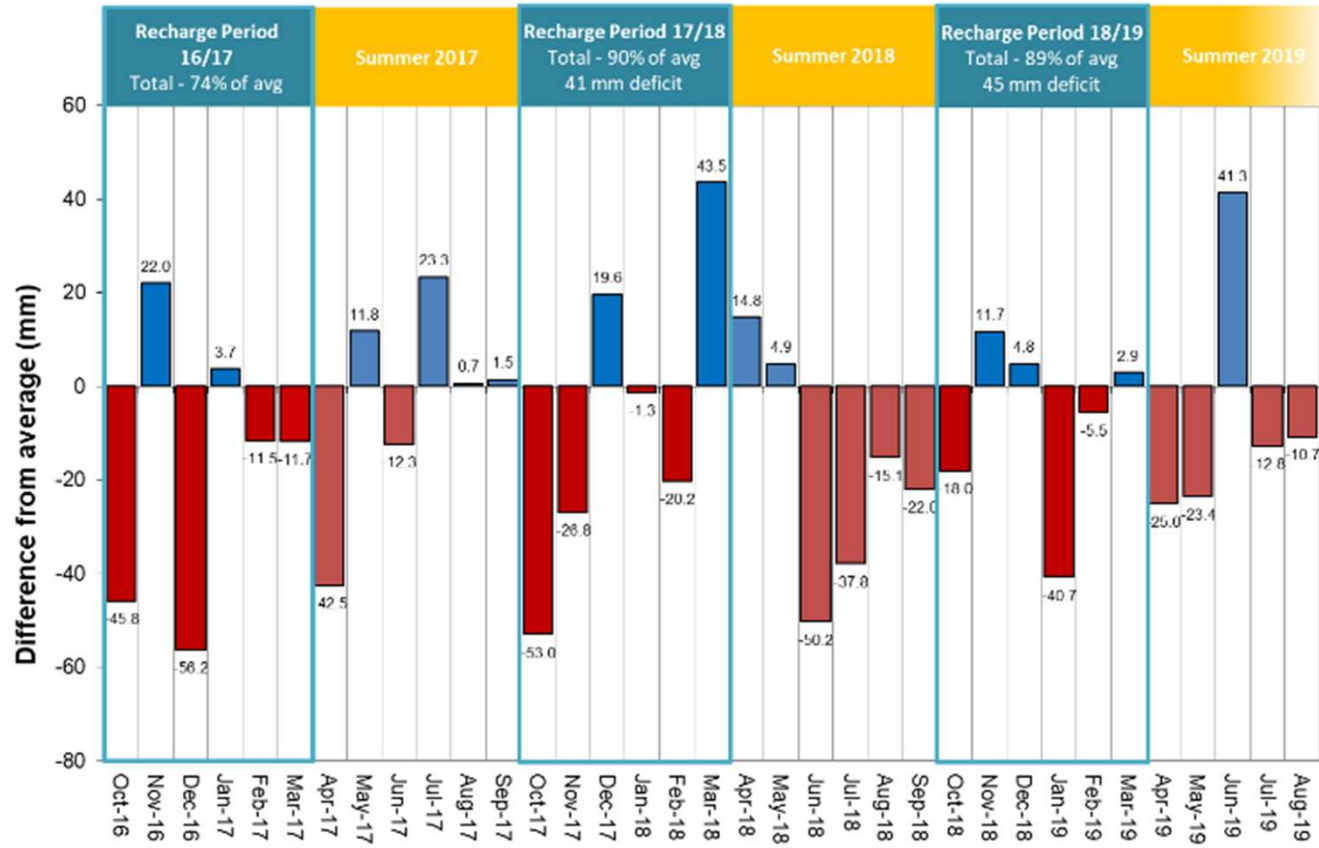


Water meter



Cost of water (South West water)

Thames Water Rainfall 2016/7 – 2018/9



<https://www.thameswater.co.uk/help-and-advice/water-quality/where-our-water-comes-from/reservoir-levels-and-rainfall-figures>

Water resources: sustainable long-term planning

Present a plan for sustainable water management in the River Chess catchment which meets the needs of the present whilst safeguarding the needs of the future

Create a plan that uses the following terms:

| | | | |
|------------|--|----------------|----------------|
| Risk | River health | Climate change | Water level |
| Mitigation | Standard of living and quality of life | Sustainability | Water shortage |
| Adaptation | Population growth | Resilience | River Health |