Chalk Streams and Little Stour: Impacts of Climate Change and Abstraction

Chalk streams represent some of the rarest habitats on Earth, with 85% of them located in Southern and Eastern England. These streams, in their natural state, boast a rich variety of wildlife, making them the most biodiverse among English rivers. They provide diverse habitats for invertebrates, fish, birds, and mammals. However, these invaluable ecosystems are facing significant threats. Pollution, reduction in flow rates, decline in native species, urban development, population growth in the South East of England, and excessive water consumption are all contributing factors.

The Little Stour is an excellent example of a small lowland chalk stream. It is approximately 11.5-km long, draining a catchment area of 213 km2. The highly permeable nature of the catchment results in this stream and the Nailbourne which flows into the upper reaches of the Little Stour at Garrington, being dominated by groundwater levels. Whereas the Nailbourne, is an ephemeral chalk stream flowing for around 6 months once every seven years or so, the Little Stour is usually perennial below its spring head at Well Chapel, Littlebourne.

Chalk streams can be historically characterised by their naturally regulated flow regimes; their headwaters are often typified by periods of desiccation alternating with periods of high *winterborne* flow. Climate change in combination with other anthropogenic activity are having a significant impact on flows. Climate change will bring drier summers and unpredictable rainfall patterns. Rising temperatures and heatwaves, have resulted in the drying up of numerous chalk streams, with some ceasing to flow altogether. This ongoing trend threatens to diminish these once-vibrant ecosystems to mere remnants of their former selves.

Amongst the specific challenges to the Little Stour, the most urgent issue is the depletion of water levels due to excessive abstraction. The demand for water has surged since the 1970s, driven by increasing household consumption fuelled by the widespread use of household appliances which has led to a 70% rise in household water usage in the UK. Additionally, inadequate investment in water storage infrastructure has forced water companies to extract more water from rivers, especially during drought conditions. Agricultural abstraction for irrigation also poses a significant threat to chalk streams, with demand peaking during dry seasons when natural river flows are at their slowest.

Recorded flow rates in the Little Stour greatly year on year and through the year. **Hydrological data for the Little Stour[1]shows complete dewatering and desiccation of the Little Stour on at least three previous occasions in the last century during drought events 1949, 1991–1992 and 1996–1997.**

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[1] Including from R. Stubbington, P. J. Wood and A. J. Boulton, Hydrological Processes, 2009: Low flow controls on benthic and hyporheic macroinvertebrate assemblages during supra-seasonal drought; Wood PJ and G.E. Petts, Hydrological Processes, 1999;
Tallaksen and van Lanen, 2004; Wright and Berrie, 1987; Caruso, 2002; Lake, 2007.

In the absence of sufficient recharging from rainfall, groundwater levels within aquifers will decline, increasing the risk of groundwater droughts. These will be compounded by anthropogenic water requirements including abstraction for agricultural, industrial and domestic uses.

Aquatic ecosystems in temperate zones that are subject to irregular and/or high magnitude events such as desiccation, are seldom adapted to withstand the extreme conditions and, as a result, are usually severely impacted when flow declines or ceases.

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