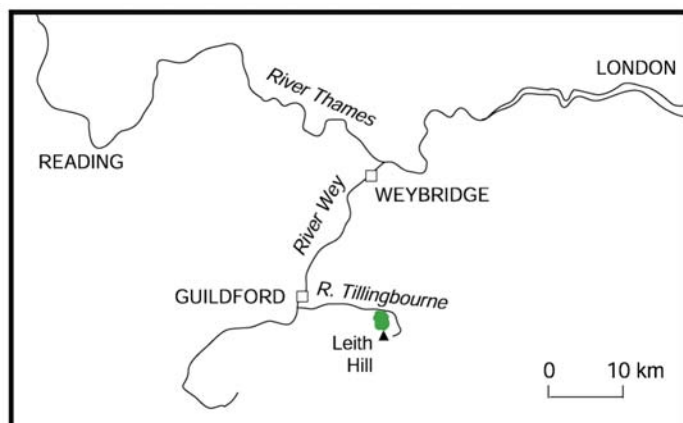


# Recovery from acidification but increasing N in the Tillingbourne Catchment, Surrey

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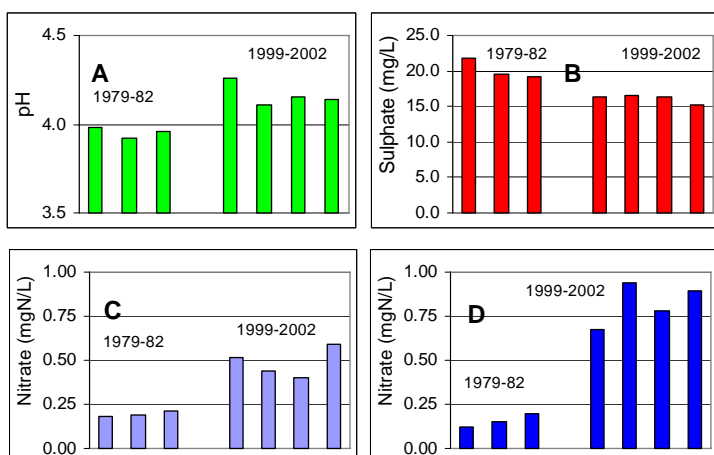
We studied the effects of changing atmospheric deposition on soil, stream and groundwater chemistry in the Tillingbourne Catchment, Surrey (in green). We made measurements in 1977-82 and again in 1998 – 2003. There are no houses or agriculture in the study area, and there were no changes in land use.



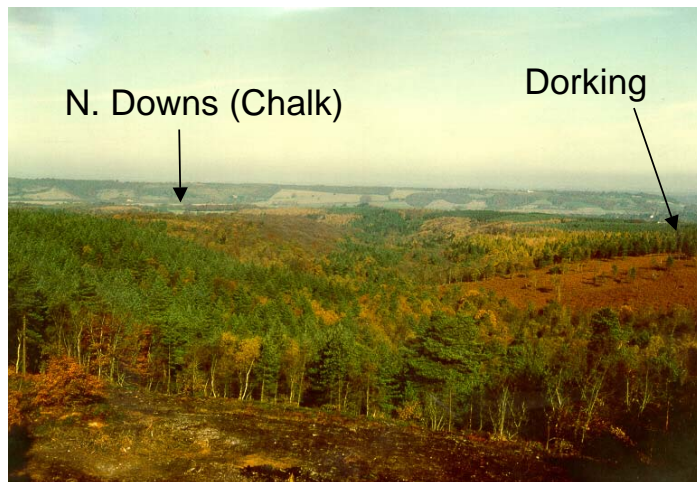
The catchment is situated on the Hythe Formation (Hythe Beds) of the Lower Greensand. The Lower Greensand is an important aquifer in SE England, and measurements showed that the catchment acts as a recharge area for this aquifer.

## Key questions

- Is the catchment responding to the large reductions in acid deposition over the last 20 years?
- Are there changes in the quality of the catchment waters (streams, wetland and groundwater)?
- Can we use models to understand these changes and project them into the future?



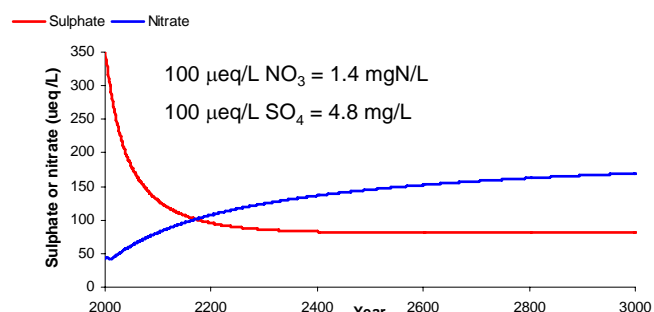
Mean annual stream pH (A), sulphate (B) and nitrate (C) and groundwater nitrate (D) over the 20 year period. During this time, UK SO<sub>2</sub> emissions declined by 67%, and oxidised N emissions by 26%. Stream sulphate has declined, with a consequent rise in pH, but not by as much as emissions. This is due to buffering by a store of sulphur in the soil. Stream nitrate has however doubled, and groundwater nitrate trebled, in spite of the reduction in N emissions.



View from the highest point of the catchment, looking N.

## Can we model the changes?

Why is nitrate increasing? There is some evidence this is related to increased nitrogen status of the soil, due to progressive accumulation of deposited N. We calibrated the MAGIC Model to the catchment and used it to predict future water quality given a number of deposition reduction and land use scenarios.



The graph shows the effects of deposition reductions (from 2000) of 63% (sulphate), 30% (nitrate) and 14% (ammonia) by 2020. Sulphate reaches a steady state, though it takes 400 years. Nitrate, however continues to increase as the soil continues to saturate. At the beginning of the period, the catchment was retaining 83% of deposited N, at the end, 14%. Though N concentrations are not high, the results raise the question as to whether non-agricultural areas will continue to maintain the quality of ground and surface waters by absorbing N.

BUT: do we understand the processes well enough to model them?

## Find out more...

Hill, Skeffington, Whitehead (2002) *Science of the Total Environment* **282-283**, 81-97  
Skeffington *et al.* (2003) Final report <http://www.berr.gov.uk/files/file21746.pdf>

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