

FLOOD DEFENCES IGNORE THE LAWS OF PHYSICS

Another occasional contribution from Mike Kettlewell, a member of a farming partnership which encompasses 400 acres of arable land, South Devon cattle and stewardship in the Cotswolds.

Surprise, surprise! This autumn has set more records for temperature and rain, delivering floods, waterlogging, loss of crops and financial strain for far too many farmers – and a clamour for government to act at a time when they are rowing back on their commitment to tackling global warming.

It is overwhelmingly probable that the climate situation will worsen over the next few decades as greenhouse gasses continue to rise. We will exceed the safe temperature limit. The current World Health Organisation prediction is for a 30°C rise in average global temperature by the end of the century. The outlook is grim indeed, despite the gainsayers!

The predictable cry is for better flood defences and more river dredging, but this simply will not do, for it ignores the laws of physics. What was good enough in the past no longer suffices. The fundamental issue is increased rainfall that far exceeds the maximum volume and flow of the river.

Dredging and bunding increases the cross-sectional area of the river a bit (πr^2) but does little for volume that requires a cubic increase ($\pi r^2 \times \text{length}$). Volume must increase to meet the demand and it is obvious that length is the limiting factor, particularly as many smaller rivers have been straightened and therefore shortened. Oh the joys of 'O' level maths!

Flow, too, depends on radius but also on resistance and slope. Dredging increases radius a bit, and reduces friction by clearing vegetation, but does nothing for slope, which is again the greater determinant of flow. So dredging cannot cope with the current or coming situation. Frequent dredging is also damaging. We must seek different solutions.

We have been draining land for over 200 years (longer in the fens) to improve cultivation, but converting flood plain meadows to arable is relatively recent. This has been highly profitable on the deep, fertile

soils, but is now looking risky and expensive with associated erosion, soil loss and clogged rivers.

Hydrologists argue that we must hold more water on the land, particularly the uplands and moors. We need to slow flows in tributaries, with more ponds, leaky dams, reedbeds and carrs. We should rethink the role of flat lands beside rivers and revert them back to permanent and diverse cover with as many as possible used as winter water storage and silt traps.

Auxiliary channels created to add length and carrying capacity can be cut, or in many situations simply restored. In this way we would farm in tune with our environment rather than continually trying to bend it to our wills, benefiting both our health and our depleted ecosystem.

In the hills, where most rain falls, we must block the drains and encourage the restoration of peat that can hold vast volumes of water and store carbon. Upland water courses can be slowed by ponds and permeable dams, in some cases created by beavers. Disused quarries and mine shafts could be holding reservoirs to help replenish aquifers depleted by summertime abstraction.

We need to remember that in the 50 miles between Oxford and London, the Thames travels 185 miles and falls only 30 metres; so while the average gradient is a fall of 60cms per mile, the average fall in the course of the Thames is only 16cms per mile.

Trying to re-engineer such a river to cope with what is coming is fruitless, so we must reconsider the sense of arable production, winter cropping in particular, in what were until recently flood meadows.

These flat valley bottoms are needed to hold water for later release. Vibrant, species-rich perennial meadows will safely hold water as well as filtering silt and nutrients. This would require reintroducing livestock, hay production and late summer grazing.

Livestock are vital managers, and we should reconsider introducing specific headage payments for this public good. A restored and vital ecosystem is the bonus. These objectives are all part of an ambitious and successful landscape recovery bid from farmers of the NE Cotswold Cluster.

In larger and more difficult to farm flood areas, land can be taken out of uneconomic production to recreate important wildlife wetlands, adding enormously to biodiversity.

The fly in this ointment is what our water companies will contribute to the solution? Little, I suspect, despite public approbrium following their egregious sewage discharges and nutrient- and pharmaceutical-rich effluent that has so damaged rivers.

This will be a bitter pill for many, but with help, support and encouragement; it can be done to the benefit of all and our environment.

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