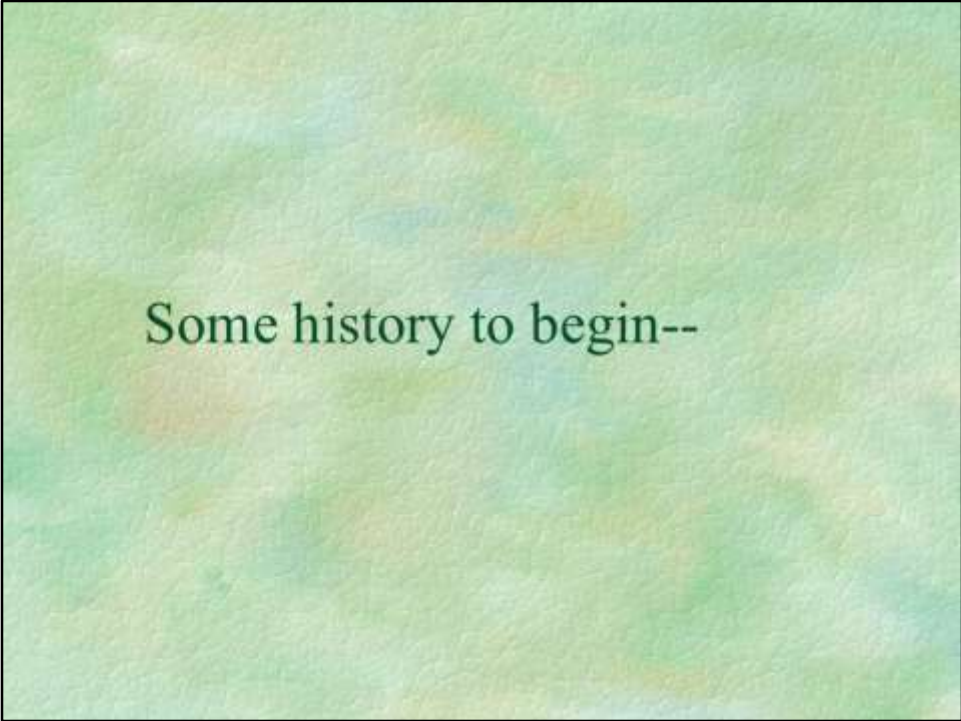




Trees, Soils and Water

Good news and bad.

Much of our understanding of trees soils and water in Great Britain is based on an impressive body of science derived from the study of 20th century conifer plantations in the uplands.



Some history to begin--

It's worth looking at the origins of plantation forestry.



The Forestry Commission was founded in 1919 to establish a strategic reserve of timber for future conflict. Here we can see Timber Jills in the Second World War stacking pit props to dry. Small diameter coniferous roundwood was the lifeblood of British mining before nationalisation brought modernisation in 1947



Note the attention to Health and Safety – cap turned round and eyes tight shut!



The establishment of plantations required extensive drainage works in the uplands, many areas of peatland which were natural reservoirs were drained.



Changes to the hydrology were profound and still affect many catchments today.



When crops are harvested, the exposure of soil and the rapid decay of root systems can cause acidification of streams.



This is exacerbated when further cultivation is required prior to re-planting.



The scale of clear-felling and re-planting is a very British thing. It is this that has cast trees as the villains in the minds of fishermen, hydrologists and water supply engineers.



But there is another side to this story.



The damage is reversible and there is a growing body of evidence that it works.



Here conifer brush has been packed into the drains.



Success, the water table recovers quickly but it's not just about removing trees. Not far from these sites in the Upper Severn. The Pontbren Farmers Group have been using trees and hedges to improve their stock management since 1997.

Lessons from Pontbren



The Group began by taking a critical look at their farm businesses. A lack of good shelter was identified as a barrier to lowering costs.

Streamside Restoration 2003



Unfenced streams, often in steep-sided gullies were a hazard to stock and a risk to biosecurity.

Streamside Restoration 2009



This was an obvious place to start planting trees for shelter.

Broadleaf Shelterbelt



An efficient shelterbelt should be dense at the bottom and thin at the top. Note the hedge on the sunny side.

Ponds and Wetlands



Ponds and wetlands were identified as sources of fluke and foot-rot. Better to fence the stock out. This pond now supplies troughs in a number of fields.

Flooding and Waterlogging



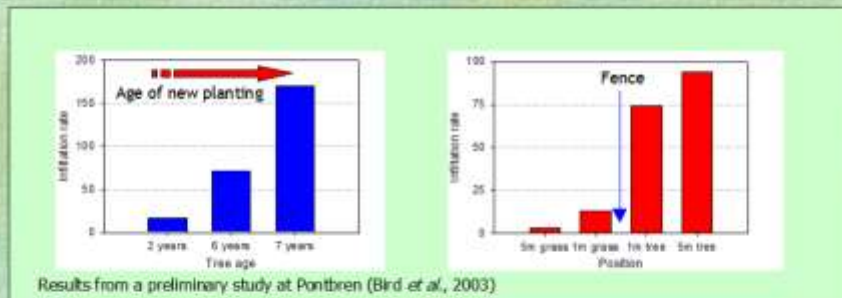
The environmental consequences were a happy accident but they triggered a major piece of research by a consortium of universities led by Prof, Howard Wheater of Imperial College



Overland flow is a significant and frequent problem, contributing to soil loss, flooding and diffuse pollution.

Hydrology

Current status of research at Pontbren



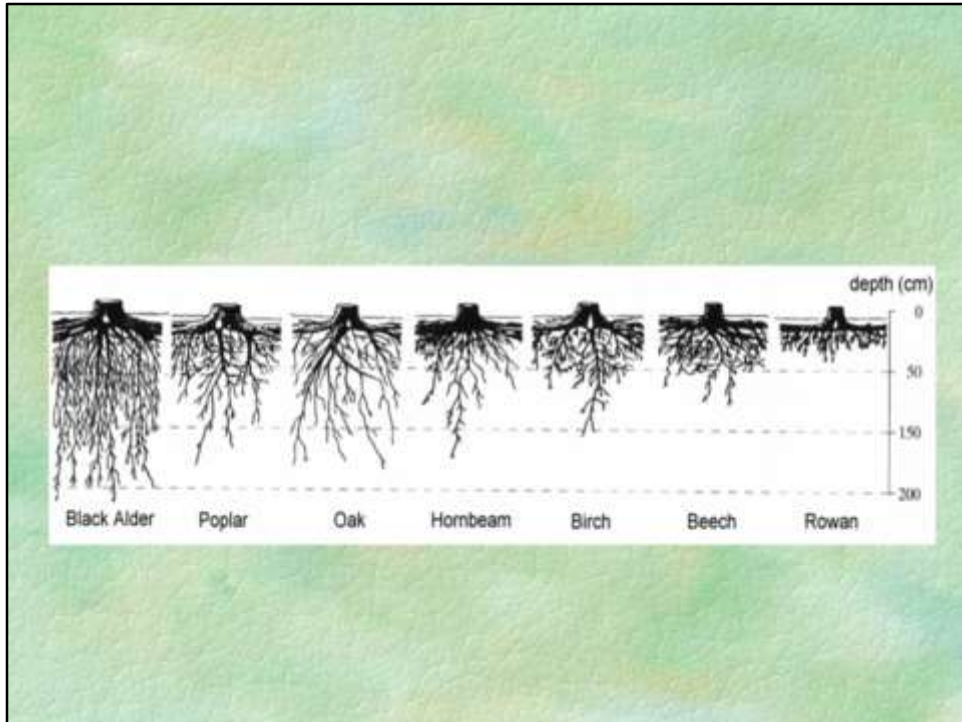
Changes in age

Changes in position

Soil in shelterbelts is more porous than adjacent pasture. There is significant benefit after 2 years.



This experiment shows the extent to which newly planted birch and ash draw rainwater into deeper layers of impervious clay.

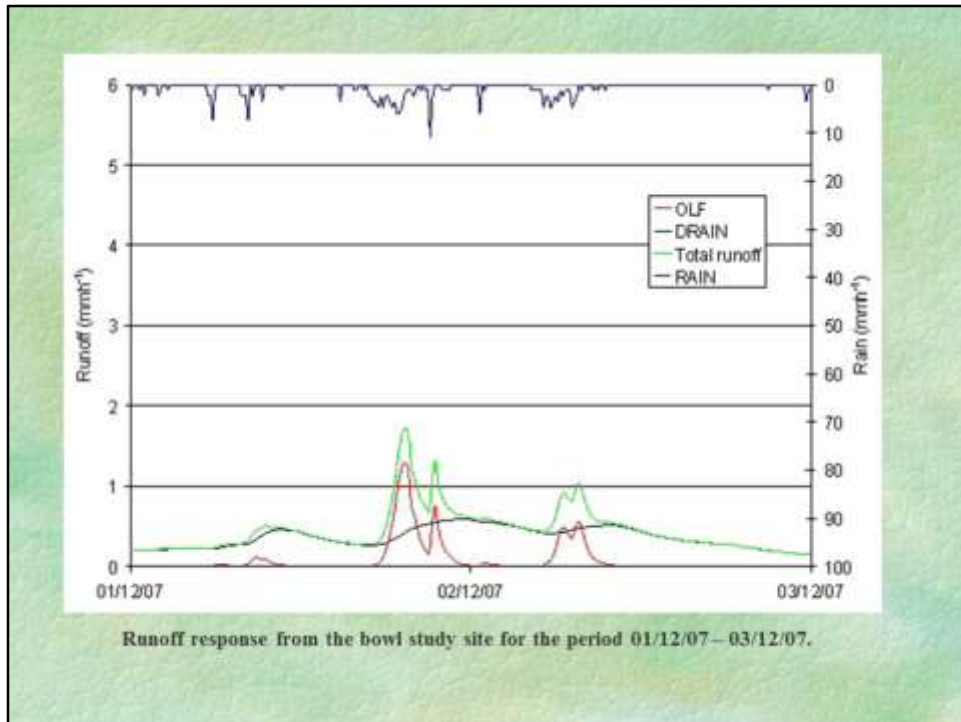


Tree species choice is important. Most native trees and shrubs have deep roots. Take care when planting near drains.

Conclusions From The Experimental Programme

- In grazed grassland, saturation excess overland flow is often the dominant runoff.
- Flow from artificial under-drainage is a second key runoff component from the hillslope in these systems
- Compared to grazed grassland, there is significantly less overland flow within tree planted areas where sheep are excluded
- Catchment-scale streamflow data illustrate that subcatchments dominated by agriculturally improved land produced higher flood peaks than those with more natural landscapes.

Narrow strips of trees, planted along contours, effectively eliminate overland flow. Buffer strips with trees are typically 12 times as efficient as grass buffer strips.

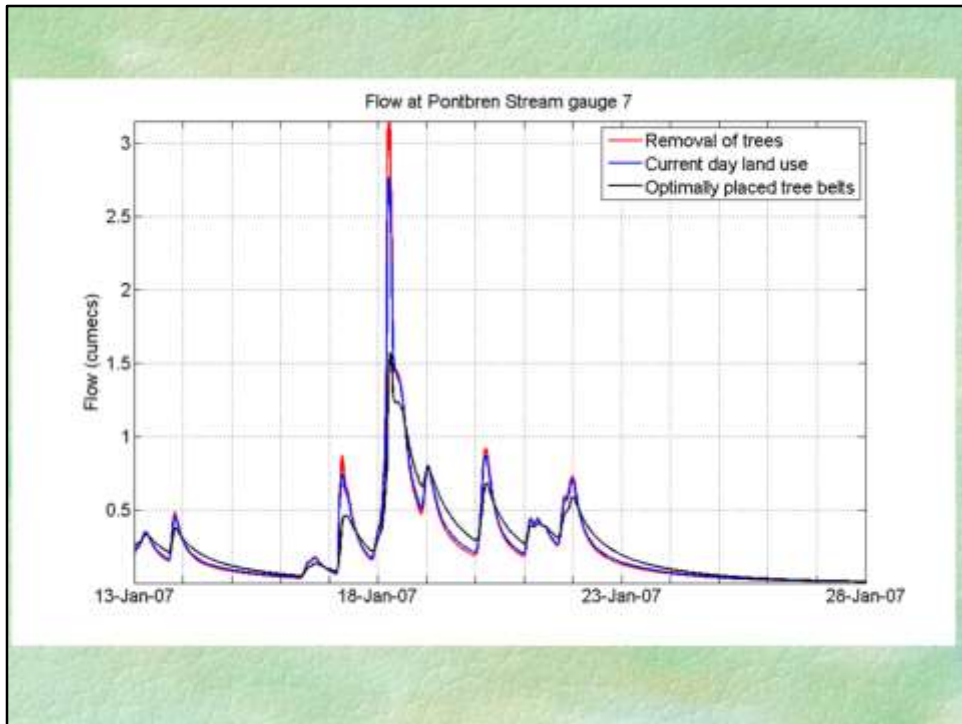


About two thirds of this storm reached the stream directly off the surface, It didn't make it to the drains.


Conclusions From The Modelling Programme

- Use of these models with the data collected within the experimental programme suggests scope for significant reduction of flood risk in low permeability landscapes (such as clay catchments) at local scales.
- Placement of single trees or small strips of woodland will generally have a positive effect on flooding.
- The significance of changes varies substantially depending on location
- Results to date suggest peak reduction of the order of 40% may be achievable
- The substantial variation at individual sites, and lack of information on the subsurface must be properly accounted for at both this and other sites.

The huge body of data collected over several years has been analysed and used to model the likely impacts in wider catchments.

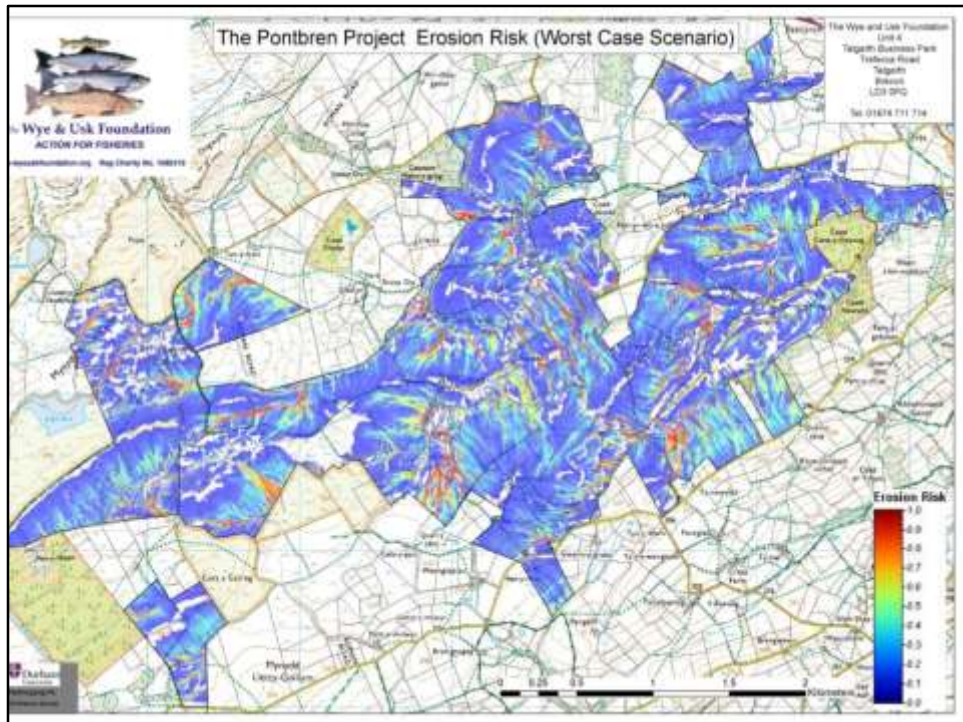


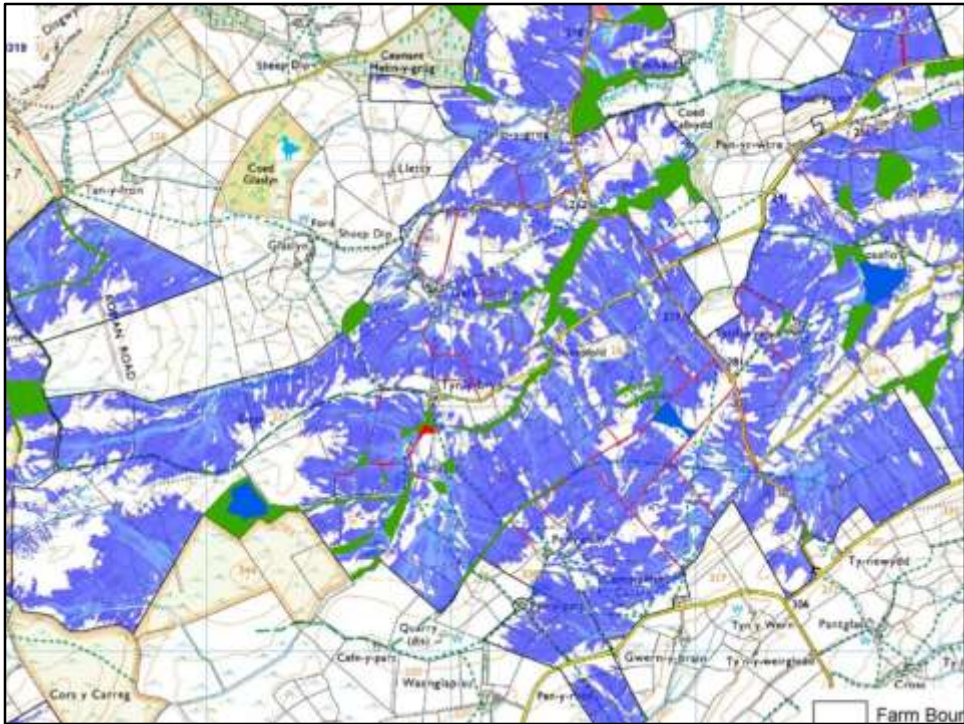
This flood in Jan 2007 suggests significant benefit from strategically placed shelterbelts occupying perhaps 5% of the farm



Where do we go from here?

The experience at Pontbren shows how well placed shelterbelts and hedgerows contribute to good stock husbandry and provide environmental benefits. The decision making at Pontbren has been all down to the farmers. Are there ways we can help that planning process?





This Scimap system developed by Durham University for the Rivers Trusts looks promising. On this evidence the farmers know best!









Diolch yn Fawr

www.coedcymru.org.uk

There is more information on the Coed Cymru website and we will be happy to provide access to the published research.