

Soils and Water

Research at Pontbren

Recently we reported the remarkable results of the exploratory trials commissioned by CCW and NAW. These showed a sixty-fold increase in porosity in grassland soils after conversion to farm woodland. From this work has come a comprehensive study over four years to establish what happens to rainwater as it passes through the soil and how this affects stream flows in the Pontbren catchment and downstream. The work is co-ordinated by the Flood Risk Management Research Consortium (FRMRC) who has apportioned elements of the work at Pontbren to the Centre for Ecology and Hydrology, UW Bangor, Imperial College and Nottingham University. Other partners will incorporate the results of this field work into computer models of flows in the River Severn.



Sponsors of FRMRC include the Engineering and Physical Sciences Research Council, Natural Environment Research Council, DEFRA, Environment Agency, Scottish Executive, Northern Ireland Rivers Authority and UKWIR. Tree planting, hedgerow and wetland restoration is funded by Forestry Commission, NAW and through the Enfys Programme administered by the Wales Council for Voluntary Action.



From the results obtained in the extended study it has been shown that overland flow is a major component of flash floods from improved pasture. It has been shown to contribute two thirds of the rainfall reaching streams and ditches in a heavy storm. Where streamside woodland strips intercept overland flow the impact can be very positive and the study has modelled a number of scenarios based on real storms which occurred during the study and using other data. The process of using trees as part of whole catchment management for flood control, the reduction of diffuse pollution and the conservation of water resources is in its infancy in this country. The work of the farmers and scientists at Pontbren could be the start of a change of mind-set applying to rural and urban catchments now that the higher frequency of localised extreme rainfall seems to be well established. (Click here to view the FRMRC Report)

The right trees for water management

The studies at Pontbren have added considerably to our understanding of the way trees collect rainfall and transmit it into the soil. Broadleaved trees intercept blowing rain and conduct it down the branches and trunk to the soil. The roots then provide a path which carries the rainwater into the deeper soil layers very quickly. Species like ash, alder, willow, birch, oak, elm and many hedgerow shrubs are known to be particularly effective even in heavy clay soils as we have seen at Pontbren. The benefit is apparent within two years of planting the trees but it is best to avoid planting very vigorous species like willow close to field drains. The coniferous species which grow well in this country are shallow rooted and probably not worth considering.

Where to plant?

Narrow strips of trees planted as shelterbelts are most effective at intercepting overland flow if they are planted across the direction of flow. Often this will be a streamside planting but it may be advantageous to intercept overland flow higher up the slope if it is having a detrimental effect on pasture or arable crops.

Managing coniferous plantations in water catchments

Planting coniferous trees in water catchments can have a detrimental effect on water quality and water retention, particularly in the acid sensitive catchments, which are prevalent in Wales. The practice of ploughing and draining waterlogged soils before planting was common until the 1980's. The problems are exacerbated because coniferous trees are very effective scavengers of airborne pollutants, including the oxides of sulphur and nitrogen which



contribute to the acidification of soil and water. Recent efforts to reduce sulphur emissions have been effective but oxides of nitrogen are still increasing and they now pose the main threat particularly in the years after plantations are clear-felled. However, Nitrogen compounds are more biologically active than sulphur. By maintaining a vigorous field and shrub layers, growing species which coppice vigorously and avoiding clear-felling in sensitive catchments, the woodland is able to reabsorb the nitrogen released as a result of felling.

Contact Coed Cymru for further advice and information
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