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Measuring and modelling the rainfall interception loss of tree shelterbelts in an upland Welsh catchment

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Several large flood events in recent years have brought the effects of rural land use and land management change on flood risk into question. However, understanding and predicting the impacts of these actions is a fundamental research challenge. To mitigate floods, changes must increase a catchment's capacity for storage of rainfall, and/or delay the release of water downstream. In order to examine the potential of targeted rural land management for such mitigation, a multi-scale experimental programme has been established at Pontbren, in mid-Wales, an upland area of intensive sheep production.

The rainfall interception loss from woodlands is an important component of the annual catchment water balance, and increasing interception storage is also a potentially significant mitigation measure in high intensity storm events. Although the process of interception has been the subject of many studies, covering a wide range of forest types, there have been very few studies on linear vegetation structures such as shelterbelts, hedgerows and narrow strips of woodland and none within upland regions. These vegetation features are of great value in upland Wales, as they provide a variety of positive benefits, including livestock shelter and habitat connectivity. The performance of specific tree species is also of primary concern, as the development of native woodlands (deciduous broadleaved), that are appropriate to local conditions and have a diverse mixture of species and habitats, is of particular national importance.

As part of the programme, three tree shelter belts, plus one woodland edge, have been monitored in order to determine the role that native, broadleaf trees, planted as shelterbelts on intensively grazed pasture, may have in the reduction of flooding. Interception loss has been calculated from measurements of gross rainfall, net rainfall and stemflow. Parameters have been derived for the Rutter and Gash models and the models have been applied to examine the mitigating effect of these tree features in various rainfall events and over the range of seasons. Results are presented and contrasted with other studies in the literature.