



## **Environment: habitat and conservation**

### *Ways to stop floods*

#### **Dr. Sandy Smith, Open University**

Part of the Plynlimon study area is planted with spruce for the commercial exploitation of timber. The study looked at how forestry impacts on stream flow. Not all the precipitation actually makes it into the river. Part of the precipitation is evaporated from the ground back into the atmosphere. Precipitation is also caught on vegetation, from which it evaporates back into the atmosphere. This process is called interception. Finally, water can be transferred through the roots of a plant into its leaves, from which it can evaporate. This process is called transpiration. The Plynlimon researchers looked at a moorland catchment and a forested catchment. They compared how much water was lost through evaporation in each.

#### **Jim Hudson, Centre for Ecology & Hydrology**

Over the period we've noted that about fifteen percent of the precipitation in a moorland catchment is evaporated back into the atmosphere, mainly through transpiration from the vegetation. Now in the forested catchment it's slightly different. We're losing about thirty percent of the rainfall over the period, and that's a combination of transpiration through the trees, and also interception which is direct drying of the canopy. So overall, we're getting about double the amount of evaporation from a forested catchment.

#### **Dr. Sandy Smith, Open University**

More evaporation from the forest can mean less water reaching the rivers and streams. And forests can also slow the water down.

#### **Jim Hudson, Centre for Ecology & Hydrology**

When the tree is mature the canopy of the forest is very efficient at slowing up the rainfall as it comes through. Some of that rainfall is also evaporated, so it reaches the ground slower than it would in a moorland catchment.

#### **Dr. Sandy Smith, Open University**

So perhaps more forest in the catchment could help alleviate flooding. Not this type of forest, apparently.

#### **Jim Hudson, Centre for Ecology & Hydrology**

The rainfall, when it once gets to the ground surface and into the soil, it has a very rapid route into the streams through the drainage system that was put in when the forest was actually established in the first place.

#### **Dr. Sandy Smith, Open University**

The forest canopy may slow the water down, but commercial spruce forests need drainage. The drains mean water flows more quickly into the river and when the trees have been felled for timber there's very little vegetation to intercept the rain, just efficient drains carrying it away.

Drainage ditches aren't the only thing speeding up the flow of water into the river. There's also the geology of the catchment. Here in the upper part of the Severn catchment, the ground isn't very permeable so any rainwater, most of it stays on the surface and runs off downhill into the nearest stream. This part of the hydrological cycle is called run-off. In this area of impermeable rocks and steep slopes, run-off is very fast, so at times of high precipitation water reaches the river very quickly and this means high river levels. Land use could be making the run-off problem worse. Increased flooding is often linked to urban run-off: tarmac, concrete, roads, buildings and roofs, all these are impermeable surfaces and any water that pours onto them simply runs straight off.

The Severn catchment is predominantly rural so urban run-off is perhaps less of an issue than rural run-off. Downstream of Plynlimon, in the hills of Montgomeryshire, the high numbers of grazing sheep trample the soil. This means the soil becomes compacted.

**Dave Jenkinson, Coed Cymru (Welsh Woods)**

It's been seen over many years here that the land is becoming increasingly impervious. Water runs over the surface of the pasture land and it isn't absorbed at all, it seems.

**Dr. Sandy Smith, Open University**

If the rain isn't absorbed into the soil it can't become groundwater. Groundwater is another key element of the water cycle. It's water that's stored underground in the pores between soil or rock particles. It discharges into springs, into rivers, or into the sea. Groundwater travels only slowly through the water cycle. If rainwater can be absorbed underground, this will delay it reaching the river and keep river levels down.

There's no getting away from the fact that grazing sheep compact the soil. One solution is to plant native, broadleaf trees along the contours of the grazing land. If you pour water onto a field that's been heavily grazed over many years, almost none of it is absorbed into the soil to become groundwater. The soil is so compacted that any rain would run straight off the surface. But if a field has been planted with broadleaf trees any water you pour onto it is absorbed straight away. Vegetation under the trees provides the basis of a food chain for worms, voles and other animals. The animals break up and aerate the soil so it absorbs more water.

**Dave Jenkinson, Coed Cymru (Welsh Woods)**

Planting native trees has effectively changed the porosity of the land quite significantly, and what we see on a very wet day here, the water runs off the fields in silver sheets, but when it reaches these newly-planted areas it immediately disappears under the ground.

**Dr. Sandy Smith, Open University**

In theory if more farmers adopted this practice it could have a significant impact on flooding, but it would need to happen on a very large scale to make a difference.