



Environment: habitat and conservation

How Rivers Work

Dr. Sandy Smith, Open University

I'm on the flood plain of the River Severn, the river's about thirty metres away in this direction, and the river channel itself is marked by banks of pebbles. But there's also a pebble in this cutting behind me, so the Severn was once here. On top of these banks of pebbles is a layer of mud and this mud was deposited when the river over-topped its banks, flooded, took the mud with it and as the flood waned away the mud was deposited on the flood plain, renewing it.

So the river could have moved from here during last winter's floods, or at any time over the last century or so. It's a very dynamic environment with the river moving round across its flood plain.

Change can take place over hundreds, thousands, even millions of years, or over a much shorter timescale. Floods are mere blips in the river's geological history but they can have a major impact on the environment, and on us. For human beings rivers are more than just dynamic environments.

The Severn was an important trade route in medieval times and the land inside its meanders provided ideal defensive sites. Shrewsbury was originally built on high ground inside a meander. As the town grew it expanded into the flood plain, but there was a price to pay.

[News clips]

"The River Severn has extremely high levels, threatening the towns of Gloucester, Shrewsbury and Worcester."

"There are now 167 flood warnings across England and Wales."

"The floods are continuing to devastate towns along the River Severn from the Midlands to south-west England."

Dr. Sandy Smith, Open University

The autumn 2000 floods were the worst for fifty years and Shrewsbury was badly hit. These were not the first, nor even the biggest floods the town had experienced. But the seventies, eighties and early-nineties had been an unusually flood-free period. Then Shrewsbury was hit by major floods three times in five years. It appears as if changes in river flow are becoming more common. Are we watching the river alter yet again and, if so, what shall we do about it?

The autumn 2000 floods were a wake-up call for planners and politicians. The immediate response was to build a massive flood defence wall at Frankwell in the heart of Shrewsbury. So-called hard defences are being considered for other locations along the Severn. Their effects, however, are localised. They stop flood waters getting into property, but they don't actually reduce the change in river flow.

Another approach is to look more broadly at a range of factors that contribute to flooding. These can be natural factors, or human, or anthropogenic factors. To do this we need to understand more about how rivers work and we need to look not just at the Severn itself, but at the whole of its catchment. The catchment is the area of land that feeds rainwater downhill into a particular river. This is the catchment of the River Severn which includes all of its tributaries. The higher land that separates the catchments of different rivers is called a watershed. Water flows through the catchment as part of a process called the hydrological cycle. It moves around the earth in a continuous cycle, driven by the sun's energy and by gravity. Precipitation, that is rain, snow or hail, which falls onto the catchment flows out to sea via rivers and lakes. It then evaporates back into the air and the cycle repeats itself.

It may not look much but this tiny moorland stream becomes the River Severn. Its actual source is a bog a few kilometres uphill from here on the Plynlimon range in mid-Wales. Plynlimon is also the site of an important scientific study. Since 1968 they have been measuring everything related to water here, including stream flow and precipitation.

Jim Hudson, Centre for Ecology & Hydrology

Well we get very heavy rainfall here and our average annual precipitation is about two and a half thousand millimetres. As you move down the Severn catchment towards Shrewsbury you'll find that the rainfall down there is about a third of what we get up here. Where the major floods are created is when you get heavy rainfall in the uplands and heavy rainfall across the rest of the lower part of the Severn catchment.

Dr. Sandy Smith, Open University

And if there's a long period of wet weather the ground can't store all of the precipitation, so the excess goes straight into the river. If there's more water than the river channel can hold, it spills out onto the flood plain. In order to alleviate the flooding, you need to either reduce the amount of water getting into the river, or to delay its progress. This is where the way we use the land can make a real difference.