



## Forests and Water

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Trees, forests and woodlands can affect water in many ways, beneficially and detrimentally. Sustainable woodland management seeks to increase positive effects on the water environment while minimising harmful effects.



### WWW LINKS

- [Cree Valley Catchment Partnership Project](#)
- [International SHIGA Declaration on forests and water](#)
- [TADPOLE Project](#)
- [Water Framework Directive](#)

### Why forests matter

The passage of water, that has fallen as rain and snow, into rivers, lakes and reservoirs is strongly influenced by the kind of vegetation – or lack of it – on the land. Forests can be particularly important; their structure, species composition, size, extent, and the way that they are managed can have major impacts on the quantity and quality of water. The impacts are not necessarily confined to forests themselves but can affect wildlife and water users far downstream. Such effects have to be taken into account in planning for the sustainable development of our landscape and natural resources.

### How forests affect the amount of water

Trees can use a lot of water. Their large canopies hold onto a portion of the rainfall, which is then lost by evaporation. In common with all plants, moisture also escapes from minute breathing pores on their leaves, to be replaced by water sucked out of the ground by the roots. However, because trees tend to root deeper, this process can keep going for a longer time during dry summers. This combination can, in the case of some types of forest, reduce the amount of water reaching underground reserves and streams by a substantial amount. So in drier areas we have to balance the benefits of having woods against the potential problem of them contributing to a water shortage.

### How forests affect the speed of water running-off the land

As well as reducing the amount of water, forests can affect the speed of run-off from the land. This results from the action of tree roots and the accumulation of leaf mould, which help to make the soil more porous and absorbent. The sponge-like properties of forest soils are able to delay the passage of water into streams. Large areas of woodland in river catchments may reduce local flood risks by smoothing out the fluctuations between peaks and troughs in stream flow. We don't yet know enough about such effects to be able to quantify the benefits for flood control, but many agencies, including the Forestry Commission, are carrying out wide-ranging studies to improve our understanding of the relationships between land-use and water. Our aim is to integrate woodland design and management with other measures to help tackle the growing problem of flooding, particularly in our towns and cities. Some of the issues around forestry and flood management are dealt with in more detail in a separate [Forests and Flooding In Brief](#) note.

## How forests affect the quality of water

Trees naturally affect the chemical composition of water that runs off or through the ground in several ways. An important example is the ability of forests to act as very effective air filters, removing damaging sulphurous and nitrogenous pollutants from the atmosphere. While this can be an advantage in urban areas by helping to clean the air that we breathe, it can pose a serious problem in some of our upland areas. Many of the pollutants so efficiently filtered out of the atmosphere by large blocks of evergreen woodland are acidic. Where the rocks and soils are already naturally acidic, the polluting acids can't be neutralised and pass directly into streams. This has resulted in increased acidification of surface water and contributed to a decline in fish populations. Now that the issue is better understood, forest design and management have been revised to minimise the filtering effect. Together with the continuing reduction in the industrial emission of acid pollutants, these measures will also help the recovery of acidified streams and lakes.

The way that forests are managed can also affect water quality. Cutting trees, preparing ground for planting and building access roads disturb the soil and pose a risk of sediment being washed into watercourses. This has to be controlled through good planning and design of forest operations. Another issue is the release of nitrogen and other nutrients from the soil and the mass of decaying branches left behind after harvesting the timber. While this maintains the natural cycle of fertility on some soils, on others abnormal amounts of nutrients may move into streams or groundwater where they become pollutants. As with acidification, the potential for this problem to develop has to be recognised and the way that forests are managed adjusted to minimise its occurrence.

## Trees on riverbanks

People appear to like a combination of trees and water. The same mixture also seems to be good for wildlife. But riparian woodland as it is called has to be carefully designed and managed. A dense, uninterrupted fringe of trees not only spoils views and restricts access, but is likely to cause problems for fish and other freshwater life through too much shading. If we get the right balance, riparian woodland can benefit both wildlife and people. It can also help to protect water quality by stabilising river banks against erosion and removing dissolved pollutants in run-off from the surrounding land.

## The role of the Forestry Commission

The measures by which forestry can help protect and improve the freshwater environment are set out in a code of practice, *The Forests and Water Guidelines*. The Guidelines have been jointly developed by the Forestry Commission and the Northern Ireland Forest Service with the help of the other UK government agencies concerned with protecting water and wildlife. A group of experts drawn from all these partners regularly update the Guidelines as new research reveals new problems and new solutions. The Guidelines will become a key document as the UK moves to implement the Water Framework Directive through domestic legislation. The Directive obliges all Member States of the European Union to take action to maintain the ecological status of water, where it is already good, and to improve it where it falls below standard. All land management practices are important to achieving these objectives. They represent a vital element of sustainable development, to which forestry policy-makers and practitioners will continue to contribute.

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