



**Confor**  
Promoting forestry and wood

# FORESTRY AND FLOODING



# Summary and Recommendations

Scientific evidence gathered over many years and from a wide range of sources supports the view that tree-planting in upland areas can help reduce flood risks as part of a broader package of natural flood management measures.

With this in mind the government should take forward the following policy recommendations:

- 1 The National Flood Resilience Review should examine the case for greatly enhanced tree planting in those areas of England severely affected by flooding in December 2015 and January 2016;
- 2 The UK Government should recognise that in addition to reducing flood risks, tree planting can also deliver a wide range of other benefits, including a strategic timber supply, reduced carbon emissions, enhanced biodiversity and greater recreational opportunities;
- 3 The Environment Agency (EA), Forestry Commission (FCS) and other agencies as appropriate should identify, as a matter of priority, where tree planting in upland river catchments in the UK would be most beneficial to reduce future flood risks;
- 4 The Department for Environment Food & Rural Affairs, as part of the National Flood Resilience Review, should work with HM Treasury to identify financial mechanisms (grant schemes and fiscal measures) that could be used to encourage increased tree planting in these target areas selected by EA and FCS.

# Introduction

The devastating floods of late 2015 and early 2016 have focussed attention on what steps can be taken to reduce the impact of extreme weather and to increase resilience in the upstream landscape to protect downstream communities.

After the floods in 2007, a large amount of money was spent building flood defences to protect vulnerable areas, but many of these proved to be insufficient when faced with the very heavy rain experienced in December 2015.

Attention has begun to shift to longer-term approaches to flood mitigation, with a focus on what steps can be taken to slow down the flow of water from the uplands, and whether altering land management can help – including increased tree planting.

The UK's uplands are unique in Europe in that they are largely treeless, as a result of many hundreds of years of clearance. Many people enjoy these open spaces, but they are poor at retaining water, particularly during heavy rainfall. We have engineered our landscapes – through measures like improved drainage and stream and river straightening - to move the water downhill and away as quickly as possible, often shifting the problem downstream.

There is now considerable interest in planting more trees in our uplands to strategically slow the flow of water and reduce the impact of downstream flooding, as part of a package of long-term measures to alleviate the risks from future flood events.

Confor and Forest Research launched a significant report in March 2015, *The Role of Productive Woodlands in Water*

*Management* – to demonstrate the role trees can play in lessening the likelihood of floods, as well as offering significant potential improvements to the water environment and a range of additional economic and environmental benefits.

Anne-Marie Trevelyan, MP for Berwick-upon-Tweed, highlighted the potential in a House of Commons debate in December 2015: “In the light of the floods in Cumbria and elsewhere, I am pleased to say that flood defences provided security and protection, as they were supposed to, in north Northumberland. Will the Secretary of State consider, as a matter of urgency, increasing the number of trees we plan to plant during this Parliament from 11 million...to some 200 million [to] cover some 50,000 hectares, much of which could be in the upland areas of river basins, to help nature to hold water and to reduce the risk of flooding in the long term.”

In her response, Secretary of State Liz Truss MP said: “I completely agree with her about looking at the environment on a catchment level and making sure that we put in place tree planting programmes that can both reduce flood risk and improve the environment at the same time.”

Mrs Trevelyan, Vice-Chair of the All-Party Parliamentary Group on Forestry, later stressed that she plans to make enhanced tree-planting to help alleviate long-term flood risks a key priority of her parliamentary work in 2016.

# How do trees make a difference?

There are a number of ways that trees can alter the “run-off” of water from our uplands:

1

## INTERCEPTING RAINFALL

Trees evaporate more water from their tall canopies than grass or other short vegetation, so less rainfall reaches the ground (via interception).

2

## STORING MORE WATER IN THE SOIL

Tree roots are much, much larger and deeper than grass roots, so they will open up the soil structure and allow water to percolate into the soil much more quickly and more deeply. This means that for any given area of land, the soil under trees has the potential to store much more water and delay its passage downstream than the same area under grass.

3

## SLOWING THE FLOW

Trees along streambanks and fallen trees and branches help to slow down the flow of flood waters within streams and rivers.

4

## REDUCING SILT IN WATERWAYS

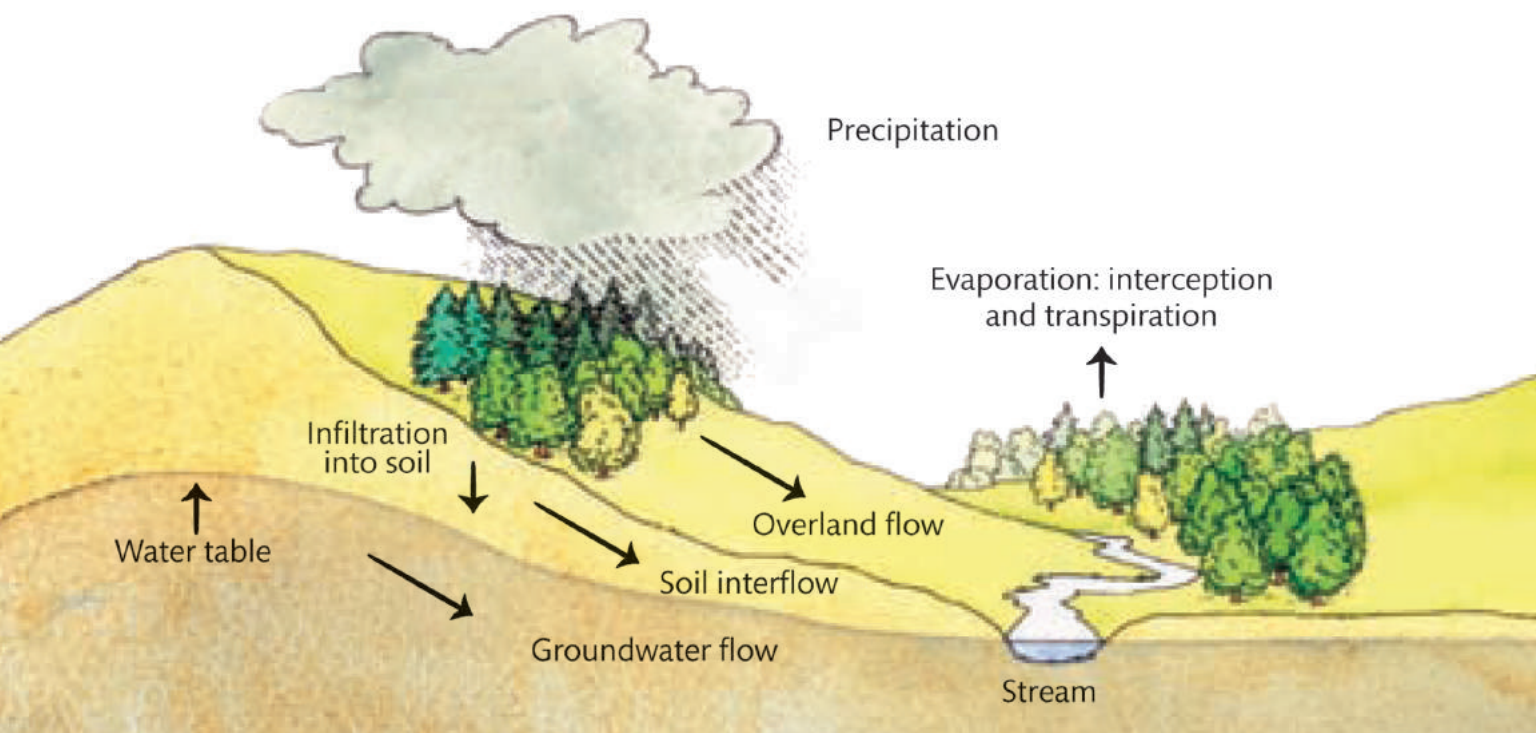
One of the problems in lowland rivers is the amount of silt, reducing the capacity of river channels to contain flood waters. Much of this silt is soil and small stones washed into streams from fields. By planting trees, we can protect the soil and reduce the chance of erosion. Also, we can plant buffers of trees across hillsides and along streams to capture sediment in water flowing off adjacent fields, stopping it from entering rivers, so we won't need to dredge it out.

5

## RETAINING WATER ON FLOODPLAINS

Trees in flood plains – most of our flood plains in the UK are cleared of trees, and many are also built on. Restoring floodplain woodland in appropriate places can significantly reduce the speed of flood flows and potential impact of flooding. Wet woodland is great at retaining flood water on the floodplain and allowing it to be released more slowly downstream.

The ability of trees and woodlands to slow down flood flows not only helps to reduce the size of the flood but also gives more time for people to respond to flood warnings and move belongings upstairs, reducing flood damage.



Forestry Commission - Forests and Water Guidelines, 2011

## Natural Flood Management: case studies

There have been a number of experiments in the uplands to investigate how trees can contribute to Natural Flood Management.

### PONT BREN

This project was designed and led by farmers in the Cambrian Mountains in mid-Wales to investigate whether planting new productive woodland in strips across the slopes of their land would reduce run-off. They discovered that water infiltration into the soil quickly improved following planting and within a few years was 60 times better than in the adjacent fields. <http://www.coedcymru.org.uk/images/user/5472%20Pontbren%20CS%20v12.pdf>

### PICKERING

This North Yorkshire town was prone to flooding and was therefore chosen by the Forestry Commission-led partnership project “Slow the Flow” to trial a wide range of Natural Flood Management techniques, in particular the use of large woody dams. These “leaky dams” are created within stream channels and use logs and branches, secured to the banks to hold back flood water and to slow it down. The results were very effective: <http://www.forestry.gov.uk/fr/INFD-7ZUCL6> and the project generated a large number of reports, papers – some of them here as well as national media coverage.

The research paper on large woody dams (LWD) says: “Figure 4 shows that each block of LWD dams exerts a delaying effect on the travel time of the flood peak, which appears to be unrelated to flood storage volume. While the effect is generally small, the combined impact of a network of LWD dams in a catchment could be significant for managing downstream flood risk”

### PEEBLES

A project by the Tweed River Forum on the Eddlestone Water, which flows into the Tweed, is helping to significantly reduce the potential for flooding downstream. Although it is early days, the work is thought to have contributed to protecting Peebles in the first lot of floods in mid-December 2015, although the town did suffer during the larger flood event later in the month. The work on the Eddlestone includes planting woodland, fencing several miles of river bank and reinstating several “meanders” to return the river to its original length. This news report highlights how the project is working; see Tweed Forum for more information.





## Are there any risks from planting trees, can they increase flooding?

Until the early 1980s, the traditional methods of forestry planting were similar to upland farming. The focus was on draining the ground and ensuring water moved downhill as quickly as possible, with many sites prepared using deep ploughs pulled behind tractors. However, modern forestry is very different by seeking to minimise soil disturbance and control water flows, with all planting schemes required to consult with a wide range of stakeholders including the Environment Agency (SEPA in Scotland). Full Environmental Impact Assessments are regularly undertaken, including hydrological surveys. All forestry operations are closely regulated by the Forestry

Commission using the 80-page Forest and Water Guidelines, with very clear requirements for drainage works and the creation of riparian buffer zones. For more information see [http://www.forestry.gov.uk/pdf/FCGL007.pdf/\\$FILE/FCGL007.pdf](http://www.forestry.gov.uk/pdf/FCGL007.pdf/$FILE/FCGL007.pdf) – Figure 1 in this report comes from this document.

These Guidelines also cover all existing forests as they are harvested, redesigned and replanted – over time, they will become more effective at intercepting water and reducing storm flow.

The washout of woody debris can be a hazard to some downstream bridges and to undersized culvert

pipes and the placement of woody dams needs to be carefully-planned upstream of these structures to reduce the risk of blockages. However, there is some evidence that having more trees along river banks and a network of large woody debris dams will help to intercept and retain any fallen trees and branches before they can strike any bridges.

There is also criticism that planting trees is too long-term a solution. However, current research shows that a change from grazed pasture to woodland can begin to deliver water retention benefits after a year – and far greater benefits as the trees grow and mature.

# So why aren't we planting more trees?

There are lots of reasons; partly, we are not planting more because it can be relatively expensive and difficult to get trees to establish in some areas. Fencing is often required to exclude sheep and deer, which can be particularly costly, although grant funding is available for planting trees.

There are lots of cultural issues too. Some people used to seeing tree-less hill sides often object to any change in what they perceive as a "natural" environment. A recent application to plant 40 hectares of mixed woodland in Northumberland National Park was delayed by four years because the park authority thought the area should remain as open ground.

Farmers and landowners have for many years been encouraged to "improve" their ground, by draining and opening up ditches, and removing scrub vegetation. The current rules of the Common Agricultural Policy require land to be in "good agricultural condition" and farmers are penalised if they have trees on their land.

Planting trees can reduce the annual income received by farmers from the Government, and this must be addressed in any support mechanisms to encourage new planting.

Confor has worked hard to encourage farmers to see planting trees as an opportunity to diversify

their business and improve animal welfare and quality for long-term sustainability. Well-designed productive mixed woodland on more marginal agricultural land can diversify income streams for farmers in the long-term, as well as providing shelter belts for livestock. Confor's Eskdalemuir report demonstrated the relative benefits of forestry in Scotland's southern uplands <http://www.confor.org.uk/WhatsHappening/Default.aspx?pid=1519>

Even the Scottish Farmer believes that the economics of forestry make sense: <http://www.thescottishfarmer.co.uk/news/sheep-sums-dont-add-up.27294658>

## Conclusion

There is an increasing case for more tree planting for flood alleviation. While the different ways that trees can contribute are well understood, some continue to call for more convincing evidence before we act. However, the reality is that we will probably never have enough data to satisfy everyone, while our climate is changing and more rainfall and bigger storm events are expected.

Many countries around the world have made the connection between deforestation and erratic water supply and flooding. In Kenya, for example, the Government has specifically protected upland forests, because it recognises their role in regulating run-off and ensuring water is available during the drier summer months.

Recent events show that we cannot simply rely on traditional engineering approaches to protect affected communities from flooding. Planting trees won't work overnight, but has the potential to make a significant contribution to tackling the climate-change induced rise in flood risk. More trees can help restore the natural capacity of our landscapes to attenuate flood flows and should be part of a long-term strategy. At the same time, tree-planting creates rural employment, increases biodiversity and carbon sequestration; and produces a product for which there is an infinite demand – timber.

So it's time to adopt a more sustainable approach to flood mitigation and come up with positive proposals to support greatly enhanced tree planting in river catchment areas.

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