

# Water Management on your Farm: Catchment Based Approach



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As climate conditions continue to change the sustainable management of water on farm is of great concern for many land managers around Scotland. From unprecedented wet weather to drought conditions, farms need to become resilient to ensure that they can try to minimise the impact of these changing weather patterns on land.

A catchment is an area of land drained by a river and its tributaries. The natural movement of water throughout a catchment is ultimately impacted by topography, however, centuries of land use and land management have modified the natural flow of water. Typical catchment areas are usually broken up into three sections, **upper**, **middle** and **lower**. Changing the energy of a river in any one of these catchment sections means a change in other sections. Piecemeal approaches to dealing with water in a catchment only move problems from one area to another. Through managing water at a catchment scale, a more comprehensive synergistic response can be built, increasing resilience of communities throughout the entire catchment area.

## Natural Flood Management - Catchment Based Approach

An example of a piecemeal approach to flooding problems on specific area of land in a catchment is the straightening of rivers in the upper and middle reaches. If no measures are taken to accommodate the higher volumes and velocities of water subsequently reaching the lower sections of the catchment, it can cause detrimental flooding events to communities. The relationship between land and water is different in each section of the catchment, therefore the flood management approaches used should be appropriate to the characteristics of the catchment section.



## Flood Management in the Upper Section

The uppermost section of a catchment offers the highest potential to slow downstream flows. The upper reaches are usually defined by smaller faster flowing streams and creeks as the water flows off peaks and ridges into larger flows further downstream. In this section the more water that can be held near the headwaters of the reach will limit the stress on downstream flood measures and riverside communities. Some of the best ways to increase upper catchment water retention include:



Photo by H. Bibby

**Afforestation**



**Peatland protection restoration**



Photo by C. Stephen

**Improved livestock management**



**Creation of healthy riparian zones**

**Afforestation** practices can be put in place anywhere across a catchment and will generally help limit water runoff. In the upper section they can be particularly effective as less developed areas allow for high planting numbers. New trees will naturally capture water within their branches as well as increasing soil porosity through new root infiltration into deeper soils. Increased soil porosity from deciduous tree planting will allow for up to 8 times the rainfall capture of pine plantations or grassland. This holds more water out of the rivers at the outset of a flood and will lead to lower peaks throughout a flood event. Advice should be taken when considering planting trees to ensure the species, land, and topography is suitable.

**Peatland** protection and ecosystem improvement also offer ways to decrease flooding through increased water capture within the soils. Peatlands act as natural sponges for rainfall and will hold on to extremely high amounts of water if properly preserved, as well as increasing soil organic carbon (SOC), which is associated with increased water retention.



## Flood Management in the Middle Section

The middle portion of a river offers better options for water storage on floodplains. This section is more defined by **wider slower moving segments of a river** where most of the water in the catchment has already reached the main river. Options for flood control in these areas includes:

- Removing or lowering river embankments
- Adding scrapes or wading pools for water to pool in
- Establishment of leaky dams

These changes would need to fit with the two main types of river zones in this section:

**Depositing zones** - where the river runs wide and slow.

Deposition zones work well with the removal of embankments where the river can be more responsive and meander as necessary. This can be unproductive for the surrounding landowners so the creation of more controllable scrapes or wading pools that will fill and drain with the flood waters may be more acceptable. Adding large woody debris, preferably full trees with the root plate still attached, can act as natural redirection measures while also improving the riverbed for smaller fish and crustaceans.

**Erosion zones** - where the river is narrower and more prone to erosion along its banks.

Along the erosion zones the installation of leaky dams is the most effective way for forcing flood flows into the adjacent floodplains where it will not damage downstream properties as well as rejuvenate adjacent farmland through new sediment deposition. These dams are simple to make and will result in significantly lower flood peaks further downstream.



Leaky dam from the [Designing and managing forests and woodlands to reduce flood risk: UK Forestry Standard Practice Guide](#)



## Flood Management in the Lower Section

The lowest section of a river catchment stands to benefit the most from upstream flood reduction measures. These areas cities, towns and villages that have been built right along riverways and have less porous surfaces for water to be held in. They also have the least amount of flood protection options of any part of a river. Traditionally in lower sections, flood management defences have been mainly grey infrastructure like concrete floodwalls and dikes. Some options for flood management in these areas:

- Installation of urban trees, which will capture some water within their branches.
- Creation of more green spaces that can be accessed by rain and surface runoff so that water can soak into the ground, replenishing ground waters and reducing the volumes reaching drainage systems.
- Examples include rain-gardens and Sustainable Urban Drainage systems (SUDs).
- Removing hard surface areas and replacing them with more porous options, such as green roofs and permeable pavement, will hold on to more water and help avoid overtaxing drainpipes.
- Creation of designated areas for flooding such as public parks where flood infrastructure can be landscaped into the area and allow for an increased uptake of water into areas where flooding will be less damaging.

These changes are often extremely costly and take a long time before fully completed.

The lowest sections of a catchment will always struggle with flooding as they will be coping with the highest volume of water with the least number of responses to a flood event. By addressing flooding holistically across the catchment, the damage that is caused by storms and floods can be reduced while still protecting the river and the surrounding areas.

## Wider Ecosystem Services Provided by Catchment Flood Management Approaches

Improvements made for flood protection can benefit the surrounding landscape. Such as:



One example of a successful flood protection measure is the [Eddleston Water project](#) that has been created just north of Peebles. This project is a test project to examine the viability of natural flood management principles within a catchment area. The changes include re-meandering the river, planting of new trees and shrubs in the riparian area and the creation of new wetland areas along the river to act as sponges to flooding. This example shows the potential for natural solutions to help protect communities from significant flooding.

Catchment level management allows for the best overall outcome to flood events and helps protect the most vulnerable areas from catastrophic damages. Smaller changes made throughout the catchment minimise the impact made to any one landowner or area and instead allow for each riverside community to determine what improvements are the most feasible to their own lands.

If you are interested to find out more about potential catchment management project please contact your local advisor for advice.

## Example of Catchment Base Approach: Woodlands and Natural Flood Management

In October 2022 the UK government released a new [guidance](#) on using woodlands as a part of natural flood management. This guide gives specific instructions on how landowners can help limit flooding through the introduction of new woodlands. Figure 1 below demonstrates the catchment management options that could be available for the different sections in a catchment.

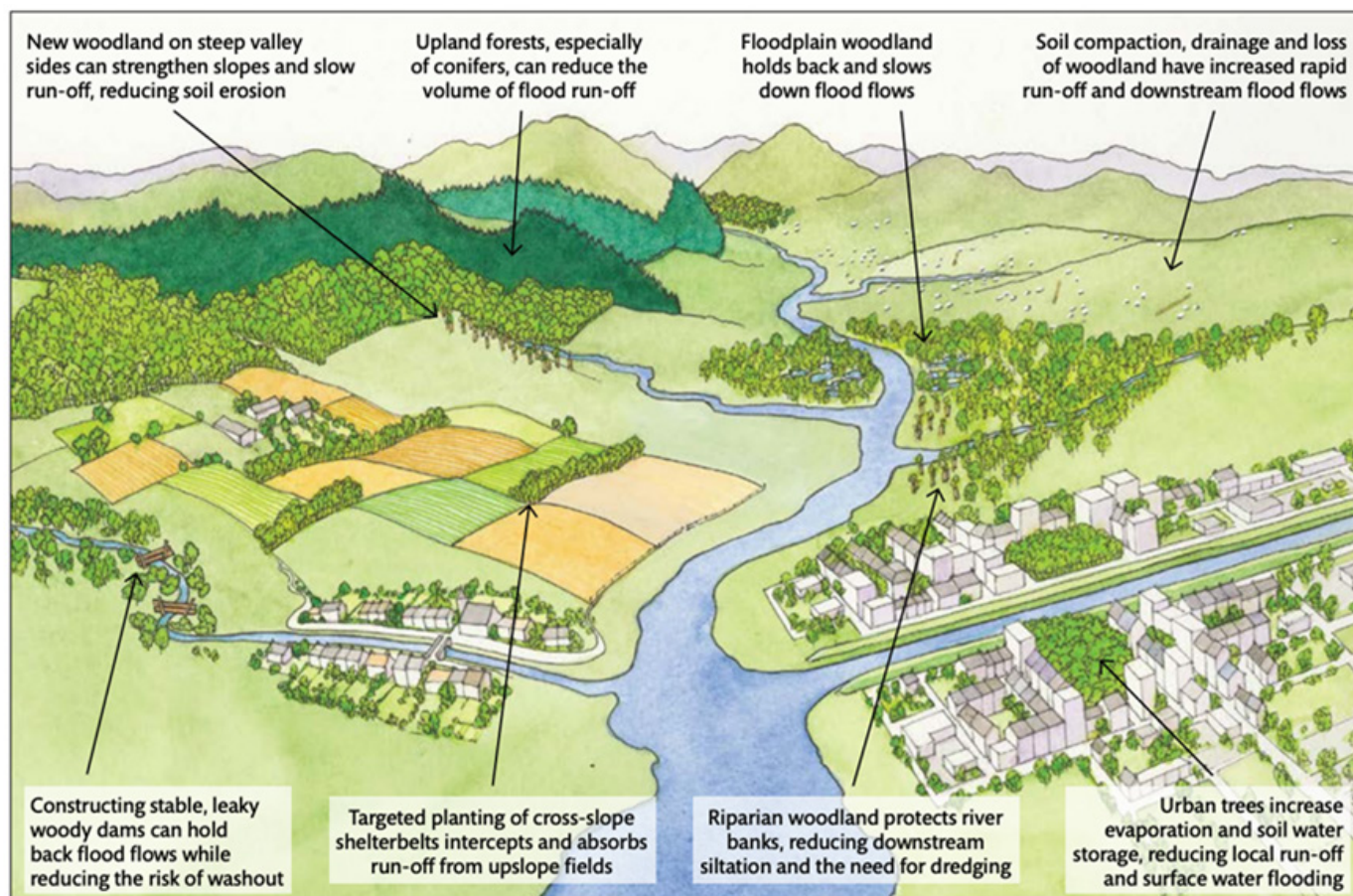


Figure 1: Natural flood management uses woodland and trees to slow the flow as part of a whole catchment approach to managing flood risk. From the *Designing and managing forests and woodlands to reduce flood risk: UK Forestry Standard Practice Guide*

## Projects around Scotland

The Eddleston Water Project



Revive the Allan



Scottish Case Study Finder



The Spey Catchment Initiative



Cairngorms Connect  
Insh Marshes



Dee Catchment Partnership



The River South Esk  
Catchment Partnership



## Further Information

Forest Research (2022) Designing and Managing Forests and Woodlands to Reduce Flood Risk  
([forestresearch.gov.uk](https://www.forestry.gov.uk/forestresearch))

NatureScot (2022) Flood Management

SEPA (2015) Natural Flood Management Handbook

NFM Network Scotland

Farming and Water Scotland - Natural Flood Management: A Farmers' Guide

