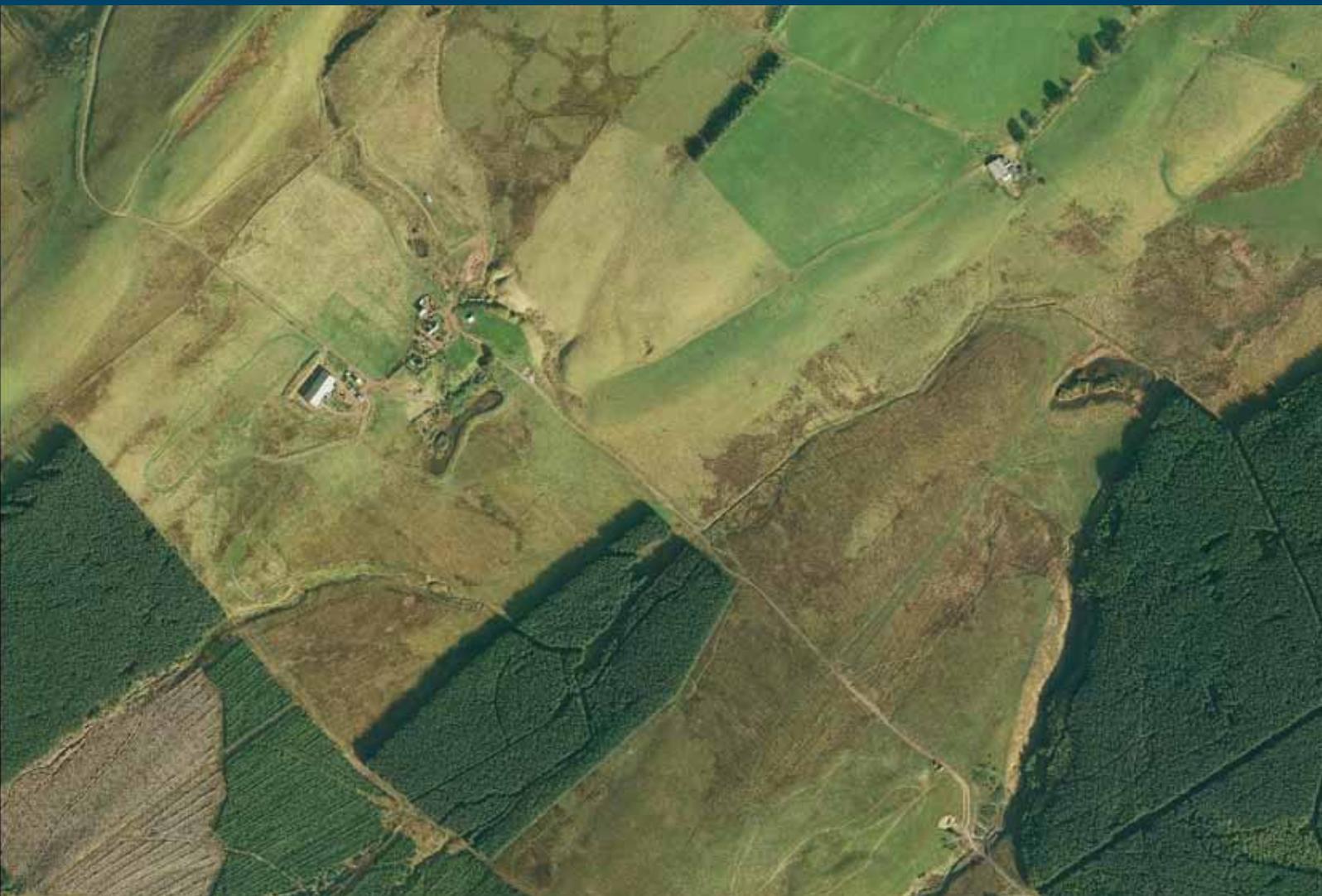


## NON-TECHNICAL SUMMARY

# Implementing Natural Flood Management (NFM) Measures



<b>LOCATION</b>	Ruddenleys Farm, Eddleston Water, Peeblesshire
<b>AIM</b>	To slow down rainfall run-off rates and to naturalise watercourses
<b>SUMMARY</b>	Five different measures were implemented: 1. Planting native woodlands, 2. Creating retention ponds, 3. Establishing riparian woodlands, 4. Placing log jams and 5. Creating waterside margins and wetlands

## Background and aims: How might climate change affect land management and how might farmers work with it to deliver sustainable land use?

If climate change predictions are correct, we can expect more extreme weather events in future. With respect to intense rainfall events, as experienced in recent years across southern Scotland, it seems sensible to look at ways of reducing the amount of damage to land and property. Well- designed Natural Flood Management (NFM) measures also reflect good land management practice. NFM offers a range of techniques that aim to reduce flooding by working with natural features to temporarily store or slow down flood waters. These techniques can never solve the problems associated with flooding, but they can contribute to reducing the height of the flood peak and subsequent damage to property.

**The Eddleston Water** is a tributary of the River Tweed and has a catchment area of 70 sq. km. In the early 19th century, the river was canalised and straightened throughout the majority of its length and embankments constructed to protect the surrounding land from flooding. It is estimated that nearly a third of its channel length was lost as a result, with a corresponding loss in habitat for flora, fauna and fish. Over the past 200 years, there has been virtually no recovery in the shape of the river. This means there is a lack of defined pool-riffle sequences and the river remains disconnected from its floodplain to a large degree. Prior to works commencing, this section of the Eddleston Water was categorised as 'Bad' status under the Water Framework Directive (WFD) classification, because of these morphological pressures.

**The Eddleston Water project** aims to restore the natural habitats across the wider catchment to improve the ecological status of the river and its fish populations. It also aims to measure the effect that these restoration measures have on flood attenuation downstream. A key objective is to work with land managers and communities to bring about meaningful and sustainable water and land management changes, and to recognise the services nature provides to society. A comprehensive monitoring programme has been developed to measure the effects on the ecology and hydrology. The project is led by Tweed Forum.

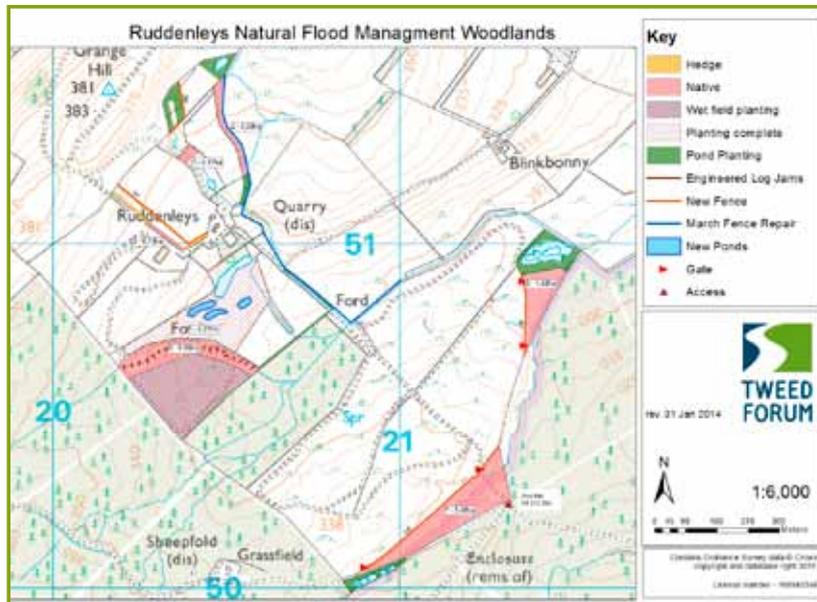
### **The objectives at Ruddenleys were to;**

- Reduce surface water flow rates by planting areas of native woodland
- Restore the watercourses to a more natural state
- Create more diversity in habitats to attract more wildlife species onto the farm
- Improve the farm landscape whilst making sheep management easier
- Monitor the effect of peak flows on this section of river and on the NFM measures implemented

### **The NFM programme**

Tweed Forum is co-ordinating NFM enhancement measures across 60 sites within five sub-catchments of the Tweed river system. The catchments involved include: the Ettrick and Yarrow valleys, upper Teviot, Gala Water, Bowmont Water and Eddleston Water.

Map showing the Natural Flood Management measures implemented at Ruddenleys farm



## Four key points to consider when implementing a Natural Flood Management programme

### 1 Land use issues and challenges

Ruddenleys is an upland livestock farm in the western Scottish Borders. The ground rises to 400m and comprises grazed pasture for hill sheep. Some of the land had been used as an off-road driving school. This activity had caused damage to several watercourses and stream banks. The NFM measures put in place were designed not only to help slow the flow of floodwater run-off but also to restore riverine and wetland habitats. The landowner was keen to explore the potential of using natural processes, by managing existing habitats and creating new ones, to reduce flood risk downstream in Eddleston and Peebles..

### 2 Land management opportunities

Tweed Forum helped facilitate and co-ordinate a programme of Natural Flood Management measures that all partners agreed would enhance the river and floodplain habitats. Five different measures were implemented: 1. 17ha of new native woodland planting, 2. 1,220m of water retention ponds created, 3. 200 clumps of trees planted, 4. 1,800m of waterside margins and wetlands fenced off and planted with native trees, and 5. 10 log jams sited in watercourses.

The river works required authorisation from SEPA (Scottish Environment Protection Agency) and, being an SSSI, consent from SNH (Scottish Natural Heritage).

### 3 Land management benefits:

Due to ongoing flooding issues downstream, the five Natural Flood Management measures implemented could bring a significant number of positive benefits to the valley. Tweed Forum has been instrumental in completing a series of catchment-wide demonstration sites to showcase the wide variety of NFM measures that can be implemented at a catchment scale. The multiple benefits accruing include:

#### Benefits to the farm business through restoring the watercourses

The pasture land was of fairly poor grazing quality, so its return to native woodland was encouraged by the farmer. Through fencing off the stream sides and planting with native trees, bank-side erosion should be reduced significantly. The new stock fencing and newly planted riverside trees will allow native grasses on the banks to colonise and regenerate free from stock trampling. In time, the tree cover may help provide opportunities for sheltering and shading livestock in adjacent field areas. Water storage ponds provide a resource for the farm. The soft wood timber used for bank-side protection (and log jams) was sourced locally.

#### Benefits to the community through reduced rainwater run-off rates

Reconnecting the river with its floodplain and naturalising the river itself should lead to reduced peak flood levels, which will, in turn, protect built property and infrastructure in towns downstream. The planted trees will increase rainfall interception and infiltration, thus reducing over-land flow of rainwater. Free from bank-side grazing, these short sections of restored watercourse will become narrower and deeper, encouraging a more natural riverine system to function.

#### Benefits to wildlife and the environment through habitat creation

Watercourses are often confined by man-made floodbanks but the creation of adjacent riverine habitats, such as woodlands connected to watercourses and wetlands connected to ponds, reconnects rivers with their floodplains. Species that may benefit include: dipper, kingfisher, Atlantic salmon, otter, Brown trout, lamprey, Reed bunting, Great crested newt, wildflower and butterfly species.

#### 1. Native woodland planting at Ruddenleys (17ha)

17ha of new native woodland was established at Ruddenleys. The planted grasslands were species poor with occasional wet flushes of soft rush. Tree species planted included a broad mix of rowan, birch, alder, hawthorn, hazel, Bird cherry and willow. Slowing the flow of surface water run-off after heavy rain, was a key objective.



## 2. Waterside margin management and riparian woodland planting

The watercourses, which had been used as part of a four-wheel drive school, were fenced off from sheep and sparsely planted with a range of native trees appropriate to ground conditions. Care was taken not to over-shade the watercourses. The enhancement of water quality was a key secondary objective.



## 3. Landscape-scale tree planting

Native woodlands were established along heavily modified watercourses and extended out onto wider field areas and lower hill slopes. Habitat connectivity and landscape enhancement were key additional benefits.



#### 4. Wetlands and water retention ponds

An area of wetland and a series of water retention ponds were created to increase the length of time water is held on site, which is particularly beneficial after major rainfall events. An added benefit is the habitat created for wetland species.



#### 5. Log jams built into the stream banks

Log jams, cut from locally sourced Sitka spruce and set into the bank-sides, are designed to slow the flow of water after heavy rainfall events. Grass, bracken and other vegetation will build up against the logs, reducing flow rates and causing water to flow more slowly downstream.



## 4 Costs and funding

The costs of the project are set out below.

Farm	New floodplain woodland planting	Log jams installed in water channel	New fencing required	Flood storage ponds	Total
Ruddenleys	16.37ha	10	1,273m	4,000 sqm	
Expenditure	£45,321	£2,060	£14,251	£8,677	£70,309

The costs involved in undertaking the natural flood management works at Ruddenleys, costs exclude VAT and do not include costs for facilitation

## Outcomes and lessons learned

One of the main lessons learned is that working in a loose but focused partnership has enabled the design and delivery of a successful river restoration programme. Without the partnership – local landowners, Tweed Forum, SEPA, Dundee University and the contractors (primarily cbec and Glendinnings) – such a project would not have been feasible or possible. Other organisations, notably Tweed Foundation, Scottish Natural Heritage and the Scottish Government, also had a vital part to play in the project's success. Such partnerships do not come about by accident; they also require clarity of leadership and governance. An overarching lesson is that time spent developing such partnerships is a crucial first step. Finding multiple sources of income is a critical second step in project management to ensure all real and potential costs are covered.

### The objectives at Ruddenleys were to:

- Reduce surface water flow rates by planting areas of native woodland
- Restore the watercourses to a more natural state
- Create more diversity in habitats to attract more wildlife species onto the farm
- Improve the farm landscape whilst making sheep management easier
- Monitor the effect of peak flows on this section of river and on the NFM measures implemented.

### It is intended that the restoration actions of the wider Eddleston Water project will contribute to:

- An improvement of the 'ecological status' of the water body under the Water Framework Directive (WFD) classification and a reduction in flood risk within the catchment.
- An increase in the habitat supporting designated species: otters, Atlantic salmon, Water crowfoot, lampreys.
- The development of a demonstration site that other practitioners, land managers, policy makers, agencies etc can visit to exchange knowledge and share experiences.

### Final comment

The habitat mosaic of new woodlands, wetlands, ponds and more naturalised watercourses should achieve the multiple objectives of reducing peak flow rates and also enhancing biodiversity value, improving water quality and restoring soil carbon.

### View of the newly planted native woodlands and ponds



### Flood storage pond creation



### Project Partners, Funders and Facilitators

The programme of conservation works was facilitated by Tweed Forum staff.

If you are a land manager and would be interested in carrying out something similar on your land, please contact Tweed Forum for a confidential discussion of what might be possible and to explore potential funding sources.

Further information can be obtained from:

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