

NON-TECHNICAL SUMMARY

Implementing Natural Flood Management (NFM) Measures



LOCATION	Cringletie and Lake Wood, Eddleston Water, Peeblesshire
AIM	To slow down rainfall run-off rates and to re-naturalise the river
SUMMARY	Six different measures were implemented: 1. Re-meandering of 800m of the Eddleston Water, 2. Embankment removal along the straightened river, 3. Green bank protection using trees with root plates, 4. Pond and pool creation, 5. Native tree planting and 6. Conifer plantation restructuring to native woodland

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 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, to a large degree, the river remains disconnected from its floodplain. 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 Cringletie and Lake Wood were to:

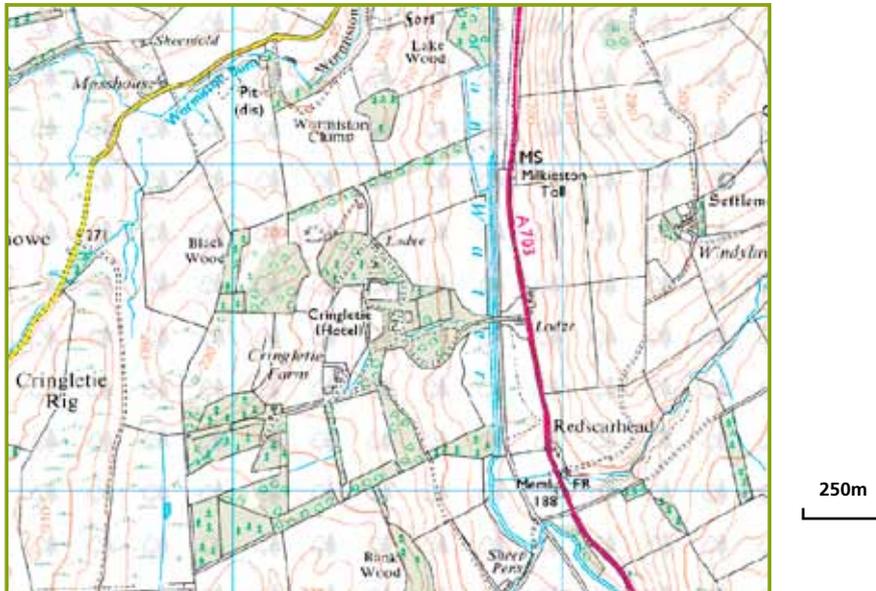
- Restore a straightened 800m stretch of river to a more natural morphology.
- Remove artificial embankments.
- Reconnect the river with the floodplain.
- Establish wetlands and floodplain woodlands.
- Plant native trees on the river banks.
- Monitor the effect of peak flows on this section of river 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.

Cover image: Overview of the entire section of restored river (looking south) with the Cringletie site in the middle distance and Lake Wood closest to the camera

Location map of the straightened section of the Eddleston Water near Peebles, prior to reinstatement to a more naturalised river system. The conifer plantation which was harvested and replanted is marked centre top (Lake Wood).



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

1 Land use issues and challenges:

Five neighbouring farms comprise the sites at Cringletie and Lake Wood. The land use type at Cringletie prior to NFM works consisted of rough grazing on the disused embanked railway line, embanked and straightened watercourse and adjacent rush pasture. Lake Wood was a mature Sitka spruce plantation. Landowners were happy to explore the potential for natural processes 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 involved agreed would enhance the river and floodplain habitats. Six different measures were implemented: 1. Re-meandering of 400m of the Eddleston Water, 2. Embankment removal along the channelised river, 3. Root wad bank-side protection, 4. Pond and pool creation, 5. Floodplain tree planting and 6. New native woodland planting.

The river works required authorisation from SEPA and, being an SSSI, consent from SNH. A felling licence was required from FCS (Forestry Commission Scotland) to remove the conifers used for bank-side protection.

3 Land management benefits:

Due to ongoing flooding issues downstream, the six Natural Flood Management measures implemented will bring a significant number of positive benefits to the valley. The multiple benefits include:

Benefits to the farm business through restoring the river to its natural course

The newly restored river channel will help prevent the potential loss of good pasture land during flood events. By removing embankments and reconnecting the river with its floodplain, some of the speed and force of flood water will be reduced; riverbank erosion should also be minimised. 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 timber used for bank-side protection was sourced on site.

Benefits to the community through reduced rainwater run-off rates

Surface water run-off rates, particularly after heavy rain, should be reduced through reconnecting the river with its floodplain. Planting trees to trap vegetation and removing bank-side grazing will encourage a more natural riverine system as those sections of the watercourse narrow and deepen. These measures should lower peak flood levels and help protect property and infrastructure in towns downstream.

Benefits to wildlife and the environment through habitat creation

The main benefits to wildlife are through the creation of habitat linkages. Watercourses are often confined by man-made embankments, but the creation of adjacent riverine habitats such as wetland and scrub reconnects rivers with their floodplains. Species that may benefit include: kingfisher, Atlantic salmon, otter, Brown trout, lamprey, Reed bunting, Great crested newt, wildflower and butterfly species.

Aerial view of the straightened section of watercourse (running N-S down the centre of image) before reinstatement back to more a naturalised river system



1. Re-meandering of the Eddleston Water

View looking south during re-meandering works, showing the old straightened river channel (left) and new channel (right)



View looking north from Cringletie one year after river re-meandering



2. Old river channel embankment removal

High flow level on the Eddleston Water. Removing the steep channelised riverbanks allowed the river to reconnect with the floodplain.



3. Native species tree planting on floodplain

Low density native tree species planted along the riverbanks and across the floodplain included: alder, Bird cherry, aspen, oak, hazel, rowan, willow and Crab apple



4. Overflow ponds and water retention pools

Ponds were created on the floodplain to add water storage capacity and enhance biodiversity



5. Root plate bank protection

Sitka spruce root wads (the root plate plus 5m of trunk) being used to pin the bank on outside bends where erosion is most likely; the root plate forms the bank-side.



6. Harvesting conifer trees at Lake Wood plantation

The conifer plantation at Lake Wood prior to felling



The same plantation area after felling, restocking with broadleaf trees and channel re-meandering



4 Costs and funding

The costs of the project are set out below.

Farm	New floodplain woodland planting	New watercourse channel created	New stock fencing required	Design for new channel	Total
Cringletie	2.0ha	500m	1050m		
Expenditure	£6,000	£49,000			£54,658
Lake Wood	1.8ha	300m	995m		
Expenditure	£9,187	£15,700	£9,167	£7,725	£41,779

The above costs do not include facilitation services; costs are exclusive of VAT

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 re-meandering of the river (and other restoration elements). 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. Other organisations, notably Tweed Foundation and Scottish Natural Heritage, also had a vital part to play in the project's success, as did the underlying support from Scottish Government. 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 necessary second step in project management, to ensure all real and potential costs are covered.

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 see and learn what can be done and how to do it.

Final comment

The work done during 2013 has raised the WFD status of the river from 'Bad' to 'Poor'. The work done during 2014 (further re-meandering of the main stem and log jam construction in the dredged upper reaches) is likely to push this to 'Moderate'.

All these improvements will help build resilience to more extreme events - both flooding and drought.

As part of a wider integrated catchment management programme, have the objectives been achieved?

The project has been very successful in bringing about habitat restoration across a large area. Whilst the local fishery trust (The Tweed Foundation), have carried out comprehensive electrofishing surveys on a couple of key tributaries, they felt the main stem was too big to allow any meaningful before and after comparisons. However, it is their view that fish populations will increase proportionately with the increase in channel length. At Lake Wood there has been a 50% increase in fish numbers, with overall channel length increasing by approximately 30%. A big flood of December 2014 caused a great deal of sediment adjustment and there is now a defined pool-riffle sequence.

Whilst the Eddleston is also an important salmon spawning tributary, the restoration done to date is likely to benefit trout to a much higher degree. Although there are good riffles between meanders (which will be useful for spawning and will be favoured by juvenile salmon), the flow is generally much slower than previously (as expected when increasing channel length). Deep pools have formed, which will favour larger trout and be useful for adult salmon on their way upstream at spawning time. Increased overhanging vegetation will protect fish from predators.

Whilst the Water crowfoot has re-colonised very rapidly it is too early to say what effect the works have had on invertebrate numbers and types. Likewise, it will be a number of years before we can collect and accurately interpret the hydrological data to estimate the impact on flood attenuation. The native riparian vegetation is also recovering quickly, which will benefit key species, such as otter, due to the increased level of cover.

All these improvements will help build resilience to more extreme events - both flooding and drought. The work has been very well received by the local community and we have had a number of reports that this has already reduced flooding in Peebles. Whilst it is too soon to prove this, such positive feedback is encouraging.

Promoting to others the benefits of the change in land management

The Cringletie and Lake Wood sites have been visited many times by organised groups. A diverse range of people, including farmers, farm advisors, government agency staff, academic institutions, university students and school groups have all benefited from seeing the work on the ground.

Dundee University staff showing groups around the newly restored sites



In autumn 2013, Paul Wheelhouse, Minister for Environment and Climate Change, opened Phase 1 of the project by personally digging the final cut, enabling the river to flow into the newly created channel



Project Partners, Funders and Facilitators

The programme of conservation works was facilitated by Tweed Forum staff and Dundee University are undertaking monitoring studies. Funding was obtained from a number of sources, including the Scottish Government, SEPA Restoration Fund, Scottish Power and individual farmers.

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:
Tweed Forum, South Court, Drygrange Steading, Melrose, TD6 9DJ.
T 01896 849723 E info@tweedforum.org
www.tweedforum.org