

NON-TECHNICAL SUMMARY

Implementing Natural Flood Management (NFM) Measures



LOCATION	Kelsocleuch, Bowmont Valley, Roxburghshire
AIM	To slow down rainwater run-off rates to reduce flooding and to capture coarse sediments
SUMMARY	Five different natural flood management methods were undertaken: 1. Grade Control Engineered Log Jams, 2. Bank Protection Engineered Log Jams, 3. Bar Apex Engineered Log Jams, 4. Flow restrictors, 5. New native woodland planting and transverse hedge planting

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 floodwaters. 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.

Erosion is one of many natural river processes. Problems arise where the rate of erosion is considered too rapid to be acceptable and can be problematic for a number of reasons; for instance: loss of valuable agricultural land, risk to local infrastructure and increased sedimentation loads downstream. Land managers can lose large amounts of their highly productive land to riverbank erosion (or gravel deposition) which can have significant detrimental impacts upon a farm business. The need to maintain and restore riverbanks in a sustainable way is therefore important

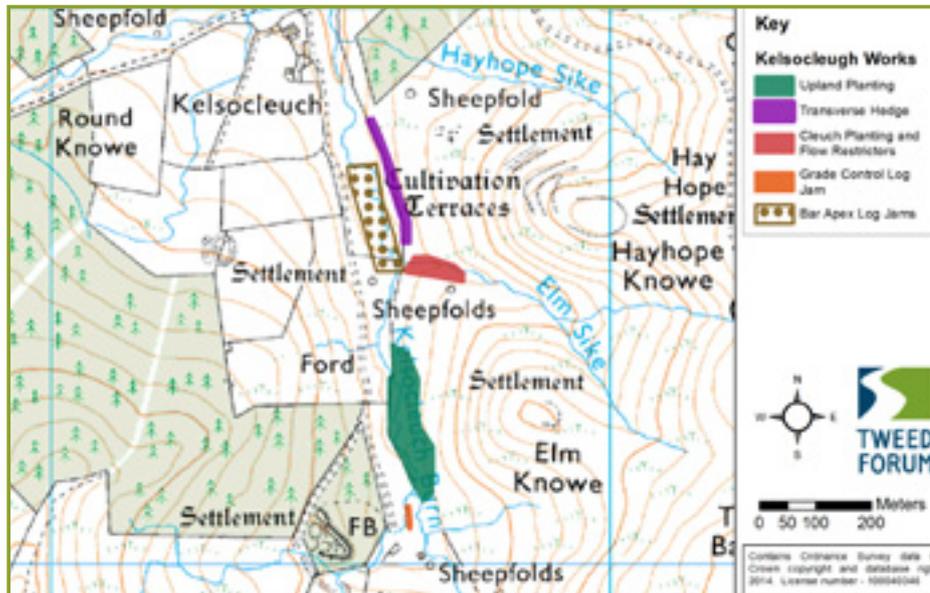
Riverbank protection works have a number of benefits, such as:

- Stabilisation of river banks reduces loss of good agricultural land
- Reduction in undesirable sediment deposition in other areas
- Reduction in excessive sedimentation within watercourses, which silts up gravel beds and destroys spawning and invertebrate habitat
- Reduction of channel widening that results in shallow flows, especially in summer, which can cause increases in water temperature and reductions in oxygen levels, leading to fish mortality.
- Reduction in faecal contaminants from livestock which enter watercourses
- Development of stable banksides creates habitat linkages for mammals, birds, flowers and insects, as well as riverbank grasses and trees. The more rapidly vegetation can be established on newly stabilised banks, the better the long-term prospects for bankside protection

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 types and location of Natural Flood Management (NFM) measures put in place at Kelsocleuch



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

1 Land use issues and challenges

Kelsocleuch farm lies towards the head of the Bowmont valley, 10km south-east of Yetholm in the Cheviot Hills. The farm is around 600ha in extent, and rises from 233m at Cocklawfoot farmhouse, to 610m on the Scottish-English Border at Windy Gyle.

The larger than average floods of 2008 and 2009 affected Kelsocleuch land by scouring out already deep burns and depositing discrete areas of gravel along and across the floodplain haughs. Access by vehicle was unaffected on the farm, but there were associated problems downstream. Some fences and water gates had been damaged, which were replaced at the farmer's expense. New landslips appeared in the higher and steeper hill cleuchs, with significant erosion of peat hagsgs on the flatter high tops. The farmer, Mr Thomson, was aware of the increasing intensity and frequency of recent rainfall events and was sure the floods were generated from the Gyle Burn area of the farm. Mr Thomson thought that it might be possible to slow down the floods at source by increasing rainfall infiltration through the removal of livestock and planting native trees. By doing this, there is potential to increase the amount of water stored in soil and gravel deposits. In general, this can have the effect of slowing down water run-off after storm events. It is acknowledged, however, that this effect can be overwhelmed during extremely heavy localised downpours, when the landscape is saturated.

2 Land management opportunities

Tweed Forum and Cheviot Futures' staff were instrumental in facilitating a programme to help slow the flow of floodwaters at Kelsocleuch. The farm has a number of sections of eroding riverbank, which present a number of management issues to the farm business and also threaten local infrastructure. The sites have been identified through the innovative Farm Resilience Plan approach, which was undertaken within individual farm holdings by Cheviot Futures. This approach was, in part, to act as a demonstration opportunity to compare and contrast the merits (or otherwise) of different natural flood management measures. This work was supported by a site-specific consultant's report. 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

Discrete sites were identified for implementing five different Natural Flood Management measures. The benefits of the restoration works are outlined below.

Benefits to the farm business through restoring and maintaining riverbanks

The newly restored stream banks will help prevent the loss of more good land during flood events. New stock fencing and newly planted riverside woodlands will allow native grasses on the banks to colonise and regenerate free from stock trampling. Planting hedgerows across hill slopes will help slow down surface water run-off and provide shade and shelter for livestock. Flow-restrictor log jams placed across narrow burns and ditches help prevent bankside erosion and Grade Control Log Jams placed on the bed of the burn prevent the stream from down-cutting further. Bar Apex barriers on the floodplain help reduce sediment input to the main water channel by trapping sediment and gravel in situ. In addition, hazel shrubs planted along the riversides will provide a source of sticks to make traditional shepherds' crooks.

Benefits to the community through reduced run-off rates

By stabilising the riverbanks, there should be less sediment available to enter the river during flood events. The planted woodland and hedgerow should help trap vegetation and slow overland flow of rainwater. This should lead to reduced peak flood levels, which may help protect built property and infrastructure downstream.

Benefits to wildlife and the environment through habitat creation

Stabilising riverbanks allows wildlife habitat to develop and to link the river with adjacent habitats. Species that may benefit include: kingfisher, Atlantic salmon, otter, Brown trout, lamprey, Reed bunting, Great crested newt and butterfly species.

4 Natural Flood Management measures, costs and funding

1. Grade Control Engineered Log Jams

Grade Control Engineered Log Jam features are intended to assist the repair and natural stabilisation of incised erosion within watercourses. 100m of grade control structures have been completed in the headwaters of the Bowmont in order to regenerate a section of the Kelsocleuch Burn. This section had been eroded vertically through water being channelled at speed through pipes which replaced a small bridge. The plan is to replace the pipes with a small timber bridge and fence off and plant the riverbanks.

Locally sourced and cut sections of European Larch placed across the burn and pegged together should help prevent more scouring and down cutting by the watercourse.



2. Bank Protection Engineered Log Jams

80m of Bank Protection Engineered Log Jam (ELJ) works have been completed on this farm (and two others within the Bowmont Valley at Swindon Haugh and Clifton-on-Bowmont) with varying design specifications at each site, to allow comparisons to be made and lessons learnt with regard to their effectiveness.

Locally sourced and cut sections of European larch set into the eroding bank and pegged together should help prevent more bankside erosion and sediment deposition into the river



3. Bar Apex Engineered Log Jams

Twelve Bar Apex Engineered Log Jam features are designed to replicate the action of fallen and stranded timber within a floodplain situation, slowing down the rate of floodwater flow and encouraging the deposition of suspended sediments. It is hoped that the introduction of such structures may have a role to play in the sustainable management of sediment transfer within dynamic upland river systems such as the Bowmont. Native trees have been planted alongside the structures in order to provide longevity to the features. Once the timbers have rotted away, the trees will hopefully be well established and strong enough to continue the flow reduction and sediment trapping function.

Bar Apex structures at Kelsocleuch



4. Flow-restrictors

At Elm Sike ten flow-restrictors have been placed across the stream. These mimic fallen dead trees which occur naturally in ancient woodland.

A series of small log jams pegged into a tributary of the main channel will encourage eroded gravel and silt to settle out behind the structures, as well as store flood water



5. New native woodland planting and transverse hedge planting

Planting trees as native woodland or hedgerow features on farmland has long been recognised as being of benefit to conservation and biodiversity, and is actively encouraged through forestry and agri-environment schemes. Woodlands and hedgerows can intercept run-off and hold back flood waters, increase the rate of infiltration from rainfall, provide a windbreak and a barrier to intercept soils mobilised by windblow, provide shade and shelter to livestock and also connect areas of wildlife habitat.

Planting native trees and shrubs alongside watercourses, particularly in the upper reaches of a river, in small upland cleugh and gullies can greatly assist the natural management of floodwater, reducing flooding and erosion risk. Such works are of greatest benefit at a collaborative, catchment scale, such as that being developed in the Bowmont valley.

New native woodland planting at Kelsocleuch, with hazel included to provide traditional shepherd's crooks.



Transverse hedge planting can reduce surface flow of rainwater by increasing filtration



Expenditure and Income

Farm	Grade Control Engineered Log Jam	Bank Protection Engineered Log Jams	Bar Apex Engineered Log Jams including planting	Woodland planting	Transverse Hedge Planting	Total
Kelsocleuch	20m	80m	12	4,000 sqm		
Expenditure	£2,099	£7,001	£2,542	£2,400	£1,400	£15,442

Illustrative costs, excluding supply of timber and fencing

Outcomes and lessons learned

Following the significant September 2012 flood event, the log jams at Kelsocleuch fared reasonably well, reflecting their headwater location and resultant comparative reduced vulnerability. For example, the Bar Apex Log Jams all survived intact, as did the structure of both the Bank Protection and Grade Control Log Jams, although some additional erosion of the banks at the Grade Control site and some of the backfill material from the bank protection site was evident. We are reasonably confident in our conclusion that the latter was largely due to the flood event occurring so soon after works were completed (approx. five weeks), meaning that backfill had insufficient time to settle and consolidate.

Promoting to others the benefits of the change in land management

Kelsocleuch is a tenanted farm to Roxburghe Estates. By working with other farmers and landowners in the valley, real benefits can be achieved through working at a catchment scale. Organised visits can be arranged but must be co-ordinated through Tweed Forum.



Project Partners, Funders and Facilitators

The works at Kelsocleuch were undertaken as part of the Cheviot Futures project, seeking to build resilience to the effects of climate change amongst the land management community. Cheviot Futures was a cross-border project (2011-2014), managed by Tweed Forum in partnership with Northumberland National Park Authority, and predominantly funded by the 2007-2013 LEADER programme (Northumberland Uplands and Scottish Borders). Roxburghe Estates provided additional financial support.

Case studies, including further information relating to the works at Kelsocleuch, are available on the project website (www.cheviotfutures.co.uk) and on request from Tweed Forum.

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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