

NATURAL FLOOD MANAGEMENT MEASURES

A practical guide for landowners in
the Derbyshire Derwent catchment



ACKNOWLEDGEMENTS

This guide has been developed to provide clear information regarding natural flood management (NFM) measures for farmers in the Derwent catchment.

This document was updated October 2021 specifically for the River Derwent, Derbyshire, as part of the Derwent Connections Green Recovery Challenge Fund and People's Postcode Lottery.

The document is based on the publication 'Natural Flood Management Measures – a practical guide for farmers (2017),' which was specifically requested by the farmers and land managers of the Yorkshire Dales National Park, and compiled by the Yorkshire Dales National Park Authority, Yorkshire Dales Rivers Trust and North Yorkshire County Council, with support from Natural England and the Environment Agency.

All information contained in this publication – including links to websites and further reading – is believed to be correct at the time of going to press.



Between June 2022 and March 2023 the Derbyshire Wildlife Trust have funding available to support landowners with natural flood management measures throughout the Derwent Catchment.

If you own or manage land in Derbyshire and would like to work with us on woodland creation or natural flood management measures, please get in touch at:

derwentconnections@derbyshirewt.co.uk

Tell us:

- Your Name
- Contact Details (an email address or phone number)
- Location of your land (please provide a Grid Reference, Postcode or What3Words)
- Current land use
- Size of your land (less than 1ha, 1-5ha, 5-10ha, over 10ha)
- Do you own the land? (if you help manage the land do you have contact details for the owner?)

Our Living Landscape advisors will be in contact with you to arrange a site visit and discuss funding for your project.

WORKING TOGETHER IN PARTNERSHIP

Green Recovery Challenge Fund



The National Lottery Heritage Fund



Derbyshire Wildlife Trust



INTRODUCTION

Floods are nothing new. Humans have lived with extreme weather for thousands of years. However, climate change science predicts an increase in occurrence and severity of high rainfall events. Subsequent increases in extreme flooding will occur.

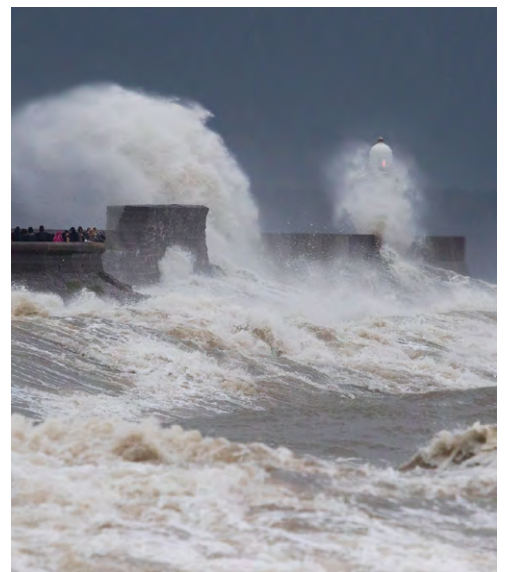
Within the UK, our flood defence system includes large-scale, hard engineered solutions in and around major cities and flood banks; small-scale engineered solutions for rural communities and farmland; and coastal engineering. There is increasing political and public interest in how the management of the wider countryside can contribute to the UK's flood defence system, with particular reference made to NFM.



Ladybower Reservoir © Kayleigh Wright



Engineered channel in Long Eaton © Environment Agency



Sea Wall

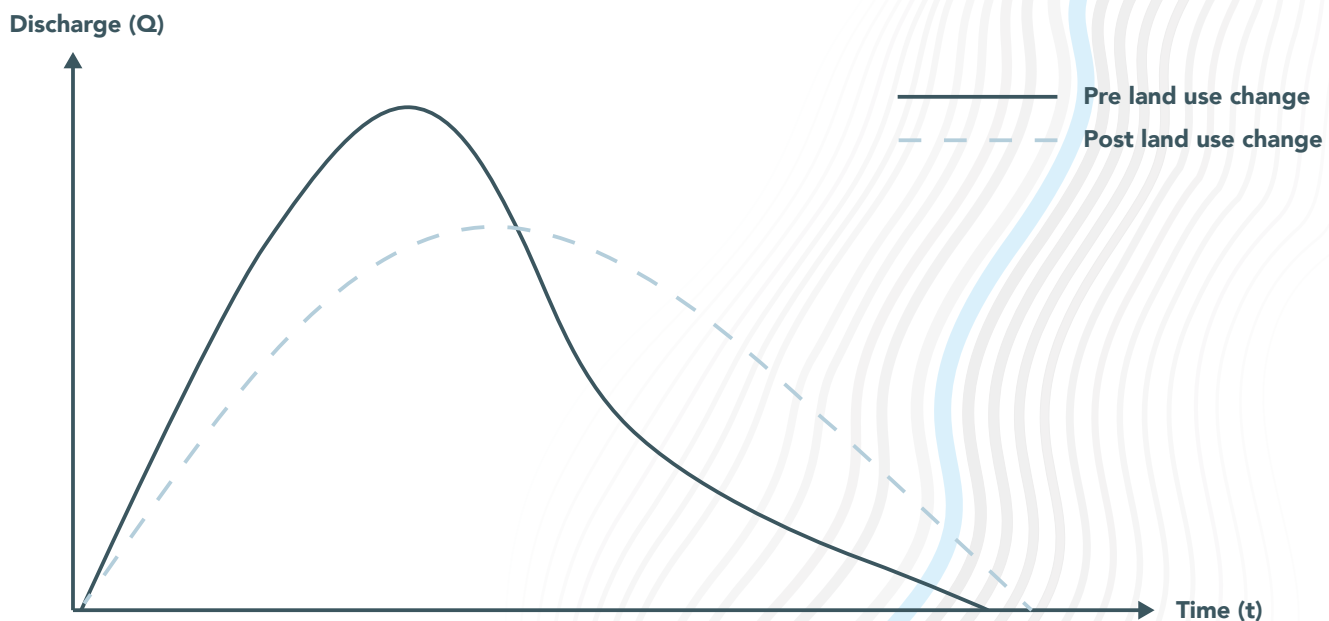




WHAT IS NATURAL FLOOD MANAGEMENT?

Natural flood management aims to **reduce the downstream flood peak**, the maximum water height of a flood, or to **delay** the arrival of the flood peak downstream, increasing the time available to prepare for floods.

This is achieved by restricting the progress of water through a catchment, using a range of physical interventions. These interventions work with the natural features of the catchment to slow down or store flood waters.



They rely on one, or a combination, of the following underlying mechanisms:

- **Increasing soil infiltration:** free-draining soil will make saturation less likely, potentially reducing surface runoff.
- **Evaporation** from vegetation and soil can also make space for water.
- **Slowing water** by increasing resistance to its flow – for example, by planting floodplain or riverside woods, or blocking grips on moorland.
- **Storing water** by using, and maintaining the capacity of, ponds, ditches, embanked reservoirs, channels or land.
- **Reducing water flow connectivity** by interrupting surface flows of water – for example, by planting buffer strips of grass or trees.

Natural flood management structures have been designed so that they **do not** significantly impact on farming, are typically **small in size**, and can be considered an extension to the farm's land drainage system.

Each structure or technique performs a small amount of runoff storage or attenuation, gradually releasing flood water over 12 to 24 hours. It is the collective network, rather than individual features, that aims to provide flood mitigation in the immediate vicinity and further downstream.

Natural flood management is not the complete solution to flooding, but is one of many tools needed to manage flood events. These tools are more effective at reducing the frequency of flooding for high probability fluvial events (for example, less than a 1 in 20-year return period) compared to extreme events (for example, a 1 in 200-year return period). Used in conjunction with other flood management solutions, like hard engineering, natural flood management will have a beneficial impact on slowing the flow of flood water downstream. Research at a number of small-scale catchments has shown this to be the case.

NFM IN THE DERWENT CATCHMENT

Two large-scale flooding events occurred in the catchment in November 2019 and February 2020, causing damage to buildings and land, and resulting in a loss of income for landowners and local businesses.

NFM can play its part by putting in place practical measures which mimic natural processes to slow down water flow and retain water in the landscape. This is important within the Derwent catchment as it has the potential to provide a range of benefits to land managers/owners, the landscape and the wider community.



Flooding in Derwent © DCC

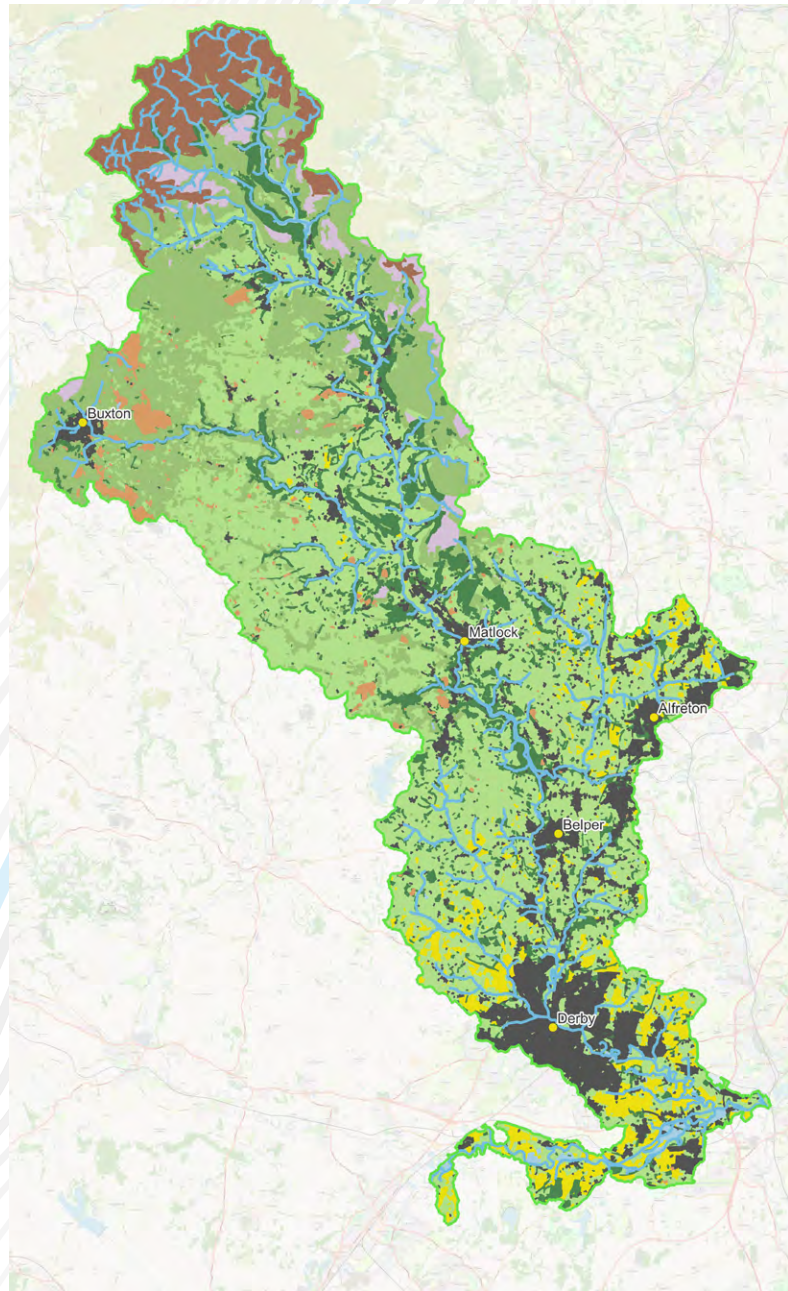
BENEFITS FOR LAND OWNERS:

- ✓ Reduction in soil loss across the holding
- ✓ Increased stability of the soil, and of riverside land
- ✓ Increased soil fertility, and reduced run off, reducing costs
- ✓ Improved soil quality, which has additional benefits, including increased water retention, reducing the risks of summer drought
- ✓ Improved water quality for stock and wildlife, which can support meeting the requirements for the EU Water Framework Directive.



BENEFITS FOR LANDSCAPE AND SOCIETY:

- ✓ Improvement of water quality
- ✓ Reduction in sediment and pollution downstream
- ✓ Economic benefits from higher landscape quality, such as tourism, business investment and diversification
- ✓ Better opportunities for outdoor recreation, and the associated health and wellbeing benefits
- ✓ Creates environments more resilient to climate change.



OPPORTUNITIES WITHIN THE DERWENT CATCHMENT



- | | |
|---|--|
| 1 Moorland Grip and Gully Blocking | 9 Reducing Soil Compaction |
| 2 Headwater Woody Bundles | 10 Mixed Species Herbal Ley |
| 3 Cross-slope Woodland & Hedgerows | 11 Online Storage Pond |
| 4 Cover Crop | 12 Offline Storage Pond |
| 5 In-channel Leaky Barriers | 13 Wetland Creation |
| 6 Flow Pathway Bund | 14 River & Floodplain Restoration |
| 7 Overland Leaky Barrier | 15 Swales |
| 8 Field Boundaries | 16 Cross Drains |



USING THIS GUIDE

This guide has been developed to provide the advice and key information needed to aid decision-making, should you wish to install flood management features on your farm. We have included funding sources to support the work you may want to undertake.

The various measures have been grouped into three different levels of intervention:

LEVEL 1

Measures requiring minimum or no consultation with authorities such as the Derbyshire Wildlife Trust or Environment Agency (EA). These measures are usually low cost and simple to install, but extremely effective.

LEVEL 2

Measures requiring a certain level of consultation and possibly consent of authorities (see summary of consents section). These measures are a mix of low-to medium-cost and may need contractors' help to install them.

LEVEL 3

Measures involving a level of design that is targeted to certain locations within the catchment, requiring planning permission and consents from authorities, and, in most cases, involving professional water management consultant advice. These measures are usually high-cost and need contractors to install them.

SET-UP COSTS

LOW

Land manager can implement system with minimal advice, equipment, and specialist material.

MEDIUM

Requires some raw materials, specialist equipment, and/or expert involvement.

HIGH

Requires significant raw materials, specialist equipment, and/or expert involvement.

MAINTENANCE COSTS

LOW

Mostly involves routine inspections and low-grade management, which can be undertaken by the land manager.

MEDIUM

Expert advice or equipment required occasionally (e.g. < 10 yrs).

HIGH

Expert advice or equipment required frequently (e.g. < 5 yrs).

INTERVENTION LEVEL 1

WATERCOURSE BUFFER STRIPS

Creating wide strips of vegetation alongside streams, ditches and rivers helps slow the surface water runoff from the surrounding landscape. These strips act not only as a barrier to hold back water, but also as a filter – capturing sediments, nutrients and any pesticides and fertilisers present in the runoff. This would otherwise enter the river and reduce water quality. These buffer strips can also be fenced off, preventing livestock from accessing the riverbanks and the watercourse and further increasing water quality. Pasture pumps can be installed in combination with buffer strips to ensure livestock maintain access to water.

FLOOD MANAGEMENT PURPOSE

Buffer strips can increase surface roughness, slowing the flow of storm water and increasing infiltration. They also reduce soil and nutrient loss from fields and stabilise the banks of watercourses, therefore reducing erosion. This in turn will improve water quality in streams and reduce the build up of sediment in watercourses throughout the catchment.



Buffer © Guy Edwardes 2020VISION



HOW

Careful management of a strip of land adjacent to the stream, maintaining native vegetation and excluding livestock.



CONSTRUCTION AND CONSIDERATIONS

- Potential installation of pasture pumps to allow livestock access to water
- If the strip is to be fenced from grazing, there may be reductions in eligible land area under the Basic Rural Payments Scheme
- If a fence is within 3m of the middle of the river or field boundary then the eligible area remains unchanged.



BENEFITS

- Prevents agricultural chemicals, sediment and nutrients reaching the watercourse, reducing waste
- Can reduce effects of spray drift
- Reduces risk of erosion and loss of valuable topsoil
- Reduces risk of livestock acquiring waterborne diseases
- Can reduce overland flow impacting roads and neighbouring properties
- Strengthens riverbanks
- Wildlife habitat creation. Buffer strips can also qualify as Ecological Focus Areas (EFAs) under the Common Agricultural Policy (CAP) greening requirements
- Can also be planted with trees to increase benefits for NFM and to increase value for wildlife.



LEVEL OF MAINTENANCE

Possible requirement: **LOW**



KEY LOCATIONS

Throughout the catchment, adjacent to rivers, and especially on grazed land next to streams and ditches that suffer from high sediment loads. Primarily land with sandy and light silty soils, medium and chalk and limestone soils.

In-field strips on arable land at risk from soil erosion. This option works well alongside other runoff interception options, such as contour bunds and hedgerows.



COSTS

Se-up cost: **LOW**

Maintenance cost: **LOW**

Currently, the Countryside Stewardship (CS) scheme contains a range of buffer strip, grass margin, and riparian management strip options, with payments ranging from £170 to £557 per hectare.

Local Rivers Trusts (RT) may assist with riparian fencing cost in their project areas.



ADDITIONAL INFORMATION

More information on how to use and maintain buffer strips is available online as part of options under the Countryside Stewardship Scheme.

INTERVENTION LEVEL 1

IN-FIELD BUFFER STRIPS



In-field buffer strips are grass strips placed along the boundary or across the middle of a large field. These buffer strips offer several benefits for NFM and when used next to existing features, such as hedgerows, woodland and dry stone walls, they will provide habitat for wildlife and form links or corridors between other habitats.

FLOOD MANAGEMENT PURPOSE

Buffer strips in fields reduce overland flow by increasing surface roughness. They also increase infiltration, and prevent sediment, soil and nutrient loss.

HOW

Creating a strip of more dense and permeant vegetation along boundaries or across sloping fields. This can be seeded, or you can simply allow existing vegetation to grow. These can be mown to prevent scrub from forming.

CONSTRUCTION AND CONSIDERATIONS

- Can impact livestock movements through fields
- If the strip is to be fenced from grazing, there may be reductions in eligible land area under the Basic Rural Payments Scheme. If a fence is within 3m of the middle of the field boundary then the eligible area remains unchanged.

BENEFITS

- Prevents agricultural chemicals, sediment and nutrients reaching the watercourse, reducing waste
- Can be designed to straighten irregular field edges, enhancing crop operations
- Can reduce effects of spray drift
- Reduces risk of erosion and loss of valuable topsoil
- Can reduce overland flow impacting roads and neighbouring properties
- Wildlife habitat creation. Buffer strips can also qualify as Ecological Focus Areas (EFAs) under the Common Agricultural Policy (CAP) greening requirements.

LEVEL OF MAINTENANCE

Possible requirement: **LOW**

KEY LOCATIONS

Throughout the catchment. On arable land at risk from soil erosion.

COSTS

Set-up cost: **LOW**

Maintenance cost: **LOW**

The Countryside Stewardship Scheme contains a range of buffer strip, grass margin and riparian management strip options for eligible land.

More information can be found online:
www.gov.uk/countryside-stewardship-grants

ADDITIONAL INFORMATION

More information on how to use and maintain buffer strips is available online as part of options under the Countryside Stewardship Scheme.

INTERVENTION LEVEL 1

INCREASING SOIL PERMEABILITY

- REDUCING SOIL COMPACTION

Soil compaction occurs when soil is squashed into an impermeable layer. This can be caused by high livestock densities and the movement of farm machinery. Gateways, farm tracks, tramlines and water/food troughs are areas most at risk from compaction.

The effects of soil compaction can be detrimental to grass and root growth, reducing the ability of grass to pick up nutrients, particularly nitrogen and water, from the soil. It creates conditions for waterlogging and poaching and increases the risk of runoff, leading to soil and nutrient loss. Wet soils stay colder for longer,

reducing the number of available grazing days. They can also make harvesting difficult, which is likely to reduce the quality of the resulting silage. Runoff from compacted soils is 50–60% higher than on aerated healthy soils.*

*Agriculture and Horticulture Development Board (AHDB), 2016



HOW

Managing soil compaction is one of the most effective treatments farmers can undertake to reduce overland flow and lower flood risk. It can help to increase the amount of water held in the soil over a wide area.



CONSTRUCTION AND CONSIDERATIONS

Techniques include:

- Mechanically aerating soils using spiked aerators. Undertake minimal tillage for arable crops or when considering re-seeding
- Managing crop rotation and reducing livestock density through livestock rotation
- Avoid using heavy machinery on wet soils to further protect from compaction
- Creation of hardstanding areas or regular moving of feed and water troughs can help reduce localized soil compaction
- To create a hardstanding area, the soil must be dug to a depth of at least 150mm and the areas extended around the trough to at least 2.5m wide. A geotextile membrane can be laid down before the hardcore and edged with timber.



BENEFITS

- Reduces runoff and soil compaction over a wide area
- Improved fertiliser uptake and reduced fertiliser input needed
- Promotes strong root growth
- More efficient crop growth
- Increased grass cover due to longer water availability
- Reduction of muddy areas in key locations
- Improves water quality by reducing runoff and soil loss into streams.



LEVEL OF MAINTENANCE

Possible requirement: **LOW**



KEY LOCATIONS

Any field below the moorland line, particularly where water is seen to flow across the surface in high rainfall events. Also fields used for winter grazing.



COSTS

Set-up cost: **LOW**

Maintenance cost: **LOW**

Payments are available for hard bases under Countryside Stewardship, mid and higher tier providing the land is eligible.

Payments cannot be claimed for hard bases within 10m of a waterway or under livestock housing that is not associated with feed or drinking.



ADDITIONAL INFORMATION

Festulolium research – www.sureroot.uk

Soils – <https://ahdb.org.uk/greatsoils>

INTERVENTION LEVEL 1

PLANTING AND MANAGING HEDGEROWS

Hedgerows are an intrinsic part of the landscape within many parts of the Derbyshire countryside and, along with dry-stone walls, act as field boundaries. Historically, many have been removed to allow larger parcels of land to be farmed. They act as a valuable shelter belt for both crops and livestock, and help reduce wind erosion of soils.

Hedgerows provide habitat for many farmland birds and wildlife species, but also perform a natural flood management function by trapping sediment and slowing water flow between fields, similar to buffer strips.



Hedgerow © Chris Gomersall 2020VISION



HOW

Hedgerows reduce the volume of runoff by promoting rainfall infiltration into the soil and reducing the rate of runoff.

They remove water faster from the soil than crops during periods of excessive rainfall through increased evapotranspiration.

They trap sediment and reduce sediment flow into watercourse.



CONSTRUCTION AND CONSIDERATIONS

New planting: plant a double staggered row hedge using 4–6 plants per metre, with a distance between the rows of 1–1.5m.

Plant a varied row of trees between these hedging plants.

Use tree tubes (0.7m tall) to protect young plants from rabbit damage. Protect both sides of a new hedge with a stock proof fence, erected at least 1m from the centre of the hedge.

Planting should be carried out between November and March.

Up to 75% of the species can be thorns – for example, hawthorn and blackthorn. Consider a mix of shrub species, including hazel, guelder rose, rowan and holly, to enhance hedgerow for wildlife.



BENEFITS

- Creates areas of shelter and shade for livestock
- Trap and filter runoff, preventing loss of fertilisers, sediment and pesticides
- Animal health may also be improved through reductions in standing water from increased infiltration rates
- Limits spread of disease, reducing animal-to-animal contact
- Provide habitat for farmland birds and beneficial insects.



LEVEL OF MAINTENANCE

Possible requirement: **HIGH**

Newly planted hedges will require annual maintenance until at least 1.5m tall, particularly with regard to weed control, cutting every two years from then on to ensure life of hedgerow. Cutting to a box shape will increase benefits for wildlife, as well as shelter for stock. The laying of hedge every 12–15 years will increase wildlife benefits and the overall health of the hedge.



KEY LOCATIONS

Consider planting a new hedge across a slope where runoff occurs or perpendicular to the river in a floodplain.

Where hedgerows have been lost from an area or the network is very fragmented.

Restoration and management in areas where there are good networks of hedgerows.



COSTS

Set-up cost: **MEDIUM**

Maintenance cost: **LOW**

Countryside Stewardship (CS) scheme capital grants – mid and higher tier, hedgerows and boundaries grant.



ADDITIONAL INFORMATION

Countryside Stewardship (CS) scheme – <https://www.gov.uk/government/collections/countryside-stewardship-get-paid-for-environmental-land-management>

INTERVENTION LEVEL 1

PLANTING TREES AND WOODLAND MANAGEMENT

Well-sited and well-managed upland, floodplain and riparian woodland can provide a wealth of benefits. They offer important wildlife habitat, and increased canopy shade and shelter for water-based flora and fauna. They can also provide shade and shelter for livestock, and prevent damage to crops and soil erosion.

There is growing interest in the potential to use woodland measures to help reduce flood risk. The Forestry Commission (FC) has been directly involved in a number of trials and demonstration projects – for example, at Pickering. These projects have shown that looking after existing native woodlands and plantations, and targeting certain areas for tree planting, will significantly slow overland flow of water and reduce river bank erosion within that area.

The roots of bankside trees and associated vegetation help to bind and strengthen stream banks, reducing the risk of bank collapse, erosion and siltation.



HOW

Planting of trees increases the roughness of the vegetation, slowing the flow of water during a flood event.

It reduces the volume of runoff, by promoting rainfall infiltration into the soil and reducing the rate of runoff.

Well-managed woodland cover can increase the capture and evaporation of rainfall.

Interception can reduce the amount of rainfall reaching the ground by as much as 45%, or more for some types of woodland. A reduction of even half of this amount could therefore make a major contribution to flood control.

CONSTRUCTION AND CONSIDERATIONS

Existing woodlands should ideally be fenced from livestock to encourage tree regeneration and increase vegetation under the canopy.

New planting will need protecting from livestock grazing.

Under-planting of shrubs and young tree saplings improves the infiltration rates of existing woodland.

For new areas, link up with existing woodland or hedgerows to create a wildlife corridor effect.

Works well alongside the leaky woody dam technique.

BENEFITS

- Creates areas of shelter and shade for livestock
- Reduces floodwater damage on productive farmland and can trap and filter runoff, preventing loss of fertilisers, sediment and pesticides.



LEVEL OF MAINTENANCE

Possible requirement: **LOW**

for management of existing woodland

MEDIUM

for native woodland creation. Initial maintenance tasks would include weeding, checking or straightening guards, and replacing failed trees as the plantation becomes established. Guards will need to be removed when the trees are grown.



KEY LOCATIONS

Throughout the catchment – in particular, remote upper catchment areas.

Across slopes following a contour.

Existing woodlands, plantations and shelter belts.

Alongside watercourses.



COSTS

Set-up cost:

MEDIUM

Maintenance cost:

LOW

Possible funding routes include Countryside Stewardship (CS) scheme – higher and mid tier, as well as initiatives from the Woodland Trust.



ADDITIONAL INFORMATION

Countryside Stewardship (CS) scheme woodland grants – www.gov.uk/government/publications/countryside-stewardship-woodland-management-plan-grant-manual-2017
Basic Payment Scheme (BPS) – www.gov.uk/government/collections/basic-payment-scheme

INTERVENTION LEVEL 1

WINTER COVER CROPS

Winter cover crops are non-cash crops that can be grown on land that would otherwise be left bare over the winter months after harvest. They help to reduce nitrate leaching and may also reduce the risk of potential pollutants, such as sediment and nutrients being carried into neighboring watercourses.

Winter cover crops help to reduce overland flow, prevent soil erosion and increase the health and permeability of soil.



Winter crop cover © Paul Harris 2020VISION



HOW

Sow any plant that can grow throughout the winter. Do not destroy until immediately before establishment of following spring crop. You can use phacelia, vetch, ryegrass, grazing rye, barley and mustard, or a mix of these depending on local conditions and needs.



CONSTRUCTION AND CONSIDERATIONS

Sow plants that have the ability to grow throughout the winter. Leaving crop residues throughout winter can also act to protect the soil surface and increase infiltration.

Deep-rooting plants will provide additional benefits by loosening compacted soils. Using cover crops may require altering the arable rotation away from winter drilling towards spring.

Can be used as part of Ecological Focus Area (EFA) for the Basic Payment Scheme (BPS) when two species of cover crop are grown.



BENEFITS

- Slows runoff by increasing land roughness
- Conserves soil moisture
- Prevents soil erosion
- Returns nitrogen to the soil, reducing fertiliser costs
- Deep rooting plants will improve the soil quality over the years by loosening compacted soils, improving the nutrient content and increasing soil biological activity
- Cover crops can be used in CAP Ecological Focus Areas and crop diversification, if you use 2 species of crop.



LEVEL OF MAINTENANCE

Possible requirement: **LOW**



KEY LOCATIONS

Works well on arable or temporary grassland adjacent to watercourses, particularly on sloping fields. As well as areas where water is seen to flow across the surface in high rainfall events in lower parts of a catchment.



COSTS

Set-up cost: **LOW**

Maintenance cost: **LOW**

Certain types of cover crop can be grant-aided through the Countryside Stewardship (CS) scheme.



ADDITIONAL INFORMATION

Payments are available under Countryside Stewardship for mid and higher tier providing the land is eligible.

Cover crops –

www.cfeonline.org.uk/5-winter-cover-crops

<https://cereals.ahdb.org.uk/media/655816/is41-opportunities-for-cover-crops-in-conventional-arable-rotations>

Countryside Stewardship (CS) grants –

<https://www.gov.uk/government/publications/countryside-stewardship-mid-tier-including-water-quality-capital-items-manual>

INTERVENTION LEVEL 1

CROSS DRAINS IN FARM TRACKS

Tracks provide a significant transport pathway for water and sediment. This creates problems with erosion of the track and deposition of sediment on farmland, roads or watercourses. Tracks are costly to repair but are essential to the farm. A cross drain is a system to move water across a path or route and can be used to collect runoff from a vulnerable area. Water can be diverted to places of vegetation to slow down the flow.



HOW

Cross drains divert the main pathway of water, reducing flow volume, velocity and sediment load. When used with a sediment trap, they can slow the flow of storm water significantly.



CONSTRUCTION AND CONSIDERATIONS

On steep slopes or where runoff volume is high, a number of cross drains will be required, located at specific intervals along the track.

Can be linked with swales and sediment traps alongside the track to encourage sediment to drop out of the water.

Also prevents sediment being washed onto grassland. The size of the cross drain will depend on local conditions. Small drains are typically 0.1 x 0.1m, constructed of concrete, wood or clay pipe. For heavy rainfall, 0.2 x 0.2m drains can be constructed from stone or wood.



BENEFITS

- Farm tracks suffer from less erosion and last longer
- Stone and sediment caught in traps can be re-used on the track, saving time and money
- Potentially reduces pooling of water at the end of the track.



LEVEL OF MAINTENANCE

Possible requirement: **LOW**

Cross drains should be inspected, cleaned out, or reshaped to original capacity after each major storm.



KEY LOCATIONS

Tracks on steep hillsides, adjacent to yards or roads, or within close proximity of a watercourse.



Pathway erosion © Peter Haynes



COSTS

Set-up cost:

LOW

Maintenance cost:

LOW

Countryside Stewardship (CS) scheme. Local Rivers Trusts (RT) in their project areas.



ADDITIONAL INFORMATION

Countryside Stewardship (CS) grants –

www.gov.uk/countryside-stewardship-grants/cross-drains-rp5

INTERVENTION LEVEL 1 INVASIVE SPECIES CONTROL

Removal of invasive, non-native species of plants will help to ensure healthy, diverse vegetation throughout the catchment. Invasive species, such as Himalayan balsam, can establish on river banks and will outcompete the native plant species and destroy understory vegetation. Himalayan balsam then dies down in winter, leaving river banks free of vegetation and therefore susceptible to runoff and erosion. Japanese knotweed and rhododendron can have a similar effect.

Controlling invasive species and allowing native species to re-establish will ensure maximum absorption capacity of soil and reduce runoff and erosion.



Himalayan balsam © Gillian Day

HOW

Physical control, such as removing plants and disposing of them off-site, or chemical control, by spraying with herbicide.

Seeds are often carried down the river, so it is best practice to start at the head of the catchment and work downstream. This will help control invasive species on a catchment scale.

CONSTRUCTION AND CONSIDERATIONS

N/A

BENEFITS

- Ensures maximum absorption capacity of soil
- Reduces runoff and erosion
- Removes competition for native plants allowing deep rooted native species to colonise
- Reduces the risk of invasive species colonising areas further down the catchment.

ADDITIONAL INFORMATION

www.himalayanbalsam.cabi.org/what-is-himalayan-balsam/
Environment Agency Guide on Aquatic and Riparian Plant Management – Controls for Vegetation in Watercourses: <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/aquatic-and-riparian-plant-management-controls-for-vegetation-in-watercourses>

LEVEL OF MAINTENANCE

Possible requirement: **MEDIUM**

Regular maintenance may be needed depending on effectiveness of control methods.

KEY LOCATIONS

Throughout catchment. Riverbanks.

COSTS

Set-up cost: **LOW**

Maintenance cost: **MEDIUM**

Payments are available under Countryside Stewardship for land that is grazed and located next to ditches, rivers or streams under the SW11: Riparian management strip option. This is providing the land meets the requirements. This option, however, must address other factors in addition to invasive species, such as restricting livestock access to the watercourse.

More information can be found online:

<https://www.gov.uk/countryside-stewardship-grants/riparian-management-strip-sw11>

INTERVENTION LEVEL 2

FIELD BOUNDARIES

Planting new hedgerows, or restoring historic dry-stone walls that follow the natural contour of the slope, will reduce overland flow and encourage infiltration. Hedgerows and dry-stone walls can be combined with buffer strips to further increase the NFM benefit and create additional habitat for wildlife.

Planting new or restoring old hedgerows and repair and restoration of dry-stone walls can block overland flows, reduce soil erosion and diffuse pollution. Planting of hedgerows that follow the contours of the land can intercept and slow runoff. Hedgerows and dry-stone walls can also be used to direct or control movement of animals and machinery away from areas vulnerable to erosion.



Dry Stone Walling © Ben Wolstencroft

HOW

November is generally the best time to plant new hedgerows; however, if planting into clay soils wait until March. Planting should not be undertaken in freezing weather or waterlogged ground. If the landscape is characterised by single-species hedgerows then the planting mix should reflect this.

CONSTRUCTION AND CONSIDERATIONS

No one species should make up more than 70% of the total. If new hedgerows are planted, consider linking existing hedgerows and habitats. Fence off the plants if sheep, cattle or horses graze the land. Keep fences far enough away so the hedgerow can grow at least 1.5m in width. Rabbit netting may be needed, either on its own or with stock fencing, if there is a known problem with rabbits or hares. Tree shelters can also be used.

Prepare the ground along a 1.5m wide strip to provide good soil conditions and as little competition from other vegetation as possible.

Plants should be:

- 2-year-old transplants
- at least 450mm high
- planted in a staggered double row 40cm apart with a minimum of 6 plants per metre
- kept clear of weeds until they are established.

Remove individual guards and tree shelters once the plants are established.



LEVEL OF MAINTENANCE

Possible requirement: **MEDIUM**

Newly planted hedgerows will require annual maintenance. New hedgerows should be trimmed in at least the first 2 years to encourage bushy growth, allowing the hedge to become taller and wider at each cut. Competitive weeds should be controlled (including brambles, nettles and grasses) during the first growing season.

Prevent livestock and grazing animals from damaging the hedge by setting fencing at least 1.2m from the centre of the hedge, or, if there is a bank, as close to the base of the bank as possible.



COSTS

Set-up cost: **MEDIUM**

Maintenance cost: **MEDIUM**

Countryside Stewardship Scheme capital grants (mid and higher tier) are available, such as:

- BN11: Planting new hedges
- BN12: Stone wall restoration

INTERVENTION LEVEL 2

FIELD BOUNDARIES CONTINUED



BENEFITS

- Reduces runoff and prevents loss of fertilisers and pesticides
- Reduces soil erosion and encourages infiltration
- Creates wildlife habitat and important food supplies
- Works well with buffer strips
- Creates shade and shelter for livestock
- Can prevent animal-to-animal contact, reducing the spread of disease.



ADDITIONAL INFORMATION

More information is available online:

www.gov.uk/countryside-stewardship-grants/planting-new-hedges-bn11

www.gov.uk/countryside-stewardship-grants/stone-wall-restoration-bn12



KEY LOCATIONS

Throughout catchment. Particularly across steep-side fields where runoff is known to occur. Not suitable on blanket bog.

Suitable where hedgerows have been lost from an area or become fragmented.



INTERVENTION LEVEL 2

CONTOUR BUNDS AND DETENTION BASINS

Contour bunds are low earth mounds that are built to follow the contour of the slope. These work most effectively when constructed across known runoff pathways which appear after heavy rainfall. Through creating the contour bund, a detention area is made, where water can be retained and allowed to disperse through a combination of infiltration into the soil, evaporation and slow release.

Detention basins can be designed so that the area is normally dry and can remain productive, as well as providing an opportunity for reclaiming soil and nutrients, or they can be designed to encourage the development of wetland habitat. Alternatively, levels can be set to encourage the development of wetland habitat within the flood storage area by permanently retaining some water.

Creation of bunds across known runoff pathways can intercept water flowing over the ground, slow the flow and redirect runoff. Bunds can also be used to direct or control movement of animals and machinery away from compaction sensitive areas. Detention



HOW

Design of bunds should take into account the contour of the surrounding land, the position in the landscape, and the soil type. Detention areas should be sized for the area draining into it. Specialist advice may be required.



CONSTRUCTION AND CONSIDERATIONS

Design of the bunds or detention basin should be site-specific and carried out by a land drainage specialist.

Detention areas should be sized for the area draining into it.

Design of bunds should take into account the contour of the surrounding land, the position in the landscape, and the soil type.

The location of these solutions may well be suggested by the reaction of the landscape to heavy rainfall. Their design should be tailored to each distinct location.

Consideration should be given to where the water would go if the storage area becomes full and the bund overtopped. These exceedance flowpaths should not create a new flood risk area.

Permanent standing water will be classed as ineligible features under the Basic Payment Scheme (BPS) rules if they are 0.01 hectares, or if together they add up to 0.01 hectares or more. Bigger features will be mapped by the Rural Payments Agency (RPA) and farmers must deduct them from their eligible areas. An impoundment licence from the Environment Agency may be needed if the structure affects a river, stream or lake.

Flooded agricultural land is still eligible for BPS if the flooding is temporary and the land would otherwise still be available for agricultural activity. Deliberate and planned flooding of

agricultural land to create new watercourses and permanent wetlands, is not considered to be a temporary flooding event as the land is not being maintained in a state suitable for grazing or cultivation which is the primary eligibility factor for BPS.

- Can impact livestock movements through fields
- Can make cutting and mowing practices more complex



BENEFITS

- Directly intercepts and redirects runoff
- Reduces soil erosion and diffuse pollution
- If bunds are grassed and permanent, they can provide additional wildlife habitat
- Bunds can be engineered in such a way as to provide access to fields in times of flood which would otherwise be inaccessible
- Detention basins and bunds provide opportunity for nutrient reclamation.



LEVEL OF MAINTENANCE

Possible requirement: **MEDIUM**

Require regular inspection to ensure that they are intact and the area behind the bund is not filled with silt.

Dependent on the scale and design.

Arrangements for on-going maintenance may need to be submitted as part of any planning application.

INTERVENTION LEVEL 2

CONTOUR BUNDS AND DETENTION BASINS CONTINUED



KEY LOCATIONS

Small slopes prone to runoff during flood events. Areas where runoff with a heavy sediment load is known to compromise local drainage.



COSTS

Set-up cost:

MEDIUM

Maintenance cost:

MEDIUM

Funding options: Countryside Stewardship Scheme

Countryside Stewardship Scheme grants (capital items) for mid and higher tier are available for eligible land, such as:

RP9 Earth banks and soil bunds

RP7 Sediment ponds and traps

More information is available online:

<https://www.gov.uk/countryside-stewardship-grants/earth-banks-and-soil-bunds-rp9>

<https://www.gov.uk/countryside-stewardship-grants/sediment-ponds-and-traps-rp7>



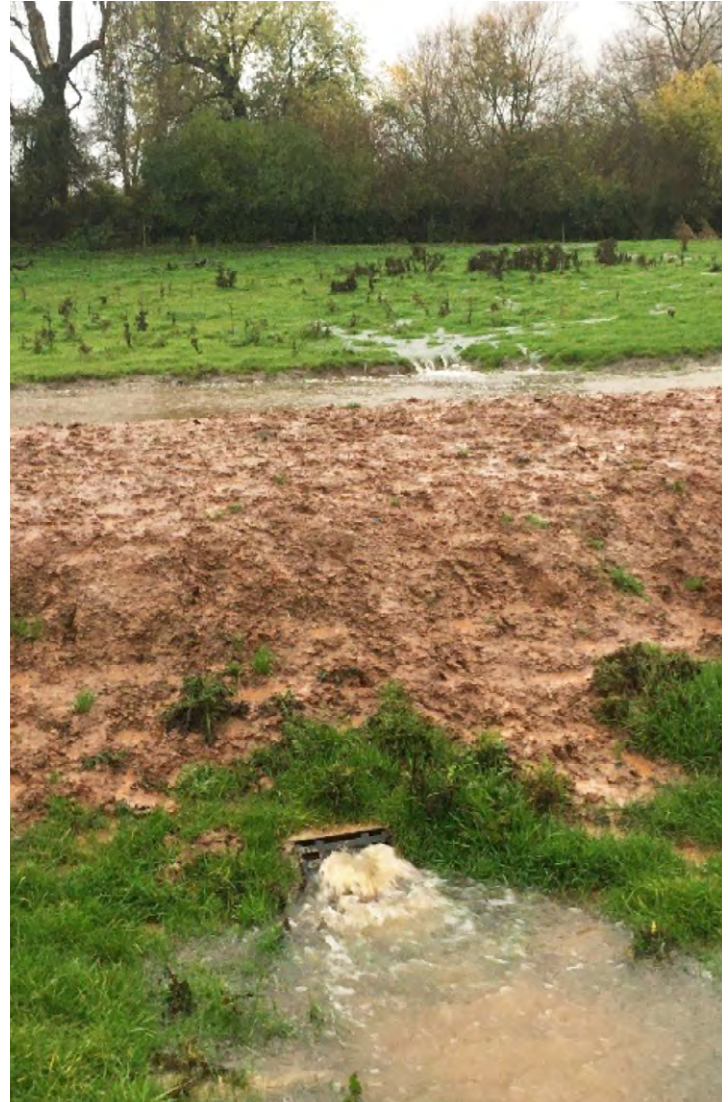
ADDITIONAL INFORMATION

<https://www.derbyshire.gov.uk/environment/flooding/suds/sustainable-drainage-systems-suds.aspx>

www.susdrain.org/resources/ciria-guidance.html

Basic Payment Scheme (BPS) criteria –

www.gov.uk/government/collections/basic-payment-scheme



INTERVENTION LEVEL 2

LEAKY BARRIERS

Leaky barriers can be constructed in a variety of locations across the catchment. These structures are often built from logs and woody materials and are placed in streams or ditches to hold back water. Where possible, these structures are designed to mimic the natural complexity of rivers and create a variety of habitats and flow conditions.

Leaky barriers slow and divert flood flows and allow increased infiltration of water into the soil. They are designed to slowly drain trapped water once the flood flow has passed. Leaky barriers are set above normal stream level so only flood flows are blocked. A network of leaky barriers work well on a local scale to control channel flows.

HOW

Large logs can be laid across small streams in a cross formation and wedged into position. Smaller woody material can be wedged in between the large logs. To maximise impact, it is recommended to place more than one leaky barrier at different locations across the land holding.

If possible, use locally sourced wood from the catchment. Debris bundles can also be constructed in wooded areas to further roughen the surface of the floodplain and trap overland flows.

CONSTRUCTION AND CONSIDERATIONS

- Risk of woody material moving further downstream
- It is recommended to consider the potential impacts downstream and to follow design standards (such as those available from the Forestry Commission)
- Surrounding land may need to be capable of withstanding periodic flooding due to spillover when there is a high rainfall event
- Requires consent of Lead Local Flood Authority (LLFA).

BENEFITS

- Delays flood peaks further downstream
- Traps sediment
- Can provide additional habitat for fish and invertebrates
- Low cost and effective
- Can be designed to incorporate a silt trap, improving water quality
- Reduces runoff.

LEVEL OF MAINTENANCE

Possible requirement: **MEDIUM**

May require periodic checking to ensure the integrity of the leaky barriers and remove any sediment or blockages where necessary. High longevity if well maintained.



Leaky barrier at New Mills © Environment Agency

KEY LOCATIONS

Throughout catchment, often alongside wooded areas in smaller watercourses. Leaky barriers work well alongside other woodland measures, such as understorey planting.

Leaky barriers can also be constructed in ditches in open farmland, as well as in small upland ditches in open land, away from woodland and flowing channels. Due to possible effects on fish passage, in-ditch barriers are more suited to small watercourses and ditches where fish passage is less important, or where the watercourse runs dry during the summer months.

COSTS

Set-up cost:

MEDIUM

Maintenance cost:

LOW

Funding is available through the Woodland Improvement Grant (WIG): <https://www.gov.uk/guidance/legacy-woodland-grants-and-obligations#english-woodland-grant-scheme>

Countryside Stewardship Scheme grants (capital items) for mid and higher tier are available for eligible land, such as:

RP12: Check dams

More information is available online:

www.gov.uk/countryside-stewardship-grants/check-dams-rp12

ADDITIONAL INFORMATION

Case study at Pickering: <https://www.forestresearch.gov.uk/research/slowing-the-flow-at-pickering/slowing-the-flow-at-pickering-about-the-project/>

INTERVENTION LEVEL 2

EROSION CONTROL ON SLOPES AND BANKS

Different materials, such as fascines (bundles of sticks) and geotextiles, can be installed on slopes to stabilise areas at risk of erosion, and assist the establishment of vegetation.

These materials are used to strengthen slopes and riverbanks, trap sediment, reduce soil loss and provide a structure to allow additional vegetation to establish.



Slope erosion © Peter Haynes

HOW

Fascine structures can be made according to the scale of the slope or riverbank under management. They can be constructed in a series of rows on a slope, within an erosion scar or landslide, or as a bank running alongside a river or stream. Local woodland managers can provide fascines made from thinning.

Geotextiles are usually natural mesh sheets which can be installed in the soil to hold it together and facilitate vegetation. Geotextiles can be purchased in quantities according to the needs of the local site.

BENEFITS

- Reduced erosion and reduced transfer of sediment into rivers
- Reduced runoff
- Allows establishment of vegetation for long term stabilisation.

KEY LOCATIONS

Throughout catchment. Steep slopes, riverbanks, anywhere prone to erosion.

LEVEL OF MAINTENANCE

Possible requirement: **LOW**

Inspection may be needed to ensure that the installation remains in place and that vegetation is reestablishing on the slope.

COSTS

Set-up cost: **MEDIUM**

Maintenance cost: **LOW**

Possible funding through Countryside Stewardship scheme.

ADDITIONAL INFORMATION

www.treesresponsibility.com

www.treesresponsibility.com/wp-content/uploads/2013/09/SOURCE-2015-booklet.pdf

SOURCE-2015-booklet.pdf

INTERVENTION LEVEL 2

SWALES

Swales are linear, shallow, vegetated drainage features that convey and store surface water and provide the opportunity for infiltration and water treatment by encouraging settlement.

They can be built in combination with bund detention areas, or on their own to channel and redirect water flow that happens after heavy rain.

They are easily incorporated into the landscape, and the increased roughness of the vegetated channel helps to slow the flow of water. This can be reduced further by the introduction of check dams and berms across the swale.



HOW

Swales reduce runoff rates by slowing over-land flow. They reduce volume of runoff by increasing the opportunity for infiltration and evaporation. Swales trap sediment which can reduce the function of neighbouring watercourses and drainage systems.

CONSTRUCTION AND CONSIDERATIONS

Design of the swales should be site specific and take into account the contour of the surrounding land, the position in the landscape, and the soil type.

The location of these solutions may well be suggested by the reaction of the landscape to heavy rainfall. Their design should be tailored to each location.

Consult with the Rural Payments Agency (RPA) about eligibility for the Basic Payment Scheme (BPS) as a swale may be considered a 'new watercourse' which would render that area as an ineligible feature.

BENEFITS

- Reduces soil loss and surface scour
- Provides pollutant treatment by allowing settlement.

LEVEL OF MAINTENANCE

Possible requirement: **LOW**

Low, though some vegetation control may be required. Maintenance is increased by the addition of structures within the swale.

Removal of sediment and re-spreading onto land will require a waste exemption licence from the Environment Agency (EA).

KEY LOCATIONS

Shallow slopes prone to runoff during flood events.

Areas where runoff with a heavy sediment load is known to compromise local drainage.

COSTS

Set-up cost: **MEDIUM**

Maintenance cost: **LOW**

Possible funding through Countryside Stewardship scheme.

ADDITIONAL INFORMATION

Swale design –

<http://adlib.everysite.co.uk/adlib/defra/content.aspx?id=000HK277ZX.0HCIIG33ALM59DZ>

INTERVENTION LEVEL 2

SEDIMENT TRAPS

A sediment trap is a containment area that interrupts the flow path and allows silt and sediment to settle. A sediment trap can be simply an excavation with an inlet and an outlet, or a more complex series of chambers. Sediment traps are unlikely to provide significant flood prevention on their own, but provide very useful function when used in conjunction with other measures.



HOW

A small excavation is created, usually with a gravel outlet. Rocks and vegetation around the outlet will protect against erosion. Access will need to be provided for dredging. Generally the larger the basin, the greater the removal efficiency. The design should accommodate peak flows.

CONSTRUCTION AND CONSIDERATIONS

Land and maintenance requirement.

Bund height should be created from compacted subsoil and should not exceed 1.3m. The slope of the sides should be less than 1 in 4 or gentler and vegetated. Where a bund is used to create a sediment trap (such as in a low corner of a field) the field side bank should be as gentle as possible, ideally no steeper than 1 in 20, to provide a filter strip function. Ensure access is provided for dredging.

The size will depend on runoff volumes to be intercepted; however, the greater the scale, the greater the removal efficiency. Consent may be required to remove and spread sediment caught in a sediment trap. Sediment traps are not intended to treat wastewater or effluents.

Sediment traps will be classed as ineligible features under the Basic Payment Scheme (BPS) rules if they are 0.01 hectares, or if together they add up to 0.01 hectares or more. Bigger features will be mapped by the Rural Payments Agency (RPA), and farmers must deduct them from their eligible areas.

BENEFITS

- Can be scaled up or down according to needs of site
- Suitable for small drainage catchments
- Improves water quality
- Retains washed-off top soil allowing for respreading
- Enhances longevity of other NFM measures, such as in-ditch barriers and ponds.

LEVEL OF MAINTENANCE

Possible requirement: **LOW**

Sediment traps will need to be regularly emptied. The frequency will depend on the area being drained and how much sediment is carried by the stream or ditch.

Removal of sediment and re-spreading to land will require a waste exemption license from the Environment Agency

KEY LOCATIONS

Sediment traps should be used within an area where surface runoff flows downhill. Adjacent to, or within, ditches.

COSTS

Set-up cost: **LOW**

Maintenance cost: **LOW**

Funding options include countryside stewardship scheme and local rivers trusts, if land falls within their project areas.

ADDITIONAL INFORMATION

Agri-environment scheme guidance on sediment traps and bunds

www.ruralpayments.org/publicsite/futures/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/rural-sustainable-drainage-systems---sediment-traps-and-bunds/guidance-for-sediment-traps-and-bunds/

INTERVENTION LEVEL 2

OFFLINE FLOOD STORAGE AREAS (PONDS)

Offline flood water storage areas are areas of land adjacent to water courses that are adapted to capture and store flood waters during periods of high flow. These are often situated within a flood plain, and can be designed to hold some water permanently, which may add to the wildlife value of the land. Flood water is directed out of the watercourse and into a pre-constructed storage area. The flood water is then stored temporarily and is released back into the watercourse in a controlled manner. This provides extra storage capacity for water during flood events.



NFM storage pond in Leicestershire © Environment Agency



HOW

Offline flood water storage areas require specialist design and construction and a suitable site needs to be selected. It is recommended to create an irregular shape for water storage, and inlets, outlets and spillways will need to be constructed. A liner may be required. Offline flood water storage should drain within 6–10 hours, so that there is storage available in the eventuality of multi-day extreme flood events.



CONSTRUCTION AND CONSIDERATIONS

- Requires land
- Flooded agricultural land is still eligible for BPS if the flooding is temporary and the land would otherwise still be available for agricultural activity. Deliberate and planned flooding of agricultural land to create new watercourses and permanent wetlands, is not considered to be a temporary flooding event as the land is not being maintained in a state suitable for grazing or cultivation which is the primary eligibility factor for BPS.



BENEFITS

- Removes sediment from the channel which can be reused on the farmland
- The depth and speed of drainage can be manipulated according to the needs of the farmer
- Can be a valuable community asset if well designed
- Provides rich wildlife habitat
- Retention of water is also beneficial in times of drought.



LEVEL OF MAINTENANCE

Possible requirement: **MEDIUM**

Requires maintenance for removal of sediment and debris, which can vary from monthly to yearly according to need and whether the pond has a sediment trap. Management of vegetation may also be required.



KEY LOCATIONS

Throughout the catchment near to watercourses. At the bottom of the slopes, particularly in fields draining to a single corner.



COSTS

Set-up cost: **HIGH**

Maintenance cost: **LOW**

Countryside Stewardship Scheme grant options for higher tier are available for eligible land, such as:

SW12 making space for water

More information is available online:

<https://www.gov.uk/countryside-stewardship-grants/making-space-for-water-sw12>



ADDITIONAL INFORMATION

The Runoff Attenuation Features Handbook (Newcastle University and the Environment Agency):

research.ncl.ac.uk/proactive/belford/papers/Runoff_Attenuation_Features_Handbook_final.pdf

INTERVENTION LEVEL 2

ONLINE FLOOD STORAGE AREAS (PONDS)



NFM pond in Leicestershire © Environment Agency

Online (in stream) ponds are a depression or basin on land through which a water channel flows. This feature can be designed to store some water permanently, depending on the individual requirements.

Online ponds provide water storage capacity during storm events. The water slowly drains from the pond once the flood period has passed.



HOW

Construction of a basin or ditch connected to the stream. Construction can depend upon the local needs of the site. The pond can include an armored spillway to avoid erosion damage when overtopped.



CONSTRUCTION AND CONSIDERATIONS

- Flooded agricultural land is still eligible for BPS if the flooding is temporary and the land would otherwise still be available for agricultural activity. Deliberate and planned flooding of agricultural land to create new watercourses and permanent wetlands, is not considered to be a temporary flooding event as the land is not being maintained in a state suitable for grazing or cultivation which is the primary eligibility factor for BPS.



BENEFITS

- Reduces runoff
- Removes sediment from the channel which can be reused on the farmland
- Can be designed to incorporate a silt trap, improving water quality
- The depth and speed of drainage can be manipulated according to the needs of the farmer
- Can act as a year-round wetland providing additional wildlife habitat
- Retention of water is also beneficial in times of drought.



LEVEL OF MAINTENANCE

Possible requirement: **MEDIUM**

Requires maintenance for removal of sediment and debris, which can vary from monthly to yearly according to need and whether the pond has a sediment trap. The pond may also require management of vegetation.



KEY LOCATIONS

Areas of low lying topography, adjacent to the watercourse.



COSTS

Set-up cost:

HIGH

Maintenance cost:

LOW



ADDITIONAL INFORMATION

The Runoff Attenuation Features Handbook (Newcastle University and the Environment Agency, 2011):

research.ncl.ac.uk/proactive/belford/papers/Runoff_Attenuation_Features_Handbook_final.pdf

INTERVENTION LEVEL 2

BLOCKING MOORLAND DRAINAGE GRIPS

A series of dams can be used to block grips (man-made drainage channels) and gully systems (naturally occurring drainage channels) in moorland areas. This raises the water table, creating a habitat for plant species, especially Sphagnum mosses, which help the bog act as a water storage facility. This work is often undertaken in conjunction with work to restabilise blanket bog which may require revegetation and inoculation with moorland species. Gully blocking is particularly applicable on drained moorland and in grips or gullies that are actively eroding. Blocking of grips and gullies aims to convert traditionally drained moorland back to active blanket bog. This reduces runoff and slows water down during flood events.



Gully with stone dams on the roaches © Environment Agency

HOW

Different types of dams can be used. These include heather bales, machine built peat dams, plastic dams, stone dams and timber dams. Specifics for dam installations can be found in the fact sheet links below.

CONSTRUCTION AND CONSIDERATIONS

- Can alter access to moorland.

BENEFITS

- Slows the flow of water, raising the water table
- Re-wetting reduces severity of wildfire
- Reduced soil erosion and reduced transfer of sediment into rivers
- Can reduce the need for hard engineering flood risk measures lower down in the catchment.

LEVEL OF MAINTENANCE

Possible requirement: **LOW**

Well-implemented grip and gully blocking work requires minimal maintenance. Periodic inspection of some dam types may be beneficial. In bare peat areas on blanket bogs, revegetation of gullies and grips, in addition to blocking, is encouraged.

KEY LOCATIONS

Upper catchment, in areas of drained and eroded moorland.

COSTS

Set-up cost:

MEDIUM

Maintenance cost:

LOW

Cost is dependent on scale and complexity. Will require specialist help for a technical assessment before installation. There are peatland restoration partnerships which can advise on funding for these interventions.

Moors for the Future Partnership funding information:

www.moorsforthefuture.org.uk/working-with-privatelandowners

Yorkshire Peat Partnership (YPP):

www.ypppartnership.org.uk

Factsheets are available that give detail on the different types of dam and their relative strengths and weaknesses:

<https://www.moorsforthefuture.org.uk/our-work/restoring-blanket-bog/working-with-water>

ADDITIONAL INFORMATION

Managing blanket bog:

<https://www.moorsforthefuture.org.uk/our-work/our-projects/moorlife2020/conservation-works/blanket-bog-land-management-guidance>

INTERVENTION LEVEL 2

STABILISATION AND REVEGETATION OF BLANKET BOGS

Creating or maintaining stable, vegetated blanket bog with a high water table on moorlands reduces the volume and slows the flow of water flowing off high ground. Water flows rapidly from exposed peaty soils, whereas active blanket bogs dominated by Sphagnum mosses and other moorland species can significantly increase absorption and slow the flow of water.

The intervention maximises the amount of water that can infiltrate peat soils and be stored by vegetation structure.



Bog © Mark Hamblin 2020VISION



HOW

Depending on extent of degradation, bare peat is stabilized with heather brush or geotextiles, treated with lime, seed and fertiliser mix to knit the surface, and then treated with moorland species including Sphagnum mosses to produce a functioning blanket bog.



CONSTRUCTION AND CONSIDERATIONS

- Removing livestock, such as sheep, from targeted areas of habitat restoration in upland areas can be a requirement for success.



BENEFITS

- Reduced risk of wildfire
- Reduced erosion and reduced transfer of sediment into rivers can reduce the need for hard engineering flood risk measures lower down in the catchment
- Improved biodiversity benefit for moorland species.



LEVEL OF MAINTENANCE

Possible requirement: **LOW**

High longevity



KEY LOCATIONS

Upper catchment. Areas of degraded blanket bog characterised by bare peat or dominated by heather or native grasses, sedges and rushes (graminoids) without a healthy mix of moorland species, including Sphagnum mosses.



COSTS

Set-up cost:

MEDIUM

Maintenance cost:

LOW

Medium – dependent on scale and complexity. Will require specialist help for a technical assessment before revegetation. There are peatland restoration partnerships which can advise on funding for these interventions.

Yorkshire Peat Partnership (YPP):

www.yppartnership.org.uk



ADDITIONAL INFORMATION

Factsheets are available that give detail on the different types of dam and their relative strengths and weaknesses:

<https://www.moorsforthefuture.org.uk/our-work/restoring-blanket-bog/working-with-water>

INTERVENTION LEVEL 3

RIVER AND FLOODPLAIN RESTORATION

Restoration of rivers and floodplains to a more natural state by removal of artificial engineering works and reversing alterations. Works can include restoration of meanders, removal of embankments, restoration of original river shape and revegetation with native species.

River and floodplain enhances the natural water retention capacity and function of the river and surrounding floodplain. The aims are to connect the river with its floodplain, to slow the flow and detain water for longer, and to reduce erosion caused by unnatural river behaviour.



Engineered channel in Long Eaton © Mark Hamblin 2020VISION

HOW

River and floodplain restoration generally requires collaboration with other stakeholders and experienced contractors.

Previous meanders and curves in the water course can be identified by historic aerial photographs and maps. The greatest benefit is achieved by targeting installation to wide, flat areas where there is little risk to property or infrastructure. A phased approach is necessary to enable controlled diversion of flow into the restored river course.

CONSTRUCTION AND CONSIDERATIONS

- Alteration of current channel form requires land
- Flooded agricultural land is still eligible for BPS if the flooding is temporary and the land would otherwise still be available for agricultural activity. Deliberate and planned flooding of agricultural land to create new watercourses and permanent wetlands is not considered to be a temporary flooding event, as the land is not being maintained in a state suitable for grazing or cultivation which is the primary eligibility factor for BPS.

BENEFITS

- Constrained channels have higher energy so bank erosion can be accelerated, and if embankments fail the effect is dramatic and can result in land loss and debris being deposited on the floodplain. Allowing more natural lower energy flooding reduces risk of bank and embankment failure, soil loss and enables land to drain back into the channel rapidly as levels fall
- Removes need for maintenance of artificial engineering works
- Reduces the peak flow at sensitive locations, such as road bridges or residential areas
- Can be achieved naturally in some cases, with minimal interventions to kick-start the process
- Provides rich wildlife habitat
- Wider community value.

LEVEL OF MAINTENANCE

Possible requirement: **HIGH**

The process of restoration can take many years. The Countryside Stewardship SW12 Making space for water option is about supporting farmers to let river channels “flex” as they would do naturally. This option lasts for 20 years, instead of the standard 5 years for the grant scheme, because the work needs a high level of change. Areas of restoration will need to be monitored over time to identify if any modifications are required to the restoration work.

Once restored, the level of maintenance should generally be low, as the river can function naturally.

KEY LOCATIONS

Lower catchment, in rivers and floodplains, where channel alteration and/or engineering has taken place.

COSTS

Set-up cost: **HIGH**

Maintenance cost: **MEDIUM**

Set-up cost is dependent on site, and specialist advice on funding may be needed.

Countryside Stewardship Scheme grant options for higher tier are available for eligible land, such as:

SW12 Making space for water

More information is available online:

<https://www.gov.uk/countryside-stewardship-grants/making-space-for-water-sw12>

ADDITIONAL INFORMATION

The River Restoration Centre Manual:

www.therrc.co.uk/MOT/Final_Versions_%28Secure%29/3.6_Dearne.pdf

www.therrc.co.uk/MOT/Final_Versions_%28Secure%29/1.11_Highland_Water.pdf

INTERVENTION LEVEL 3

WETLAND CREATION

Wetlands are normally shallow ponds and marshy areas covered almost entirely in vegetation. They are designed to accept runoff water that otherwise may discharge into a watercourse and to hold it for long enough to allow sediments to settle and for pollutants to be removed through plant uptake and breakdown in the soil. Wetlands can also provide significant biodiversity benefits. Designs for wetlands vary widely and can range from single-celled wetlands to systems with multiple stages.

Wetlands improve water quality by providing natural water filtering services, thereby removing sediment and pollutants from the water. Wetlands can also act as a water storage area during time of flood, and can reduce the flood peak downstream.



Wetlands © Jenny Morley



HOW

Wetlands should be designed with a significant storage capacity. Seasonality should be considered when selecting plant species.

Wetlands should not be created in areas where they may pose a flood risk to nearby property. This is because of the role they play as flood water storage areas.



CONSTRUCTION AND CONSIDERATIONS

- Requires land and maintenance
- Flooded agricultural land is still eligible for BPS if the flooding is temporary and the land would otherwise still be available for agricultural activity. Deliberate and planned flooding of agricultural land to create new watercourses and permanent wetlands is not considered to be a temporary flooding event, as the land is not being maintained in a state suitable for grazing or cultivation which is the primary eligibility factor for BPS.



BENEFITS

- Effective removal of water contaminants, including suspended solids and pathogens
- Functions well in cold conditions
- Retention of water year-round
- Can be a valuable community asset if well designed
- Possible creation of nature reserve and educational visits
- Provides rich wildlife habitat.



LEVEL OF MAINTENANCE

Possible requirement: **LOW**

Requires regular checking and removal of sediment if necessary. If the wetland becomes a community asset there may be need for communications with the community.



KEY LOCATIONS

Throughout catchment. Simple wetlands are more suited to a small-scale intervention plan on a single farm whereas more complex multi-staged wetlands can be designed in larger areas of the catchment.



COSTS

Set-up cost: **HIGH**

Maintenance cost: **LOW**

Set-up cost is dependent on site, and specialist advice on funding may be needed.

Countryside Stewardship Scheme grant options for higher tier are available for eligible land, such as:

SW12 Making space for water

More information is available online:

<https://www.gov.uk/countryside-stewardship-grants/making-space-for-water-sw12>



ADDITIONAL INFORMATION

www.trentrivertrust.org



CONSENTS AND PERMITS

Undertaking certain intervention measures for NFM may require consent prior to construction. This section gives information on the types of permits and consents required and who these will need to be obtained from.

PERMITS FOR WORKS IN MAIN RIVERS AND FLOODPLAINS AND CONSENTS FOR WORKS IN ORDINARY WATERCOURSES

Intervention treatments proposed to be undertaken on main rivers, floodplains and ordinary watercourses will require consents or permits prior to construction.

The type of consent or permit required will be dependent on the type of watercourse. Measures that are to be implemented on a main river or floodplain will require a permit from the Environment Agency.

Measures that are to be implemented on an ordinary watercourse will need consent from the Lead Local Flood Authority. It is recommended to implement each NFM measure to standard construction dimensions to enable faster approval.

Standard construction dimensions for NFM measures can be found in design standards and additional material from the Environment Agency, Moors for the Future Partnership, the Forestry Commission and other organisations found in the Contacts section below.

CONSENTS FOR WORKS ON LAND WITH PROTECTED STATUS

Intervention treatments that are proposed to be undertaken on land with protected status, such as Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC) and Special

Protection Areas (SPA), will require Natural England consent. Interventions on SAC or SPA land will also require a habitat regulations assessment from Natural England.

However on land with protected status, if permission is sought for interventions from another statutory body, such as the Environment Agency, or from work the local council has approved through the planning application process, then a separate consent will not be required from Natural England (if the statutory body or local council have consulted Natural England as part of the process).

PLANNING CONSENT

Planning consent may be required when constructing larger structures as intervention measures for NFM. A discussion about proposed work should be held with the local planning authority prior to construction.

SCHEDULED MONUMENTS

Consent will also be required for intervention measures proposed to be undertaken on or near to scheduled monuments.

INFORMATION ON LAND WITH PROTECTED STATUS

It is possible to find out whether your site has protected status by searching online using the websites listed below and by contacting the appropriate regulatory agencies using the contact details outlined in the table on the next page.

<https://www.gov.uk/guidance/protected-areas-sites-of-special-scientific-interest>

www.magic.gov.uk/home.htm

SUMMARY TABLE OF CONSENTS AND CONTACT DETAILS FOR REGULATORY AGENCIES

FEATURE	PERMIT/CONSENT FORM REQUIRED	CONTACT INFORMATION
Main river (including its flood plains and flood defences)	Environment Agency	Environment Agency Telephone: 03708506506 Email: enquires@environment-agency.gov.uk www.gov.uk/guidance/flood-risk-activities-environmental-permits
Ordinary watercourse	Local Lead Flood Authority	Local Council www.gov.uk/find-local-council
Scheduled monument	Historic England	Historic England Telephone: 0370 333 0607 www.historicengland.org.uk/advice/planning/consents/smc/
Site of Special Scientific Interest (SSSI)	Natural England	Natural England Telephone: 0300 060 3900 Email: enquiries@naturalengland.org.uk www.gov.uk/guidance/protected-areas-sites-of-special-scientific-interest
Special Area of Conservation (SAC) or Special Protection Area (SPA)	Natural England (will require a Habitats Regulation Assessment)	Natural England Telephone: 0300 060 3900 Email: enquiries@naturalengland.org.uk

SOURCES OF FUNDING AND GRANTS FOR NFM INTERVENTION MEASURES

The table below provides information on potential sources of grant funding to implement NFM measures.

SCHEME	WHAT IS AVAILABLE?	FURTHER INFORMATION
The Derbyshire Wildlife Trust Derwent Connections Project National Heritage lottery fund	Between June 2022 and March 2023 the Derbyshire Wildlife Trust will be working with local landowners to create natural flood management measures throughout the Derwent catchment.	Email: derwentconnections@derbyshirewt.co.uk Tell us: <ul style="list-style-type: none"> ■ Your Name ■ Contact Details (an email address or phone number) ■ Location of your land (please provide a Grid Reference, Postcode or What3Words) ■ Current land use ■ Size of your land (less than 1ha, 1-5ha, 5-10ha, over 10ha)
Natural England Countryside Stewardship	Most of the measures listed in this guide can be funded through Countryside Stewardship. There is different funding available for different types of NFM measures. Some measures, such as gully blocking, are only applicable within higher tier Countryside Stewardship.	https://www.gov.uk/government/collections/countryside-stewardship-get-paid-for-environmental-land-management
Forestry Commission Woodland Improvement Grants (WIG)	When bringing woodlands under woodland management plans, landowners are able to apply for Woodland Improvement Grants for woodland NFM features, such as leaky woody dams.	https://www.gov.uk/government/publications/countryside-stewardship-woodland-management-plan-grant-manual-2017
Woodland Trust MOREWoods	Assistance is available to private land managers who are looking to plant up to 500 trees – providing tailored advice, grants and funding, and trees and protection Grants of up to 60% costs are available	https://www.woodlandtrust.org.uk/plant-trees/trees-for-landowners-and-farmers/morewoods/

CONTACT DETAILS FOR MORE INFORMATION

If you are interested in installing NFM measures on your land and would like more information and help, here are useful contacts:

ORGANISATION	CONTACT INFORMATION
Derbyshire Wildlife Trust	Name: Molly Dunne, Derwent Connections, Project Manager Telephone: 01773 881188 Email: derwentconnections@derbyshirewt.co.uk
Environment Agency	Telephone: 0370 850 6506 Email: enquiries@environment-agency.gov.uk
Forestry Commission	Telephone: 0300 067 4000 Email: fe.England@forestry.gsi.gov.uk
Natural England	Telephone: 0300 060 3900 Email: enquiries@naturalengland.org.uk
The Woodland Trust	Telephone: 0330 333 3300
Rural Payments Agency	Helpline for queries on eligibility of features for BPS: 03000 200 301

