# Runoff Attenuation Features

## A guide for all those working in catchment Management

This guide has been produced from work carried out as part of the Belford Catchment Solutions Project – a partnership project between the Environment Agency, Newcastle University and Local Landowners.

April 2011

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# Foreword

It has long been recognised that changes in land use over previous decades has had an impact on the speed of flood propagation during periods of heavy rain. Research projects, along with common sense, tell us that changes to land management can yield significant benefits to flood risk downstream.

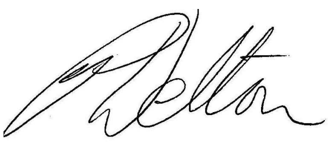
Using funding from the Northumbria Regional Flood Defence Committee, ideas have been put into practice on a catchment scale in Belford meaning that real examples have been trialled and their relative success on reducing flood risk has been established.

The Belford project has also demonstrated the link between reducing flood risk and improving water quality as most of the features constructed deliver both of these benefits, as well as increased habitat and biodiversity in some areas.

Landowners have suffered minimal impact on the operation of their farms and have become convinced of the benefits this type of work delivers – even seeing the benefits to their own operations from the capture of sediment washed off fields.

The project is still being monitored to understand the true impact of the work carried out but it has already been established that catchment management is a cost effective, sustainable and multi-beneficial way to reduce flood risk and improve water quality.

We hope you find this guide useful.



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# CHAPTER 1: Background and Introduction

## Background to Catchment Management

Agricultural drainage and land management techniques play a key role in the contribution to the speed and size of flood events as runoff from the land is hugely influenced by farming practices in the catchment.

In 2004, the Environment Agency carried out a research project with support from Newcastle University, Cranfield University and NERC to look at the 'Impacts of Rural Land Use and Management on Flood Generation'. R&D Technical Report FD214 developed tools for assessing the increased runoff caused by soil degradation and land management techniques.

Between 2004 and 2007, Newcastle University continued the research into catchment management techniques by trialling and monitoring a variety of flow intervention features on their farm at Nafferton in Northumberland. This research has proven that flow intervention structures, both in the watercourse and on the surrounding farmland, can have a significant impact on the flood levels downstream by slowing and storing floodwater. At the same time, Newcastle University were able to demonstrate the beneficial impact such features have on water quality, leading to an understanding of the multiple benefits that changes in land use and construction of small interventions can have.

## Belford

The small rural community of Belford, Northumberland, has a population of about one thousand. It is at high risk of flash flooding from the Belford burn which runs through the town. Flooding in the town has affected property on at least five occasions in the last four years.

The catchment to Belford is 10km$^2$ and ranges from upland pasture to lowland arable farmland. During periods of heavy rainfall, water flows quickly off the land and into the many watercourses before passing through the centre of the town.

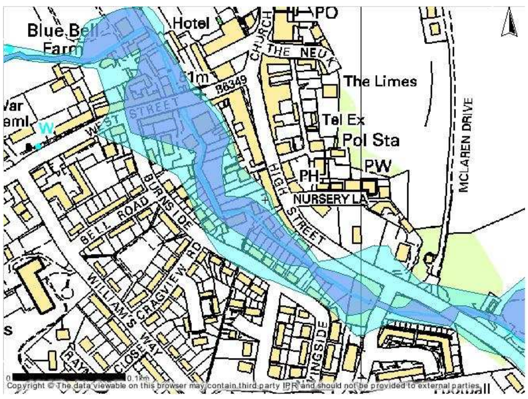


*Figure 1 – Flood Risk in Belford*

As funding for a traditional flood defence scheme could not be justified, the Northumbria Regional Flood Defence Committee allocated funding to implement a catchment management scheme to deliver an effective, sustainable and economically-viable approach to reduce flood risk for the town.

A partnership project between the Environment Agency and Newcastle University was established with the aim of working with landowners upstream of the town to reduce flood risk and deliver other improvements in the catchment.

**Introduction to the Belford Project**

The Belford Project started in 2007 and began with the aim of constructing dozens of flow intervention structures in the catchment upstream of the town. A variety of different techniques have been used to slow and store flood water during time of heavy rainfall.

*Figure 2 – Flood Risk in Belford*

Techniques that have been used include:

- Online ponds
- Offline ponds
- Ponds that intercept overland flow
- Large Woody Debris
- Features to increase channel and floodplain roughness

The online and offline pond features involve either a bund across the river channel or a bund adjacent to the river that excess water spills in to. The features work by storing water when the river is high, and releasing it slowly back to the river after the peak has passed.

Large woody debris has been installed in woodland to slow the flood peak and divert it on to the floodplain. Planting shrubs and pinning timber to the woodland floor has provided greater roughness. Techniques such as fencing of watercourses and planting bank-side vegetation have complemented the other, more formal, interventions.

The project has demonstrated the multiple benefits that can be achieved through the thoughtful implementation of a variety of features. The benefits include:

- Reduced flood risk downstream
- Reduced levels of diffuse pollution
- Habitat creation
- Increased biodiversity
- Preventing the loss of topsoil and fertiliser from farmland.
- Increased farm productivity from re-use of captured sediments

This guide seeks to document the features that have been used in Belford and discuss their relative success for various locations along with the technical considerations and likely benefits.

# CHAPTER 2: Offline Flow Storage

Storage of flood flow from the river in offline ponds – ponds adjacent to the watercourse can reduce flood peaks downstream by physically storing some of the flow but also slowing the rate of the flood peak downstream.

## 2.1 – Introduction

Once flow has entered the river, either by subsurface flow and drains or by overland flow, that flow is taking the most direct route downstream presenting the flood risk to the communities in its path. By diverting some of the river flow out and into a small storage pond, a proportion of the flood water is attenuated. In addition, by forcing some of the flow to travel through a storage pond, the route for the flow downstream is more tortuous and therefore flood peaks downstream are slower to rise.

In many cases these storage ponds can be created on buffer strips and permanent pasture where the impact on the farm is limited. At Belford several techniques to allow flow to spill out of the channel have been used such as cutting swales in river banks and building simple flow control structures in the watercourse.


*Figure 3 – Spill point created by lowering river bank on the outside of a bend*

Offline storage ponds are part of an holistic approach to reducing runoff from different sources within the catchment.

## 2.2 – Key Features

1. Water forced out of the river into a pre-constructed storage area.
2. Bund of earth or timber used to hold water within the pond.
3. Water released back to the watercourse slowly via an outlet point once the flood peak has passed.
4. Ponds can be designed to hold some water all year round for ecological benefits.

*Figure 4 – Offline Storage Pond constructed of leaky timber barrier so as to release flow slowly back to the river*

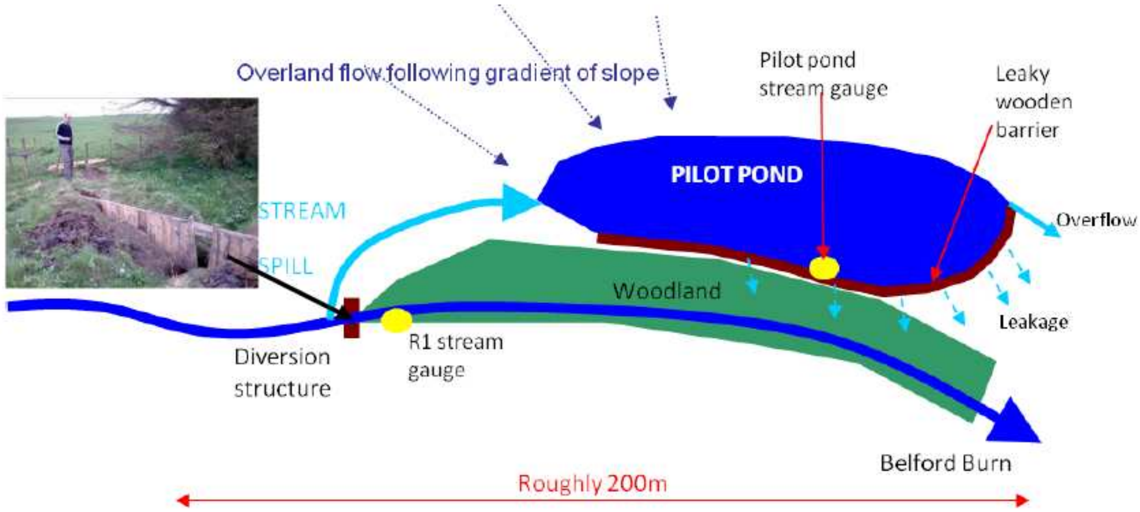
## 2.3 – Key Benefits

- Flood water stored, reducing flood peak
- Flood water slowed down slowing rate of rise of flood peak
- Sediment is removed from the flow which improves water quality and the sediment can be returned to farmers field
- Where ponds are designed as permanently wet, new wildlife habitat is created increasing the biodiversity of the catchment

## 2.4 – Technical Issues

1. The storage area is constructed by placing a bund of earth or timber around the storage area downstream of a spill point from the river channel

*Figure 5 – Schematic of storage pond with a timber in-channel spill feature and leaky timber bund*




2. The spill point is created by lowering the riverbank to a predetermined flood level or by constructing a simple in-channel control structure.
3. In-channel control structures are built using timber or soil so as to limit the flow that is able to pass downstream before being forced out of the channel and into the storage pond.
4. Natural features within the channel such as large boulders, trees and bends can be used to assist with stream control and improve the level of spill without the need for in-channel structures

*Figure 6 – Timber in-channel structure diverts excess flow onto floodplain and into storage pond*

5. Flow should be allowed to take the most tortuous route from the spill point to storage pond to improve attenuation
6. Overspill from the storage feature should be allowed to spill back to the river channel in a safe manner by way of an armoured spillway or similar.

7. Buffer strips and the insides of small meanders are non-productive areas of land and make ideal storage pond locations due to the lack of impact on farm productivity.

### 2.5 – Environmental Considerations

- Where the channel is large enough to support fish, features should be designed to allow fish caught in the ponds to find a route back to the channel as the flood waters recede.
- The depth and the speed of drainage can be manipulated according to the site and the requirements of the farmer. Allowing some permanent standing water, or seasonal ponds, increases the biodiversity of the feature.

### 2.6 – Consents and Approvals

On ordinary watercourses, in stream channel diversion structures may require a land drainage consent from the Environment Agency for works in a watercourse where they interrupt normal flow. On main rivers a consent will be required for any works within 5m of the watercourse.

Planning consent may be required for larger structures and a discussion about proposed works should be held with the Local Planning Authority.

*Figure 7 – Offline Pond in the dry placed on buffer Strip*

*Figure 8 – Offline pond starting to fill during heavy rain*

# CHAPTER 3: Online Flow Storage

Storage of flood flow from the river in online ponds – ponds on the course of the river – can reduce flood peaks downstream by physically storing some of the flow but also slowing the rate of the flood peak downstream.

### 3.1 – Introduction

Another method to store and slow flood flow in the river is to store some of the flood flow in an online pond – a pond on the course of the river. These features have similar flood risk benefits to the offline ponds as they create a more tortuous route for the flow travelling downstream.

Online ponds can prove particularly effective when used on small watercourses, tributaries and ditches to attenuate flow as it first enters the watercourse system. Generally, these ponds are small and either attenuate flow within the channel or on small areas of buffer strips adjacent to the watercourse. They are noted for storing flood waters and slowing runoff and for trapping sediment. In low flows, developed wetlands can have water quality benefits.

*Figure 9 – Online Pond during normal conditions*

### 3.2 – Key Features

1. Water stored on the line of the channel behind an earth or timber bund.
2. Water released back to the watercourse slowly via an outlet point once the flood peak has passed
3. Ponds can be designed to hold water all year round
4. Armoured spillway required for earth bunds to allow for overtopping

*Figure 10 – Online barrier in small farm ditch*

### 3.3 – Key Benefits

- Flood water stored, reducing flood peak
- Flood water slowed down slowing rate of rise of flood peak
- Sediment is removed from the flow which improves water quality and the sediment can be returned to farmer's field

- Online ponds can be designed as permanently wet which creates new wildlife habitat and increases the biodiversity of the catchment

### 3.4 – Technical Issues

1. The storage area is constructed by placing a bund of earth, timber or another material across the watercourse
2. Earth bunds require an armoured spillway to prevent erosion when overtopped.
3. Features can be designed with an outlet of a predetermined size or, for smaller ditches, can be designed to slowly leak. High flows then back up behind the barrier
4. A network of in-ditch barriers works well on the local scale. In-channel wetlands help to improve water quality and the features trap sediment which can be returned to the farm.

*Figure 11 – Rock Armoured spillway on an online pond during flood conditions*

5. The barrier, or dam, is not water tight. It needs to be able to 'leak' or pass water so the flow slowly re-enters the watercourse after the peak flow has passed.
6. Fish passage can be restricted by online structures so they are more suited to small watercourses and ditches where fish passage is not important or the watercourse runs dry during the summer months.

### 3.5 - Environmental Considerations

Sedimentation will occur over time. A management plan is required at the outset determining how the pond will be managed. The three options are to:

a) allow it to develop loosing the flood storage capacity but gaining biodiversity benefit.

b) manage the pond actively reducing the development of biodiversity and ensuring the capacity is maintained at all times.

c) allow the biodiversity to develop and manage the sediment in an environmentally sensitive manner, this may restrict when the sediment is removed.

*Figure 12 – Willow in-ditch barriers*

## 3.6 – Consents and Approvals

On all watercourses, in stream channel structures that interrupt normal flow will require a consent from the Environment Agency for works in a watercourse.

Planning consent may be required for larger structures and a discussion about proposed works should be held with the Local Planning Authority.

The Water Framework Directive requires that there is no deterioration in status.  This may result in online structures being looked upon less favourably in the consenting process

# CHAPTER 4: Intercepting Fast Flow Pathways

Intercepting fast flow pathways by placing a bund across the overland flow route prevents the runoff from quickly reaching the watercourse. This has the benefit of slowing the natural runoff and therefore reducing flood risk, while trapping sediment being washed from the fields.

## 4.1 – Introduction

Flooding downstream on a watercourse often occurs when heavy rainfall on either a dry or saturated catchment causes overland flow to occur. These overland flow pathways transfer the rainfall into the watercourses quickly, resulting in a rapid rise in river levels and contributing towards to the flashy nature of certain catchments.

*Figure 13 – Overland Flow During Heavy Rainfall*

As surface flow pathways become mobilised they collect a huge amount of sediment from the fields and take this directly into the watercourse. This leads to significant 'spikes' in diffuse pollution levels in the watercourse and can lead to sedimentation of the channel.

One of the most simple forms of runoff management is to disconnect surface flow pathways and store this water in the low points on the fields, buffer strips or woodland. This prevents the rapid transference of the rainfall to the watercourse and reduces sediment loads in the flow, thereby reducing diffuse pollution levels in the watercourse and reduced flood levels downstream.

*Figure 14 – Overland Flow During Heavy Rainfall*

### 4.2 – Key Features

1. Can be built from local material
2. Feature built across overland flow pathway to intercept flow
3. Can often be built in the lowest and therefore dampest part of a field
4. Water released slowly via outlet point
5. Large volume of sediment removed from flow that can be returned to farmland.

*Figure 15 – Bund across primary flow pathway with raised outlet pipe*

### 4.3 – Key Benefits

- Rapid runoff stored, reducing flood peak
- Runoff slowed down slowing rate of rise of flood peak
- Majority of sediment load removed from the flow which improves water quality and the sediment can be returned to farmer's field
- Some field pond areas have delivered improved crop yields due to sediment deposited during attenuation.
- Where barriers constructed in already damp corners of fields, improved habitat can be created by enhancing the wetness of the field corner.

### 4.4 – Technical Issues

1. Pathways can be identified using aerial photograph, Lidar or through site inspections to assess contours. The best method to confirm pathways is to visit site during heavy rainfall and to photograph pathways as they are active.
2. The feature is constructed using earth, timber or stone placed across the flow pathway. Soil or stone bunds can often be built with local material.
3. Features need to be designed with an outlet pipe/structure of a predetermined size. This can either be passive, such as a simple outlet pipe, or active, such as a sluice gate to allow the landowner more control depending on his use of the land.
4. This feature should be able to drain and empty completely within 5-20 hours to allow further storage.

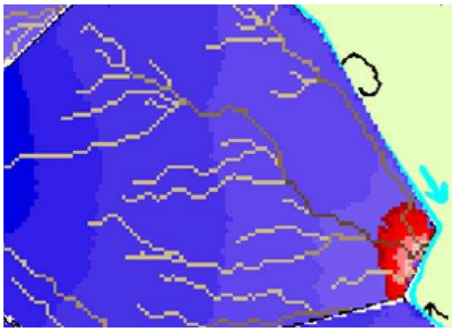


*Figure 16 – Lidar being used to identify overland flow pathways and low points*

*Figure 17 – Outlet Sluice from field pond*

5. Bunds can be designed to overtop along their entire length reducing the need for scour protection.
6. Raising the outlet pipe above ground level will encourage maximum removal of the sediment load.
7. Low levels of maintenance are required to keep the drainage pipes clear and empty the sediment that gets trapped. Landowners should be encouraged to return trapped sediment to their fields.
8. These features cause very few problems as they are not impacting on watercourses and can be built in areas that benefit the farm such as by raising access tracks out of damp areas of fields (Figure 19).

*Figure 18 – Bund being constructed across primary flow pathway*

*Figure 19 – Field bund, acting as a raised access track, storing overland flow during heavy rain*

### 4.5 – Environmental Considerations

- Hedgerows are a valuable habitat providing corridors across agricultural land, they should be protected within these schemes with bunds inside hedgerows.
- These can be designed to create damp areas for wildlife, if appropriate within the farm.

### 4.6 – Consents and Approvals

As these works are not on or near a watercourse then a Land Drainage consent is not required.

Planning consent may be required for larger structures and a discussion about proposed works should be held with the Local Planning Authority.

*Figure 20 – Overland Flow During Heavy Rainfall*

# CHAPTER 5: Large Woody Debris

Woodlands are usually a low productive area and are therefore ideal for flow attenuation. Simple timber dams, sourced from the woodland, placed across the stream can spill water onto the woodland floor, attenuating flow, slowing flood peaks and improving woodland habitat.

## 5.1 – Introduction

Many small streams in the UK pass through areas of woodland or forest. Woodland on farms is usually a low productive area and prove to be the ideal area to landowners for the storage, slowing and filtering of flood water.

*Figure 21 – Flood flow through a Woodland*

The creation of large woody debris (LWD) dams can slow and divert flood flow onto the woodland floor and thereby make the flow follow a more tortuous route through the trees. The denser the woodland, particularly the under-story, the slower the flow will be and the more attenuation that will occur.

This reduces flood risk downstream and can lead to improved habitat in the woodland. In addition, this type of intervention is often replicating what can and does happen naturally in a woodland.

## 5.2 – Key Features

1. Timber sourced from within the woodland.
2. Preference is to use non-native tree species of low ecological value such as sycamore.
3. Two large tree trunks laid in a cross formation across the channel to rest safely on both banks, wedged in position.
4. Smaller timbers can be wedged in place between the larger ones.
5. Varying the height of the timber above normal flow will determine the frequency of inundation of the woodland.

*Figure 22 – Timbers placed in cross formation*

6. Timber pinned to the woodland floor or under-storey vegetation will increase roughness and aid attenuation.

Figure 23 – Trunks and brash pinned to woodland floor

Figure 24 – Under-storey planting of hazel and holly to increase floodplain roughness

### 5.3 – Key Benefits

- Floodwaters back up behind timber dams and spill out into woodland
- Attenuation occurs behind timber dam and through storage on the floodplain, reducing flood risk downstream.
- More torturous flow route slows travel time of flood peak.
- More frequent inundation of woodland floodplain can lead to wet woodland being created.
- By replacing felled trees with native species can improve the biodiversity of the woodland.

*Figure 25 – Flow beginning to overflow into woodland during high flows*

### 5.4 – Technical Issues

1. Timber needs to be secured in position to prevent it being removed in high flows and being washed downstream.
2. Timber can be secured naturally by carefully wedging timber in place between bank sides and other timbers. Forks in timbers can be used to support other timbers.
3. Crossing timbers within the channel will reduce scour by forcing overtopping of the dam down the centre of the channel rather than towards the banks.
4. Timber not wedged or supported should be pinned in place. This can be done by driving wooden stakes on either side.
5. Timber should span over normal flow to ensure fish passage is not affected.
6. Low spanning timbers will result in regular inundation of the woodland whereas high spanning timbers will result in less frequent inundation but will be more effective at slowing higher peak flows.

7. Floodplains should be roughened up where possible to further attenuate out of bank flow. This can be achieved by securing further woody debris on the floodplain, whether trunks or brash, or by under-storey planting of species such as holly and hazel.

*Figure 26 – Large Woody Debris Dam*

*Figure 27 – Under-storey planting to increase roughness*

8. Consideration should be given to the impacts of timber being displaced. If there is no natural prevention of large timber travelling downstream then a timber bollard screen should be constructed downstream to trap any timbers should they become dislodged.
9. Timber sourced in the immediate vicinity to where the structure is to be placed can be simply winched into position preventing the need for any heavy machinery in the woodland.

### 5.5 - Environmental Considerations

- Trees should only be felled outside of the bird nesting season.
- All trees should be checked for specific habitats, such as bat habitat, by a specialist prior to felling.
- It is important that fish passage is maintained within these structures
- These features work very well with wetland scrapes and the development of wet woodland.
- Potential changes to the channel should be considered at the outset to ensure any changes are managed correctly removing the need for hard engineering solutions.

### 5.6 – Consents and Approvals

On ordinary watercourses, in stream channel structures may require a Land Drainage consent from the Environment Agency for works in a watercourse where they interrupt normal flow. If the timbers do not interrupt normal flow then it is unlikely that a land drainage consent will be required. On main rivers a consent will be required for any works within 5m of the watercourse.

Trees should be checked for TPOs and in such cases advice sought from the TPO Officer at the Local Authority.

Habitat surveys are likely to be required prior to any felling activities taking place. This should also include surveys of the dam sites to ensure no habitat, such as water vole habitat, will be disturbed.

*Figure 28 – Large Woody Debris dam plus pinned brash barrier on flood plain*

# CHAPTER 6: Riparian Zone Management

Simple management of the riparian zone can reduce the speed of propagation of flood flows and can have a significant effect on improving water quality through the reduction in sediment load and livestock access to the watercourse.

## 6.1 – Introduction

Poor riparian zone management can increase the propagation of flood flow downstream by reducing the roughness of the river channel. Reduced roughness will allow flood flow to travel downstream more quickly and reduce the opportunity for the flow to spill out of bank and onto the floodplain.

Livestock poaching can have a significant impact on riverbank degradation and can have serious consequences for water quality from the introduction of sediment and faecal matter into the watercourse.

*Figure 29 – Livestock poaching leading to bank degradation and pollution*

Simple measures can be employed to prevent livestock access, stabilise the riverbanks and increase channel roughness. The benefits include reduced flood risk, improved water quality and improved river habitat.

## 6.2 – Key Features

1. Several Management methods are available that can be used in isolation or in combination.
2. Fencing of the watercourse prevents livestock access and allows riverbanks to naturally establish with vegetation thereby reducing erosion risk and increasing roughness.
3. River channels and floodplains can be roughened up by simple tree or shrub planting

*Figure 30 – Livestock poaching leading to bank degradation and pollution*

4. Flood plains in woodlands can be roughened up by planting dense under-storey species such as holly or hazel. Away from woodlands, bands of willow called willow-hurdles can be planted to slow floodplain flow. These

hurdles will naturally catch debris and form a greater barrier to flow over time.

*Figure 31 – Under-storey planting to roughen woodland floodplain*

*Figure 32 – Willow Hurdles to slow and attenuate flood flow*

### 6.3 – Key Benefits

- Increased roughness in river channels will slow and deepen flow thereby slowing the propagation of flood flow downstream and increasing the likelihood of flow spilling onto the floodplain thereby attenuating and slowing the flow further.
- Preventing livestock access to the watercourse will protect riverbanks from degradation therefore allow natural vegetation to establish and increase roughness.
- Preventing livestock access to the watercourse will also significantly improve water quality by removing the sediment load from the degrading banks and by preventing the faecal inputs to the river.

*Figure 33 – Fencing stabilises riverbank and reduces sediment loading in stream*

- Increasing roughness and preventing livestock access also improves the riverside habitat creating a more biodiverse river corridor.
- Buffers zones kept ‘soggy’ are good for de-nitrification.

### 6.4 – Technical Issues

1. Fencing and planting can be combined with other features to maximise benefits.
2. Use of the buffer zone should be maximised using the various techniques.
3. Native species should be used for planting where possible.
4. Fencing should be FSC, or similar, to ensure sustainability of source.
5. Where buffer zones exist, fences can be moved back to allow greater natural use of the buffer zone.

6. Buffer zones can contain small ponds or can be kept ‘soggy’ using ditch or buffer zone barriers.
7. Where watercourses are used specifically for livestock drinking then alternative drinking facilities will need to be provided. This can be done by allowing a single dedicated access point for drinking, or by abstracting a small amount of flow to supply a drinking trough.

*Figure 34 – Dedicated crossing and watering point for livestock*

8. Willow hurdles will have to be actively managed, presumably by coppicing. This can give an added benefit in creating a supply of biomass fuel

**6.5 - Environmental considerations**

- Native species should be used within any planting regime.

**6.6 – Consents and Approvals**

On ordinary watercourses no consents are required unless the works are within the watercourse itself.

On main rivers a land drainage consent will be required for any planting or fencing within 5m of the watercourse.

In some areas tree planting may not be possible if riparian trees present a risk of bridge blockage downstream should trees fall into the river. Tree planting is most likely to be possible in the upper reaches of watercourses where the risk of wooden debris travelling downstream to populated areas is low.

# CHAPTER 7: Habitat Creation

Any project that seeks to implement changes in a catchment to reduce flood risk downstream should maximise the potential for habitat to be improved or created at the same time. Often habitat and flood storage come hand-in-hand. Many features can be adapted with minimal effort to improve their habitat potential and working in a catchment creates opportunities for separate habitat creation works to be carried out at the same time.

### 7.1 – Introduction

Creating new habitat in a catchment will improve the biodiversity of the local area. Introducing catchment management techniques to slow and store flood water creates opportunities for habitat creation at the same time and with minimal additional effort.

By working with the features to be installed, they can be modified to improve the habitat that they offer. In some areas, working in the catchment will yield opportunities to create separate areas of new habitat which should be exploited wherever possible.

*Figure 35 – Pond Creation with online flood storage*

With the improvements to water quality from the delivered features, the additional habitat created will generate significant environmental improvements to the biodiversity of the river corridor and surrounding area.

### 7.2 – Key Features

1. Planned features should be exploited for their habitat potential
2. New habitat opportunities should be sought while working in a catchment

### 7.3 – Key Benefits

- New habitat will increase the biodiversity of the surrounding area.
- Habitat can often create flood risk and water quality benefits.
- Wet or boggy areas will create habitat and improve de-nitrification.

### 7.4 – Technical Issues

1. Ponds that can be kept wet will have much greater habitat potential than ponds which remain dry, however seasonal ponds are highly beneficial to wildlife. The regime of the pond can be designed controlling, inflows,

outflows and occasionally using clay liners. The design process should involve the farmer and a wildlife advisor.

2. Opportunity for new habitat should be considered at all times, particularly if it can benefit any of the other key objetives. For example, a wildlife pond can be created to act as a flood storage pond or to provide 'borrow' material for the construction of earth bunds elsewhere.
3. Where grass-seeding is required, this can be done with a wildflower mix with the agreement of the landowner.

*Figure 36 – Online pond acting as backwater in small stream. Doubles as flood storage.*

**7.5 – Consents and Approvals**

If habitat creation is part of a planned feature then no additional consents are usually required other than those needed for the feature.

If habitat is retro-fitted or created new then land drainage consent may be required for any work within 5m of a main river. It is not likely that any additional consent will be required on ordinary watercourses.

## Credits

Thanks must got to the following people for making the Belford Project a success:

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Rachael McFarlane – Biodiversity Officer, Environment Agency

Farmers, land owners and community of Belford

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## Future Additions to the Guide

1. Future Applications of Catchment Management

2. Feature Cost Details

3. Funding Possibilities