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Managing Overland Floodwaters

6.4 Breaching a flood bank to reconnect active floodplain processes

BURN OF MOSSET

LOCATION - FORRES, MORAY, SCOTLAND NJ04955727

DATE OF CONSTRUCTION - 2008

LENGTH - 500M

COST - £100,000

Burn of Mosset	Medium energy, gravel
WFD Mitigation measure	**Click Here** to view details
Waterbody ID	23021
Designation	None
Project specific monitoring	Annual & reactive

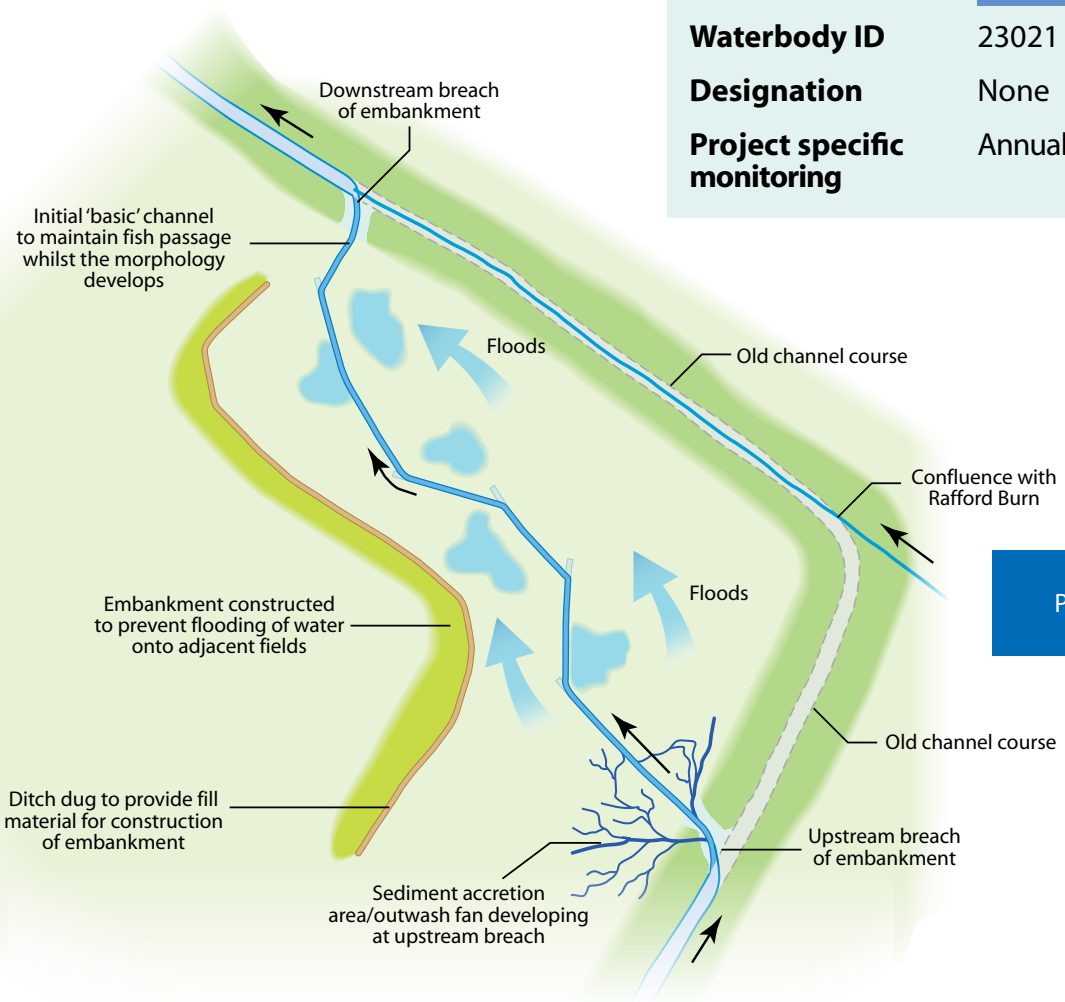

Figure 6.4.1
PLAN VIEW OF THE SEDIMENT ACRETION AREA

Description

The Burn of Mosset is a small but geomorphologically active gravel-bed stream that drains an area of 49km^2. It flows northwards through the town of Forres before entering Findhorn Bay. Forres has had a long history of flooding from the burn, with six events causing serious property damage and disruption within the last 50 years.

A new Flood Alleviation Scheme (FAS) included the construction of an upstream earth fill embankment dam designed to allow for discharges up to 8.5 m^3/s to flow through Forres, with excess floodwater temporarily stored behind the dam.

This upstream storage area, the focus of this case study included an extensive natural sediment accretion zone. It has a large capacity to store sands and gravels and also retain large woody material. This will reduce the risk of sediment blockage or damage of the dam control structure from sediment or large wood respectively.

The implementation of this natural sediment accretion zone replaced the need for a conventional sediment trap as part of the wider FAS.

The work aimed to create a mosaic of river and floodplain habitats by allowing active river processes to develop a multi-threaded (anabranched) system together with floodplain wet woodland features.

Prior to the work, the burn was a degraded perched watercourse and flowed around the edge of the field (*see Figure 6.4.1*), with dredged spoil deposits used to build the flood embankments, thus disconnecting the burn from its floodplain area.

Design

Two breaches of the existing embankments (*see Figure 6.4.1*) were created to allow flow to spill out across the floodplain. Their locations were selected using LiDAR imagery to identify low areas of land suitable for the course of the temporary "basic" channel, which was constructed to ensure that there was no interruption in migratory fish passage.

The overall aspiration was to then allow natural processes to develop a multi-thread watercourse. Initially the upstream breach in the bank was set to maintain 80% of the lower flows in the existing channel, and protected using thirty tonnes of locally sourced granite placed within the breach opening. This was to ensure that species within the existing channel could continue to use the available habitat whilst the new watercourse continued to develop.

A low embankment was constructed parallel to the new channel close to the site boundary (*see Figure 6.4.1*). this was to protect adjacent fields outside the area of the burn management works from flooding. Material was won from digging a small ditch which avoided the need to import fill over very soft ground.

Tree planting was undertaken as part of the scheme to encourage the development of wet woodland. Only tree species native to eastern Scotland and of local provenance were selected for planting including: common alder - *Alnus glutinosa* (25%); silver birch - *Betula pendula* (25%); sessile oak - *Quercus petraea* (25%); rowan - *Sorbus aucuparia* (15%); and goat willow - *Salix caprea* (10%).

Whips, between 0.45m and 0.6m in length were planted, as these tend to establish well and grow more quickly than more mature specimens. The whips were planted in clumps of three to five of the same species, spaced at two metre centres, with a planting density to allow for some failures. Mesh guards were not installed to protect the whips since there was a risk they would be washed off during a flood event and could pose a hazard to wildlife. Additionally, there was concern that any mesh could have introduced man-made debris into the natural environment downstream.

The upstream breach two years post construction: widening of breach and gravel deposit to the left; abandonment of the old course on the right (blue arrow=new route. red arrow=old route) – 2010

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Sediment accretion area/outwash fan has developed at the upstream breach – July 2011

Subsequent performance

Approximately one year after the banks were breached in September 2009 the channel experienced an estimated 30m³/s flood flow (of the order of a 1 in 10 year event). The stone protection at the upstream breach was partially washed out, as anticipated. The breach enlarged such that the majority of the flow was diverted along the new route after the flow subsided. The result was rapid development of river features, including the formation of an outwash fan (*see Figure 6.4.1*). Some ecological degradation has occurred in the short term, as the old channel is now dry except during very high flow events.

The flow interacted with woody material situated in the widened upstream breach causing erosion on the right bank of the original channel. Measures were taken to mitigate against further erosion on th eopposite bank, since any breach occurring at this location could result in flooding of a significant area of valuable grazing land. Small scale on-going adaptive management is predicted to be necessary in the short to medium term until this modified river system becomes better established.

The wet woodland habitat remains in the early stages of development but has already attracted a diverse range of flora and fauna (especially birds). Many of the unprotected whips were eaten by deer soon after being planted; it is hoped that this floodplain feature will naturally recover over time.

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Channel development. The acretion area is storing woody material and river sediments – March 2012

The material used to construct the low embankment was soft peat. The consistency of the material was subsequently found to be insufficiently resilient to avoid damage during flow events that spilled into the wider flood storage area. Minor breaches occurred in two locations along the embankment, which now allow water to flow in to the low area on the boundary of the site.

Overall this scheme illustrates what can be achieved when working with natural sediment transport processes in flood storage zones. In 2010, the Saltire Society of Scotland in association with the Institution of Civil Engineers awarded the Forres FAS its 'environmentally sustainable construction' commendation.

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Reference material – Click here