

A collaborative approach to community led flood management

Slow the Flow Calderdale is a community led flood management scheme that demonstrates how a group of ordinary citizens can pool their skill to make a positive difference to their own communities. Stuart Bradshaw gives more details.

The Calder Valley is a west-east orientated Pennine valley located in West Yorkshire in the north of England, UK, with the valley situated entirely within the

Metropolitan Borough of Calderdale. It is often regarded as the birthplace of the industrial revolution as it is home to many steeply falling streams which were used to power the early



Experimental plate weirs used for water storage and slowing the flow.



Leaky dams constructed in Hardcastle Craggs (photos by Michael Fairless).

textile mills making fustian, a hardwearing cloth made from wool.

The valley is split into three geographical areas – the Upper, Middle and Lower Calder Valley – with the towns of Cornholme, Todmorden and Hebden Bridge falling within the upper reaches, followed by Mytholmroyd and Luddendenfoot in the middle reaches and Sowerby Bridge and Elland located in the Lower Calder Valley. The valley runs for a total distance of around 26km from Cornholme to Elland and the catchment area is approximately 957km² (1) with a catchment population of 290,000 (1).

The Upper valley sides fall steeply to a narrow valley occupied by the River Calder served by three main tributaries, Walsden Water, Colden Water and Hebden Water, followed further downstream in the middle reaches by Cragg Brook and Luddenden Brook and in the lower reaches by the River Ryburn, Hebble Brook and Black Brook. The surrounding hills typically lie at 300-500m asl with the valley floor at around 100m. The hills are typically underlain by Carboniferous Namurian Sandstone locally known as Millstone Grit which was formed in river deltas 320-360 million years ago. The valleys were incised by glacial meltwaters during successive ice ages – the last retreating some 10 to 12,000 years ago. The near surface rocks are typically weathered to an unsorted sandy gravelly clay containing cobbles and boulders, this soil known as Head has in many areas been transported downhill by periglacial solifluction, consequently due to the presence of clay minerals the infiltration rates are poor. Above the steeply sided valleys a band of farmland occupies the slacker slopes and above this land the gradient slackens further to form a moorland plateau.



Felling licences had to be applied for to enable construction of leaky dams. (Photo by Michael Fairless).

The UK's uplands are internationally important for their peatlands and hold about 13% of the global blanket bog resource. Peatlands cover much of the English uplands and are present on the moorland plateau above the Calder Valley. The condition of the blanket bog varies, with their functionality reduced by atmospheric deposition which has reduced sphagnum cover, fire, peat cutting and drainage which have all impacted on water tables causing erosion and grazing which may have modified the vegetation type (2).

Significant flooding

The above factors all contribute to a long history of fluvial and pluvial flooding. Due to the



Ultrasonic river monitoring device suspended from bridge soffits at Hardcastle Craggs.

steeply falling hillsides, the River Calder and its tributaries respond rapidly to heavy prolonged rainfall. In 2012 the towns of Hebden Bridge and Mytholmroyd were flooded twice in the summer floods of that year. Over Christmas and Boxing Day 2015, Pennine areas had over 60mm of rain fall in 24 hours and some locations had over 100mm. Consequently the Calder Valley suffered one of the most significant flooding events in recent times with 2781 homes and 4416 businesses flooded all along the valley causing unparalleled damage with up to 2m of water in some streets.

Slow the Flow

The genesis of Slow the Flow Calderdale (StFC) began in the Spring of 2016 with a small conference in Hebden Bridge called "The Science of the Floods" organised by local Landscape Architect and Environmental Scientist Robin Gray.

Stuart Bradshaw, a local geotechnical engineer, was invited to present at this conference on his experimental work on the possibilities of controlling some of the run-off using plate weirs or gully blocks placed in local stream courses in the aftermath of the Boxing Day flood. Following



Woodland floor logs (SPLs) used for water storage at Hardcastle Craggs.

this event a series of meetings materialised where other local experts took interest via word of mouth and social media: Amanda McDermott, another local Landscape Architect brought along her expertise in Sustainable Drainage Systems, and Bede Mullen and Ian Vickridge with their mechanical and civil engineering backgrounds respectively. Gradually a committee of nine individuals came together and the inaugural committee meeting was held in the November of 2016 whereupon the group was officially constituted.

Partnering with government agencies such as The Environment Agency, Calderdale Council, The National Trust and Natural England, and

local groups Treesresponsibility, The Source Partnership, The Calder & Colne Rivers Trust, Pennine Prospects, Calder Futures and the local flood wardens, we set out to understand how and why the valley floods and to look at flood prevention measures and solutions to slow the volume of water which flows down the hillsides into the River Calder. All of our members are mostly local and are all volunteers giving up their time to secure a future for the Calder Valley. Our objectives are simple – to slow the flow from the upper catchment to the main river channel thereby reducing the flood peak and limiting out of bank flow where it matters, in our towns and villages.

Our projects

With our objectives defined StFC embarked upon its first project – a pilot natural flood management project to slow the flow in streams and rivers flowing through a local popular beauty spot known as Hardcastle Craggs. Hardcastle Craggs is a woodland plantation on the banks of two Calder tributaries, Hebden Water and Crimsworth Dean Beck, it occupies 122 hectares of land bequeathed to a government agency, the National Trust, in the 1920s.

We approached the National Trust with our ideas. They were very receptive so we undertook a walkover survey of the two tributaries and prepared a report which was submitted to the Environment Agency, who sanctioned a grant of £50,000 to kick start the project in November 2016. Felling licences had to be applied for so construction of leaky dams was delayed until April 2017. Since this time around 150 leaky dams have been constructed, all by volunteers at weekends. Areas of riparian wetland are present throughout Hardcastle Craggs. In some cases a distinct shallow channel is present, in other cases flow is ephemeral with these areas having a high water table even in dry weather.

Our solution places logs parallel to the main river channel and the valley contours so flow downhill to these wetlands and from the wetlands themselves is slowed to the main river. We have called these Strategically Placed Logs and these are quickly and efficiently placed by teams of volunteers.

Introducing woody debris in streams to slow the flow is in effect mimicking natural wild woodlands and streams where trees will have fallen naturally either by windfall, decay or at the end of their lives into stream beds. The woody debris eventually rots allowing colonisation of woodland plants and invertebrates providing food for mammals, birds and aquatic life. The process of wetting the woodland has added benefits for a richer diversity of plants.

The project meshes purposefully with the National Trust who have taken on the project management and who organise the skilled elements such as tree felling adjacent to watercourses ready for volunteers to begin work. It is hoped the project will be funded further over the next five years with around £500,000 of additional grants currently pending, larger main river leaky dams are proposed which will require a greater level of engineering, together with reinstatement of several disused mill ponds for run-off interception and attenuation.

Much of the 122 hectares of woodland at Hardcastle Craggs is designated as Plantation on Ancient Woodland Sites (PAWS) and the ground flora is heavily shaded and in many places absent due to the dense canopy. A 30% thin targeting non-native conifers and species such as Beech and Sycamore is required to allow the woodland flora to recover. A restored and vegetated ground flora it is hoped will intercept precipitation,



Flooding at Hebden Bridge, December 2015.

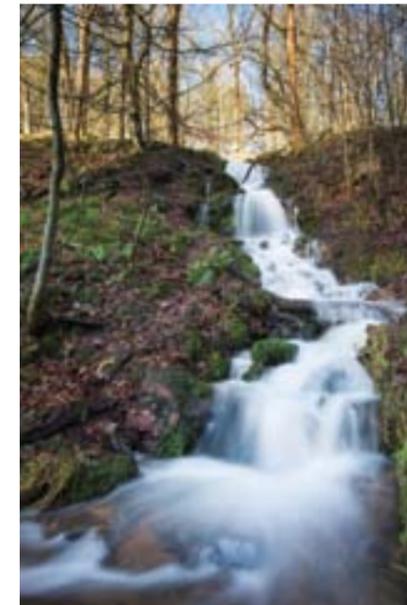
impede surface run off, reduce erosion and sediment transport and effectively slow the rate of water flow into the system of ditches and natural water courses throughout the woodland.

Of course, the felling operations also provide the timber resources required for the Natural Flood Management (NFM) interventions detailed earlier and proposed by Slow the Flow Calderdale, so there is excellent synergy between the goals of each of the two main partners to the project, Slow the Flow Calderdale and the National Trust.

Alongside this, as a second project. We have installed a series of river level monitors on structures which span the two tributaries, these use ultrasonics to determine the level of water in the streams which is plotted against real time as a hydrograph and can be viewed at:

<https://graf.thingscalderdale.com/dashboard/db/calderdale-flood-network?orgId=2&from=1515957415663&to=now>.

The intention is to gather evidence of the efficacy of the project using this data from Hebden Water, which is the river currently targeted with leaky dams and SPLs, and the adjacent watercourse Crimsworth Dean Beck,



Hardcastle Craggs is a woodland plantation on the banks of two tributaries of the River Calder. (Photo by Michael Fairless).

where currently there are no interventions, therefore it acts as a control. Once we have perfected the initial system of river level monitors the intention is to roll them out across the catchment to assist with early warning of flooding and to identify the efficacy of other NFM projects undertaken across the wider area over the longer term.

Our third project is raising the awareness of urban Sustainable Drainage Systems (SuDS) with the general public. We have produced a series of information sheets under our “You can....” mantra. This is an initiative whereupon the overall message is an emphasis on individuals to influence their own/neighbours’ flood risk by reducing the rate of run-off from their own properties, in other words “slowing the flow” applies to you and not just to “them”. The information sheets provide simple ways of slowing the flow, the simplest being the humble water butt, with the tap left open slightly ahead of heavy rainfall, perhaps watering an adjacent flower bed or planter.

Positive difference

The work and our success so far has

demonstrated how a group of ordinary citizens can pool their skills to make a positive difference to their own communities. From hereon we hope to go from strength to strength by enhancing the longevity of traditional engineering solutions currently in the planning stages, substantially reducing our flood risk and enhancing our resilience, thereby combating the increasing risks from climate change going forward. ■

Author information

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References

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All general views of Hardcastle Craggs. Photos by Michael Fairless.