Natural Flood Management in the Calder Valley

We have undertaken investigations into the potential for natural flood management to contribute to the reduction of flood risk at key receptors in Calderdale. This showed that if we can slow the arrival of water to the rivers in Hebden Bridge, we can provide small reductions in flood flows in the town. Natural flood management can also reduce the risk of surface water flooding by keeping water in the landscape instead of on the roads, and limit its impact by reducing soil erosion off the hillside into drains and rivers. There is lots of NFM activity going on in the Calderdale catchment already – there are some examples of the ongoing work below:

Yorkshire Water

Yorkshire Water together with the White Rose Forest partnership has pledged to investigate tree planting opportunities to reduce flood risk across the Yorkshire Water estate.

For example, the moors above Gorpley have been identified as a site where tree planting can take place in the near future. Sixty hectares of species poor grassland will be planted with trees which will help slow down the rush of rain water to vulnerable locations. Approximately 3,000 trees will be planted per hectare which could mean up to 200,000 trees planted over the next couple of years. Treesponsibility will be a major delivery body for this work as well as other local community groups.

Yorkshire Water and the White Rose Forest partnership are currently in the process of preparing a design for this scheme, and undertaking the surveys and consultation necessary to ensure that the project is delivered in a way that is sensitive to the site’s existing biodiversity and rights of way. We hope to be able to plant the first trees in autumn 2017.

Other natural flood management flood measures will also be implemented on these moors over the next 5 – 10 years, including:

- Blanket bog restoration
- Leaky dams
- River bank protection

Slow The Flow

To date, around 40 new volunteers have worked with Slow The Flow Calderdale at Hardcastle Crags. In only 3 weeks, significant progress has been made in a number of gullies leading into the main channel in the Crags.

Work ranges from sawing timber, trimming brush, digging, and moving trunks into place to form leaky dams and to stuff gullies. This maintains normal flow but encourages rain water onto the banks during heavy rainfall to reduce the amount of water making it into the main channels.

River Level Monitoring Project

Slow The Flow Calderdale has coordinated a professional project to install a small number of river level monitors in the Calder Valley. Plans are underway to extend the network of monitors using community workshops to build low cost monitoring and transmitting devices that will provide data for planning, warning and reassuring.

You Can Slow The Flow

Sustainable drainage systems (SuDS) mimic the natural cycle of water management, by retaining water where it lands (instead of shedding it quickly to drains and watercourses, which can lead to floods). Slow The Flow Calderdale is creating awareness of how this can be achieved by everyone in their urban environments: at home, at work, at school, in public places.
Water Supply Reservoirs and Flooding - Balancing Needs

A) Investigating scope for reservoirs to support flood alleviation

- In order for supply reservoirs to be utilised for flood storage there are a number of technical, environmental, legal and regulatory challenges to overcome. The Environment Agency, United Utilities, Yorkshire Water, DEFRA and OFWAT have established a working group and developed a process to allow the potential use of reservoir storage in support of flood alleviation. This is a process that all parties have signed up to and are currently working their way through. This is outlined in the flow chart to the right.

- The focus of the work in Stage 1 at Hebden Bridge is presented below.

- A Yorkshire wide screening study has also been undertaken in order to determine which reservoirs are likely to have the greatest potential to reduce flood risk. This would guide where the Environment Agency and Yorkshire Water would consider viable for further study. The screening exercise also allowed us to understand what the regional ask on water resources might be. Three areas were highlighted that had the greatest potential and Calderdale was one of these areas.

- Stage 2 is ongoing.

B) Hydrological modelling

- We assessed the Hebden Water catchment by building a hydrological model. This models how rainfall makes it way across the catchment, into the six reservoirs in the valley and then flows in the rivers down into Hebden Bridge. We used this model to understand how the catchment works both with and without the reservoirs using the steps shown on the right.

- The model shows that even full reservoirs provide significant reduction in peak flows due to the temporary storage.

C) Testing different reservoir drawdown scenarios with the river model

We used the river model to test a wide variety of different scenarios. If you lower or ‘draw down’ the reservoir levels then flood water can be stored in the reservoirs during a flood event. Our assessment has shown that the majority of benefits are gained when the reservoirs are 10% (scenario 090ALL) below full prior to an event as shown in the hydrograph to the right. This also shows the pre scheme indicative channel capacity of 56 cubic m/s (assuming no influence from the Calder). The impacts of drawdown options on peak flows at Hebden Bridge for the 100% full reservoirs (100ALL) through to 70% full (070ALL) reservoirs are also shown in the table below.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Method</th>
<th>Outcome and issues</th>
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</thead>
<tbody>
<tr>
<td>Constant lower water level</td>
<td>This would aim to keep reservoir water levels drawn down to a certain level at all times of the year. This option will reduce flood risk on Hebden Water significantly. This option has the greatest impact on water resources but is the easiest management option.</td>
<td></td>
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<tr>
<td>Variable water level</td>
<td>Drawdown reservoir water levels for 48 hours prior to a storm event arriving. Hard to predict storms and manage the release of water. The rate at which reservoirs can be drawn down is limited. Should have a reduced impact on water resources but also a reduced flood risk benefit over permanent drawdown.</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Return Period \ Scenario</th>
<th>100ALL</th>
<th>090ALL</th>
<th>080ALL</th>
<th>070ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in 10 years</td>
<td>66 m³/s</td>
<td>51 m³/s</td>
<td>44 m³/s</td>
<td>44 m³/s</td>
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<tr>
<td>1 in 50 years</td>
<td>85 m³/s</td>
<td>67 m³/s</td>
<td>59 m³/s</td>
<td>57 m³/s</td>
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<tr>
<td>1 in 100 years</td>
<td>89 m³/s</td>
<td>71 m³/s</td>
<td>63 m³/s</td>
<td>60 m³/s</td>
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Are you interested in helping to deliver ‘Natural Flood Management’?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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Comments