Integrated Catchment Solutions Programme

NFM Calderdale Fact Sheet – Upper Valley Gully Tree Planting

Planting trees in the gullies of upper valleys (or 'cloughs') of rivers provides multiple benefits to reducing the peak level of flood waters in catchments, by intercepting rainfall before it lands on the ground, increasing the capacity of the soil to absorb more rainfall and increasing the resistance of surface water flowing overland. Selectively planting trees along the top of watercourses also reduces the speed at which overland flow enters rivers. Using the rainfall runoff computer model SD-TOPMODEL in three sub catchments of the upper Calder valley, the benefits of upper valley tree planting were tested by identifying the headwater region of becks and streams that feed into the main water course, and simulating the effects of gully tree planting in these locations in comparison to the current baseline situation.

An example of the regions selected for upper valley woodland planting in the Upper Calder catchment upstream of Todmorden can be seen in Figure 1, which has a targeted area of 0.5km² (50 hectares). In general, the gully planting areas for the 3 catchments were in similar high slope locations, and avoided moor or peatland areas.

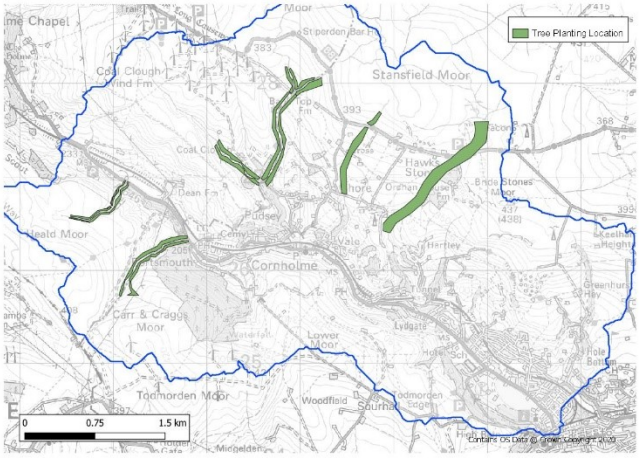

Figure 1: Location of the gully planting to be tested in the Upper Calder

Using measured differences between the properties of soil where the land cover is grass or woodland, the model was modified to woodland cover in the selected regions. Model parameters were changed to represent woodland by: depth of soil (50% deeper), lower water permeability (20% lower) and an increased resistance to water flowing across the land surface (50% greater).

An interception rate - the amount of rainfall that is captured by the tree canopy cover was also applied in the model.

The impact of the gully planting compared to the baseline computer model run for a mock storm event can be seen below, in Figure 2.

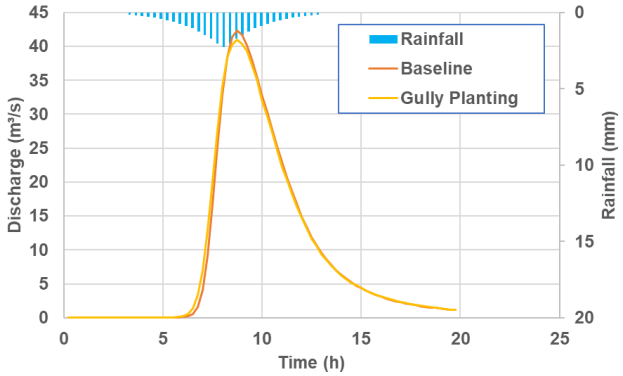

Figure 2: Comparison of the outflow for the baseline model against the gully planting model computer model runs

When comparing a baseline computer model run against the targeted tree planting computer model run for 6 rainfall events, (4 mock storm events and 2 recorded events), the modelled tree planting was found to have a beneficial impact to local flood risk, with an average decrease in the peak flow value of **1%**, an average reduction in the overall volume of flood water of **2%** and an average delay of **10-15 minutes** to the timing of the flood peak (Table 1).

Table 1: Summary of the difference in peak flow, changes to time of the peak and volume reduction from gully tree planting

Event	Peak Flow Decrease	Time to Peak Delay	Flood Volume Reduction
3 hour 1 in 10 year	2%	5 – 10 mins	1%
3 hour 1 in 100 year	2%	15 – 20 mins	4%
12 hour 1 in 10 year	>1%	5 – 10 mins	>1%
12 hour 1 in 100 year	1%	15 – 20 mins	1%
December 2015	1%	15 – 20 mins	>1%
June 2012	1%	15 – 20mins	1%

Overall, these results suggest that gully tree planting can alleviate flooding in lower reaches of rivers for relatively little ground tree cover by intercepting rainfall and overland flow before it enters a water course.

For more information about the results presented in this fact sheet please refer to the technical document hosted on the ICASP website or contact **icasp@leeds.ac.uk**