NFM Calderdale Fact Sheet – Cross Slope Tree Planting

Cross slope tree planting – or tree planting across the land - 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 to surface water flowing overland. By planting trees in strips across a hillside, overland water flow moving down slopes can be slowed and absorbed into the soil. Using the rainfall- runoff computer model SD-TOPMODEL in sub-catchments of the Upper Calder valley, the benefits of cross slope tree planting have been tested. The modelling identified areas of the catchment where cross slope tree planting may be beneficial and created a computer model run that compares the current land coverage with cross slope tree planting areas.

Cross slope planting areas were selected based on identifying locations that are currently covered with grass and where water predominately flows during a storm that allow floodwaters to enter channels. An example of the regions selected for cross slope planting in the Upper Calder catchment upstream of Todmorden can be seen in Figure1. The total area is 0.21km² (21 hectares).

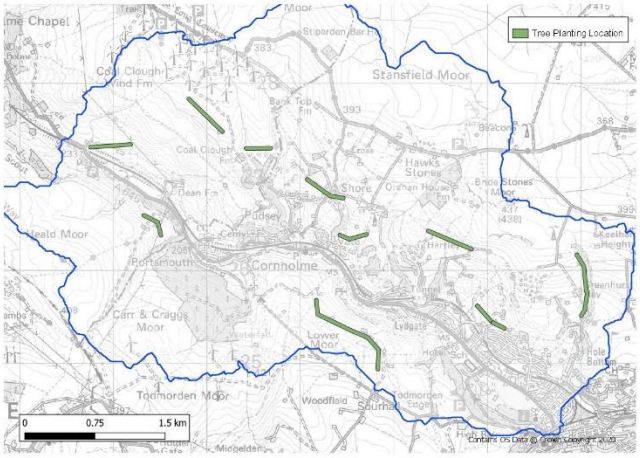

Figure 1: Map of modelled cross slope tree planting locations for the Calder upstream of Todmorden

Cross slope planting was represented within the model using both literature values and measured differences between grass and woodland. The cross slope planting locations had a greater depth of soil (50% deeper), lower permeability (20% lower) and an increased resistance to water flowing across the land surface (50% greater) compared to standard grassland.

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 cross slope tree planting can be seen when comparing the river flow values in Todmorden for two computer model runs. For an example of a synthetic 1 in 10 year, 3-hour event, the peak flood decreased by 2% and the flood peak was delayed by 15 minutes (Figure 2)

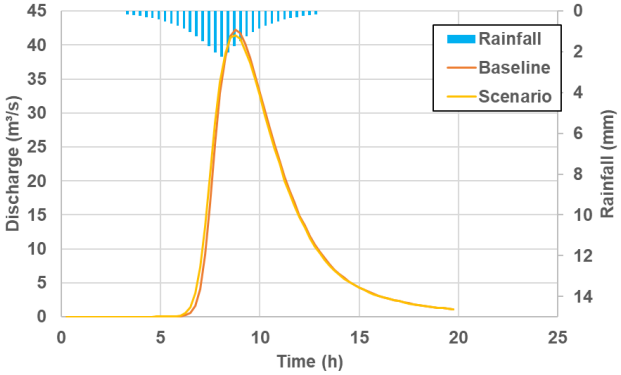

Figure 2: Comparison of the model outputs for the baseline model and the cross slope tree planting scenario

When comparing a baseline computer model run against the cross slope tree planting computer model run for 6 rainfall events, (4 synthetic storm events and 2 recorded events), there was an overall beneficial impact with an average decrease in the peak flow value of **1%**, an average reduction in the overall volume of flood water of **1.5%** and an average delay of **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 cross slope planting

Event	Change to the peak flow as a result of the intervention	Change to the time of the peak as a result of the intervention	Change to the volume of water as a result of the intervention
3 hour 1 in 10 year	Reduction of 1%	5 – 10 minute delay	Small reduction of less than 1%
3 hour 1 in 100 year	Reduction of 1%	5 – 10 minute delay	Reduction of 3%
12 hour 1 in 10 year	Reduction of 1%	5 – 10 minute delay	Reduction of 1%
12 hour 1 in 100 year	Small reduction of less than 1%	15 – 20 minute delay	Small reduction of less than 1%
December 2015	Small reduction of less than 1%	15 – 20 minute delay	Small reduction of less than 1%
June 2012	Small reduction of less than 1%	15 – 20 minute delay	Small reduction of less than 1%

The model results indicate that cross tree planting does have a benefit to flood risk, although not as significant as other tree planting schemes. More extensive cross slope planting with wider stripes and multiple planting schemes on the same slope will improve the benefits of cross slope planting.

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**