Integrated Catchment Solutions Programme

NFM Calderdale Fact Sheet – Targeted Tree Planting

Tree planting provides multiple benefits to reducing the peak level of flood waters in catchments, by intercepting rainfall before it lands on the surface and turns into overland water flow, increasing the capacity of the soil to absorb more rainfall and increasing the resistance of the surface to overland water flow. Using the rainfall- runoff computer model SD-TOPMODEL, and three sub-se catchments in Upper Calderdale, the benefits of targeted planting trees have been tested. Modelling has identified parts of the catchments where tree planting may be beneficial in reducing flood risk and provided information on the difference in flood characteristics between the current land coverage with selected tree planting.

The regions of the catchment to be tested for targeted tree planting were selected based on areas that are currently grassland and where water will predominately flow during storms. An example the regions selected for woodland planting in the Upper Calder catchment upstream of Todmorden can be seen in Figure 1. The average targeted area for the test catchments is 0.5km² (5 hectares).

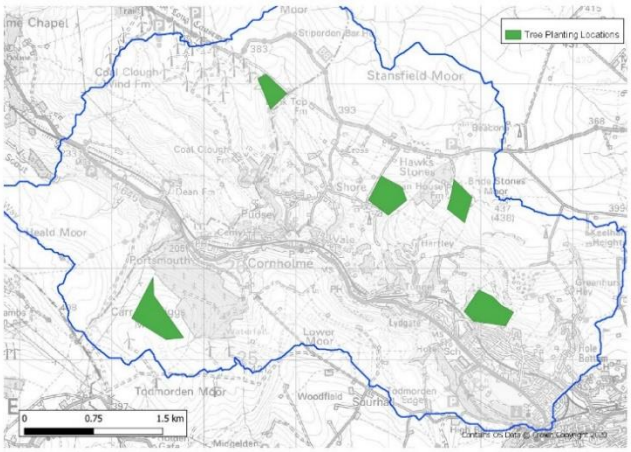

Figure 1: Location of targeted tree planting in Upper Calder

Using measured differences between grass and woodland, the model was modified in the regions in Figure 1 from grassland to woodland. This included a greater depth of soil (50% deeper), lower soil 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 targeted tree planting can be seen when comparing the difference in river flow in Todmorden for the baseline current land use model run and the targeted tree planting model. For a synthetic 1 in 10 year, 3-hour storm event, the peak flood decreased by 2% and the flood peak was delayed by 15 minutes (Figure 2).

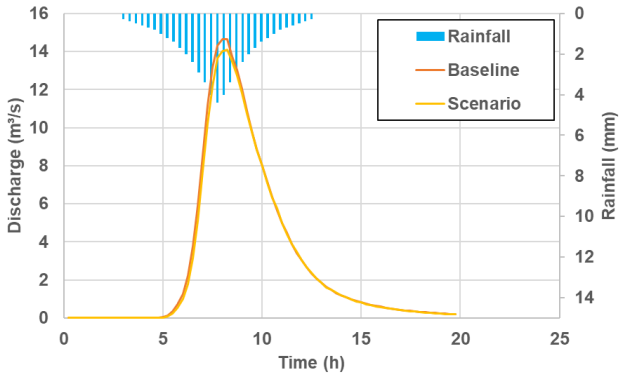

Figure 2: Comparison of river flow for the baseline computer model run and the targeted tree planting computer model run

When comparing the effect of targeted tree planting with the baseline computer model for six rainfall events, (4 mock storm events and 2 recorded events), the tree planting computer model runs were found to provide a beneficial impact to local flood risk, with an average decrease in the peak flow value of **2%**, an average reduction in the overall volume of flood water of **3%** 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 flood volume reduction from targeted tree planting from across the three catchments

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 2%	5 – 10 minute delay	Reduced by 1%
3 hour 1 in 100 year	Reduction of 2%	15 – 20 minute delay	Reduced by 5%
12 hour 1 in 10 year	Reduction of 3%	5 – 10 minute delay	Reduced by 4%
12 hour 1 in 100 year	Reduction of 1%	15 – 20 minute delay	Reduced by 2%
December 2015	Reduction of 3%	20 – 30 minute delay	Reduced by 2%
June 2012	Reduction of 2%	20 – 30 minute delay	Reduced by 4%

The results suggest that concentrated large scale tree planting can have a positive impact on flood levels helping to reduce peak flow rates and flood volumes. Further work could refine how to target areas of land for tree 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**