NFM Calderdale Fact Sheet – Reduced Grazing and Soil Improvements

Reducing the number of grazing animals and improving the structure of top surface soil has multiple benefits for reducing the peak level of flood waters in catchments. One benefit is it increases the coverage of grass which will slow the rate at which water can flow across a field. It can also increase both the rate at which rainfall can be absorbed into the soils, and the available space for storing rainfall within the soil structure. Using the rainfall-runoff computer model SD-TOPMODEL, and three test sub catchments in the Upper Calder Valley, the benefits of improving the soil structure has been tested by identifying parts of the catchment where soil improvements may be beneficial and creating a simulation that compares this to the current land coverage.

The regions of the catchment to be tested for reduced grazing were selected based parts of the catchments that are grazed and where water will predominately flow during storms. An example of the regions selected for this scenario in the Hebden Water catchment can be seen in Figure 1. The average targeted area for the Hebden test catchments is 7.2km² (720 hectares), around 6% of the catchment surface

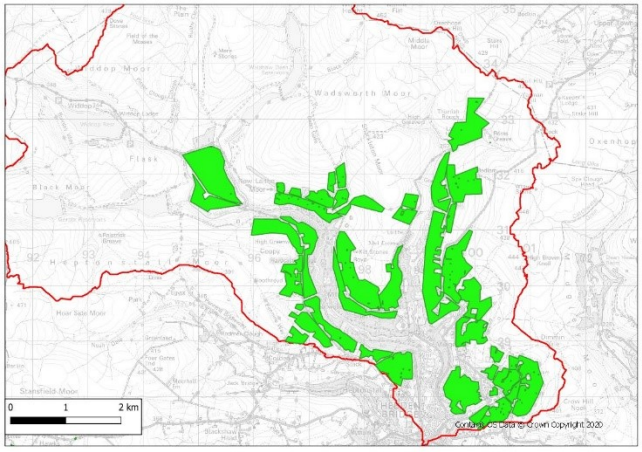

Figure 1: Map of modelled reduced grazing and soil improvement locations for Hebden Water

Using measured differences in soil properties under heavily grazed and lightly grazed areas, the model was modified to represent a lighter grazing scenario. Model parameters used to signify reduced grazing included a greater soil depth (50%) and improved soil permeability (by 20%) and an increased resistance to water flowing across the land surface (20%)

The impact of reduced grazing and soil improvements can be seen by comparing the river discharge values at the outflow of the catchments for the two simulations. For a mock 1 in 10 year, 3-hour storm event, the peak flood decreases by 4% and the peak is delayed by 5 minutes, which can be seen in Figure 2.

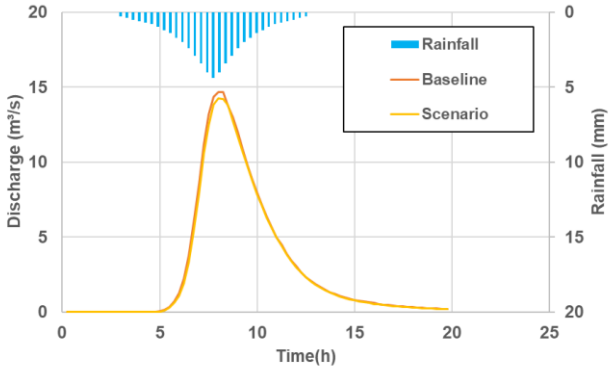

Figure 2: Comparison of the baseline computer model run vs the reduced grazing and soil improvement computer model run

When comparing a baseline simulation against reduced grazing and soil improvement scenarios across 6 rainfall events, (4 mock storm events and 2 recorded events), land management improvements were shown to reduce 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 **10-15 minute** 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 reduced grazing across the three catchments

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	1%	5 – 10 mins	5%
12 hour 1 in 10 year	2%	5 – 10 mins	3%
12 hour 1 in 100 year	1%	15 – 20 mins	1%
December 2015	2%	15 – 20 mins	2%
June 2012	2%	15 – 20 mins	4%

These results indicate that soil improvements and reduced grazing could have a positive benefit to flood risk. This could be understood in more detail with specific information about the types of soil improvements possible in the catchment.

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**