Integrated Catchment Solutions Programme

NFM Calderdale Fact Sheet – Intensive Grazing

Intensive grazing and the use of heavy machinery can have an impact on local flood risk by reducing the amount of grass covering in fields, which increases the speed at which water can flow over the land. It also leads to topsoil compaction, which reduces the ability of the soil to absorb rainfall. Further, allowing livestock to access the areas around water courses can also increase the rate at which water flowing across the hillslopes enters the water course. Using the rainfall- runoff computer model SD-TOPMODEL in three sub- catchments in the Upper Calder, the impact of intensive grazing on flooding was tested by modelling a scenario where selected regions of the catchment were modified to represent intensive grazing and compacted soil. These results were then compared with the current land management practices in the study areas.

The intensive grazing computer model run was created by identifying parts of the catchments that are grazed and where water will predominately flow during storms. An example of the locations selected to represent the intense grazing areas in the Hebden Water catchment can be seen in Figure 1. This area is 7.2 km2 (720 hectares), around 6% of the total catchment area.

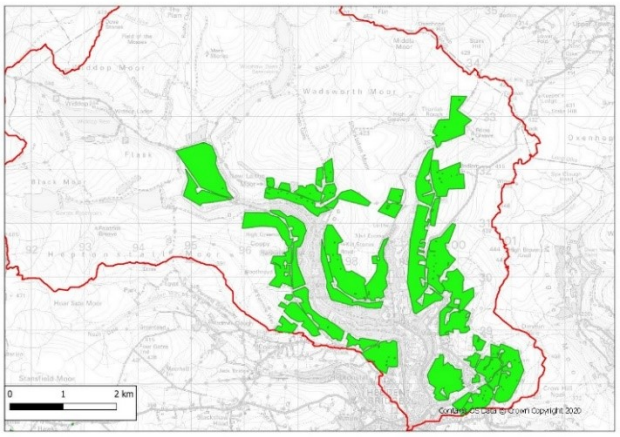

Figure 1: Location of grazed lands used in this modelling

Using measured differences between land that is covered in grass and heavily grazed land, the model was modified by decreasing the depth of soil (50% shallower), lowering soil permeability (40% lower) and a decreased resistance to water flowing across the land surface (75% less) to represent the effect of heavily grazed land.

The impact of the change in grazing pressure on river flow can be seen when comparing the river flow for the baseline model and the simulation of the heavy grazing model. For a mock 1 in 10 year, 3-hour storm event, the peak flood increased by 13% and the flood peak arrives 30 minutes earlier than the baseline model (Figure 2).

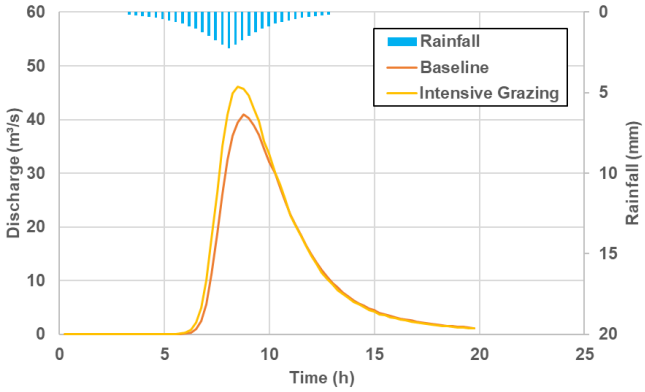

Figure 2: Comparison of the output of the baseline computer model run against intensive grazing computer model run

When comparing a baseline (current conditions) simulation against intensive grazing for 6 rainfall events, (4 mock storm event and 2 recorded events), the intensive grazing was found to increase local flood risk, with an average increase in the peak flow value of **6%**, an average reduction in the overall volume of flood water of **2%** and an average increase to the timing of the peak of **20 minutes (Table 1).**

Table 1: Summary of the difference in peak discharge, changes to time of the peak and flood volume increase from heavy grazing

Event	Peak Discharge Increase	Time to Peak Advance	Volume Increase
3 hour 1 in 10 year	7%	5 – 10 mins	6%
3 hour 1 in 100 year	5%	5 – 10 mins	1%
12 hour 1 in 10 year	4%	15 – 20 mins	2%
12 hour 1 in 100 year	1%	10 – 15 mins	1%
December 2015	4%	25 – 30 mins	1%
June 2012	4%	25 – 30 mins	1%

These results suggest that intensive grazing can have a negative impact on flood risk with higher peak flow and a faster arriving peak. It is noted that this scenario represents a 'worst possible case' example of grazing practices.

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**