DETENTION OF HEAVY RAIN ON AN EXTENSIVE NORWEGIAN SEDUM ROOF; JULY 2009

B.C. Braskerud

Norwegian Water Resources and Energy Directorate (NVE), Oslo, Norway

Abstract

Roofs with vegetation cover are used as a measure to hinder perception becoming pluvial urban floods. This paper shows how a shallow soil (3 cm) green roof functioned under a wet month in July. The runoff intensity under a rare, heavy precipitation episode (29 mm in 30 min.) was decreased by at least 26 % when the roof was initially dry. However, even on a wet green roof the runoff intensities are decreased.

1 Introduction

Using green vegetative roofs and other SUDS are possible ways of meeting the requirements from the floods directive tackling pluvial floods in urban areas. Green roofs are becoming popular in European countries and retention of more than 50 % of the annual precipitation is not unusual (Berndtsson 2010).

This paper presents results from the first summer of a green roof experiment in Oslo. Results include an intensive precipitation episode, which has the return interval in Oslo of approx. 40 years. The question often raised is: How will extensive (shallow), green roofs perform during intensive precipitation?

Corresponding author:
Bent C. Braskerud - Norwegian Water Resources and Energy Directorate (NVE), Oslo, Norway
NVE, P.O. Box 5091, Majorstua, 0301 Oslo, Norway
E-mail: bcb@nve.no

2 Methodology

A 25 year old garage roof in Oslo was divided into 3 equal parts, each 8 m^2 (see photo). An extensive sedum roof, with soil depth 3 cm, was installed on part 1 and 3, while part 2 was the reference. The green roof was a product from www.vegtech.se. Only roof no. 1 (Veg Tech System XMS 0-4) and the reference (no vegetation) are compared in this paper. The roof slope was 3.2 degrees.

Figure 1. The left hand side sedum roof and the reference was compared

Runoff water from the roof was sampled in insulated 250 l barrels, and monitored in 5 min. intervals. Pumps emptied the barrels automatically when full. A Lambrecht precipitation sensor (1518 H3) monitored the rainfall.

3 Results and discussion

Intensive precipitation on the 3rd of July (29 mm in 30 min), after a week of warm weather and drought, gave a reduction in peak runoff of 26 % from the green roof compared with the reference (figure 2). The first 9 mm was adsorbed into the green roof. The green roof peak was delayed a

few minutes and the runoff was distributed over longer time than the black roof.

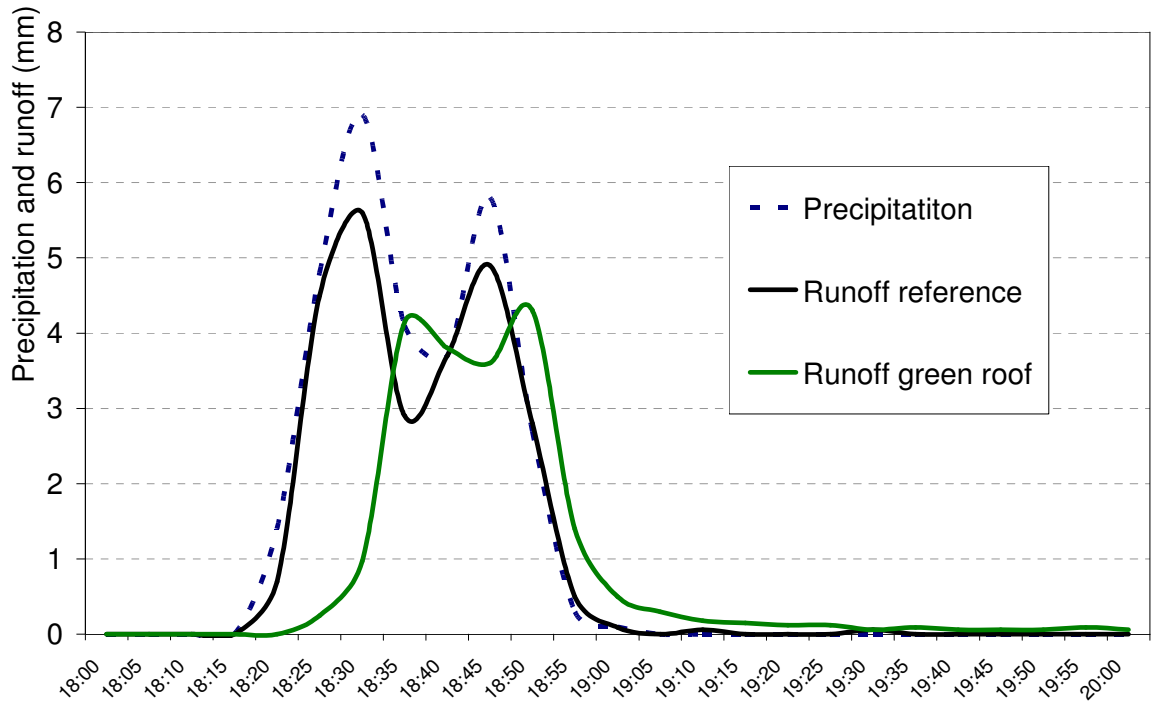

Figure 2. Precipitation (29 mm) and runoff from a roof with no vegetation (reference) and sedum vegetation, after one week of drought.

The peak retention may have been larger than observed in figure 2. Some water may have splashed from the reference roof onto the green roof due to the precipitation intensity as indicated by the precipitation gauge. The difference between the first precipitation gauge peak and the green roof peak is 40 %. After the first 9 mm the green roof is wet, but it still gives a small reduction of the peak runoff.

The rest of July was wet; total precipitation was 200 mm. For the whole month the runoff from the green roof was 25 % less than the reference roof. Wet green roofs also influence the runoff intensities. In late July the runoff peak after 14 mm rainwater (in 2 hours) was decreased by 51 and 36 % (figure 3).

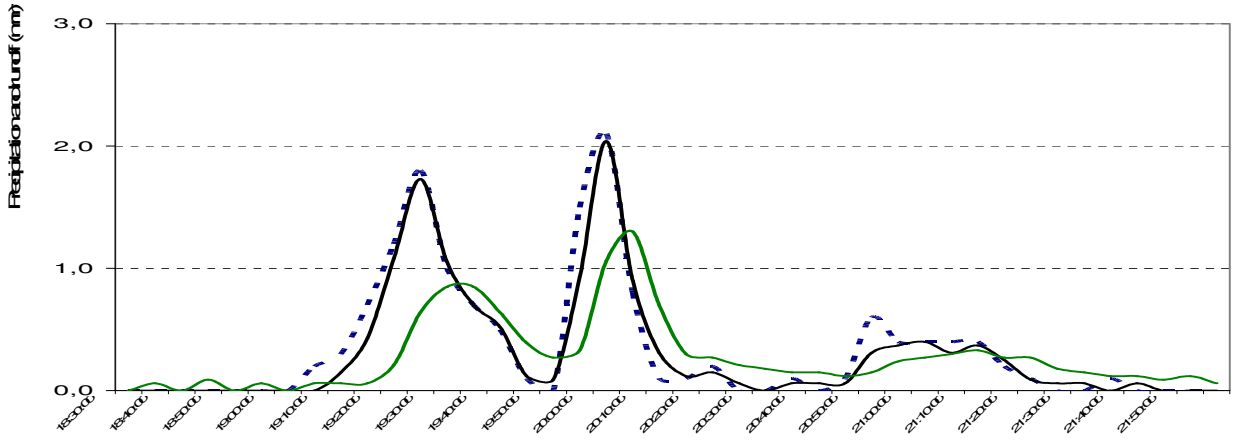

Figure 3. Precipitation on a wet green roof also reduces the peak runoff. Note that precipitation equals the runoff from the reference roof.

4 Conclusions

The future climate change projections for Norway indicate a warmer climate and more incidents with heavy rain. This could mean a situation like in figure 2; a dry roof receiving loads of water within a short time period. Green roofs are a possible measure to reduce the inundation after heavy rain over urban areas. Using green roofs and other SUDS are possible ways of meeting the requirements from the floods directive in urban areas.

Acknowledgements

I would like to thank the Interreg 4B project SAWA and NVE for financial support of the experiment.

References

Berndtsson, J. C.: Green roof performance towards management of runoff water quantity and quality: A review. Ecological Engineering **36**, 351–360, 2010.