



## GREEN ROOFS WITH 'LOW' AND 'HIGH' WATER USE PLANTS: COMPARISON OF RAINWATER RUNOFF POTENTIAL AND IRRIGATION NEEDS

A study by Roehr and Kong (2010) examined the potential of green roofs to reduce rainwater runoff leaving a rooftop using soil-water balance modeling in three cities with different climates. Runoff performance depends on local conditions such as precipitation patterns, plant selection, and soil characteristics. In Vancouver, green roofs that use 'low' water use plants can reduce the rooftop runoff entering the sewers by 29% (annual average). The summer water irrigation deficit can be reduced to 8.6 mm with a retention tray. 'High' water use plants can potentially reduce the rooftop runoff by 58% but result in a higher summer irrigation demand. Refer to the summary table for more information.

Case Study	Area 1: Vancouver	Area 2: Kelowna	Area 3: Shanghai
Precipitation	Low rainfall in summer high rainfall in winter	Low rainfall in summer Low rainfall in winter	Most rainfall in summer Less rainfall in winter
'Traditional roof' runoff volume	<b>2,578 m<sup>3</sup>/ha/year</b>	<b>400.5 m<sup>3</sup>/ha/year</b>	<b>3,283 m<sup>3</sup>/ha/year</b>
<b>'Low' water use plants (Kc = 0.3) (e.g., Sedum species)</b>			
Annual runoff reduction (not entering sewers)	753 m <sup>3</sup> /ha/year	400.5 m <sup>3</sup> /ha/year	903.2 m <sup>3</sup> /ha/year
% reduction of traditional roof runoff volume	753/2,578 = <b>29%</b>	400.5/400.5 = <b>100%</b>	903.2/3,283 = <b>28%</b>
Summer irrigation water needed	<b>Plants need:</b> 172.1 mm <b>Water deficit:</b> 54.4 mm *	<b>Plants need:</b> Not stated <b>Water deficit:</b> 48.6 mm **	<b>Plants need:</b> Not stated <b>Water deficit:</b> None
<b>'High' water use plants (Kc = 0.6) (e.g., sea pink (<i>Armaria maritime</i>), moss rose (<i>Portulaca grandiflora</i>))</b>			
Annual runoff reduction (not entering sewers)	1,506 m <sup>3</sup> /ha/yr	Not stated / Not recommended	1,806.7 m <sup>3</sup> /ha/yr
% reduction of traditional roof runoff volume	1,506/2,578 = <b>58%</b>	Not stated / Not recommended	1,806.7/3,283 = <b>55%</b>
Summer irrigation water needed	<b>Plants need:</b> 344.2 mm <b>Water deficit:</b> More than 200 mm	<b>Plants need:</b> Not stated / Not recommended	<b>Plants need:</b> Not stated ***

\* Deficit can be reduced to 8.6 mm with a 50 mm retention tray.

\*\* Deficit can be reduced to 0.7 mm with a 50 mm retention tray.

\*\*\* Deficit can be reduced to 0.0 mm with a 50 mm retention tray.

**SOURCE:** Daniel Roehr & Yuwei Kong (2010). Runoff Reduction Effects of Green Roofs in Vancouver, BC, Kelowna, BC, and Shanghai, P.R. China. *Canadian Water Resources Journal*, 35(1), 53–68. DOI: 10.4296/cwrj3501053.

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