

GREEN ROOF WATER BALANCE RESEARCH AT OKANAGAN COLLEGE, PENTICTON

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Water Balance Monitoring

A weather station has been installed on the largest of the green roof cells. The station was installed in September 2011, & the following variables are being continuously monitored:

- Air temperature
- Humidity
- Wind speed & direction
- Incoming solar radiation
- Precipitation (rainfall)
- Soil moisture @ 5 & 10 cm
- Soil temperature @ 5 & 10 cm

In Spring 2012, instrumentation will be installed to measure roof drainage through the downspout system. We will also be running a second weather station over a non-green roof portion to examine differences in energy balance & evaporative fluxes.



Vegetation Cover

Native plant species adapted to dry conditions were planted on the green roof cells in 2011. However, first-year survival was poor due, in part, to the proliferation of weeds. It is unclear whether the weed seeds were present in the growing medium or if they were transported to the roof by wind. Weeds were removed by hand in late summer 2011: the photo below shows the roof before (left) & after (right) weed removal. In order to improve the survival of planted species, irrigation was necessary during the 2011 growing season & will likely will be required in 2012. This will complicate water balance estimates, as irrigation inputs will need to be quantified.



Abstract

The new Jim Pattison Centre for Excellence in Sustainable Building & Renewable Energy Conservation at the Penticton Campus of Okanagan College includes a number of green roof sections. Green roofs have a number of potential environmental benefits relative to more traditional materials such as reduced stormwater runoff, plant & animal habitat, sound dampening, and insulation from temperature extremes. There are few available data on the hydrologic performance of green roofs in semi-arid climates such as the Okanagan Valley. The purpose of this project is to measure the water balance & hydrologic performance of the green roof at the Penticton campus. Water balance monitoring is ongoing, & includes measurement of atmospheric and soil environmental variables. Measurement of green roof drainage outputs will be initiated in spring 2012. Laboratory analyses will be conducted to quantify the physical properties of the rooftop growing medium. Using long-term data on precipitation patterns in Penticton & measurements of growing medium properties, a simple soil water balance model will be developed for testing using field data collected on-site.



Growing Medium

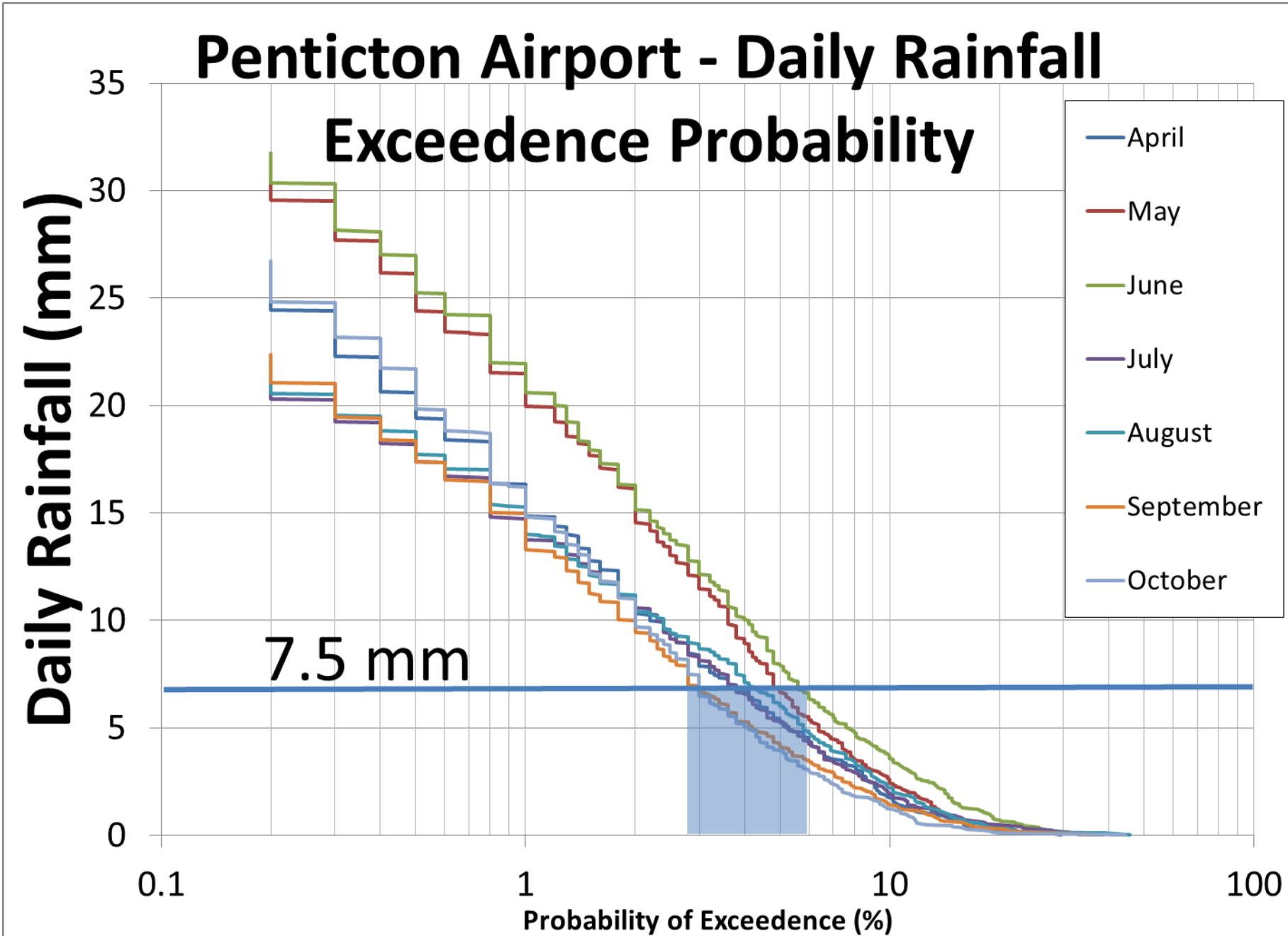
The growing medium (soil) is designed to be relatively low density (lightweight) yet capable of retaining significant amounts of water.



Based on data provided by the landscape architect, we estimate that the 15 cm layer of soil on the roof can store approximately 7.5 mm of water.

Stormwater Mitigation Potential

Analysis of 70 years of rainfall data for Penticton Airport indicate that the probability of exceeding 7.5 mm of rain in one day ranges from approx. 3-6 %. In other words, more than 7.5 mm of rain could be expected to fall during approximately 7 days per year.



Next Steps

- Install drainage monitoring instrumentation to complete water balance measurements
- Quantify the role of irrigation on water balance & performance of green roof for stormwater mitigation
- Complete measurement of soil physical & hydraulic properties.
- Develop simple water balance model to use as a teaching tool.
- Expand monitoring system to include a second smaller green roof cell



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