Project Summary
2017/18

Project 2.6
Developing tree-based infiltration systems

Restoration of natural flow regimes by disconnecting impervious surfaces from drainage networks has been identified as a key strategy in the protection of urban waterways. This strategy emphasises the need for significant (~80%) reduction in the volume of runoff events conveyed directly to urban streams. To achieve this will require a suite of strategies to be adopted, including both stormwater harvesting and restoration of infiltration processes. The potential stormwater volume reduction of tree-based infiltration systems has not been quantified, despite their substantial capacity for use throughout urban areas.

Project aim

This project is focussing on how to optimise tree-based stormwater control measures, and increase the volume of stormwater intercepted through further development of the technology. Its aims to produce two primary outputs:

- a guidance document providing technical detail on how to design tree-based systems, including selection of species and substrates as well as standard drawings; and
- a tree-based node for the MUSIC model which will allow users to model the performance of tree-based systems alongside other stormwater control measures.

Research methods

The main focus of this project will be quantifying the inputs required to create a *tree-based infiltration model* (from which will be develop a tree-based MUSIC node). Three key factors will determine the performance of tree-based systems: design dimensions, soil/substrate properties and tree species function. Significant research has already contributed to both design dimensions and substrate selection for raingardens. Therefore, the project will focus on how trees contribute to stormwater capture (as compared with sedges and rushes) and tree species selection. This will involve 3 substantial glasshouse studies. The project will also conduct field studies to provide a means of validating, if not calibrating, the tree-based model.

Figure 1. An infiltration trench being retrofitted alongside an established tree. The pipework conveys water from the kerbside into the trench which will be filled with gravel. The trench can hold ~1500 L of stormwater - supply the tree with enough water to maintain transpiration during summer and reducing stormwater runoff by ~50%.

Progress to date

The project is well into its final year and starting to consolidate major learnings from the fieldwork and experiments performed so far.

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Fieldwork in the City of Monash has lead to preparation of a paper on the engineering and design considerations for maximising runoff capture (a key component of our deliverable on producing guidelines for designing tree-based stormwater control measures (SCMs). Jasmine Thom (PhD student) is also preparing a manuscript using tree transpiration data from the same field experiment—giving understanding to the importance urban trees are in the water balance and their role in runoff retention.

Vaughn Grey's (MPhil student) fieldwork on alternative designs for newly planted street trees is showing that growth rates and therefore canopy cover can be effectively doubled by passively irrigating tree pits with runoff. This will contribute to our design guidelines for tree-based SCMs.

Jasmine Thom is has also been occupied building a water balance model for tree-based SCMs and is running through a sensitivity analysis to determine the most important design considerations affecting both runoff retention and tree performance. This model will eventually become the MUSIC node. At that stage, we will have all the data we need to translate her water balance model into the MUSIC node and complete the project.

Project team

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