

This project will focus on optimising tree-based stormwater control measures which have not been quantified, despite their substantial capacity for use throughout urban areas; as well as their ability to intercept significant quantities of both water and nutrient pollutants. There is significant potential to increase the volume of stormwater intercepted through further development of the technology.

Outcomes for waterway management: A guidance document on how to design tree-based systems, and development of 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.

Details 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 relies not just on improving the quality of stormwater runoff, but emphasises a significant (~80%) reduction in the volume of runoff events conveyed directly to urban streams. This is a serious volume reduction target and it is clear that a suite of strategies including both stormwater harvesting (e.g. tanks) and restoration of infiltration processes (e.g. vegetated WSUD) will be required.

This project focusses on optimising tree-based stormwater control measures. The potential stormwater volume reduction of **tree-based infiltration systems** has not been quantified, despite their substantial capacity for use throughout urban areas; as well as their ability to intercept significant quantities of both water and nutrient pollutants. Recent data suggests that tree-based systems (infiltration trenches) can reduce runoff volumes by at least 50-60%. There is significant potential to increase the volume of stormwater intercepted through further development of the technology.

This project will involve:

1. Development of a tree-based infiltration model.

This model will be used throughout the project to: (i) determine areas of greatest potential gains in capture/treatment efficiency and therefore guide our specific research focus, (ii) compare the performance of alternative design/species/substrate scenarios at both the system and catchment scale; and (iii) feed into the development of a tree-based node for the MUSIC stormwater model.

2. Comparison of 'stormwater utilisation' potential of tree species in the glasshouse.

This work will involve not only comparing the performance of alternative species; but also exploring the underlying mechanisms which make certain species well-suited to use in stormwater control measures. By relating performance to anatomical and morphological traits, the project will provide a means of selecting species suitable for tree-based infiltration systems across a broader range of climatic zones.

3. Quantification of stormwater capture and utilisation by tree-based systems in the field.

Field studies will be an integral component of this study and will provide a means of validating, if not calibrating, the tree-based model. They will also validate species selection work in the glasshouse. This phase of the project will involve monitoring stormwater capture and treatment performance of different system designs, substrates and species; as well as monitoring tree-specific metrics including incidence of water and nutrient stress in both mature and juvenile trees.

4. Refining the model, development of guidelines and creation of a tree-based MUSIC node.

Finally, the project will calibrate the model using glasshouse and field data, allowing a comparison between the predictive power of the model with real data, then further refinement. Using this validated model will support the preparation of guidelines which will quantify the performance of tree-based systems relative to other treatment options. The guidelines will also provide detailed technical advice on design, species and substrate selection, including standard drawings, to assist practitioners. Furthermore, the project will collaborate with eWater such that the validated model can be incorporated into the MUSIC model as a 'tree-system node'.

There will be two key practical outputs from this project:

- (i) 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
- (ii) 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.



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