

#### **School of Ecosystem and Forest Sciences**

Jasmine Thom, Chris Szota, Tim Fletcher, Vaughn Grey, Andrew Coutts, and Stephen Livesley

# Quantifying the contribution of IWM to tree growth and transpiration













# IWM and urban cooling

Urban cooling achieved through: Evapotranspiration and Shade

IWM can assist cooling by:

- providing water for evapotranspiration
- increasing canopy growth
- maintaining healthy canopies

# Evapotranspiration reduces air temperature

Shade provision reduces radiant temperature



## IWM case study 1: City of Monash



Transpiration sensor installed in study tree



Pit inlet to infiltration trench





Street view at Calembeena ave



# IWM case study 1: Research approach

- Infiltration trenches installed adjacent to established trees with 1500 L storage capacity
- Monitored tree health, transpiration, and stormwater capture
  - 4 study streets
  - 2 tree functional types (deciduous, evergreen)
  - 2 soil types (sandy, clay)
  - 2 inlet types (lintel, pit)





Excavating the infiltration trench adjacent to an established tree



## **IWM and transpiration**

- WSUD trees maintained transpiration under drier conditions
- non-WSUD trees reduced transpiration under drier conditions
- No difference in tree health between soil, tree, or inlet types.

*IWM supports transpiration under challenging conditions* 

2014/15

Year

2015/16





## IWM and the water balance\*

- Runoff retention was low (~18 %) BUT highly variable (5 – 44 %)
- Blockages restricted inflow
- Alternative inlet designs could improve retention
- Trees transpired ~18 % of all rainfall inflows
- Trees transpired 1.4 x more water than exfiltrated through stormwater capture

Inlet capacity limited stormwater capture.



\* For more information see my extended talk at Stormwater Victoria 2018, 7<sup>th</sup> June, 1:55 pm.



#### **IWM Case Study 2: Moreland City Council**



Soil Sampling



Downloading transpiration





### IWM Case study 2: Research approach





# IWM and tree growth\*

- Trees in drained systems grew twice as fast as regular tree plantings or trees adjacent to stormwater systems
- Undrained trees had poor growth rates due to waterlogging\*

IWM supports growth but waterlogging impedes growth



\*For more information see Vaughn Grey at the 2018 Stormwater Victoria Conference 6<sup>th</sup> June 11:15 am



# What have we learned?

#### Case study 1: Established trees

- IWM support transpiration during drier conditions
- Inlet capacity influences retention.
- Trees can transpire a large amount of inflows
- Larger systems with greater inlet efficiency



Calembeena Ave

#### Case study 2: Establishing trees

- IWM doubled growth of establishing trees
- Waterlogging impedes growth
- Consider underdrain or plant adjacent
- Larger systems



Barrow St



# Where to from here?

- How does infiltration rate (soil type/drainage) affect tree response for different species?
- How do we design to maximise benefit for trees AND stormwater?
- How do species drought and waterlogging strategies affect performance?\*
- Modelling the efficacy of tree-based systems
- Context-specific design guidelines



https://www.pagepersonnel.ch/sites/pagepersonnel.ch/files/styles/large/public/career-advice\_job-interview-tips\_answeringtough-interview-questions.jpg?itok=WXsdC9u-

\* For more information see Chris Szota at Stormwater Victoria 2018, 7<sup>th</sup> June, 11:50 am.





#### References

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