

An Assessment of Incorporating Trees into Bio-retention Basins

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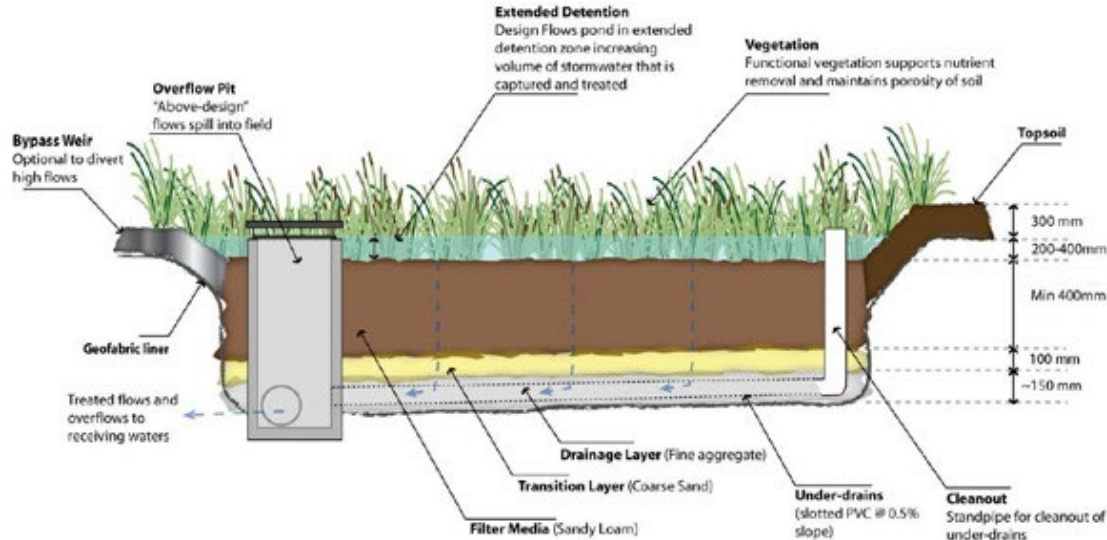




Key Messages

What I'm hoping to get across from this presentation.

- Trees can improve the treatment performance and climate resilience of bio-retention basins
- Trees can improve habitat function and aesthetics of stormwater assets
- Trees can reduce maintenance of bio-retention basins



- **What is it?**
 - Biological system for pollutant removal by plants and soil
- **How does it work?**
 - Sedimentation, filtration, sorption, biological uptake
- **Advantages?**
 - Well understood system that has been installed globally
- **Any failings?**
 - Multitude of issues with plants/performance
- **Maintenance?**
 - Little ongoing maintenance but total overhaul is required after several years

■ Quick introduction bio-retention basins





Why haven't trees been in bio-retention basins all along?

- Column tests and published data
- Short term requirements for immediate treatment performance
- Council conservatism





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■ Why is this a problem?

- Open expanses of sedge species
- Prone to dry out and die out
- Harsh, anti public spaces
- Aesthetically and physically challenging environments





Why should trees be included in bio-retention?

- Reduced Maintenance
- Improve pollutant removal performance
- Increased climate resilience
- Shading/cooling
- Increase carbon storage
- Aesthetics
- Habitat improvement
- Soil health improvement





Reduced maintenance

- Casuarina example showing leaf litter
- Litter and gross pollutants are trapped on the surface
- Allelopathy prevents weeds
- Casuarinas and other trees should have a place within a basin, not necessarily over the entire basin
- Extended life of media
- Pipe blockage has been demonstrated to not be an issue (Dalrymple & Ramilo studies)



Improve pollutant removal performance

Healthy plants = increased pollutant removal

- Plant structure improves plant health
- Improvements in soil health – not blasted by the sun or dried out
- Hydraulic conductivity
- Dropped leaf litter doesn't block or reduce dissolve oxygen



Increased climate resilience

Ability to withstand wet and dry periods

- Improvements in soil health due to shading
- Less ponding AND less evaporation – increased evapotranspiration
- More resilient vegetation



Shading/cooling

Both in the basin and fringe effects

- Other species not blasted by the sun or dried out
- Ideal on western side of basin – afternoon sun
- More stable temperature for place
- Shading for landscape features (e.g. park bench)





Increase carbon storage

Trees lock up bulk carbon

- Storage not only in trunk but in soil
- Increased carbon in soil improves removal of targeted pollutants and metals
- Wet base and increased carbon can dramatically improve pollutant removal





Aesthetics

Trees improve visual amenity

- Landscape features
- Place making
- Bio-phyllic design
- Improvement over “hostile landscaping” such as Lomandra and Juncus





Habitat improvement

Trees improve habitat,
particularly for birds

- Nesting/roosting locations
- Possums, gliders, skinks
- (pic Great Frigatebird)
- Layers of trees, shrubs and grasses provides diverse habitats



Soil health improvement

Trees improve soil diversity

- Less blockage of media
- Deeper soil and connection to base soil

How to incorporate trees into the design



■ Design tips



- Deep filter media > 0.5 metres
- Unlined
- Gaps in drainage layer to connect media to deep soil
- Tree islands – if there are maximum bio-retention width requirements
- Trees on northern and western side to shade afternoon sun
- Separate inlet zone with trees – for energy dissipation during high flow events
- Water By Design has published list of tree species of varying heights to use in and around bio-retention basins
- Trees on embankments within bio-retention basins detention basins – no issue with failure



Does
anyone
have any
questions?



Thank you

Nigel Bosworth
SLR Consulting
Newcastle





Making
Sustainability
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SLRCONSULTING.COM



Nigel Bosworth

Technical Director- Stormwater, Hydrology & Flooding

Surface Water Resources State Leader – NSW

M 0414 938 812

E nigel.bosworth@slrconsulting.com



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