

Restoring a stream through retention of urban stormwater runoff: a catchment- scale experiment in a social-ecological system

Christopher J Walsh, Tim D Fletcher, Darren G Bos, and Samantha J Imberger
(in press) *Freshwater Science*

Urban stormwater runoff degrades streams



Current dominant approaches to managing stormwater runoff for environmental protection do not protect stream ecosystems

We hypothesise that stream restoration is possible using stormwater control measures in the catchment designed to:

1. Reduce size and frequency of untreated runoff
2. Restore quality and pattern of filtered flows to match pre-development stream flow regime
3. Reduce runoff volume to match pre-development volume



The problem:

Such stormwater management is well beyond current 'best practice'.

It has not been applied across a catchment anywhere in the world.

So, its potential to protect or restore streams has not been demonstrated.

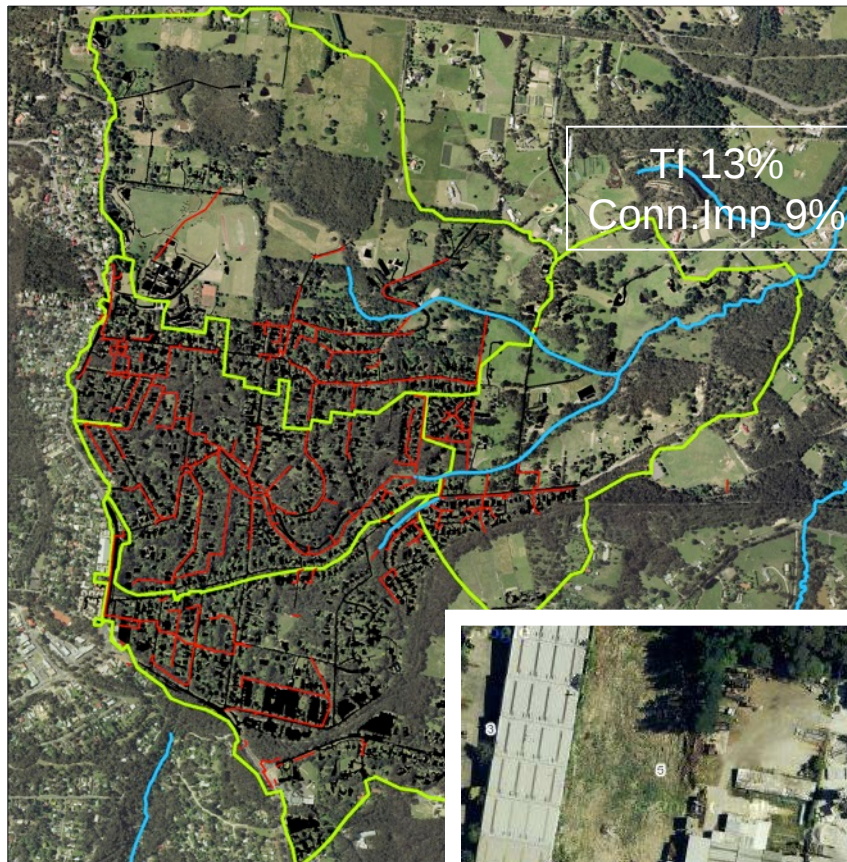
Our aim:

Test the potential of new stormwater management at a catchment-scale
to restore degraded urban streams

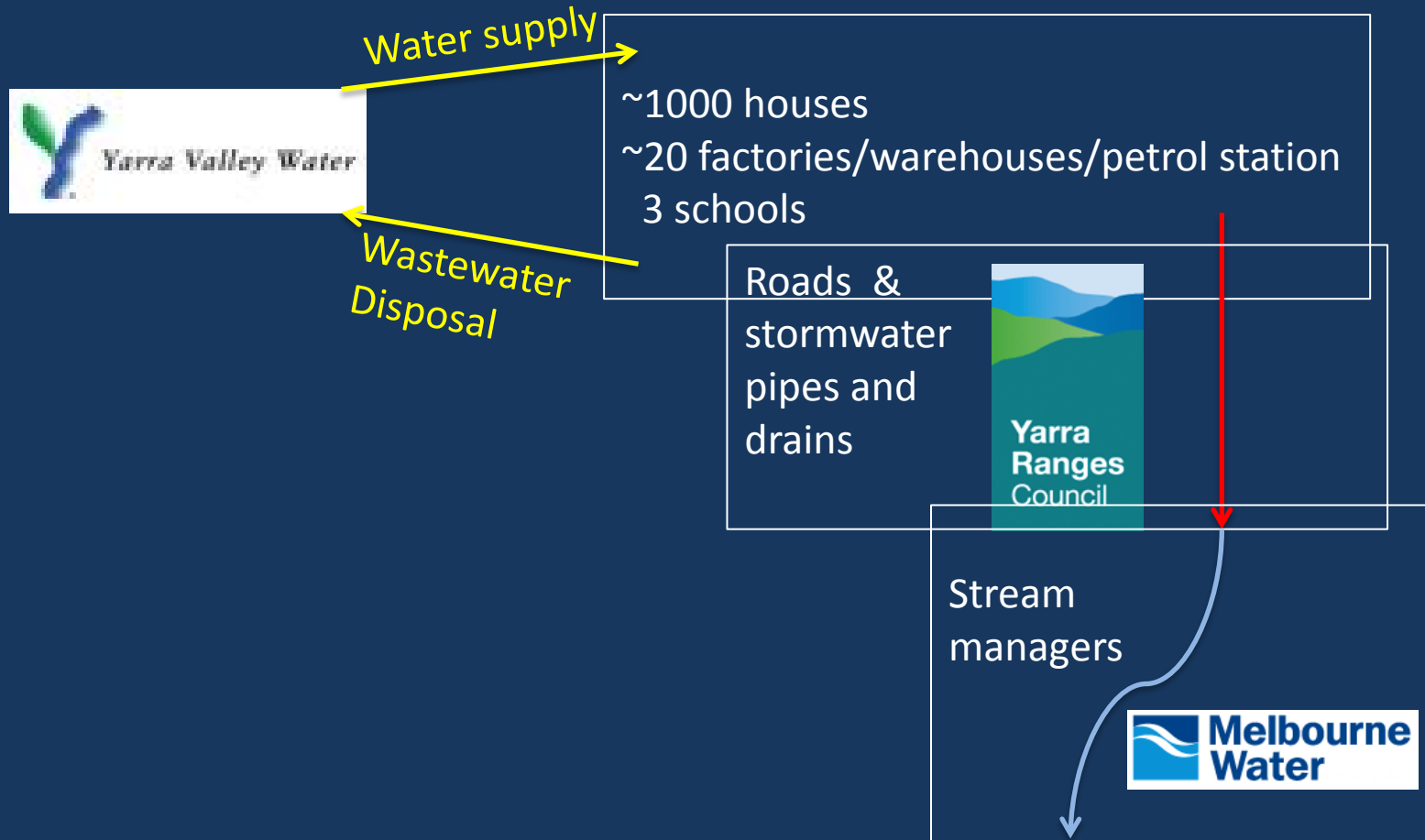
Our test catchment:

Little Stringybark Creek, Mt Evelyn

Little Stringybark Creek catchment



The LSC community



LESSONS

Building collaboration takes time and trust

This (and time for ecological response) makes such projects *necessarily long-term*.

Long-term projects allow adaptation of

- a) experimental design
- b) treatment designs

Long-term projects testing non-standard catchment treatments require
Planning provisions to protect the experimental investment

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The need for planning provisions

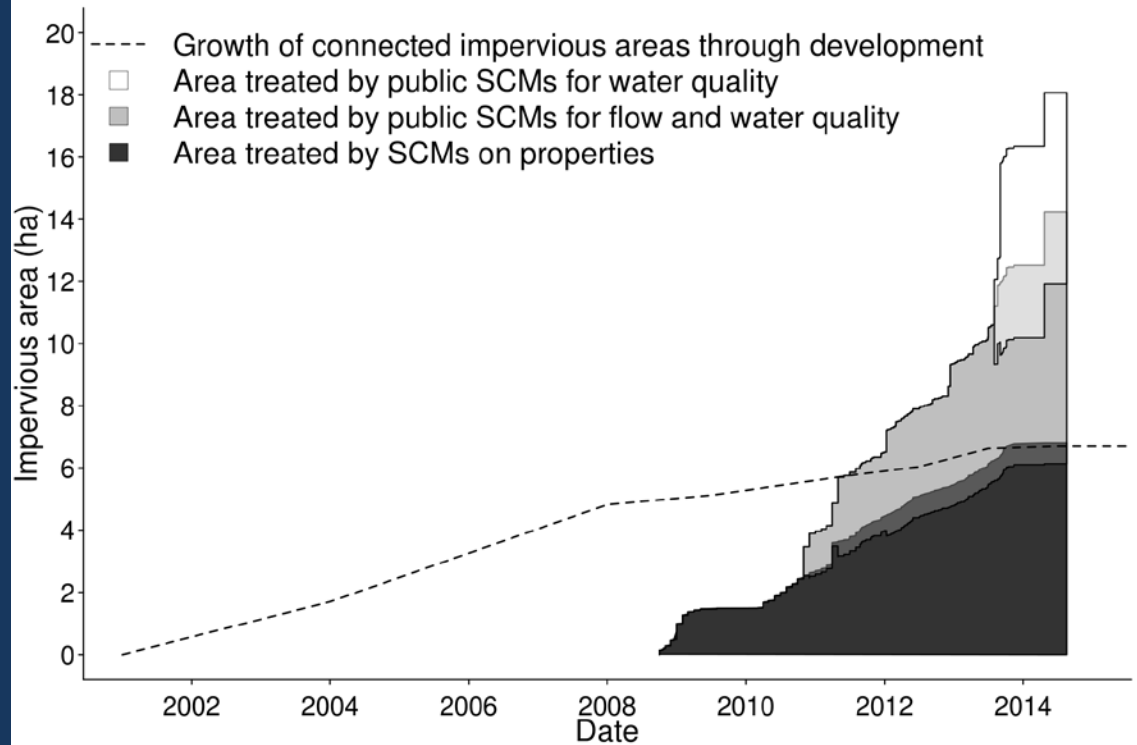
BACRI Macroinvertebrate sampling

BACRI Water quality and other ecological sampling

Hydrographic monitoring

Monitoring of LSC tributaries

Community engagement rounds



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~300 Stormwater retention systems constructed

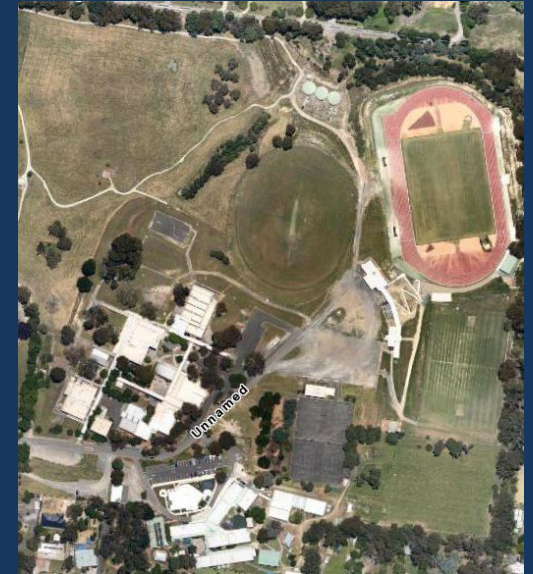
Impervious area treated
100-1,000 m²



1,000-5,000 m²



10,000-20,000 m²



We adapted our designs as we learnt what worked best and what was most welcomed by the community

SCM type	Round 1	Round 2	Round 3	Council
Rainwater tank only	41	21	1	-
Tank + rain-garden	1	2	1	2
Tank + infiltration system	10	36	3	-
Tank + passive irrigation to garden	-	13	68	-
Tank + baseflow trickle to stormwater	-	2	36	9
Rain-garden only	2	-	-	39
Infiltration system only	-	-	-	6
Low-flow water quality (WQ) filtration system	-	-	-	2

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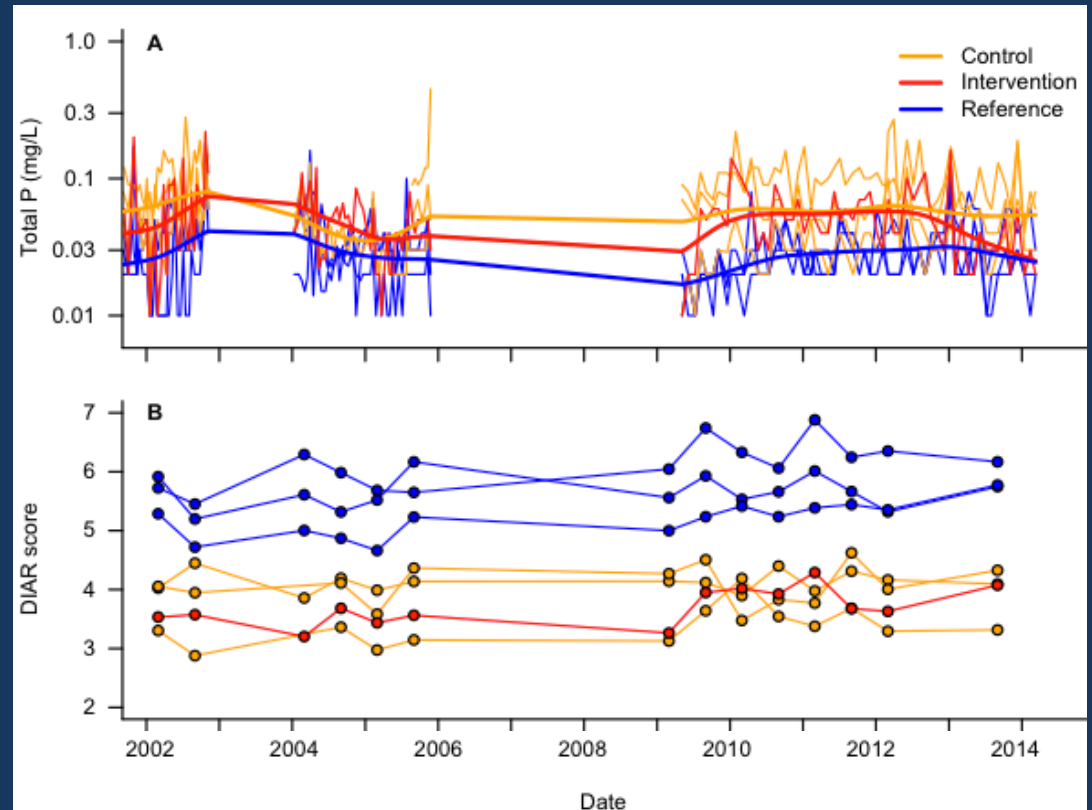
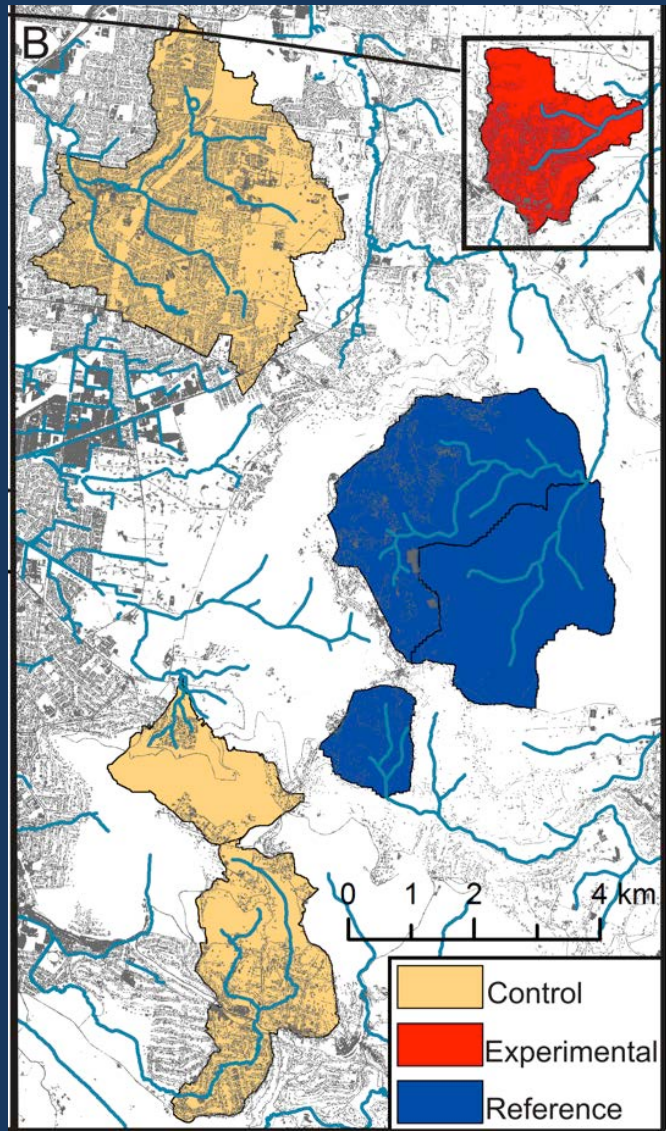
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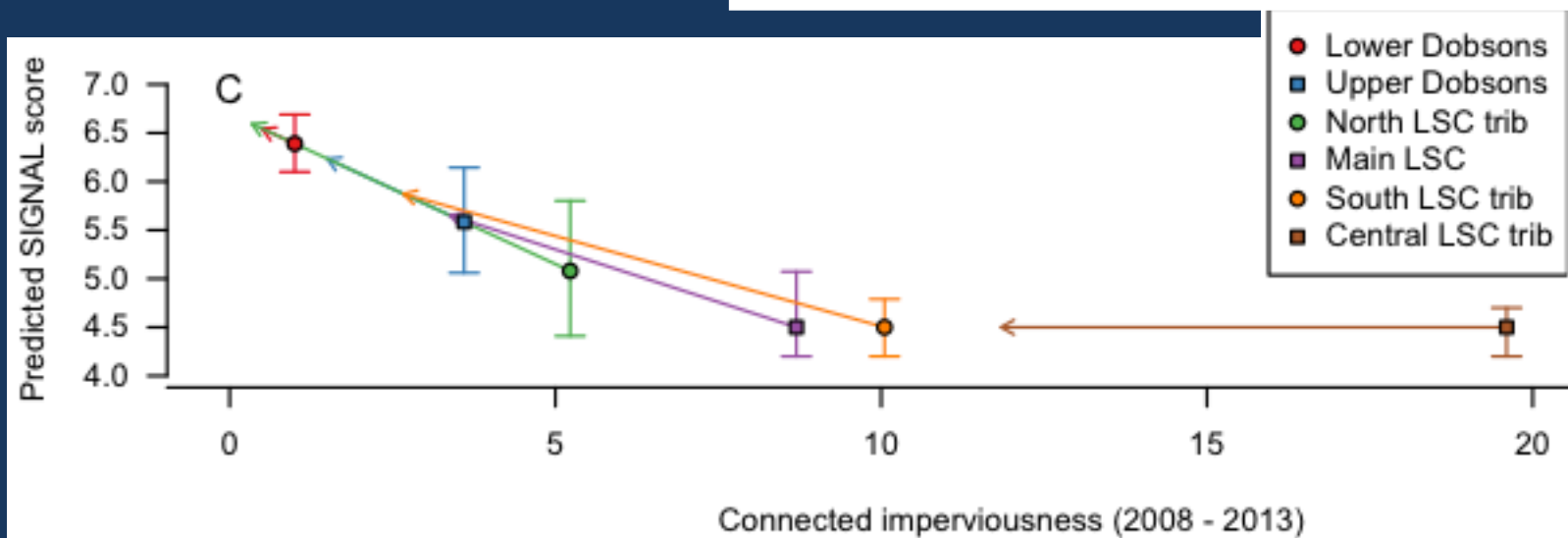
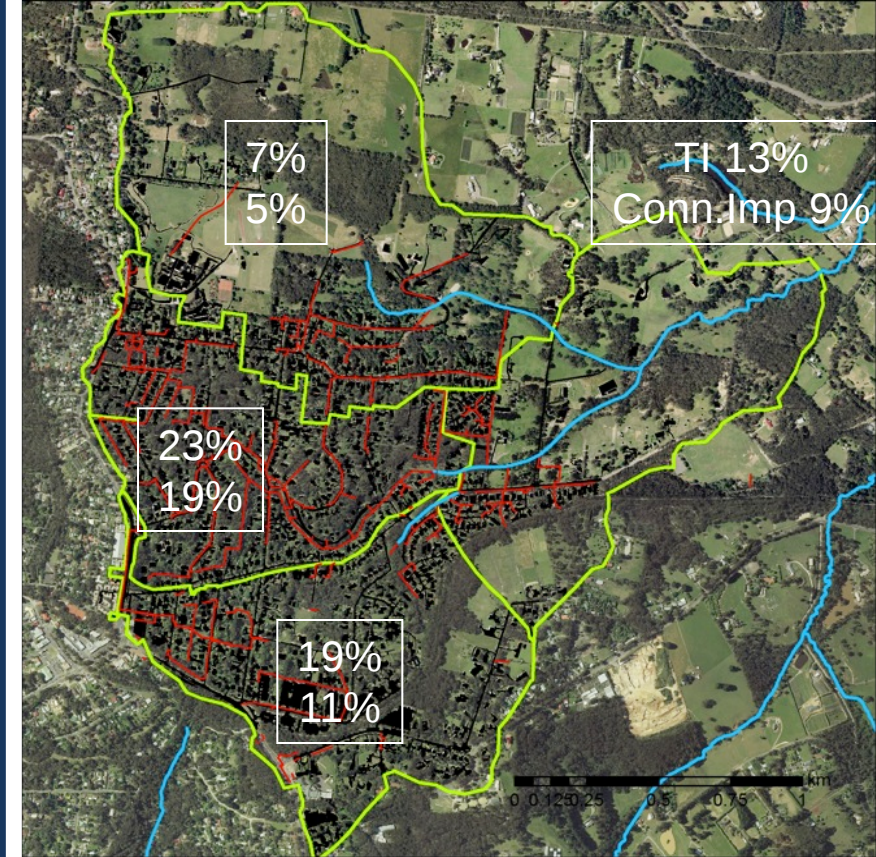
Adaptation of experimental design

1. Before-after-control-reference-impact experimental design



Adaptation of experimental design

2. Monitoring of smaller sub-catchments



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