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Valuing urban riparian corridors: The interaction of riparian buffers and channel condition and their influence on property prices

Buyani Thomy, Mark Morrison & Rosalind Bark

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Buyani Thomy, Mark Morrison & Rosalind Bark

Charles Sturt University

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Sydney WATER

NSW GOVERNMENT | Local Land Services Greater Sydney

CSIRO

FairfieldCity
Celebrating diversity

City of Canterbury
City of Cultural Diversity

Background

- All major Australian cities have a waterway that forms a prominent part of their landscape
- Urbanisation has led to degradation of many segments of these streams
- Local councils, state departments and Sydney Water are spending money on revegetation and re-naturalising these streams

The Challenge

- How to spend money available most effectively?
- Lots of worthy options but which will lead to the greatest benefit to the community?

Hypotheses

H1: *The value of increasing both vegetation and channel condition will exceed the value of increasing vegetation condition alone*

Hypotheses

- WTP may also be related to different states of the socio-ecological system

- A socio-ecological system may be defined as a coherent system of biophysical and social factors that regularly interact in a resilient and sustainable manner (Redman, Grove, & Kuby, 2004)

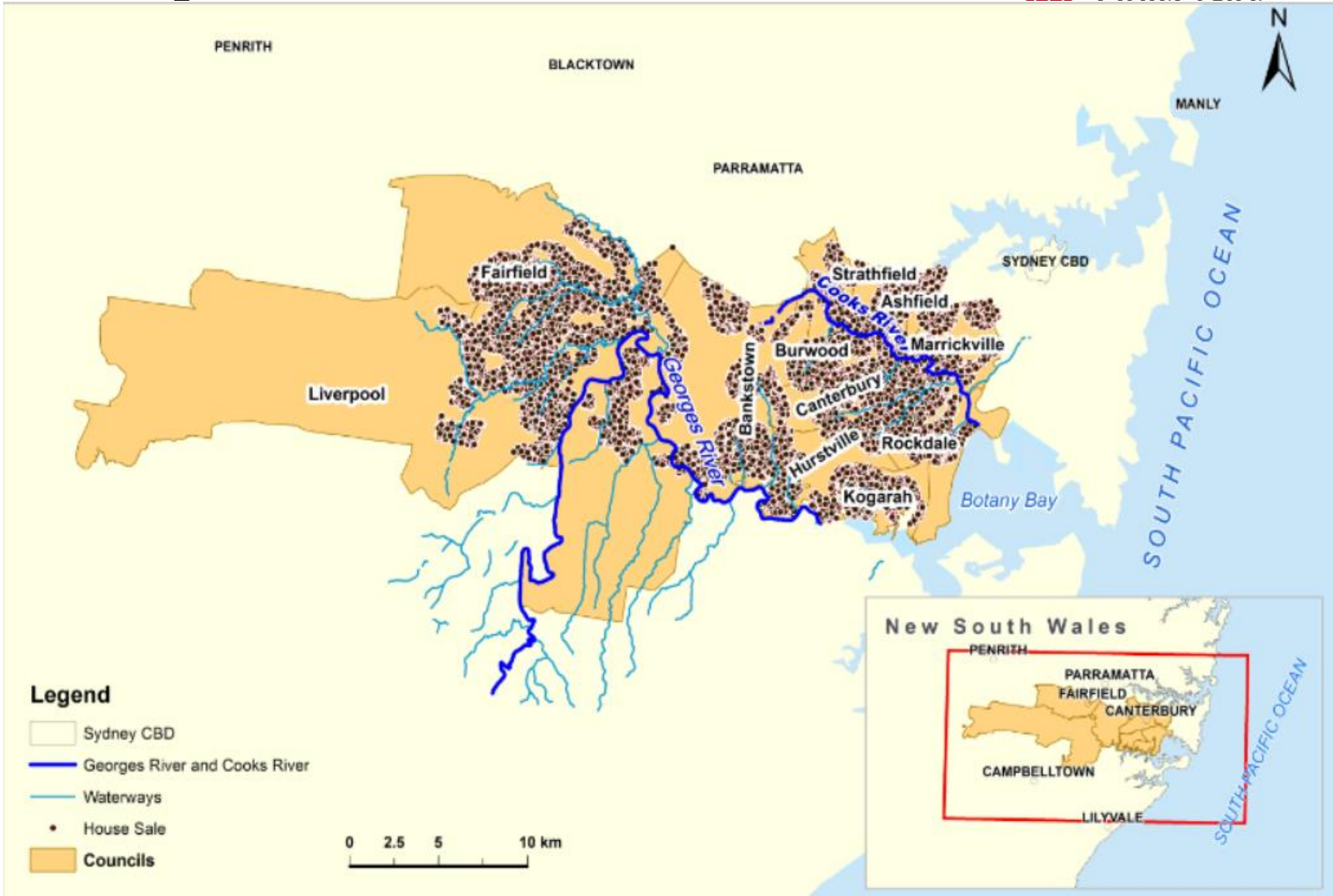
Hypotheses

- Identified three socio-ecological states
- The “bare and barren” state includes the poor and degraded conditions that have stream segments with concrete channels and minimal vegetation
- The “aesthetically pleasing” state refers to streams with less degraded channels and intact or restored vegetation buffers
- Finally, the “bushland living” state represents a more natural stream condition that is less impacted by urbanisation with extensive vegetation and unmodified channels

Hypotheses

- H2: *The relationship between house prices, and vegetation and riparian condition follows a step-like pattern with large benefits associated with moving from the "bare and barren" state to the "aesthetically pleasing" followed by moderate benefits for changes between conditions that are consistent with the "aesthetically pleasing" state and then a further high gain for changes from the "aesthetically pleasing" state to the "bushland living" state*

Study Area


PENRITH
BLACKTOWN
MANLY
PARRAMATTA
SYDNEY CBD
SOUTH PACIFIC OCEAN
Fairfield
Liverpool
Strathfield
Ashfield
Cooks River
Marrickville
Burwood
Bankstown
Canterbury
Georges River
Hurstville
Rockdale
Kogarah
Botany Bay
N
Legend
Sydney CBD
Georges River and Cooks River
Waterways
House Sale
Councils
0 2.5 5 10 km
New South Wales
PENRITH
PARRAMATTA
FAIRFIELD
CANTERBURY
CAMPBELLTOWN
LILYVALE
SOUTH PACIFIC OCEAN

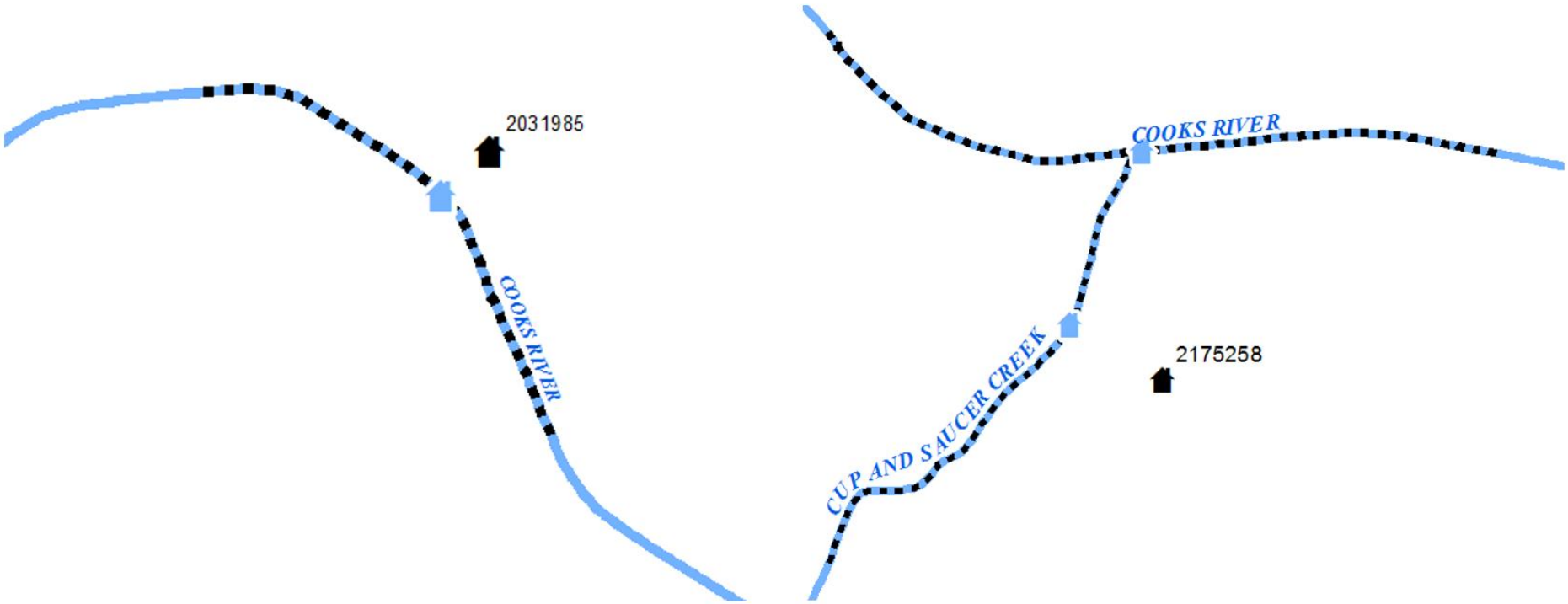
Data

- Houses sales transactionsC: Core Logic RP Data
- Neighbourhood data from ABS and BOCSAR
- Locational data from NSW LPI and GSLLS
- Waterway condition data: Alluvium Consulting Group

- There were six types of vegetation and riparian condition (VRCs) in the study area
- There are based on riparian buffer width, contiguity of vegetation and modification status of the stream channel

Vegetation and riparian condition (VRC)	Description	Characteristics
VRC 1	Degraded condition - No Vegetation/ Flood control/ Recreation	• Little to no buffer • Little to no canopy • The number and frequency of road crossings is undefined • Highly modified channel
VRC 2	Degraded Condition - little/ no vegetation	• Little to no buffer • Discontinuous canopy • The number and frequency of road crossings is undefined • Modified channel
VRC 3	Moderate Condition - little/no vegetation (cover)	• Buffer greater than 10m for 30% of length • Discontinuous canopy • Road crossings occur at intervals of >500m • Un-modified channel
VRC 4	Degraded Condition - good/ moderate vegetation (cover)	• Buffer greater than 10m for 30% of length • Discontinuous canopy • Road crossings >100m apart • Modified channel
VRC 5	Moderate Condition - good/ moderate vegetation (cover)	• Buffer greater than 20m for 70% of length • Semi-continuous canopy • Road crossings no less than 500m apart • Un-modified channel
VRC 6	Good Condition - moderate recovery potential	• Buffer greater than 50m for 70% of length • Continuous canopy • Road crossings that are no less than 2km apart • Un-modified channel

Attaching VRCs to a nearby house



a) b)

Hedonic regression equation

$$\ln(AdjPRICE_i) = \beta_0 + \sum \beta_j S_{ji} + \sum \beta_k N_{ki} + \sum \beta_l L_{li} + \sum \beta_m LGA_{mi} + \sum \beta_n VRC_{ni}$$

Semi-log model

Sample size: 29,749 house sales events

Sales data from 2003 to 2013

Spatial error model results

	Spatial error model	
Variable	**Coefficient**	**Std errors**
Bedrooms	0.0738***	0.0013
Bathrooms	0.0948***	0.0015
Landsize	0.0409***	0.0006
Age	-0.0016***	0.0001
Elevation	0.1220***	0.0134
Property offences	0.0004***	0.0001
Violent offences	-0.0081***	0.0003
Children	-0.0016***	0.0003
Non-English speaking background	0.0003*	0.0002
Unemployment	-0.0083***	0.0004
CBD	-0.0165***	0.0009
Waterway	-0.0148**	0.0059
VRC 2	0.0477***	0.0058
VRC 3	0.0566***	0.0060
VRC 4	0.0119**	0.0058
VRC 5	0.0658***	0.0054
VRC 6	0.0888***	0.0100
Lambda (λ)	0.4029***	0.0052
R^2	0.82	

Used K=4 nearest neighbours

→Small changes in the VRC coefficients from OLS to spatial error model

$R^2 = 0.82$

Homebuyers are willing to pay 4.8% more for a house nearby VRC 2 characteristics or the equivalent of $27,522 at the median house price of AU$573,378

VRC 6: 8.9% or $51,031 price premium compared to VRC 1

Results

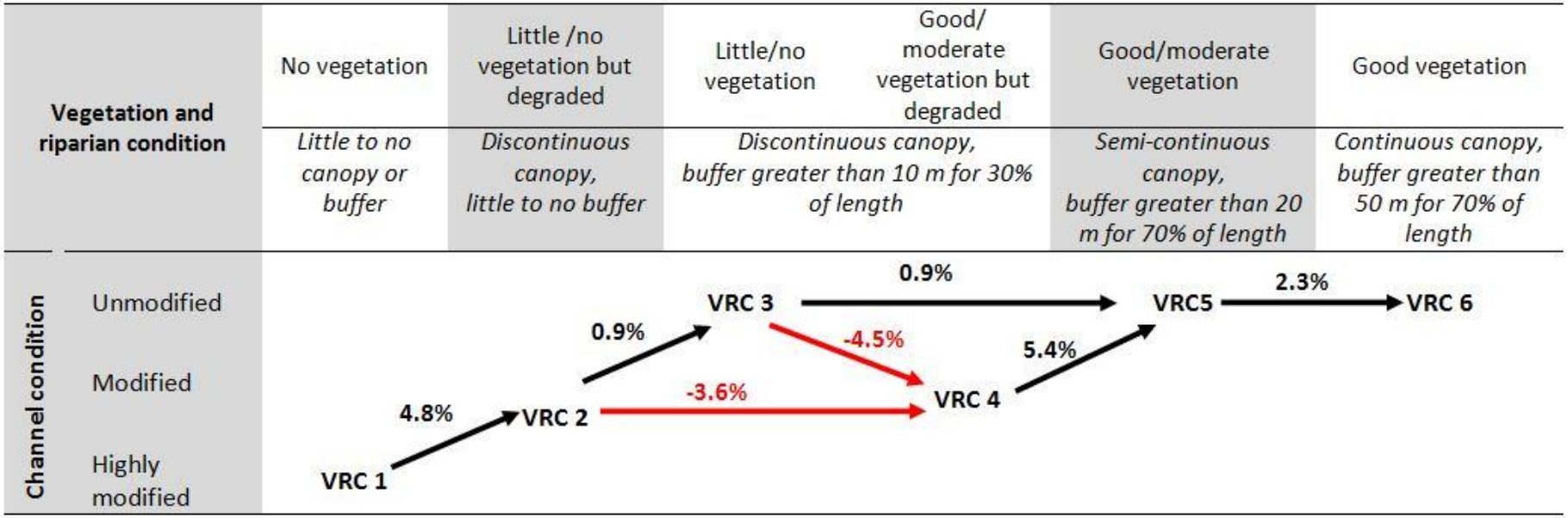


Figure 3: Effect of riparian vegetation and channel condition on house sales (based on spatial error model results)

VRC_i refers to the vegetation and riparian condition ranking of a stream segment nearby a given house based on riparian vegetation, canopy and buffer, and channel condition

Channel condition refers to the physical modification status of the actual stream, e.g. highly modified stream is one that has its banks straightened and concrete line, a modified stream is one that has rock-lined and still meandering, and an unmodified stream is one in a more natural state

The percentage values shows the implicit change in willingness to pay as a percentage of rental price across different VRC levels

Conclusions

- Channel condition moderates the value of vegetation

- The estimated marginal implicit prices are related to the socio-ecological states we developed at the beginning

Conclusions

- The benefits from fixing the channel exceed those of revegetating
- Whether to prioritise fixing channels over revegetation will depend on costs (benefit-cost ratio)
- Higher benefits for more natural and vegetated streams
- Value of revegetation for an area also depends on the current state
- Helps rank public works on streams based on economic values
- Support for investment in urban waterways