

Monetising the intangible amenity benefits of small stormwater management systems: A case study of living streams

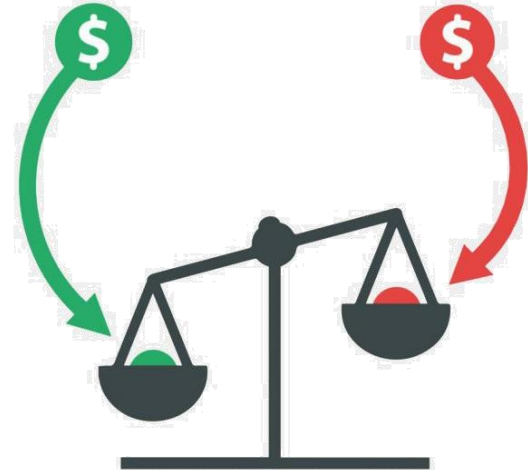
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- Non-market valuation and WSUD
- Living stream, previous research
- Motivation for this study
- Study area
- Method and data
- Results and Conclusion

Why nonmarket valuation?

- A good project should generate more benefits than costs
- Benefit: Cost analysis helps to decide
 - Is the project worthwhile?
 - Which of many projects to select?
- Many of the benefits of water sensitive projects do not have market values
 - Nonmarket valuation



Estimating Non-Market Values

- Stated preference methods
Ask people how do they value things
 - Contingent valuation
 - Choice experiment
- Revealed preference methods
Observe how do people behave
(how much do they pay for things)
 - Hedonic pricing
 - Travel cost
- Benefit transfer
 - Use information from previous studies

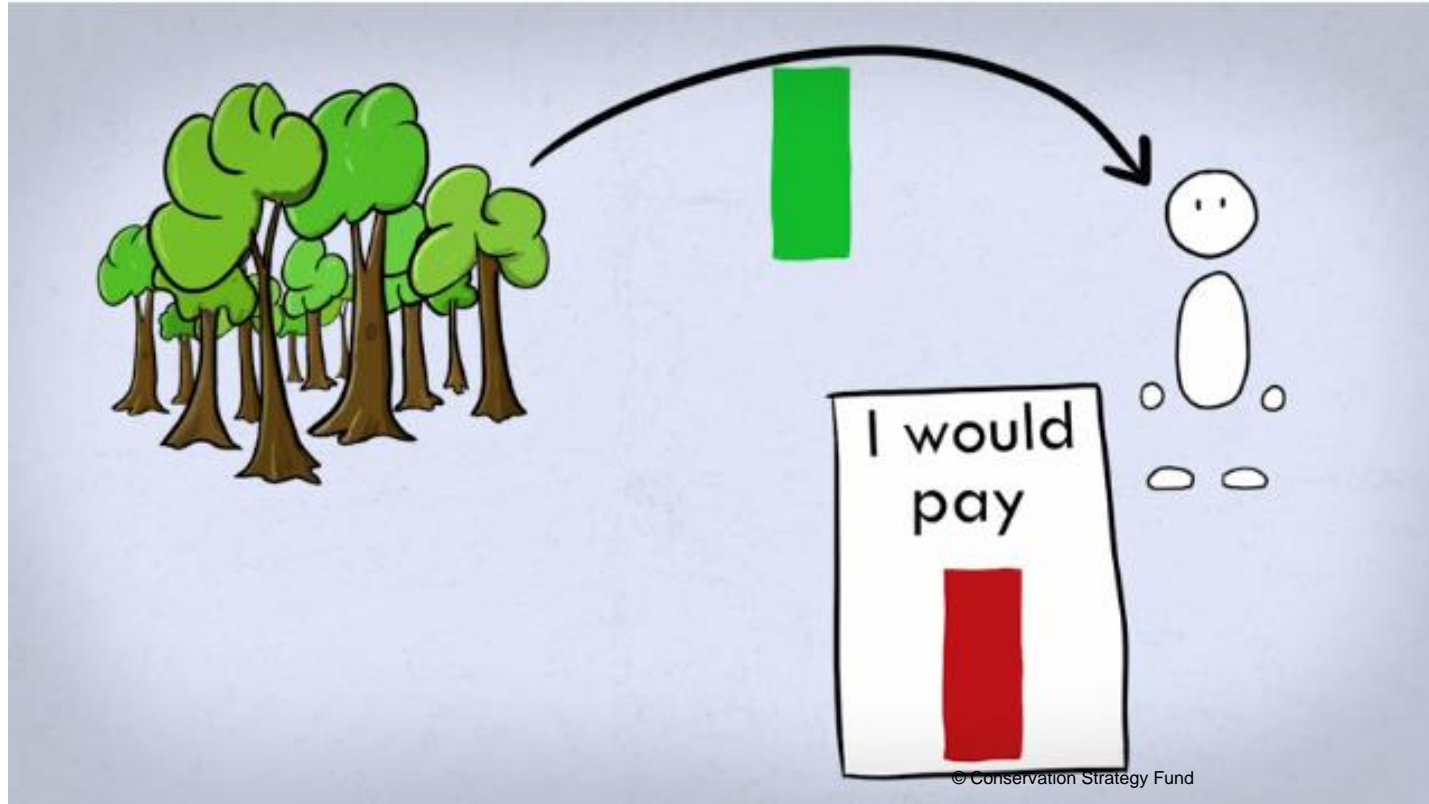


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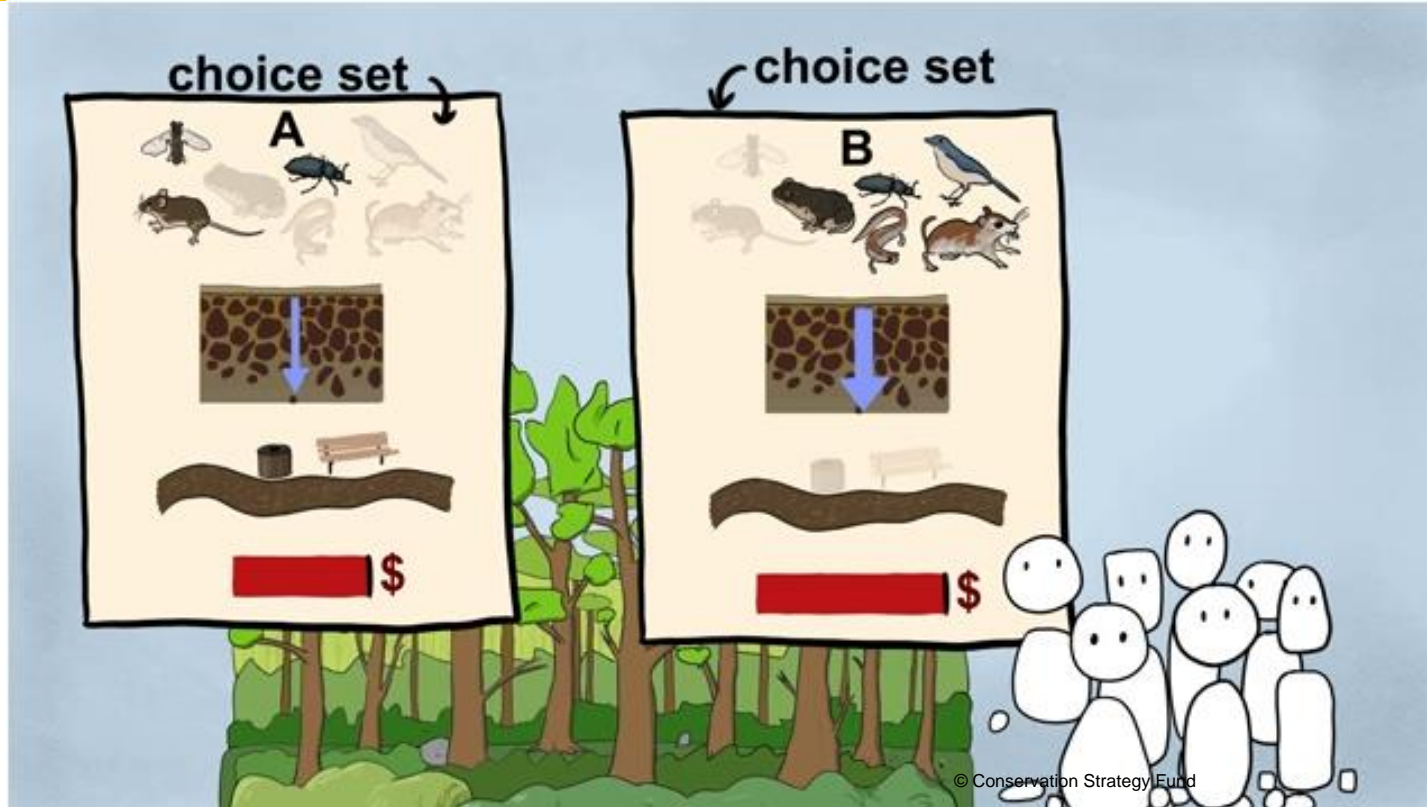
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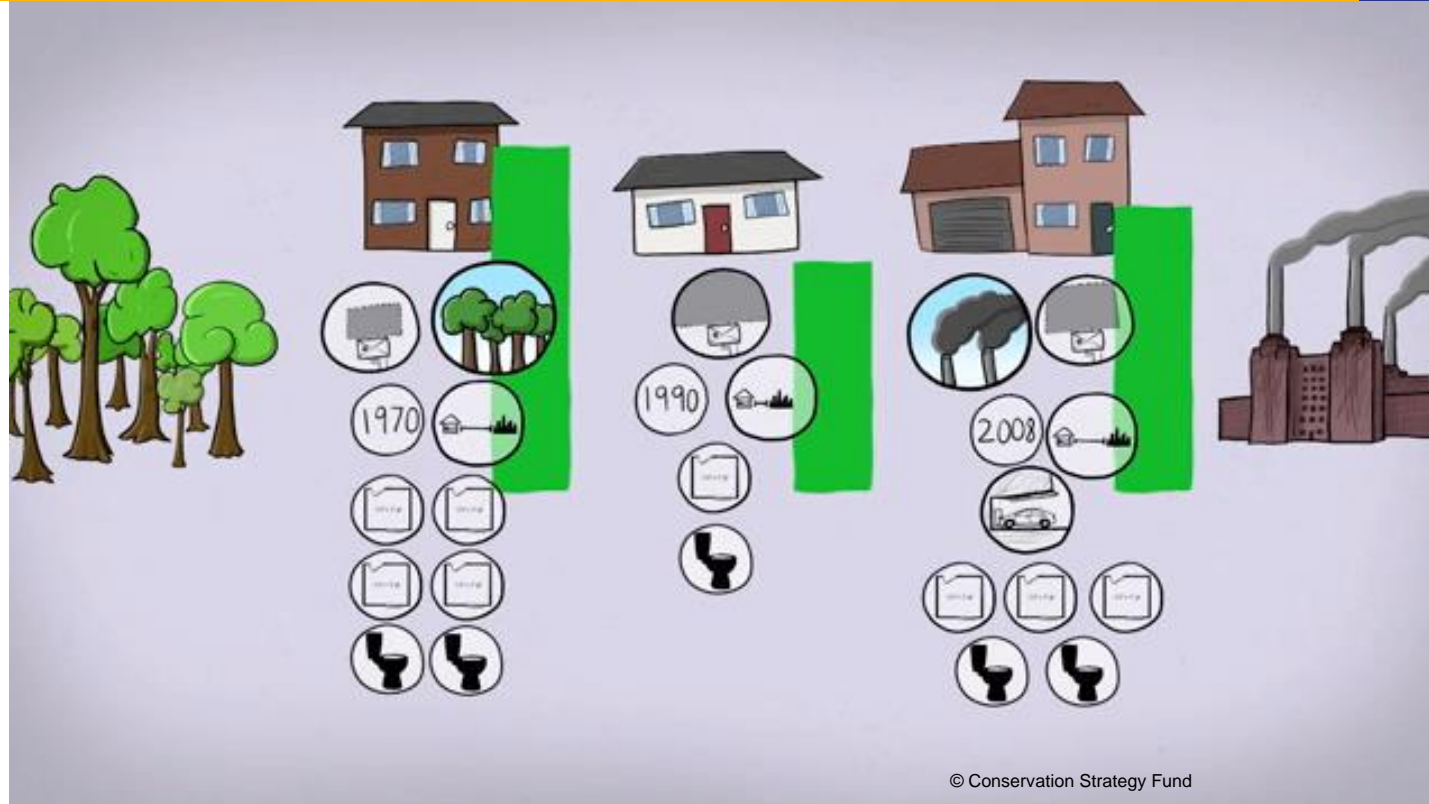
Stated preference methods: Contingent valuation



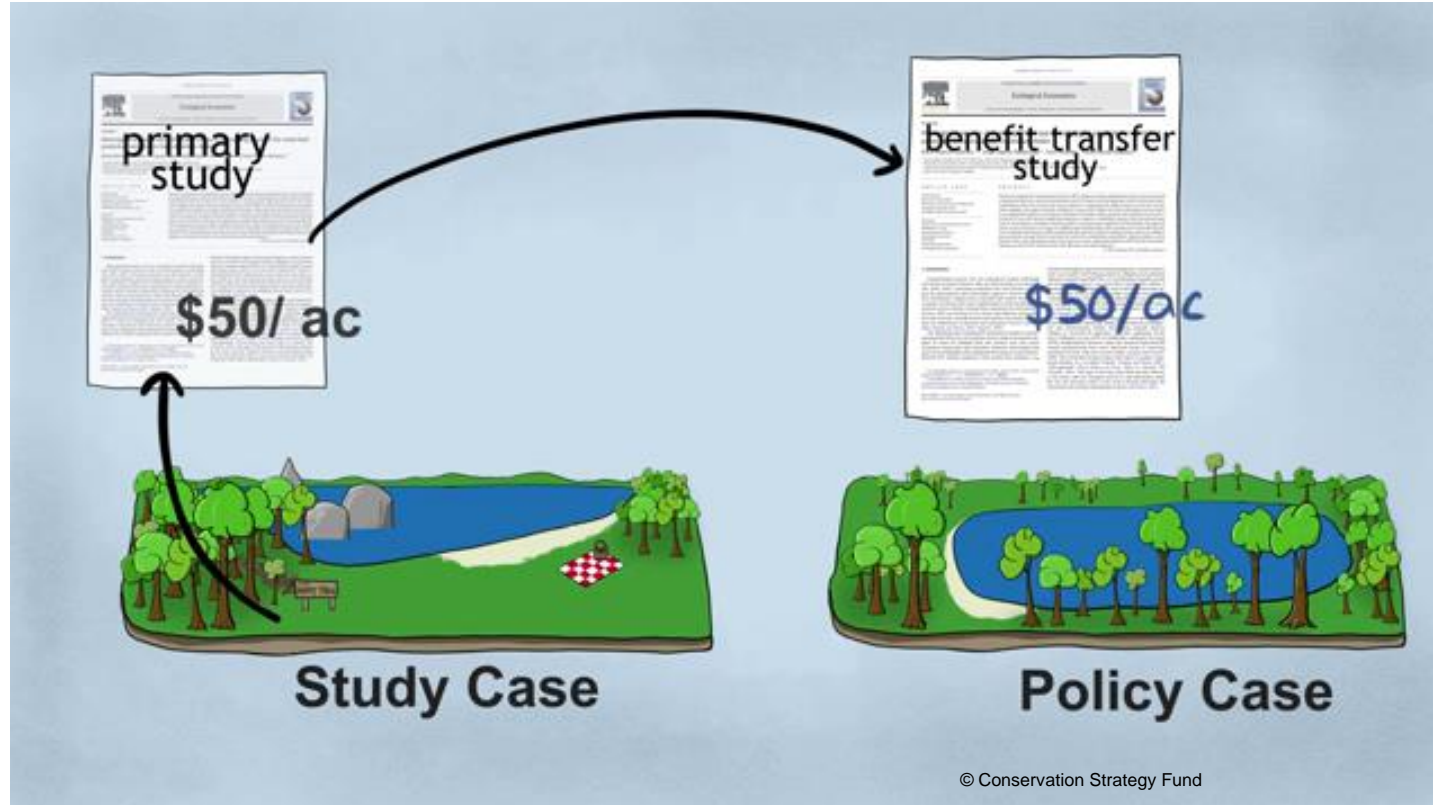
Stated preference method: Choice experiment



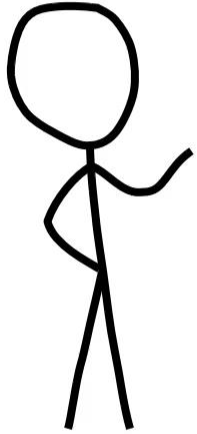
Revealed preference method: Hedonic pricing



Benefits transfer



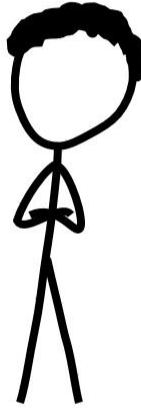
VALUING WATER QUALITY



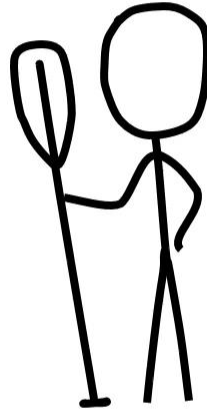
Maksym
Polyakov



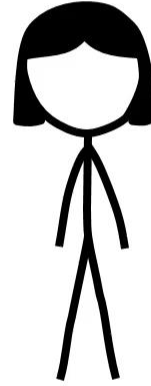
Abbie
Rogers



Sayed
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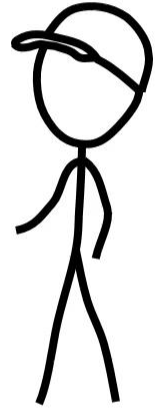
David
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Asha
Gunawardena



Michael
Burton



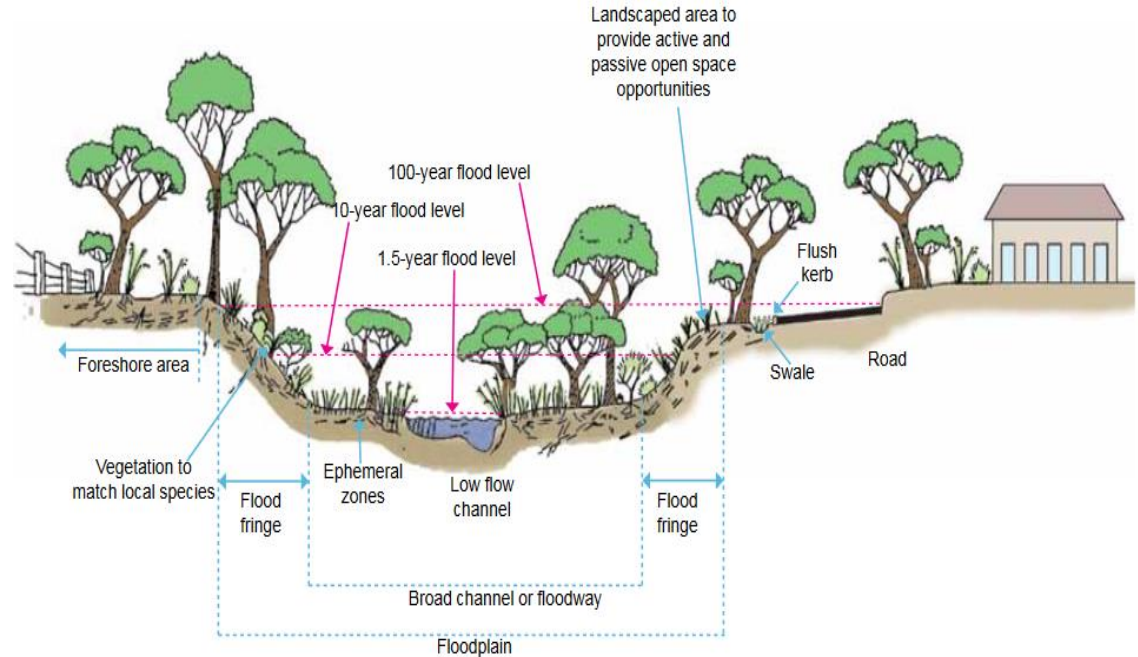
James
Fogarty

Living stream

“Living streams are constructed or retrofitted stormwater conveyance channels that mimic the characteristics or morphology and vegetation of natural streams”

(WA Water and Environmental Regulation)

Typical cross section of a living stream

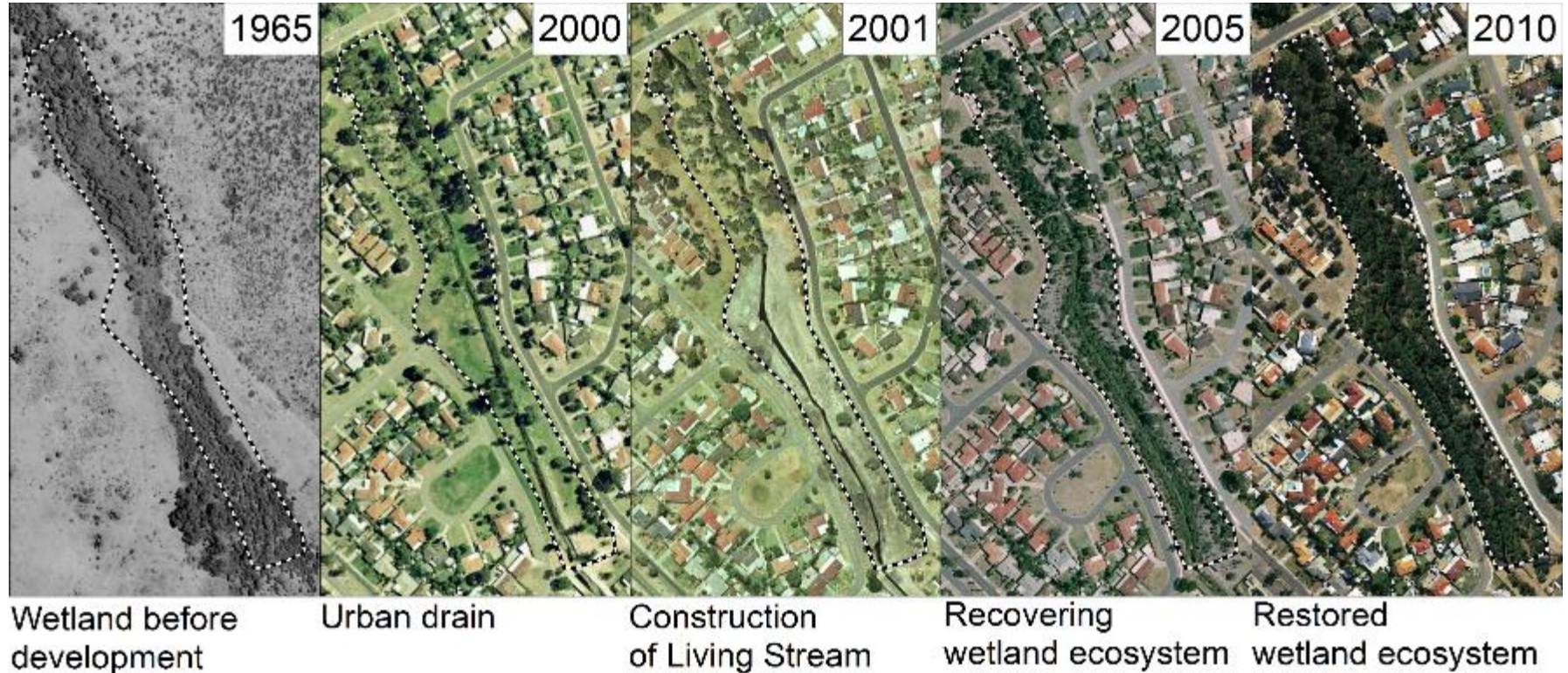


Hedonic pricing method example: Bannister Creek Living Stream Project

- Implemented from the late 2000 by
 - Bannister Creek Catchment Group
 - City of Canning
- Conventional drain
 - Drainage
- Living stream
 - Drainage
 - Remove nutrients
 - Support biodiversity
 - Social value



Bannister Creek Living Stream Project 2000-2011



Marginal implicit price of Bannister Creek Living Stream project

- Median house price \$404K
- Coefficient $0.047 = 4.7\%$
- Dependent variable $\log(\text{house price})$
- Marginal implicit price = \$19K

Amenity benefits of living streams in greenfield suburbs

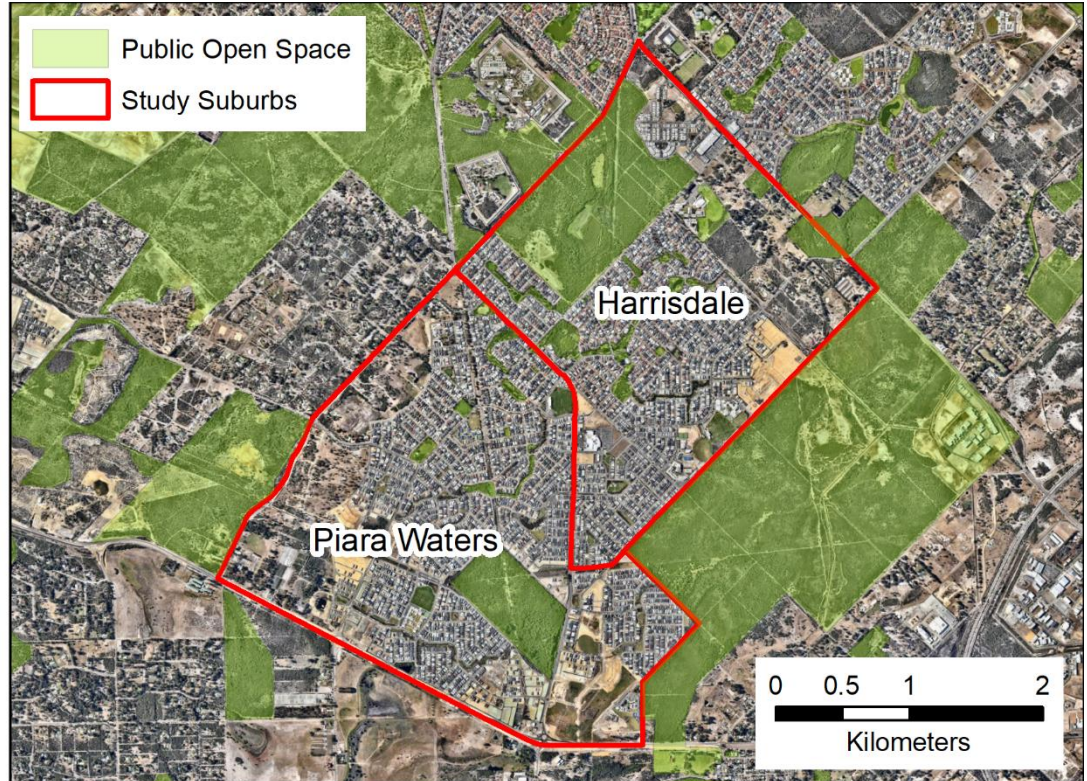
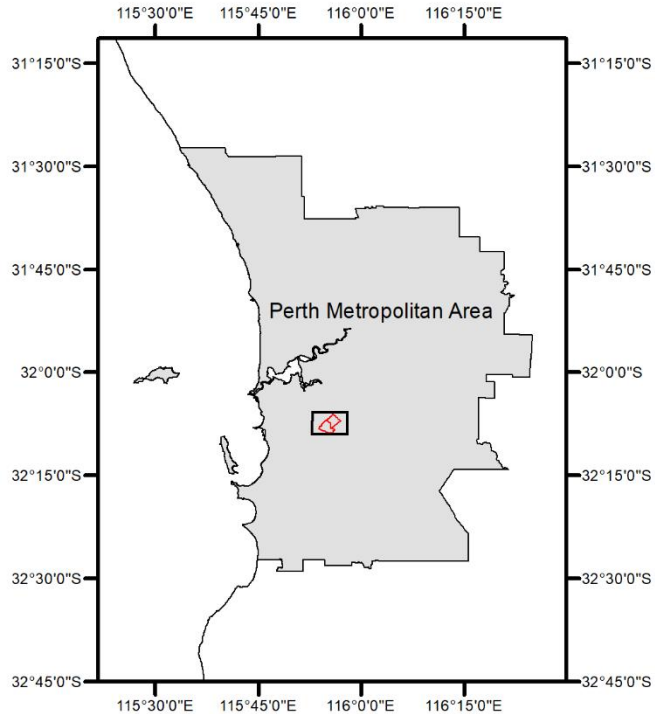
- Bannister Living Stream study looked at the non-market values of converting a drainage structure in to a living stream in an established suburb
- The amenity values of WSUD are context dependent.
- It is important to study the non-market values of WSUD in a different context (new developments) because:
 - There may be more substitute sites with similar amenities.
 - The demographics may be different than in established suburbs.

Objective of the study

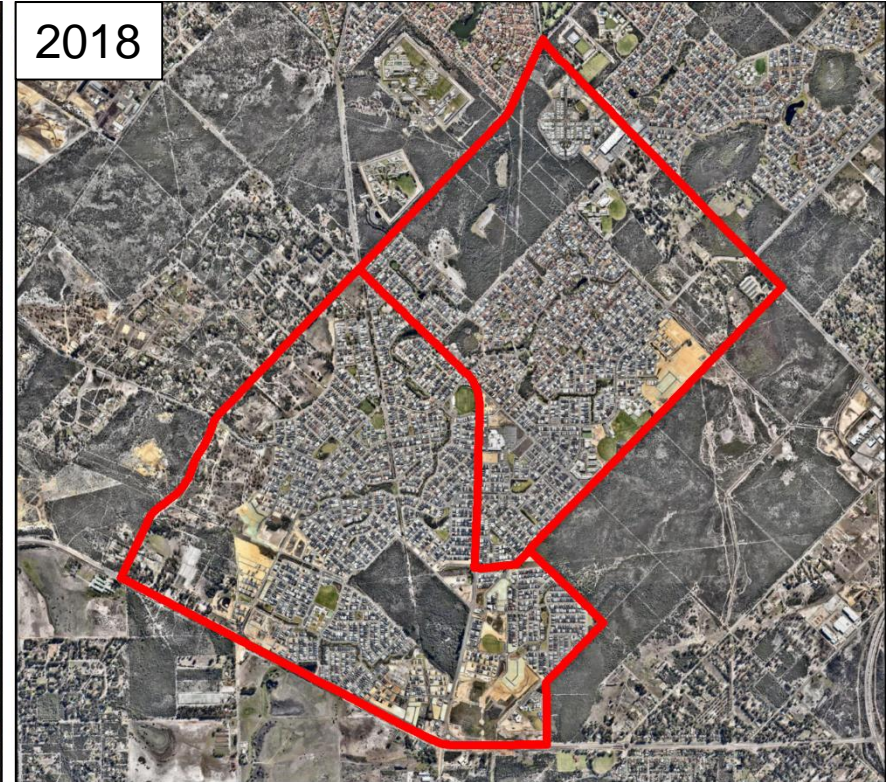
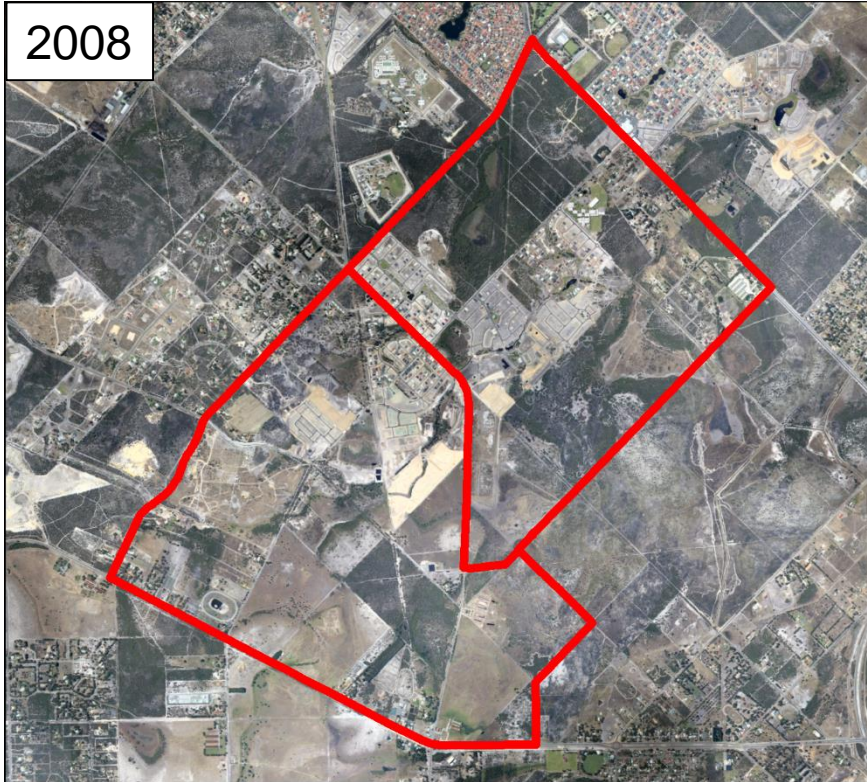
- To estimate the amenity value of a living stream in the new established suburbs, using hedonic pricing method



Study suburbs: Harrisdale and Piara Waters



Study suburbs: Harrisdale and Piara Waters

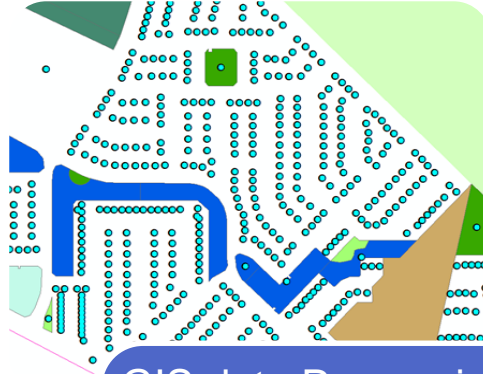


Data collection



POS classification

- Field visit
- Meeting with the industry specialists
- POS Cadastral data from Landgate
- Classify POS using ArcGIS and Nearmap



GIS data Processing

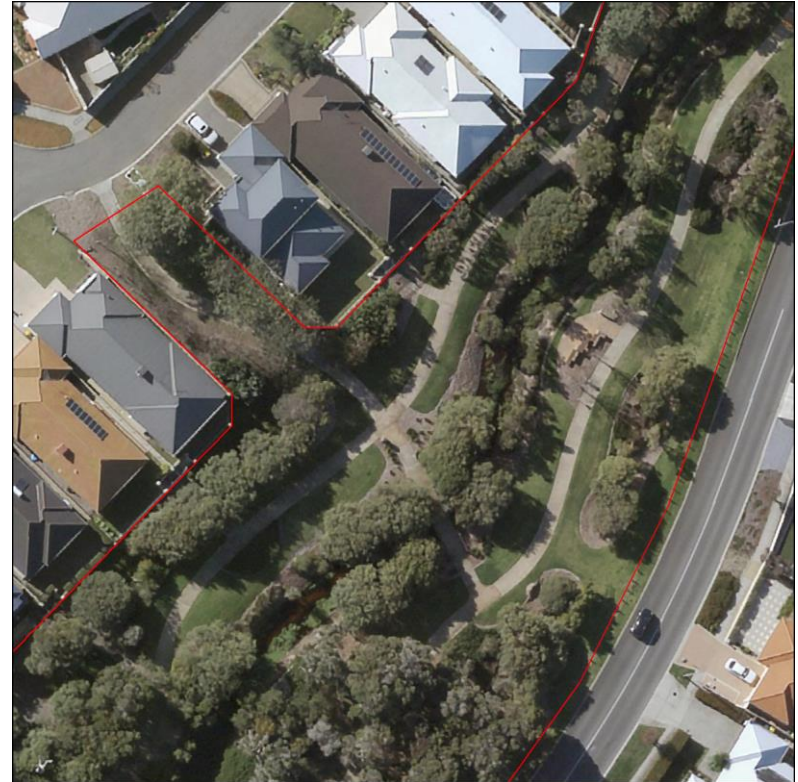
- Houses Cadastral data from Landgate
- Calculating distance from houses to the nearest POS of different types using ArcGIS



Analysis using RStudio

- Sales data from Pricefinder
- Combining spatial data and sales data
- Regression analysis










Non-activated vs Activated living stream

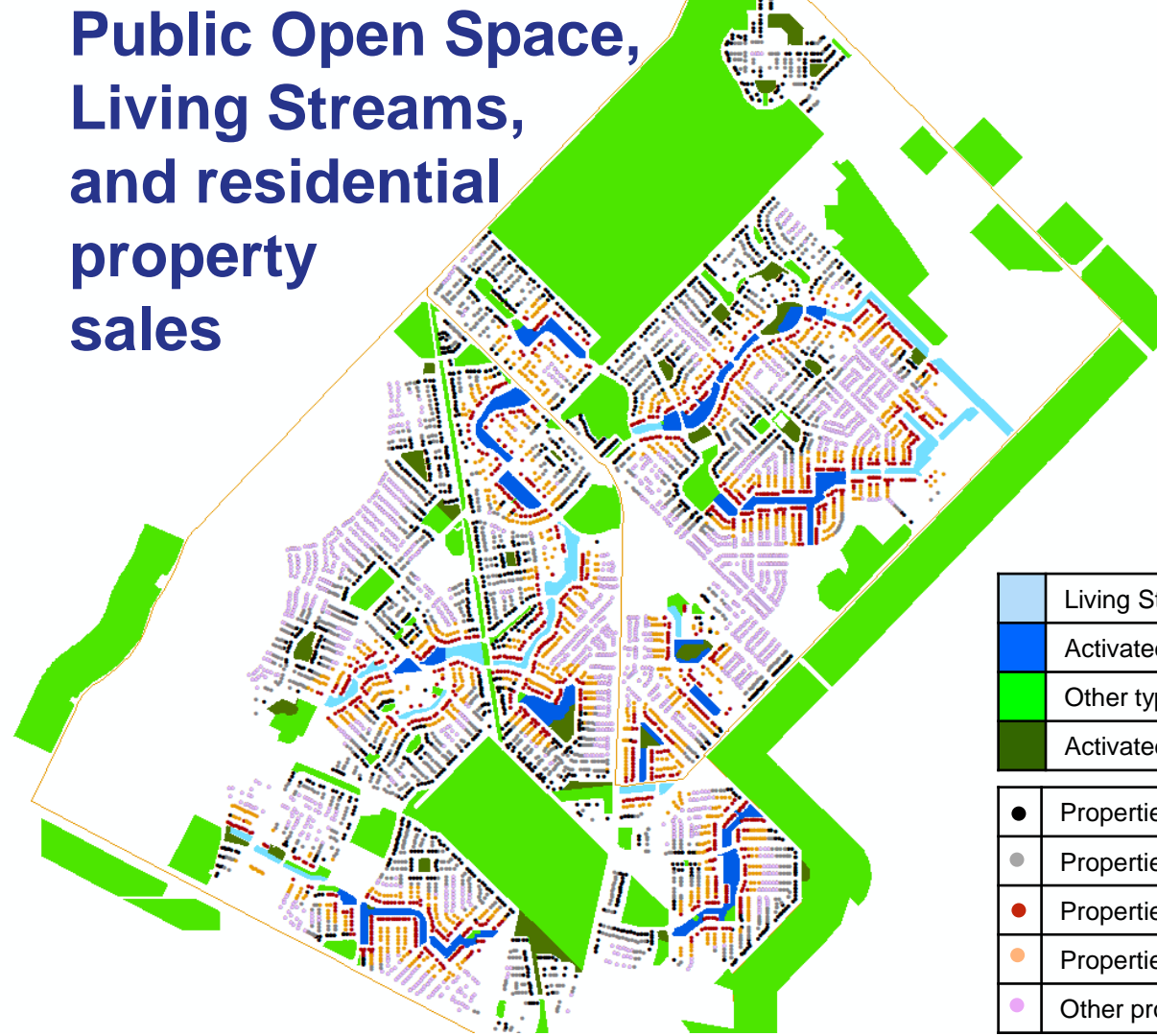


Activated living stream and other POS (park)



Public Open Space, Living Streams, and residential property sales

	Living Stream
	Activated Living stream
	Other types of POS (Park, Sport Field, Bush, Wet Land)
	Activated Other POS (Park)
	Properties within 50 m of any POS other than Living Stream
	Properties within 50 to 100 m of any POS other than Living Stream
	Properties within 50 m of Living Stream
	Properties within 50 to 100 m of Living Stream
	Other properties



Characteristics of sales data

Sales of homes built after 2007, n=2246

Variable	Mean	SD	Min	Median	Max
Sales Price, \$	546K	115K	125K	535K	1,000K
Area, sq m	498	124	193	507	923
Number of bedrooms	3.7	0.48	2	4	6
Number of bathrooms	2.0	0.18	1	2	5
Number of carports	2.0	0.27	1	2	5
House age, years	4.6	2.52	1	4	11

Sales of land (residential lots) after 2007, n=7272

Variable	Mean	SD	Min	Median	Max
Sales Price, \$	265K	55,415	140K	255K	949K
Area, sq m	447	124	195	448	1098

Data: Number of sale records by proximity to Public Open Space and Living Streams

Number of sale records

Description	Land	House	All
Total number of records	7,272	2,246	9,518
Number of records within 50 m of any POS	2,606	912	3,518
Number of records within 50 to 100 m of any POS	2,739	922	3,661
Number of records within 50 m of Living Stream	1,111	355	1,466
Number of records within 50 to 100 m of Living Stream	1,198	421	1,619
Number of records within 50 m of Activated POS (Park or Living Stream)	1,244	413	1,657
Number of records within 50 to 100 m of Activated POS (Park or Living Stream)	1,757	626	2,383

Data: Number of sale records by proximity to Public Open Space and Living Streams

Number of sale records

Description	Land	House	All
Total number of records	7,272	2,246	9,518
Number of records within 50 m of any POS	36%	41%	37%
Number of records within 50 to 100 m of any POS	38%	41%	38%
Number of records within 50 m of Living Stream	15%	16%	15%
Number of records within 50 to 100 m of Living Stream	16%	19%	17%
Number of records within 50 m of Activated POS (Park or Living Stream)	17%	18%	17%
Number of records within 50 to 100 m of Activated POS (Park or Living Stream)	24%	28%	25%

Estimating Amenity Value: Hedonic Model with Spatial and Temporal Fixed Effects

House within 50m of any
type of POS

House within 50m of a
Living Stream

Property sold after POS
is constructed

Time fixed effects
(year-quarter)

$$\text{Log}(P_{it}) = \alpha_1 POS^{50}_{it} + \alpha_2 POS^{50to100}_{it} + \alpha_3 LS^{50}_{it} + \alpha_4 LS^{50to100}_{it} + \delta_{it} + \beta X_{it} + \tau_t + \gamma_j + \varepsilon_{it}$$

House within 50 to 100m of any type of
Public Open Space

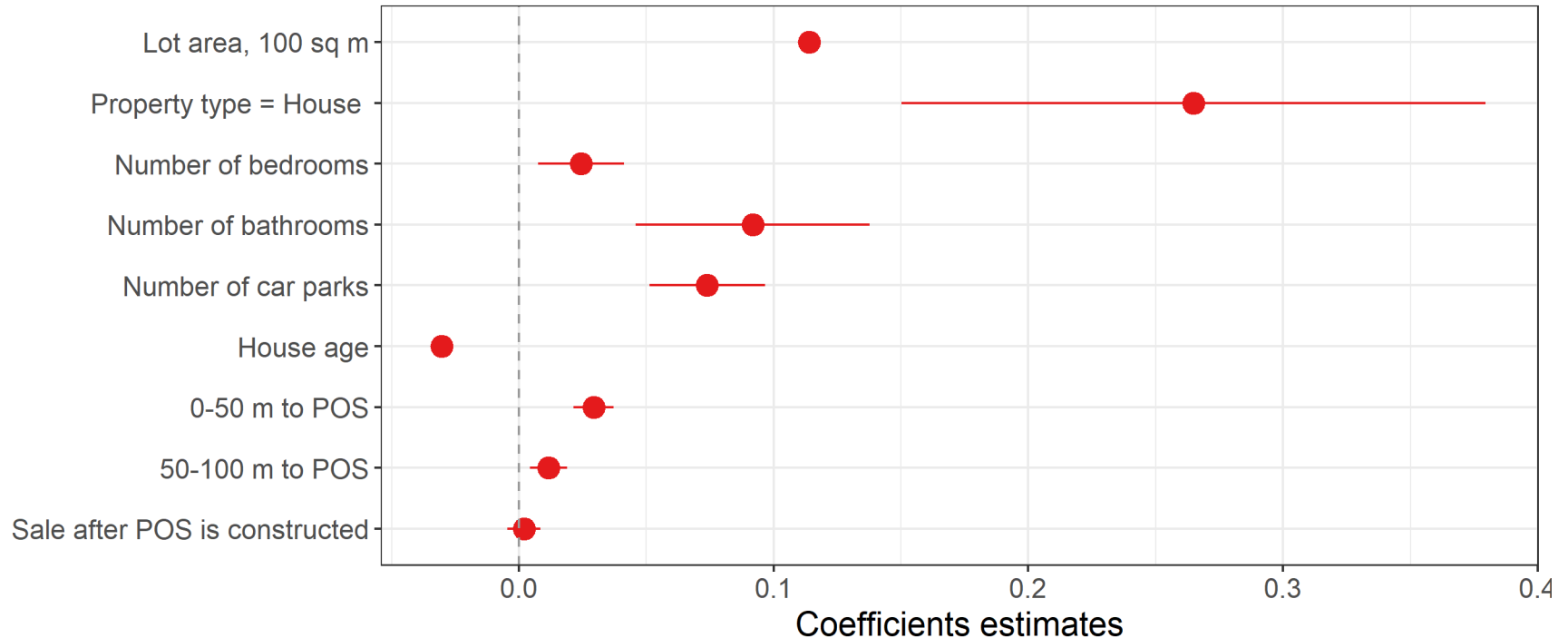
House within 50 to 100m of
a Living Stream

Characteristics
of a house

Spatial fixed
effects (SA1)

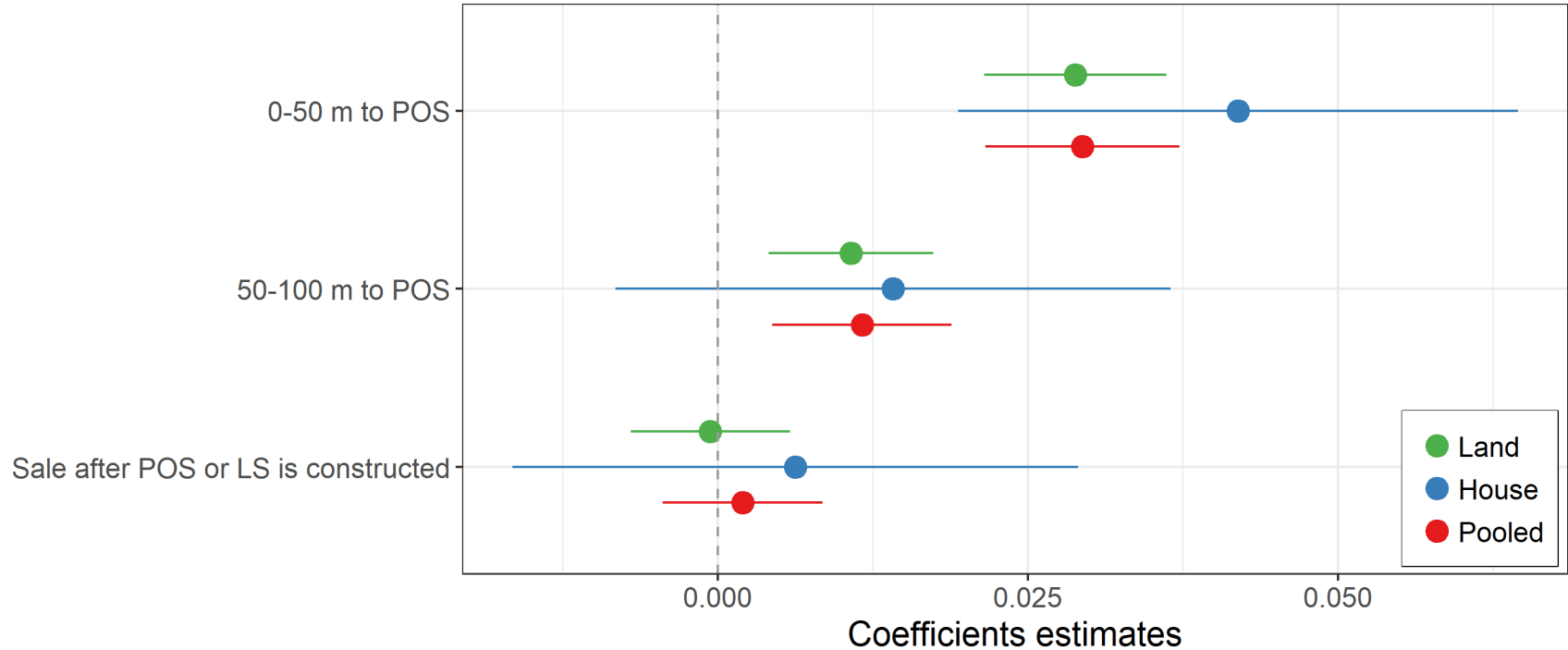
Model 1: Proximity to POS

Hedonic model, dependent variable log(sale price)



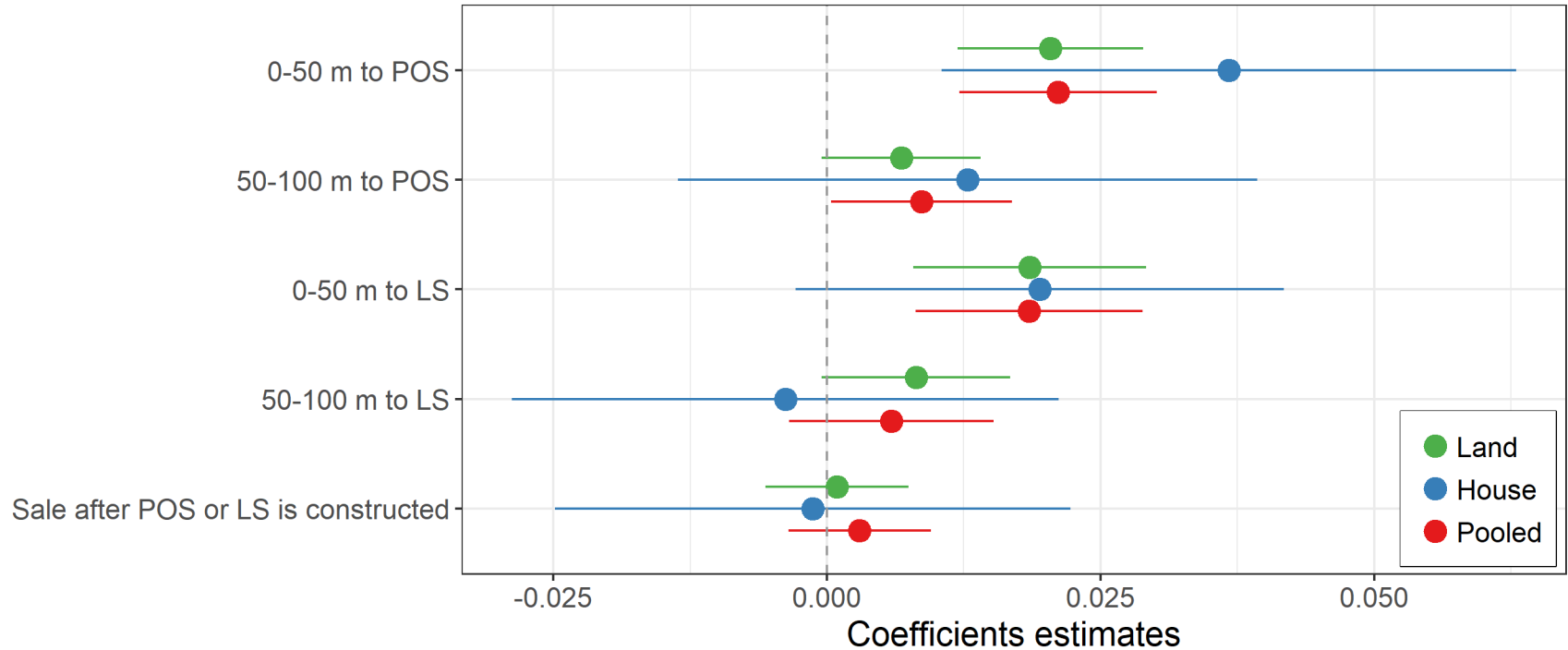
Model 2: Proximity to POS for land (lots), house (+land), and pooled model

Hedonic model, dependent variable log(sale price)



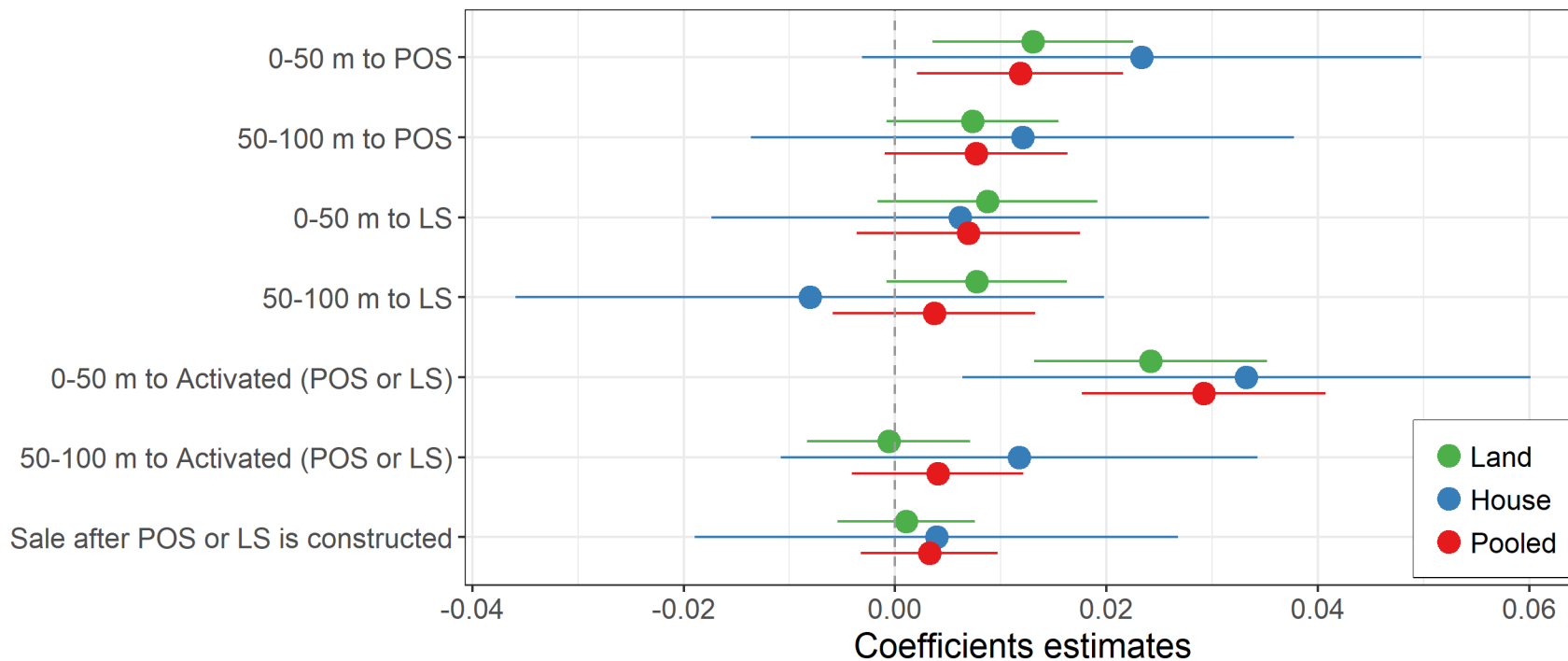
Model 3: Proximity to POS and to Living Stream

Hedonic model, dependent variable $\log(\text{sale price})$



Model 2: Proximity to POS, Living Streams, and Activated POS

Hedonic model, dependent variable $\log(\text{sale price})$



Contribution of this study

- Estimated the value of the benefits generated by Living Streams in new development
- For the first time, compared benefits of LS and other types of POS
- Estimated the contribution of recreational infrastructure (activated POS) to the benefits of POS
- Estimated impact of POS on the values of both houses and residential lots
- Analysed impact of the timing of sale in relation to construction of POS

Conclusion

- The pooled models explains 86% of the variation in lot and house prices
- Properties adjacent to public open space attract 2% to 4% premium, the premium diminishes with distance
- The premium of POS increases:
 - When POS is living stream
 - When POS contains recreational infrastructure (activated POS)
- Properties (lots and houses) adjacent to POS attract premium even when POS (living stream or park) is not yet constructed

Thank you

