

BE WHAT YOU WANT TO BE

Valuing the benefits of controlling red imported fire ants

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The logo for CQUniversity Australia, featuring a stylized 'CQ' in white and blue, followed by 'University' in a blue serif font and 'AUSTRALIA' in a blue sans-serif font below it.

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Valuing RIFA control

- Important to value the benefits of control to compare against the costs of control
- Use cost benefit analysis (CBA) for this
- Expect benefits of control to be multifaceted
- Values that people have for
 - Personal safety
 - Lifestyle and convenience
 - Environmental protection
 - Production (e.g. agriculture, services)
 - Maintaining options



Focus of this study

- Add estimates of benefits to modelling work of Tom Kompas
- Assess the values of Brisbane population for control of RIFA
- For directly inputting into Cost Benefit Analysis
 - And provide examples of valuation case studies
- Used two different non-market valuation techniques
 - Contingent valuation – a single tradeoff offering better control options (at a cost)
 - Choice modelling – several tradeoffs that offer different control options



Key Challenges for valuation

- Biosecurity issues are typically associated with risk and uncertainty
- Often thresholds and irreversibility issues
- Future loss scenarios often difficult to define
- Not clear how people view the issues associated with imported pests
 - Control options for a single species versus multiple species
 - Makes it difficult to frame scenarios
 - Or to focus on a single issue and solution



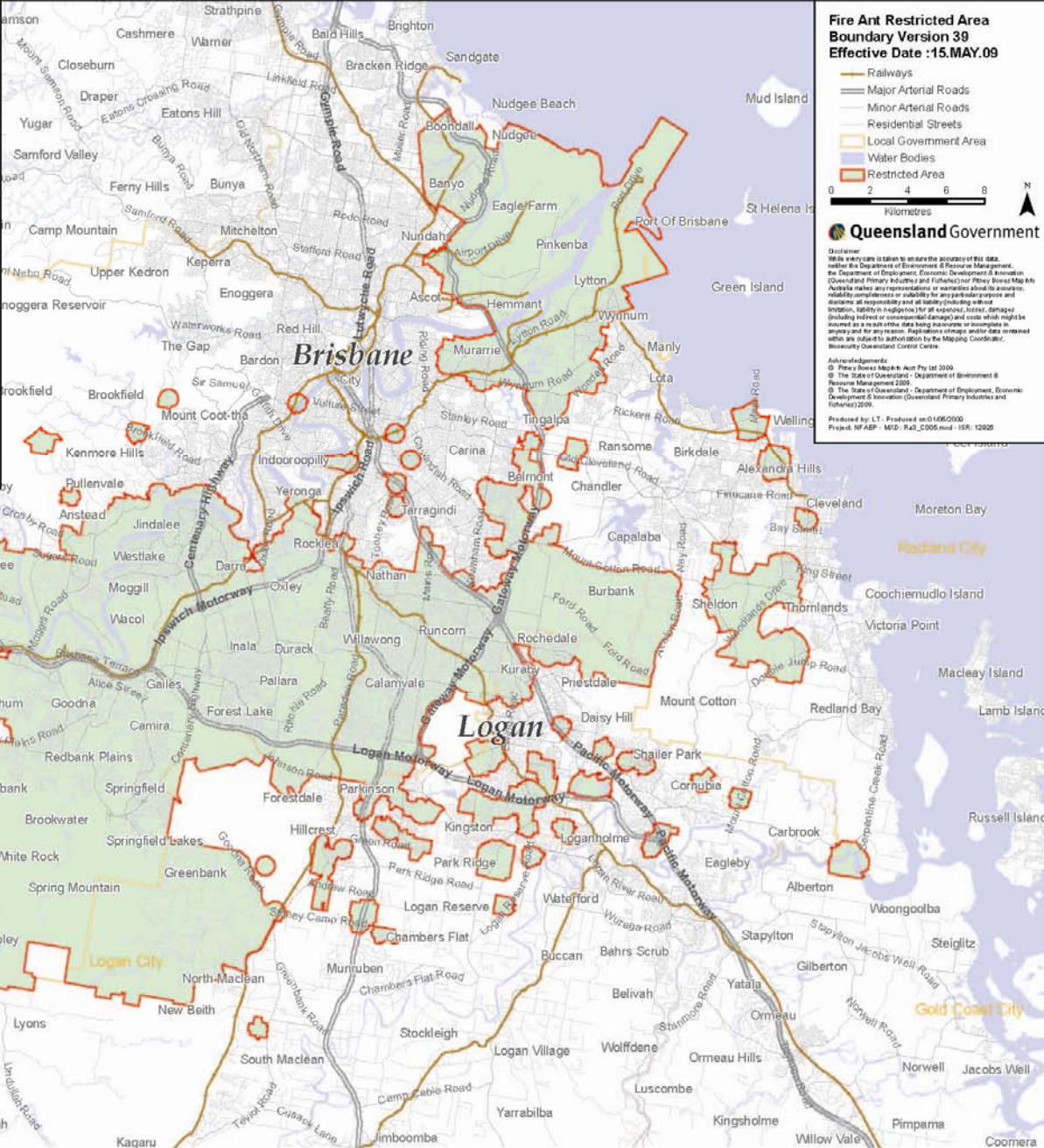
The RIFA case study

- RIFA originates from South America
- First detected in Brisbane in February 2001
- regarded as the worst of the five ant species that are rated in the top '100' of invasive species in the world
- Advantages of doing this case study
 - High knowledge of RIFA in Brisbane population
 - Species is still a threat to the community
 - There is a control area over part of Brisbane



Acacia Ridge	Canndale	Greenbank	Meadowbrook	Priestdale	Swanbank
Alberton	Carole Park	Greenslopes	Middle Park	Pullenvale	Tansh Merah
Alexandra Hills	Chandler	Gumdale	Moggill	Raceview	Tarragindi
Algester	Churchill	Headwood	Mooroona	Redbank	Tennyson
Amberley	Clayfield	Hemmant	Morningside	Redbank Plains	Thagoona
Annerley	Cleveland	Hendra	Mount Coot-Tha	Redland Bay	Thorntons
Anstead	Collingwood Park	Heritage Park	Mount Cotton	Redlands Bay	Tingalpa
Archerfield	Coopers Plains	Hillcrest	Mount Gravatt	Regents Park	Toowong
Ascot	Coorparoo	Holland Park	Mount Gravatt East	Riccardano	Toowong
Auchenflower	Coninda	Holland Park West	Mount Marrow	Ripley	Underwood
Augustine Heights	Cornubia	Inala	Mount Ommanney	Riverhills	Upper Brookfield
Balmoral	Crestmead	Ipswich	Munruben	Riverview	Upper Mount Gravatt
Danyo	Daisy Hill	Jamboree Heights	Murrumbidgee	Robertson	Victoria Point
Barestan Point	Darra	Jestrophi	Mutdapilly	Rockdale	Virginia
Belbora Park	Deebing Heights	Jindalee	Nathan	Rockdale South	Wacol
Belbowrie	Dimmore	Karalee	New Beth	Rocklea	Walloon
Belmont	Doolandella	Karawatha	New Chum	Rosewood	Washpool
Bermuda	Drewvale	Karrabin	Newtown	Runcorn	Waterford
Bethania	Durack	Kenmore	North Booval	Sudlers Crossing	Waterford West
Birkdale	Eagle Farm	Kenmore Hills	North Ipswich	Salisbury	Wellington Point
Blackstone	East Brisbane	Kingston	North Maclean	Seventeen Mile Rocks	West End
Boondall	East Ipswich	Kuraby	Northgate	Shailer Park	West Ipswich
Boronia Heights	Eastern Heights	Lanefield	Nudgee	Sheldon	White Rock
Brookfield	Elbow Vale	Larapinta	Nudgee Beach	Silkstone	Willawong
Brookwater	Ebenezer	Leichhardt	Nundah	Sinnamon Park	Willawong
Browns Plains	Eight Mile Plains	Logan Central	One Mile	Sticks Creek	Wishart
Bundsamba	Ellen Grove	Logan Reserve	Ormiston	South Ripley	Woolridge
Burbank	Fairfield	Loganholme	Oxley	Spring Mountain	Wooloona
Calamvale	Fig Tree Pocket	Loganlea	Pallara	Springfield	Wooloona
Calvert	Flinders View	Lyons	Park Ridge	Springfield Lakes	Wurukura
Camira	Forest Lake	Lytton	Park Ridge South	Springwood	Wynnum
Cannon Hill	Forestdale	Macgregor	Parkinson	Springwood	Wynnum West
Capalaba	Goodna	Mackenzie	Peak Crossing	Stretton	Yamanto
Carbrook	Goolman	Marilyn West	Pinarua	Sunnybank	Yerongipilly
Carina Heights	Goolman	Mansfield	Mansfield	Sunnybank	Yeronga
	Graceville	Marsden	Marsden	Sunnybank Hills	

Is your suburb in the above list?
 Please log on to the QPIF website www.dpi.qld.gov.au/freants for a detailed map or call the QPIF Business Information Centre on 13 25 23 for soil movement restrictions.



Fire Ant Restricted Area Boundary Version 39
Effective Date : 15.MAY.09

- Railways
- Major Arterial Roads
- Minor Arterial Roads
- Residential Streets
- Local Government Area
- Water Bodies
- Restricted Area

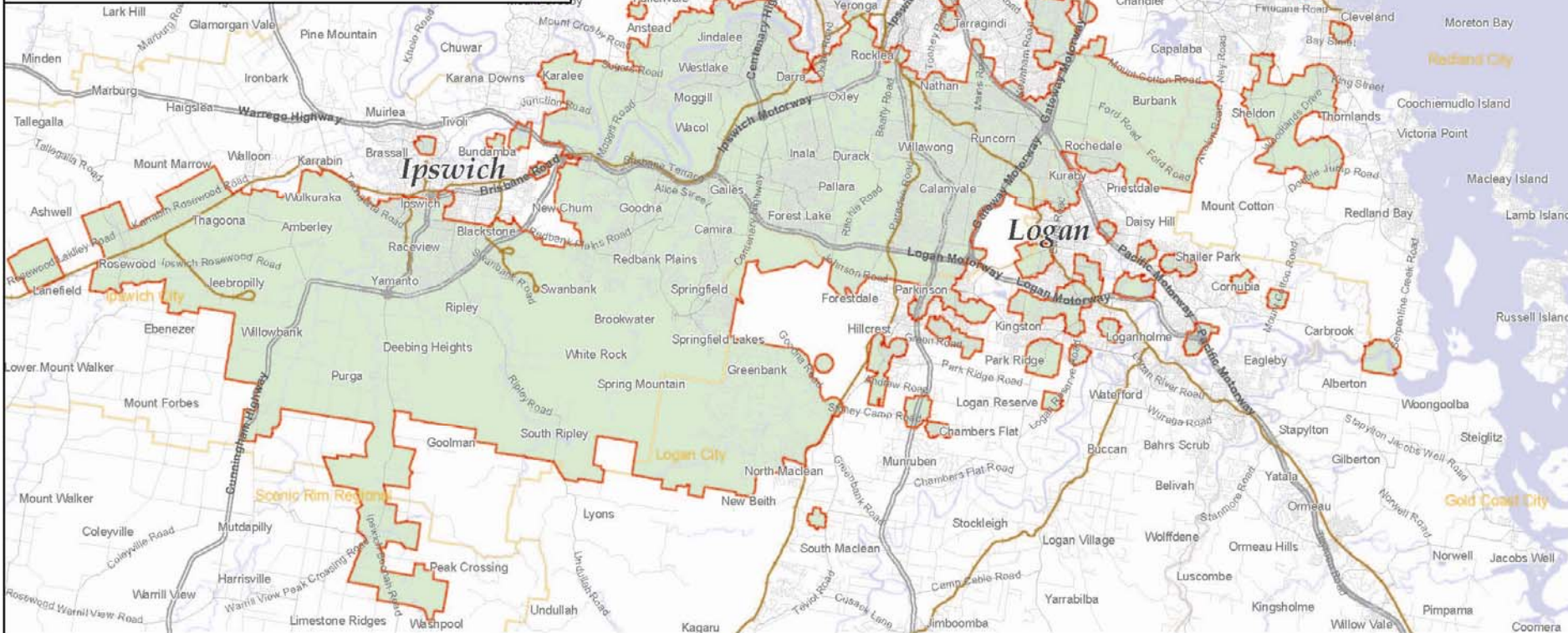
0 2 4 6 8
Kilometres

Queensland Government

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Acknowledgements
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Issues to test

- Values for reducing risks of invasive species
- Values for different control outcomes (e.g. protection of houses vs public areas vs bush)
- Values for eradication vs control
- Values for more certain vs less certain outcomes
- Preferences for different types of control options

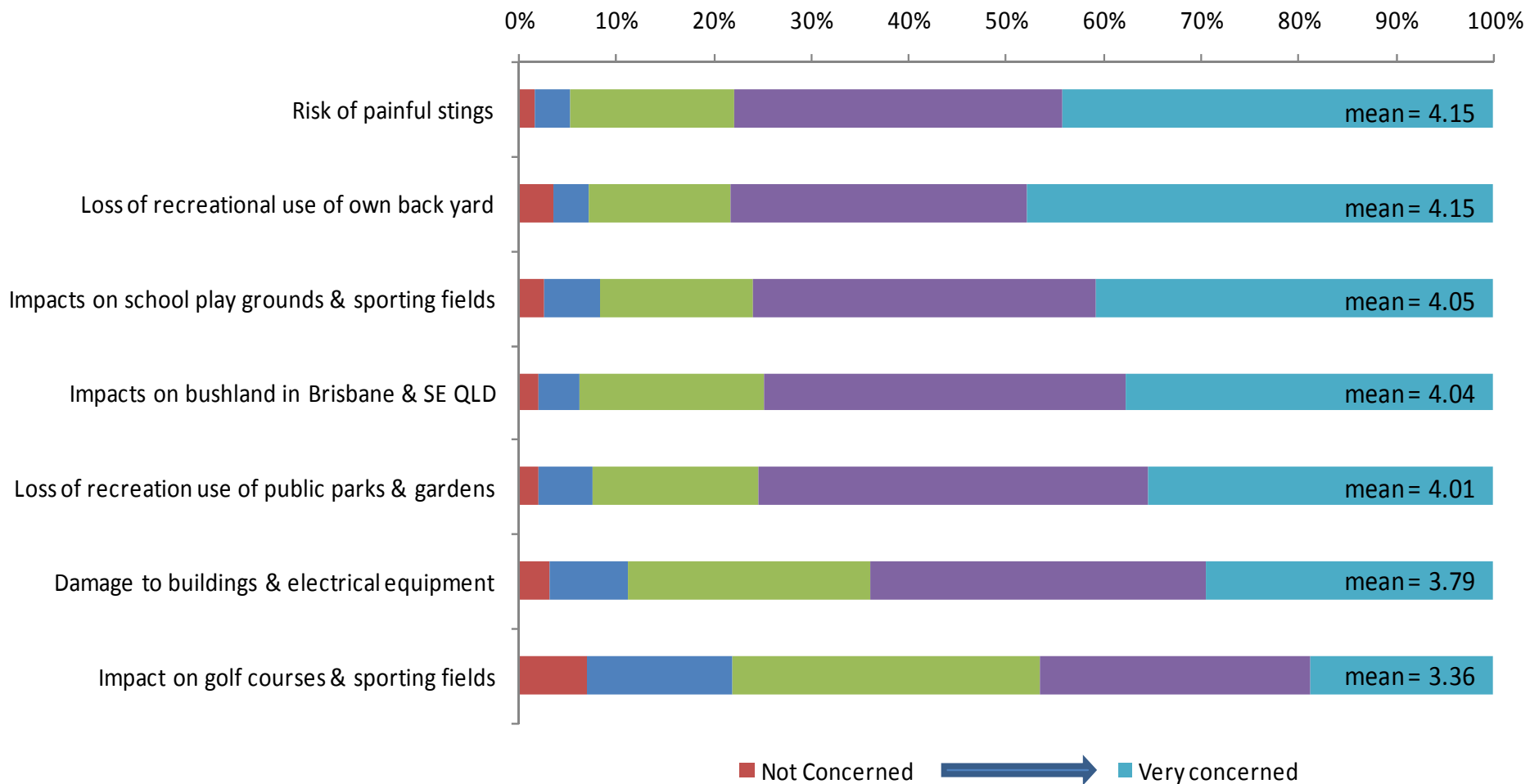


Surveying households in Brisbane

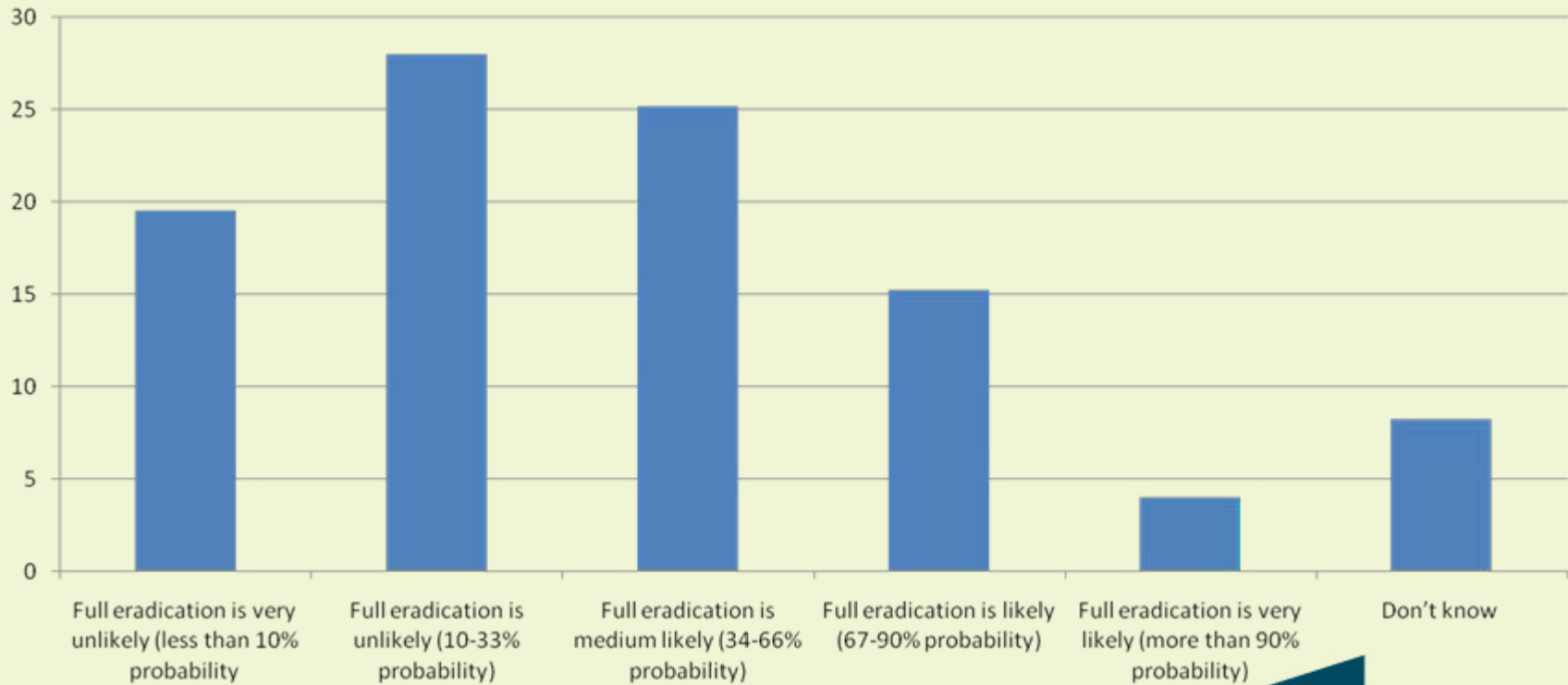
- Online survey with internet panel of Brisbane residents.
- 300 respondents in total
- Half from RIFA control area and half outside
- Collected in August 2009
- Respondents directed to DPI website on RIFA for additional information/questions
- Survey had range of general questions as well as non-market valuation
 - Choice modelling experiment
 - Contingent valuation experiment



Respondent concerns regarding the impact of Fire Ants on themselves and their community



Low confidence of eradication



3 key issues tested



The Contingent Valuation experiment

Q15. Foreign diseases and pests that have entered Queensland in the past 10 years include:

- Equine Influenza (horse flu) – major outbreak in 2008
- Papaya fruitfly – first detected in 1995; eradicated in 1998
- Sugarcane smut – first detected in 2006; outbreak not fully eradicated
- Red imported fire ants – first detected in 2001; outbreak not fully eradicated
- Citrus Canker – first detected 2004; eradicated in 2009
- Black Sigatoka (banana disease) – first detected 2001; now eradicated

Increasing quarantine inspections and surveillance could reduce the rate of new disease and pest imports to about half the current rate. If it cost an additional \$XX per household per year, would you be willing to participate? This would be \$XX **each year** for the next **10 years** to avoid approximately 3 serious foreign pests and diseases entering into Queensland.

Please answer this question bearing in mind how much you are able to pay (after taking into account all your other commitments) (please tick one)

Yes

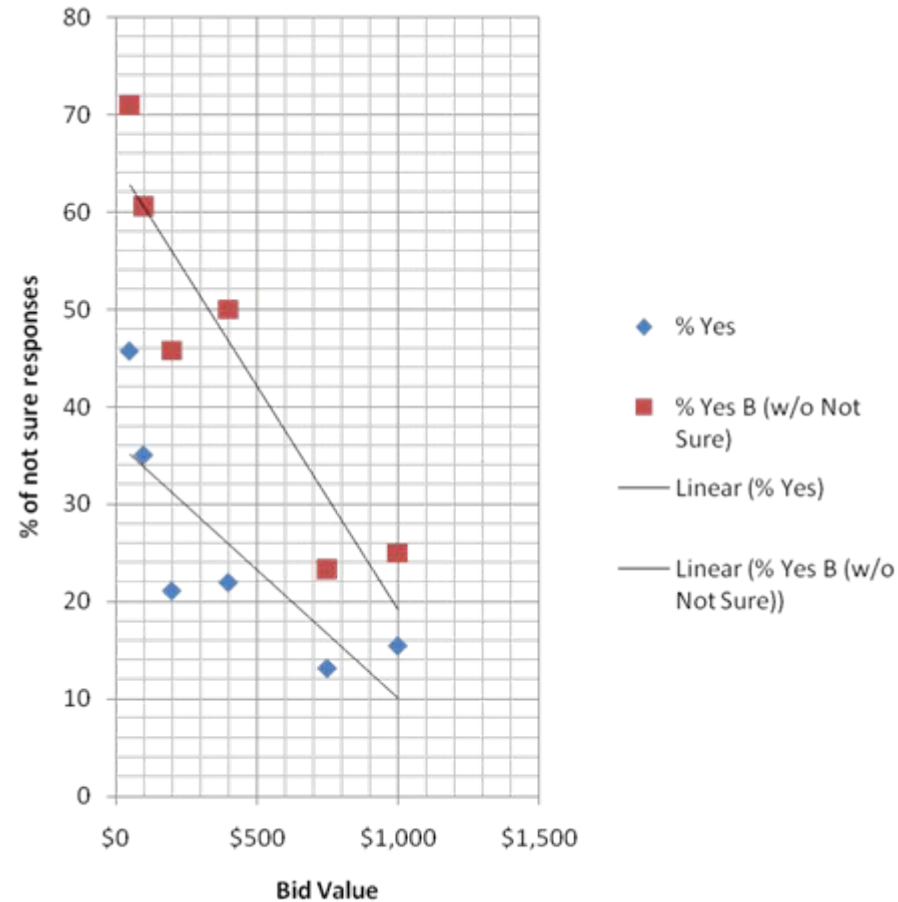
No

Not sure



CVM results

- Limited strength in model because of 'fat tail' problem
- Simple model suggests average WTP each year of \$184/household to reduce rate of serious outbreaks by half
- But high proportion of unsure responses
- Further analysis needed



CM survey - The key issues

- Main impacts identified as:
 - the health impacts from stings;
 - the impact on recreational activities in backyards, parks, sporting areas and school playgrounds; and
 - the adverse environmental impacts on native fauna and flora.
- Key attributes designed as infestation of:
 - Homes
 - Public areas such as schools and parks
 - Bushland and natural environment



Framing

- Built from overview by Antony et al. 2009
- Used spread modelling from the Queensland DPI
- Modelled potential extent of RIFA in future if no control over infestation
- Model showed approximately 30% of Brisbane region could be infected by 2020 if no further control
- This was set as the 'Future Base'

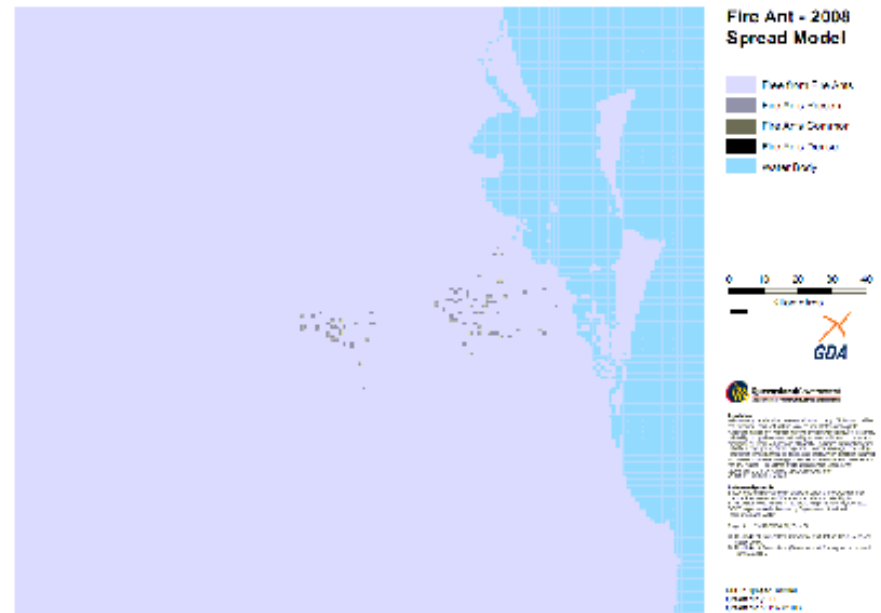


Figure 1 Extent of RIFA infestation in 2008

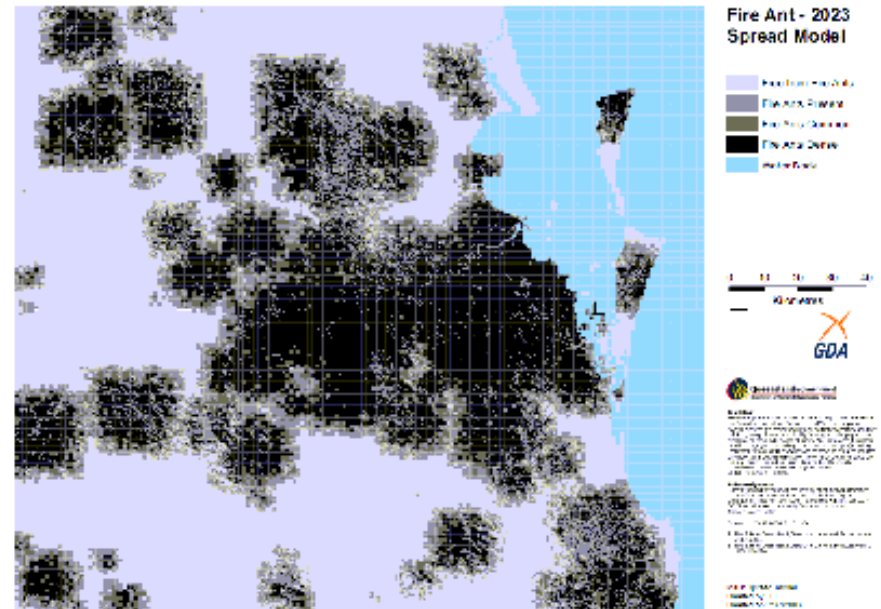


Figure 2 Modelled expected spread of RIFA in 2023

Setting the choice tasks

- Each choice task involved
 - No further control, \$0 cost to households
 - Control options, additional cost for lower infestation outcomes
- 9 choice tasks
 - Levels varied slightly for each one
- Three versions with slight differences
- Cost variable explanation
 - *Costs can include different combinations of private control costs, and rates, fees and taxes paid to government to cover public costs of control*



Example choice set

Fire Ants in Brisbane by 2020



Fire ant

Private areas



Homes
affected by 2020

Public areas



**Recreational, sporting
and school areas**
affected by 2020

Bushland



Protected areas
affected by 2020

Cost



**How much you
pay each year
to 2020**

**Your
choice**



**Select one
option only**

No control

500,000 homes
(30%)

7,500 ha
(30%)

73,000 ha
(30%)

\$0

Option A

167,000 homes
(10%)

1,250 ha
(5%)

36,500 ha
(15%)

\$20

Option B

17,000 homes
(1%)

2,500 ha
(10%)

36,500 ha
(15%)

\$50

Summary model – nested choice

Attributes	Coefficient	St. error	Part worths Per household	Units of improvement
Cost	-0.0096***	0.0007		
Private areas	-0.0553***	0.0098	\$5.79	Per 17000 houses
Public areas	-0.0287***	0.0089	\$3.01	Per 150 ha
Bushland	-0.0464***	0.0068	\$4.86	Per 2400 ha
<i>Socio- demographic attributes associated with the “no control” Option 1</i>				
Age	-0.0265***	0.0039		Younger people more likely
Gender	-0.4435***	0.1088		Males more likely
Children	0.3358***	0.1077		No children households more likely
Education	-0.1528***	0.0506		Lower education status more likely
Income	-0.2759***	0.0426		Lower income more likely
RIFA area	0.5758***	0.1124		Outside RIFA area more likely
ASC_ No control	4.2471***	0.5837		
IV parameter:	<i>Provides a statistical link between the two levels in the nested model</i>			
No Pay	1.0000			
Pay	0.6082***	0.0972		
Model statistics				
No of observations	2961			
Log L	-2774.			
Adj rho-square	0.2669			
Chi-square (D of F)	2036 (13)			

*** Significant at the 1% level

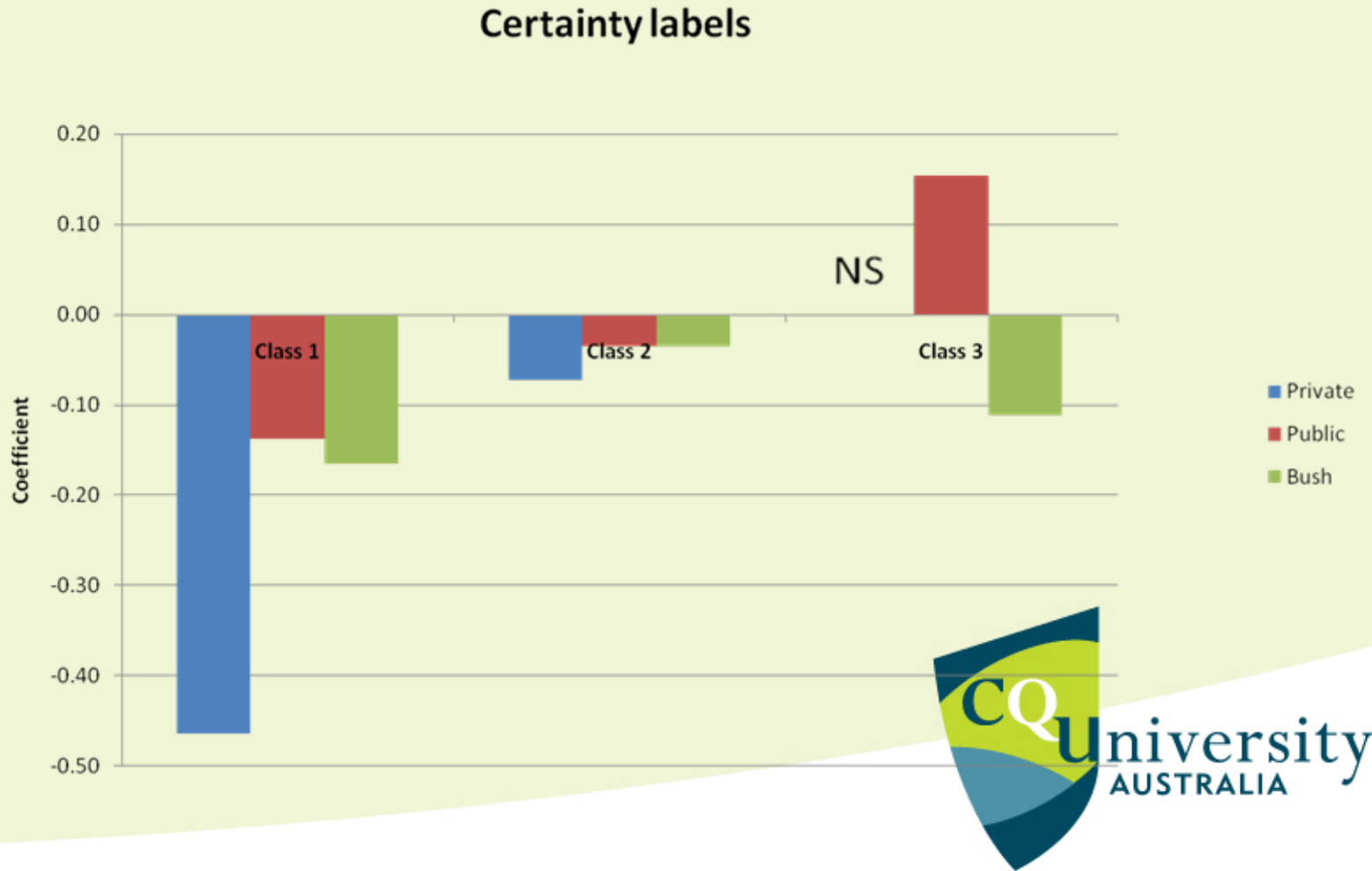


Labels for high and low certainty

- Tested with one sample if it made a difference if the options were labelled as ‘High Certainty’ or ‘Low Certainty’
- ‘High Certainty’ increased likelihood of selecting option from about 40% to about 59%
- Reverse effect for ‘Low Certainty’
- Different effects by groups – key value focused on private homes



3 latent classes for respondents – high and low certainty of outcomes

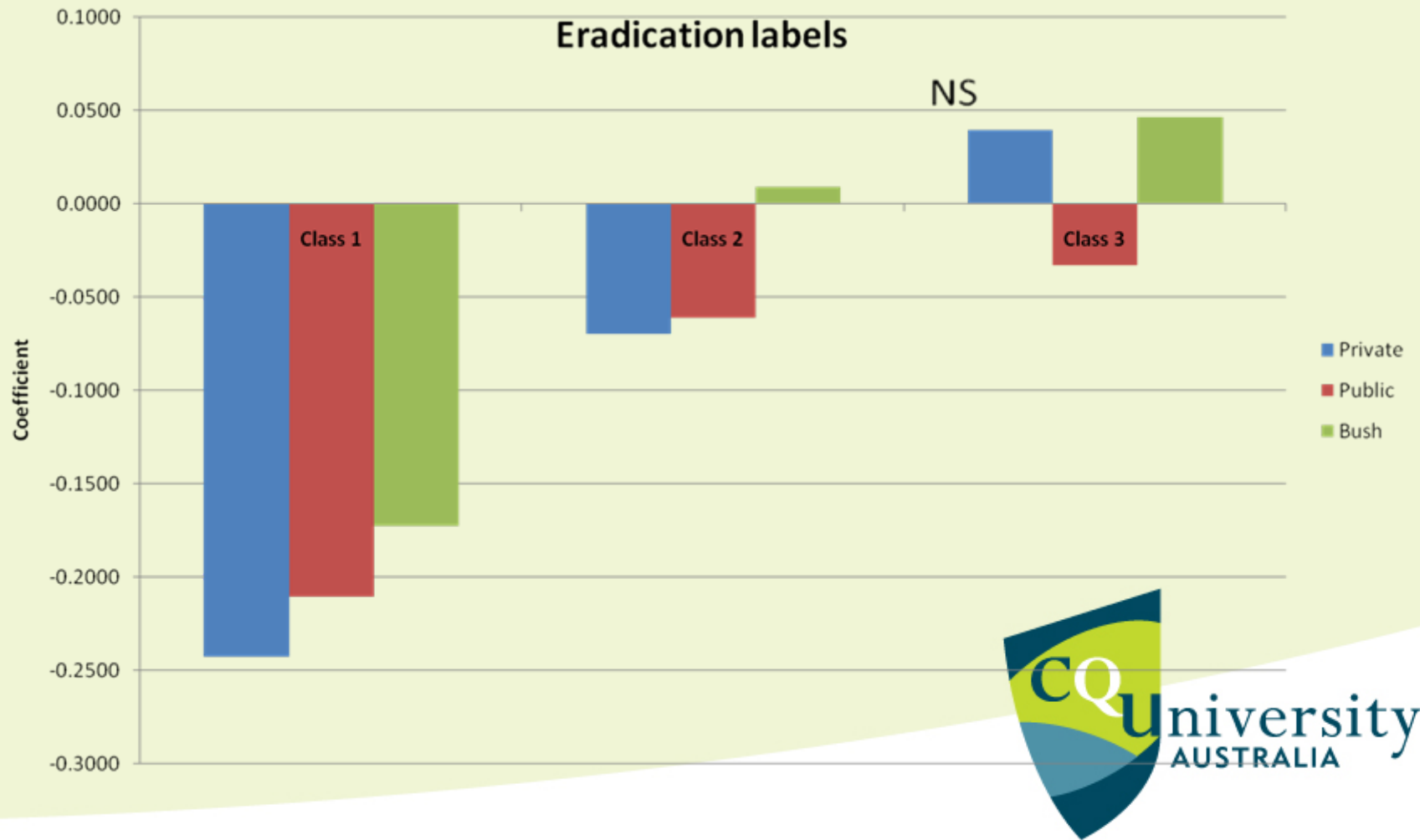


Eradication versus control

- One version offered eradication vs control
 - Eradication strategy had lower infestation levels but higher costs than control strategy
- ‘Eradication strategy’ increased likelihood of selecting option from about 40% to about 54%
 - And reduced proportion choosing ‘No control’ from 20% to 12%
- Evidence of three separate groups of households



3 latent classes for respondents – eradication and control outcomes



Model focused on certainty and eradication

Attributes	Coefficient	St. error	Part worths Per household	Units of improvement
ACS (intercept)	8.3369**	3.2627		
Cost	-0.0085***	0.0007		
Average infestation	-0.0006*	0.0036	\$0.71	Per 1% of area
Age	-0.0389***	0.0055		Older people more likely
Gender	-0.4925***	0.1445		Females more likely
Children	0.2207	0.1429		Children households more likely
Education	-0.4100***	0.0698		Higher education status more likely
Income	-0.2759***	0.0576		Higher income more likely
RIFA area	0.5634***	0.1482		Inside RIFA area more likely
High Certainty	0.8091***	0.0742		\$94 for high rather than low certainty
Eradication policy	0.9973***	0.0809		\$117 for eradication rather than control
Model statistics				
No of observations	2025			
Log L	-1749.			
Adj rho-square	0.12740			



Some conclusions

- These results show the potential for non-market valuation to provide estimates
- Preliminary results suggest strong support for control options
 - Eradication option has high value
 - High certainty option has high value
 - But significant group does not support control
- Difficult to fit models to data
 - Suggests the applications can be improved with further applications

