

Combinatorial Auctions Ideas, potential and challenges



JVAP | RIRDC | CSIRO | BBG | GBCMA | DIPNR NSW | LWA

Outline

Exploring package Auctions in NRM in Australia

1 Desert Uplands Biodiversity Corridors

2 Identifying and exploring package NRM outcomes such as biodiversity corridors,

- spatial habitat needs and other issues

3. Exploring package auctions in urban development

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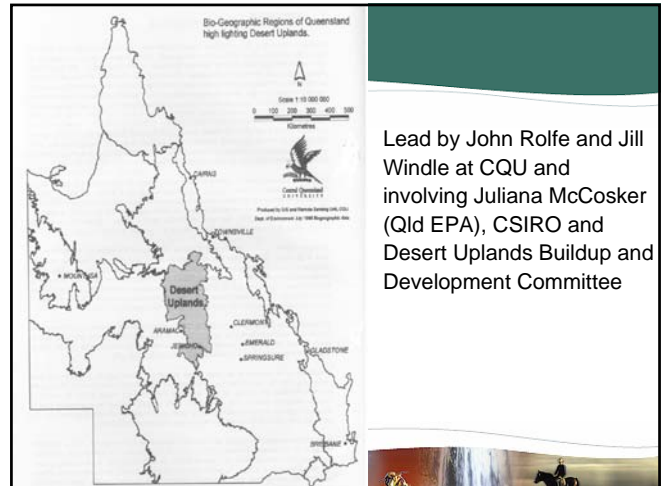


Outline

There are some related issues that are important to auction success in these contexts:

1. **Minimising transaction costs of engagement**
 - 1a. With new instruments.
 - 1b. In multiple round instruments with feedback
2. **Obtaining sufficient engagement to facilitate the coordination needed.**
 - 2a. Designing auctions and tools to encourage participation.
 - 2b. Designing payment vehicles that work.

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Lead by John Rolfe and Jill Windle at CQU and involving Juliana McCosker (Qld EPA), CSIRO and Desert Uplands Buildup and Development Committee

Biodiversity corridors in the Desert Uplands

- Current land management is causing habitat fragmentation and degradation.
- Regulation is difficult to enforce and highly resented by the local community.
- Voluntary participation in improved management is likely to be acceptable.
- But how do you *coordinate* voluntary action across a landscape?

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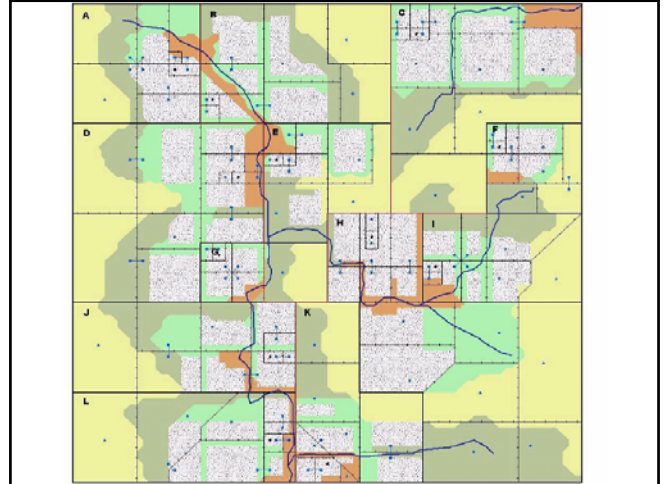


Biodiversity corridors in the Desert Uplands

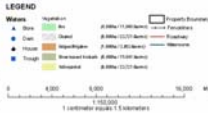
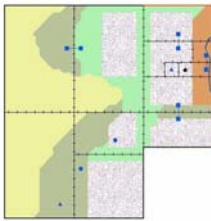
Other research questions:

- the potential efficiency gains of multiple round auctions over single round auctions,
- issues affecting participation rates,
- the level of transaction and administration costs involved, and
- the use of a conservation auction 'game' to familiarise respondents with the process.

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PROPERTY D "DUNAIRD" (32,000ha / 79,072acres)



Biodiversity corridors in the Desert Uplands

Approaches:

- **Multiple round independent auctions of various formats**
 - Same bid, different bid, different property
- **Limited cooperation model**
 - Group negotiation of corridor but individual bid submission

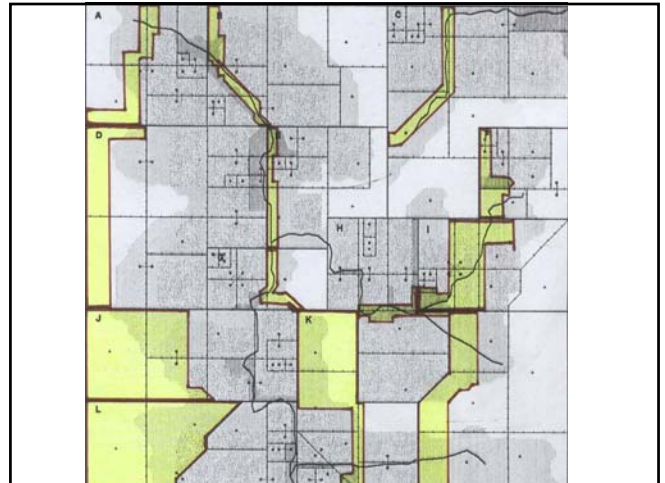
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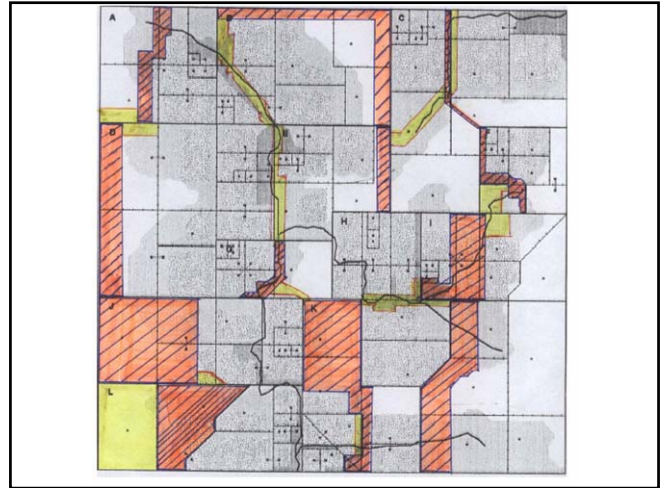
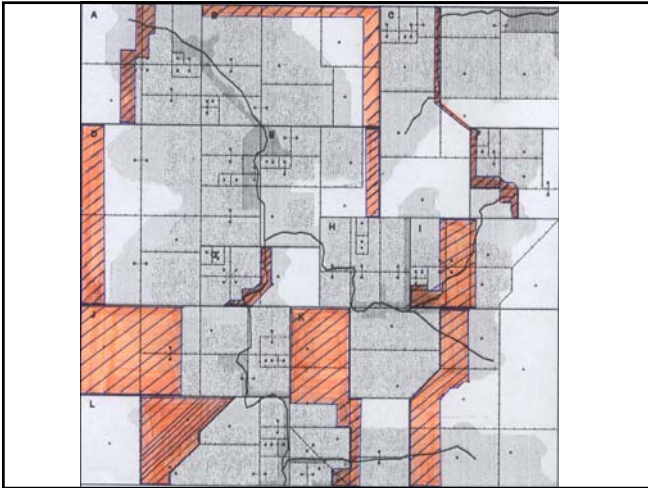
Biodiversity corridors in the Desert Uplands

Approaches:

- **Two round auction with information feedback about corridor locations.**

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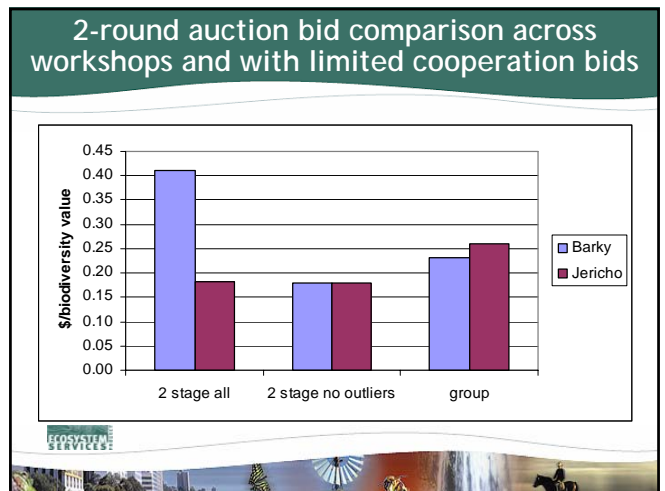
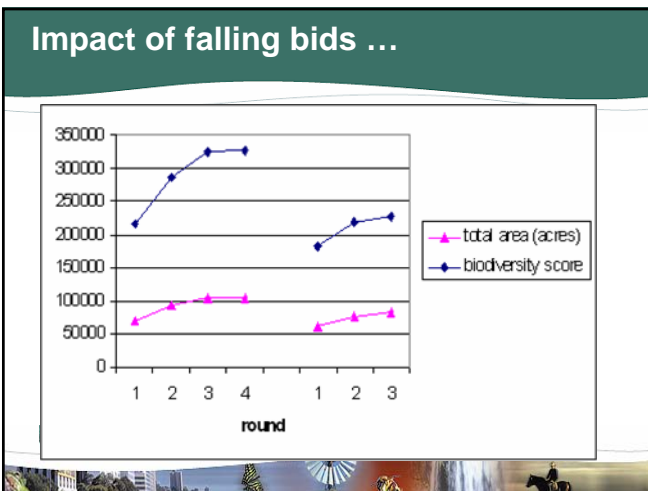
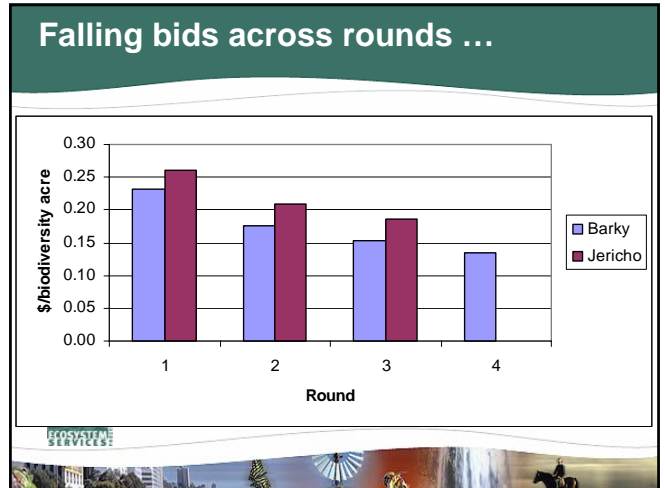


Biodiversity corridors in the Desert Uplands

Other results of interest:

- **Bids fall through consecutive rounds**
 - What does this mean for multiple round auctions
 - This effect does not appear to be significant after practice.

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Spatial issues in NRM management

1. **Corridors for biodiversity**
2. **Thresholds for specific species**
 - Can we facilitate nodes in the landscape?
3. **Mosaics of different vegetation types**
4. **Specific spatial habitat mixes such as**
 - Feed, breed combinations
 - Stepping stones across landscapes (similar to corridors)

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Spatial issues in NRM management

Some questions:

1. **Do we have the biophysical information?**
2. **Can sophisticated instruments work in a low private surplus environment?**
 - Can we facilitate engagement? At which point and how in our auction process?
3. **If not, how do we transfer public surpluses but avoid rent seeking?**
4. **Are there also other lessons from auction design of importance?**
 - For example, will uniform payment or 2nd price auctions out perform discriminatory auctions in these environments?

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Outstanding issues II

Some ideas for coordination ... or further questions

1. **Award some bids in first round to aid in coordination?**
 - Could work well if mix of special sites (hotspots) / larger stepping stones and links needed
 - May allow new entrant to 2nd round by giving incentive to participate in first
 - But would need to make sure stepping stones and links sufficiently similar to combine into a single mechanism
2. **Bid payment to encourage sufficient entry for corridor formation?**
 - Large enough to encourage entry but small enough to discourage rent seeking

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Outstanding issues III

3. **How much information should be provided about the preferred corridor path?**
 - Does this cause the equivalent problem to starting point bias in non-market valuation?
4. **How do we achieve permanent landuse change at reasonable cost in a one-shot game?**
 - Maybe we should convert to a limited number of rounds culminating in a one-shot game?
 - Can we design tools that will sufficiently educate participants to get an efficient result in a one-shot game?
 - What about one-shot game with options? E.g. convert to an annuity at current rate or lump sum equivalent?

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Other approaches

- **Agglomeration bonus**
- **Parkhurst (Mississippi), Shogren and Bastion (Wyoming)**
- **Used repetition as an institution to obtain spatial outcomes in experiments.**
- **Idea is to pay a bonus for any acre protected that borders another protected acre.**
- **Included 'cheap talk' communication**
- **repeated experiments with and without matched pairings (20 rounds).**

References:

- **Parkhurst, Shogren, Bastian, Kivi, Donner and Smith (2002)** "Agglomeration bonus: an incentive mechanism to reunite fragmented habitat for biodiversity conservation", *Ecological Economics*, 41:305-328
- **Parkhurst, Shogren and Bastian, (2004)** "Repetition, Communication, and Coordination Failure", *Experimental Economics*, 7:141-152

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Falling bids across rounds ...

Table 1
Summary of experimental design

Treatment	Transfer (\$)	Bonus (\$)	Nash Equilibria	Pareto Nash Eq.	Pairing	Pre-play cheap talk	Number of pairs
Nicholson Baseline	\$3 per parcel	None	(2,2)	(2,2)	Matched	No	8
Agglomeration Bonus I [MP-No]	\$3 per parcel	\$10 per shared border	(4,4) (5,5) (7,7) (8,8)	(4,4)	Matched	No	12
Agglomeration Bonus II [MP-CT]	\$3 per parcel	\$10 per shared border	(4,4) (5,5) (7,7) (8,8)	(4,4)	Matched	Yes	16
Agglomeration Bonus III [RP-No]	\$3 per parcel	\$10 per shared border	(4,4) (5,5) (7,7) (8,8)	(4,4)	Random	No	8
Agglomeration Bonus IV [RP-CT]	\$3 per parcel	\$10 per shared border	(4,4) (5,5) (7,7) (8,8)	(4,4)	Random	Yes	8

MP-No—Matched pair/No cheap talk; MP-CT—Matched pair w/ cheap talk; RP-No—Random pair/No cheap talk; RP-CT—Random pair w/ cheap talk.

Parkhurst et al. (2002), Table 1, p. 309.

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The concept ...

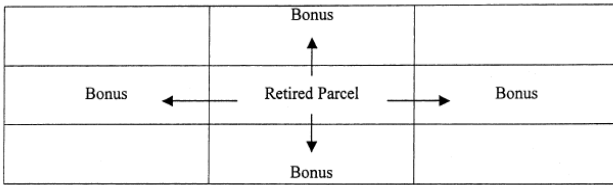


Fig. 3. The agglomeration bonus.

Parkhurst et.al. (2002), Table 1, p. 312.

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Agglomeration bonus outcomes

- **No bonus = fragmentation 100% of time**
- **Bonus without cheap talk = fragmentation 38 – 61% of time**
- **Bonus plus communication induced cooperation 92% of time in steady state (not immediate effect).**
- **There has been further experimental work on a larger scale with this approach (more landowners and heterogeneous land mixes) but I am not familiar with the results.**

Source: Parkhurst et.al. 2002.

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Coordination problems in Urban development and redevelopment

- **Both green-field and brown-field development has strong planning requirements imposed.**
- **But planners suffer from a strong asymmetric information problem**
- **So can we design an auction that would meet planning requirements but also reveal the information necessary for an efficient solution?**
- **This is a high private surplus environment – so what does this mean for complexity and cost in auction design?**

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Coordination problems irrigation supply

- **Irrigators require a specific package of water throughout a season**
- **Clear risk management issues if they can buy in advance.**
- **But specific flow paths complicate supply – especially if there are supply constraints.**
- **Can we design mechanisms to overcome these coordination problems and deliver environmental benefits?**

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For more details:

Email: stuart.whitten@csiro.au

Website: www.ecosystemsproject.org



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