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## Mesquite: Optimising Management of Core Infestations Across Australia





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+ Thanks to PMMC, NPBMG, QDPI, DAWA, LWA

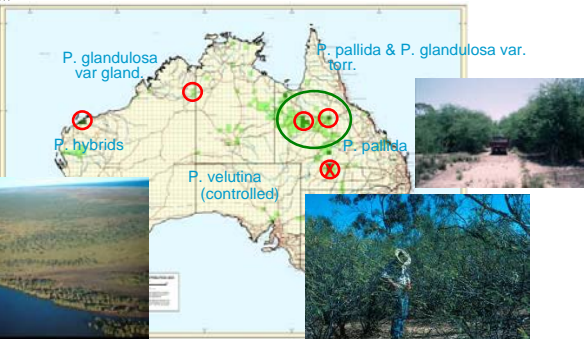





## What is the problem?

- Highly invasive, even without undue disturbance
- "keystone/transformer species"
- Can fundamentally alter way pastoralism is done







## Where is the problem?

## This talk

- CSIRO mesquite research of which the 07-8 LWA mesquite project was a continuation
- Focus on a few elements:
  - the "big picture"
  - population ecology
  - management
- Focus on largely on Western Australia



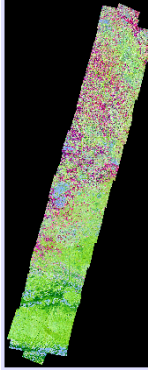
# THE BIG PICTURE

## Mapping mesquite: remote sensing?

	Actual			Totals	Error of omission
	Mesquite	Snakewood	Eucs		
Predicted					
Mesquite	107	8	85	200	0.47
Snakewood	51	770	39	860	
Eucalypts	47	19	222	288	
Error of omission	206	797	346	1348	
Overall agreement				81%	

- can pick up 3m plants
- serious confusion with eucalypts and acacias
- no good for "surveying"
- good for "change detection" (with improvement)?
- hyperspectral image not much better


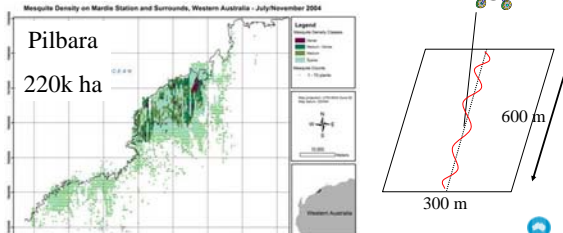
16 x 2.5 km  
(1.5x1.5m)



Todd Robinson

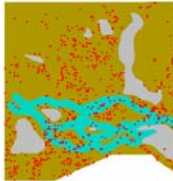
## Mapping mesquite cost-effectively

- New method: quantitative chopper survey
- Relatively cheap (at a coarse, 15.5 ha scale) [ $< 50c/ha$ ]
- Great at detecting low densities
- Future surveying will target invasions fronts and control areas

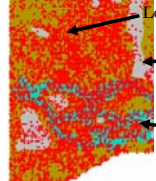



## Aerial photographs: History of invasion (Pilbara)

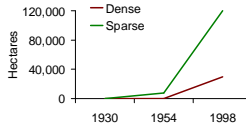
1970



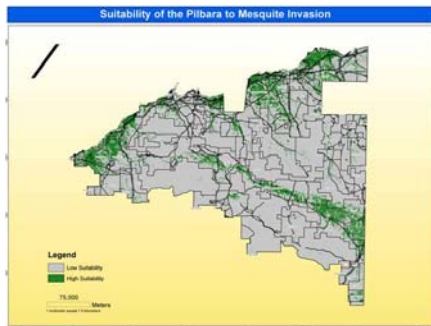
2001



- widely dispersed patches by 1970
- subsequently "in-filled"
- fastest in "good" habitats
- consistent with dispersal by sheep/macropods
- these are very poor vectors vs cattle!
- managing sparse mesquite is critical



## Landscape predictions – Pilbara Region



Ordered Weighted Averaging + fuzzy membership

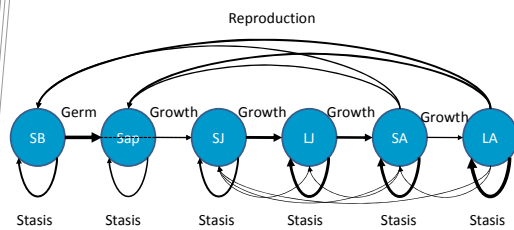
- pasture potential
- land tenure
- moisture



## POPULATION ECOLOGY

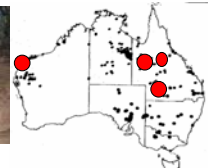


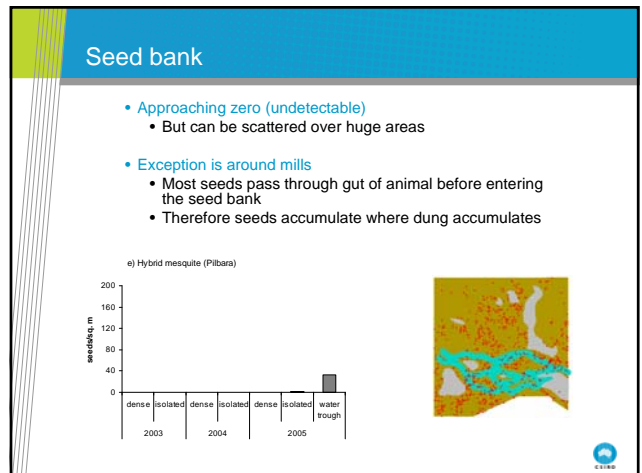
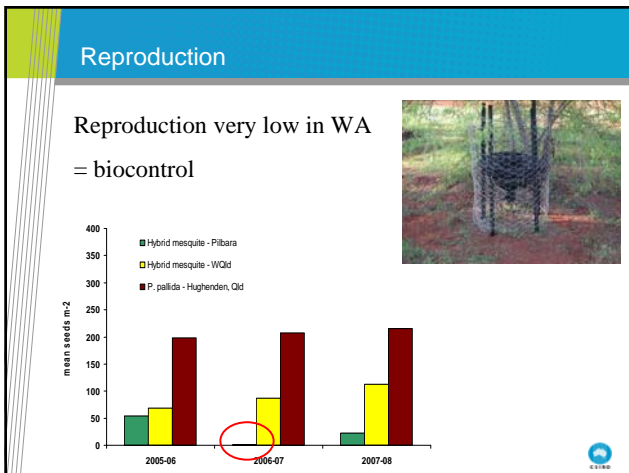
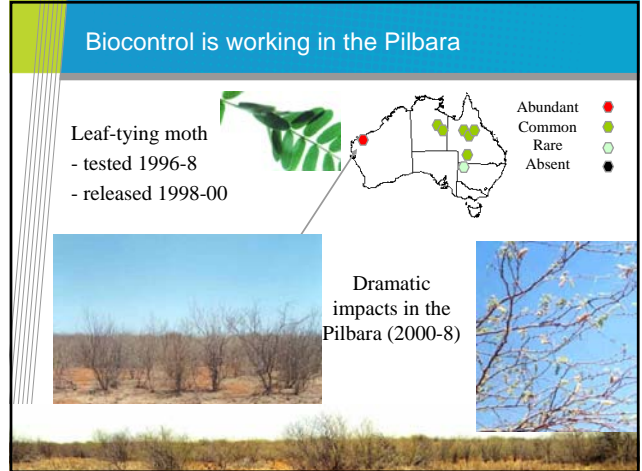
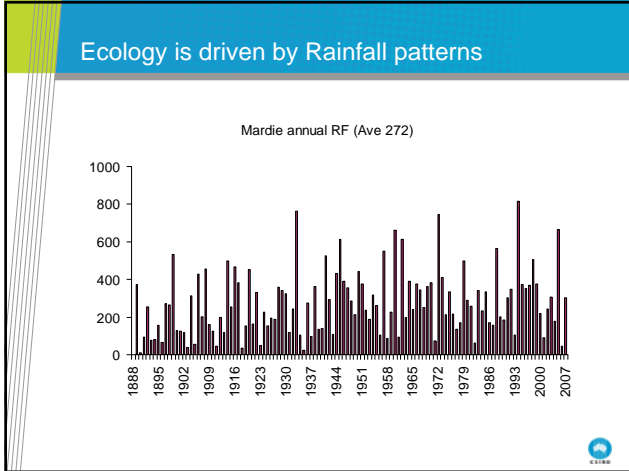
## Population model: Lifecycle



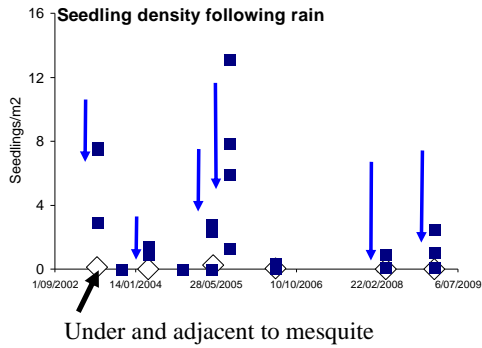
## Mesquite ecology: a national perspective

- How does mesquite ecology differ across Australia
- 15 permanent sites:
  - seed banks
  - growth rates
  - recruitment and deaths
  - effects on herbaceous layer
  - effects of biocontrol agents

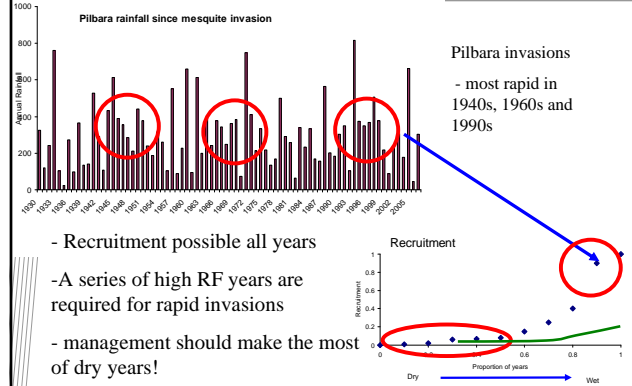




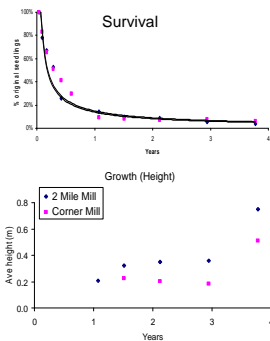
## Seedling germination through time (Pilbara)



## Recruitment and climate



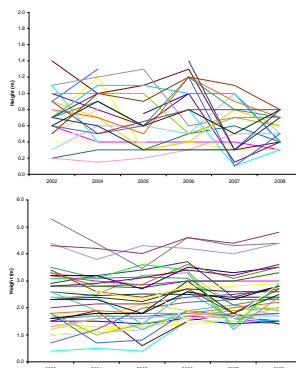
## Seedling recruitment



Mass recruitment after March 2005 rains (Pilbara, 4 years later)

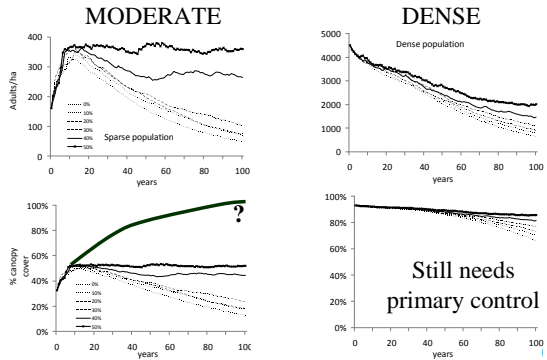
- Most survive after 1 yr
- Can be hard to spot for >4 yrs

## Juvenile and adult growth rates



Limited growth:  
drought + biocontrol

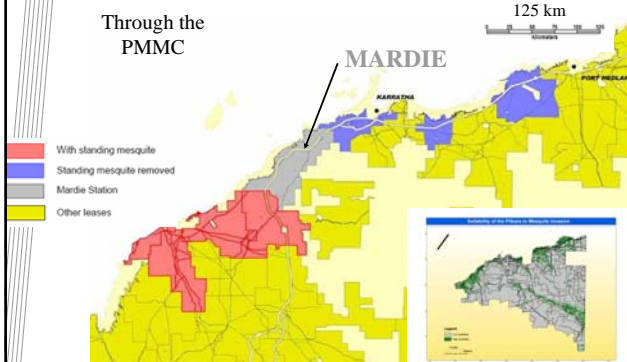
## Population dynamics (Pilbara) [work in progress]



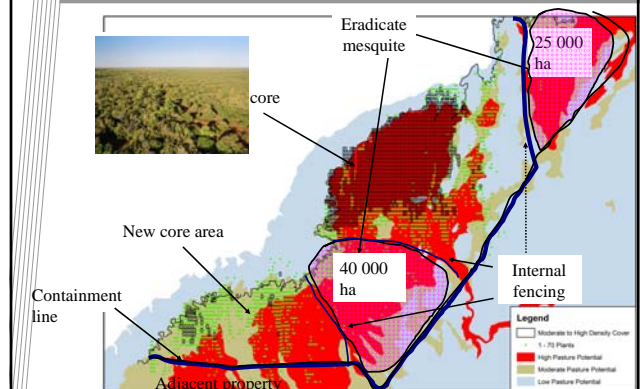
## MANAGEMENT



## Incorporating research into management: regional



## Incorporating research into management: core



## Hybrid mesquite: control is costly and challenging

- Integrated control trial (144 ha)
  - Fire must kill everything
  - Fuel is too patchy
  - Burn conditions too rare



Pre-treatments

Main treatment



## Management challenges: not as hard as we think

- Slow lifecycle, small seed banks, but
  - has a long-lived "seedling bank"
  - Populations can "explode" with a series of wet years
- Good kill rates if controls are applied correctly (machinery, basal bark)
- Greatly assisted by biological control (esp. Pilbara)
- Cheaper & less labour would be better
  - Machinery is currently the only way to kill dense fire-tolerant mesquite
  - Basal-barking is the main way to kill isolated plants
  - Labour is often limited (e.g. Pilbara)
- New agents?: e.g. to kill standing trees (South Africa work)



## Management challenges: isolated plants

Management success will depend on our ability to:

- Deal with isolated plants over large areas
  - Pilbara (120 000 ha +++)
- Manage mesquite through wet-dry cycles
  - High seed production + high recruitment + high growth



## Some ongoing work

- Ongoing monitoring: processes are slow in the rangelands!
- Mesquite genetics: is it hybridising into a "super weed"? (see me about **available PhD scholarship**)
- Optimising control strategies: what is the optimal type, timing and frequency of primary and secondary control efforts? (Pichancourt)



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