Protecting vulnerable land from high wallaby densities

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What is the problem?

Pastoralists see Agile Wallabies as pests

- Agriculture:
  - Direct competition with cattle (for feed and supplements)
  - Destruction of improved pastures (digging)
  - Destruction of hay and horticultural crops
- Environment:
  - Loss of ground cover/fuel load for fire management
  - Erosion from loss of protective ground cover
  - Rapid and efficient spread of weeds

Project Background

- 2009 Katherine Pastoral Industry Advisory Committee (KPIAC)
- 2011, 2012 Northern Territory Cattleman Association (NTCA) meetings
- 2012 May Pastoralists meet with CDU
- 2013 October Funding from MLA for Stage 1

Funding and time limited
Stage 1 is a 1 year scoping exercise)

Stage 1 main goals are to:

1. Develop a case for research and development during Stage 2
2. Establish potential partnerships to develop a wallaby management plan

Project aims

- Collate current knowledge

  Online search engines, Government Departments and other Institutions

- Get the pastoral community involved

  Steering committee formed with stakeholder, May 2014

- Quantify production losses

  Questionnaires and interviews, ongoing

- How many wallabies?

  On site population surveys, ongoing

- Identify areas/regions most affected

  On site population surveys and questionnaires, ongoing

- Causes of high wallaby densities?

  On site population surveys and questionnaires, ongoing

- Management options?

  Modelling (STAR and/or SPADE)

Methods - Collate literature

191		Relevant manuscripts
34		Publications mentioned Agile Wallabies:
	5	Books and Book chapters
	1	PhD Thesis, (Stirrat, S. 2000)
	2	Government Reports (NT and TAS)
	26	Peer-review articles

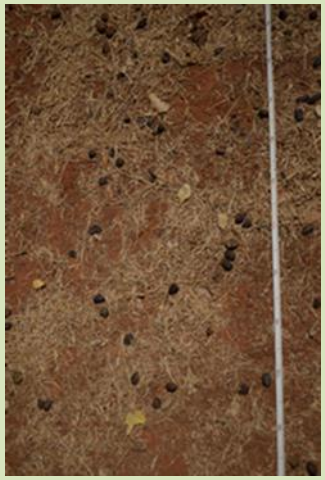
Methods - Landholders questionnaires

143			Properties listed (NT Pastoral Map, Yellow pages, etc.)
86			Obtained contact details (Yellow pages, Interviews, etc)
	6		Declined participation on first approach
	80		Received questionnaire
		5	Declined participation after receiving questionnaire
		31	Answered questionnaire
		44	Awaiting answer

Methods - Onsite population surveys

5		Properties (Sturt Plateau, VRD, and Douglas Daly)
Each property	6	1 km Agile Wallaby Transects
	12	7 m Scat Transects
3/5 properties	4	Paired Exclusion Plots (50cm x 50cm)
	4	Camera Traps
1/5 properties	2	Paired Exclusion Plots (6m x 6m) (DPIF)

Sample sizes are small funding is limited



Results

Reported densities

Article	Year	State	Region	Environment	Ind/km²
Bell (1973)	1970's	QLD		Savannah	20
				Burnt Areas	100
Croft (1987)	1983	NT	Adelaide River	Woodland	8
Dressen (1993)	1990's		Kakadu NP	Open Woodland	17
				Monsoon Rainforest	62
Stirrat (1995)	1994		Berry Springs	Open Woodland	27

Field estimated densities

'Distance' Software

Truncation: 150 m; Key function: Hazard-rate; & Series expansion: Hermite polynomial

Region	Property	Ind/km²	95% Confidence Interval	
Douglas Daly	Maneroo	**893**	274.14	2911.9
	DDRF	**489**	247.36	967.94
Mataranka	Cave Creek	**204**	131.48	316.53
Victoria River District	Scott Creek	**498**	221.09	1120.57
Sturt Plateau	Banjo	**8**	2.95	23.01

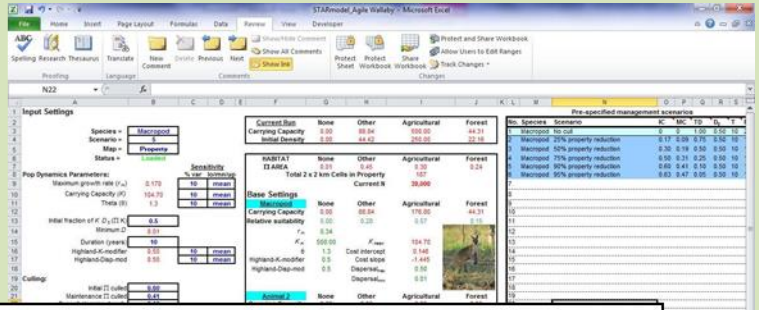
Preliminary Results - Modeling

Cost-effective strategy selection tool

*Decision framework **not** a predictive model*

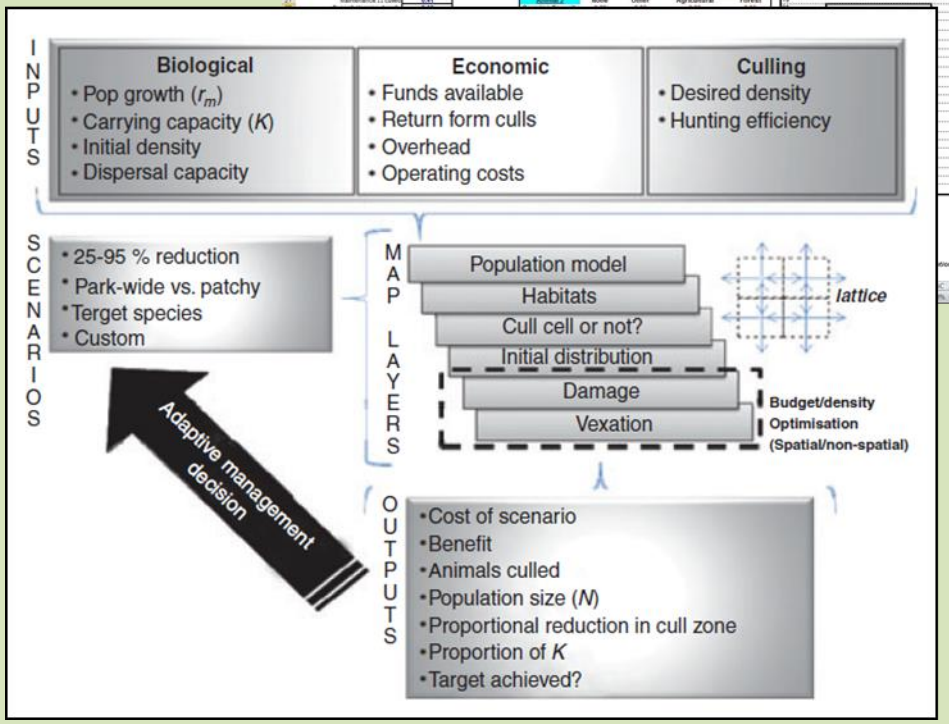
Spatio-Temporal Animal Reduction explicit models - STAR+

Previously applied to:
Kakadu NP. Buffalo, Pig & Horse *(McMahon, et al. 2010)*
East Tasmania. Pademelon *(Wiggins, et al. 2014)*



Inputs - Victoria River District

Biological	
r_{max}	0.34
K_m	490 Ind km^{-2}
Initial density	280.4 Ind km^{-2}
Economic	
Operating cost	Min $440.96 per hour
Culling	
Desire density	62 Ind km^{-2}
Hunting efficiency	0.15



Preliminary Results - Modeling

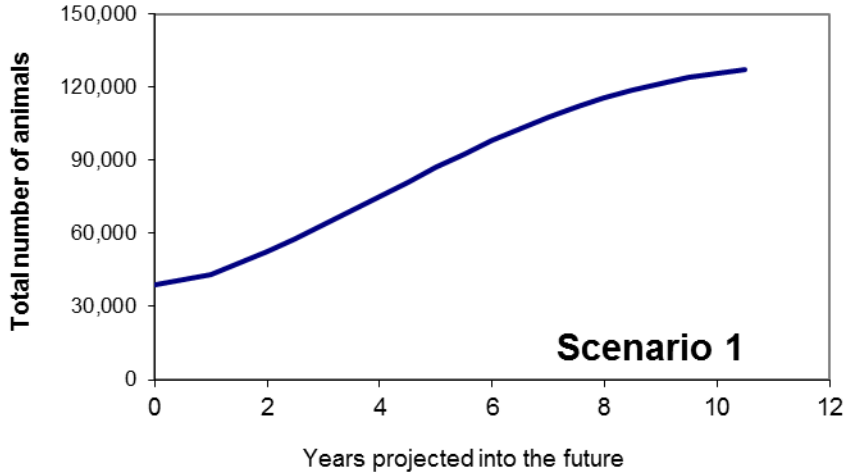
6 Scenarios tested

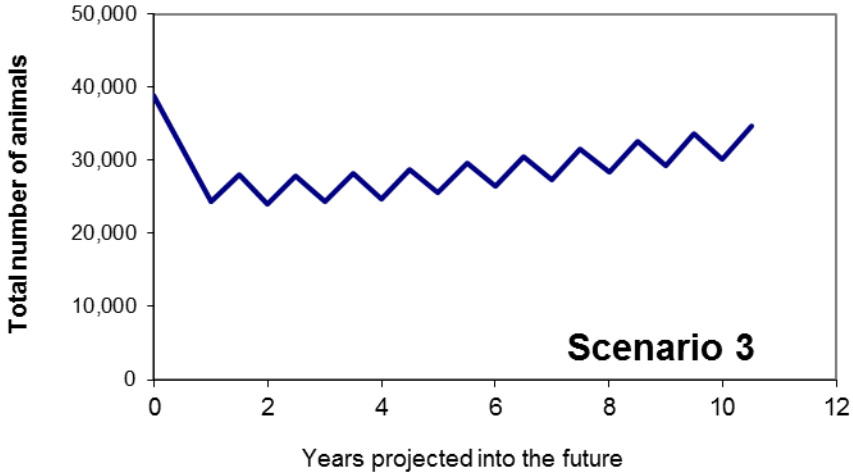
Management scenario	Reduction Target	Initial Cull (1st year)	Maintenance cull (yearly)
(1) Zero density reduction	**0%**	0%	0%
(2) Low-intensity reduction	**25%**	17%	9%
(3) Medium-intensity reduction	**50%**	30%	19%
(4) High-intensity reduction	**75%**	50%	31%
(5) Very high-intensity reduction	**90%**	60%	41%
(6) Extreme-intensity reduction	**95%**	63%	47%

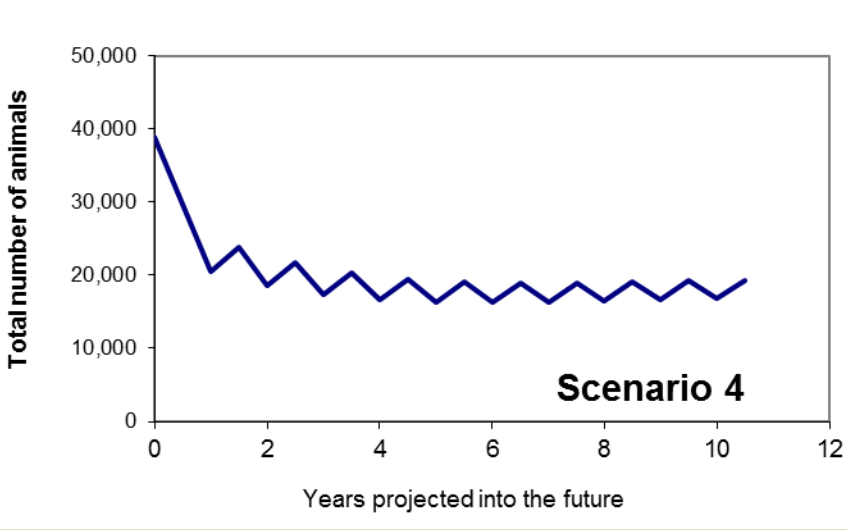
Output

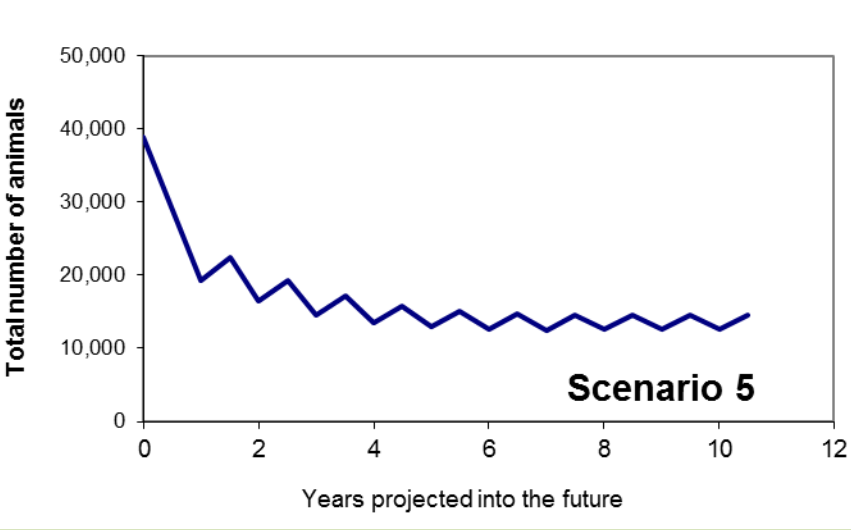
Management scenario	Animals removed	Density remaining (Ind/km^2)	Cost per animal	Cost per km^2	Total mgmt. cost
(1) Zero density reduction	0	175.77	$0	$0	$0
(2) Low-intensity reduction (25%)	55,042	132.81	$0.38	$28	$21,163
(3) Medium-intensity reduction (50%)	82,543	88.50	$0.62	$68	$50,865
(4) High-intensity reduction (75%)	**83,714**	**43.78**	**$1.35**	**$151**	**$112,987**
(5) Very high-intensity reduction (90%)	**75,681**	**23.70**	**$2.70**	**$273**	**$204,069**
(6)Extreme-intensity reduction (95%)	**70,961**	**17.65**	**$4.05**	**$384**	**$287,531**

Preliminary Results - Modeling



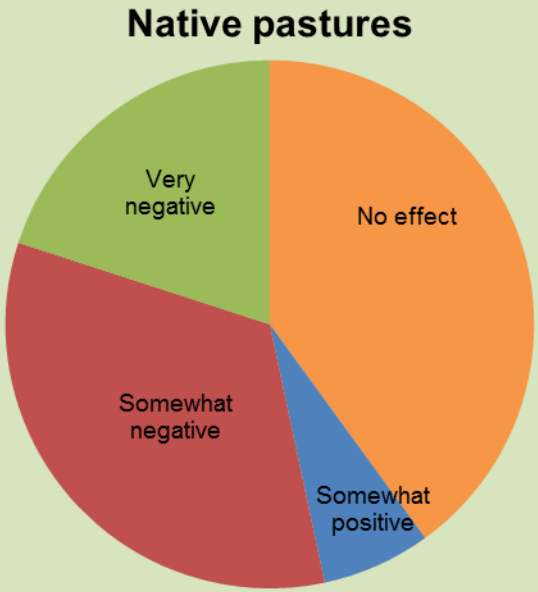


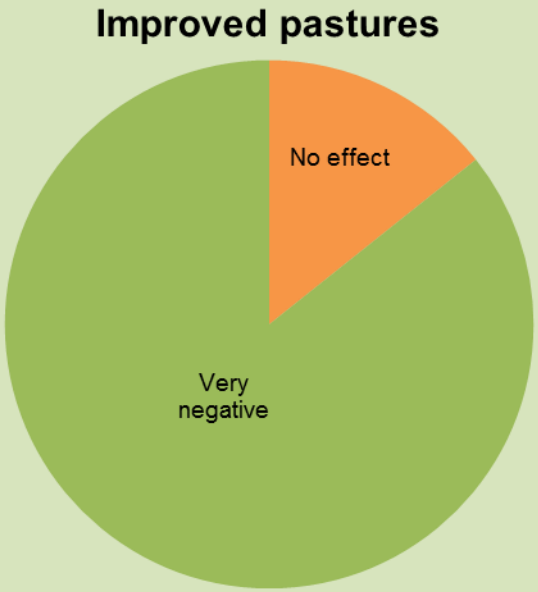




Preliminary Results - Questionnaire

How would you rate the impact that agile wallabies have on your production?





Estimates of impacts to pastoral production:

	Native Pastures	Improved Pastures	Hay production
Carrying capacity reduction 6.5% to 13% $year^{-1}$	\$6.7 to \$214 km^{-2} $year^{-1}$	\$238 to \$500 km^{-2} $year^{-1}$	\$857 km^{-2} $year^{-1}$
Cost of control			
Shooting	\$0.1 to \$25 km^{-2} $year^{-1}$ (between \$1500 and \$20,000 per year)		
Fencing	\$2100 km^{-1} excluding labour, clearing costs and recurrent maintenance		

Conclusions

- Wallaby densities are higher on pastoral land than in natural environments
  - Properties with **improved pastures** are the most affected
- Grazing pressure by agile wallabies needs to be measured directly
- A management plan for agile wallabies will be expensive
  - Cost-benefit of control methods needs to be assessed
  - Logistics, personnel and priority areas must be taken into account
- Research into alternative methods of control is needed –stakeholder supported trials will be essential because of limited funding

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