Steve Fox
KBR

Presentation

Challenges in using Queensland's Ecological Equivalence Methodology for ecological monitoring

Biography

Steve Fox works as Principal Ecologist for KBR based in their Brisbane Office. He has over 17 years experience in environmental impact assessment studies, approvals, native vegetation identification and mapping, ecological monitoring and land management and rehabilitation.

Steve has led and managed numerous environmental impact assessments for linear infrastructure projects, including gas, water and slurry pipelines, and powerlines. He has also led and managed environmental assessments for extractive industries (including coal mine and coal seam gas field developments), major transport infrastructure (roads and rail), and several major urban and regional development projects.

Steve has led and managed multidisciplinary teams undertaking approvals studies and liaised directly with federal, state and local government agencies for large and medium sized infrastructure projects.

He is thoroughly conversant with the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) as well as the various principal Queensland and Northern Territory environmental legislation and approval requirements.

Steve has provided a wide range of environmental services to the energy and mining sectors. He has previously lectured in native plant identification at the University of Queensland, is experienced in the practical application of ecological principles and has been the principal author (and technical peer reviewer) for the development of two of Queensland's most significant vegetation and biodiversity offset strategies. Steve has also developed and implemented of a number of ecological monitoring programs.

Abstract

In 2011 the Queensland Government introduced a new Ecological Equivalence Methodology (EEM) tool to assist ecologists in rapidly determining the biodiversity condition of vegetated areas. Five years have flown by and EEM is now widely applied by ecologists across the State.

What lessons have we learned?

Does EEM serve it's originally intended purpose of supporting the application of Queensland's Biodiveristy Offset Policy? How else is it being utilized? What are some

of the challenges and what are some of the potential traps for ecologists associated with use of the tool?

This paper answers these questions (and more!) by drawing on the recent experience of a cross-section of practitioners, as well as the author's own experience in applying the tool in support of a number of current offset and ecological monitoring projects.

The paper considers whether EEM data can effectively measure changes in biodiversity condition stemming from land management interventions.

Finally, using real life data, the author will show you how EEM data can be used to facilitate Federal approvals and guide land management decisions (and what to watch out for!)

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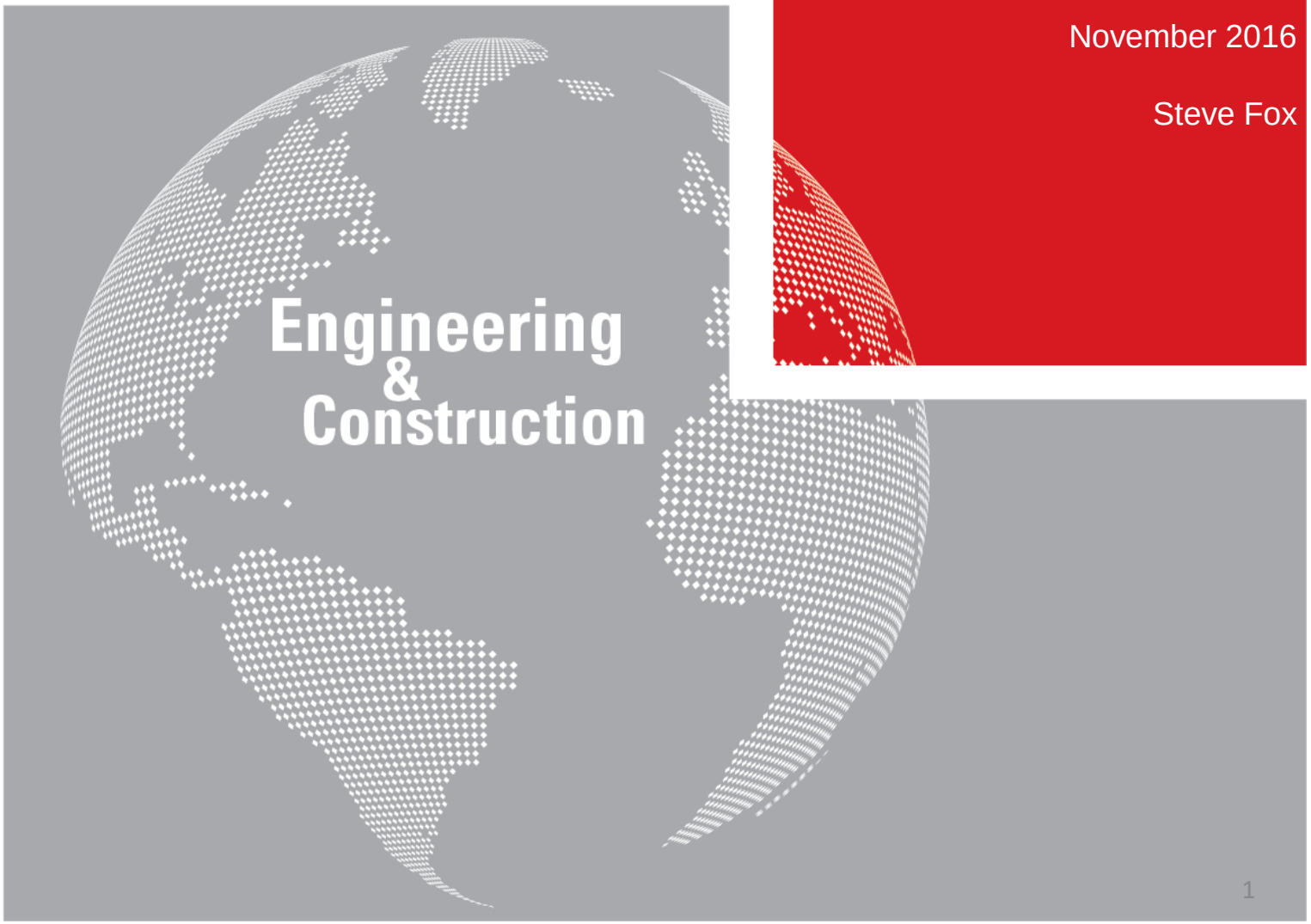
Challenges in using Queensland's Ecological Equivalence Methodology for ecological monitoring

November 2016

Steve Fox

ZERO HARM 24/7
courage to care



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Abbreviations

AU – Assessment Unit

Benchmark site – A nearby site with the same vegetation type in natural condition which is used for comparison with another site

BioCondition – Queensland's site based terrestrial biodiversity condition assessment methodology (v. 2.2, Eyre, et. al. 2015)

EPBC Act – Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

HQ - Habitat quality

RE - Regional Ecosystem under the Queensland *Vegetation Management Act 1999*

SEVT – Semi-evergreen Vine Thicket

TEC – Threatened Ecological Community under the EPBC Act

Biodiversity offsets

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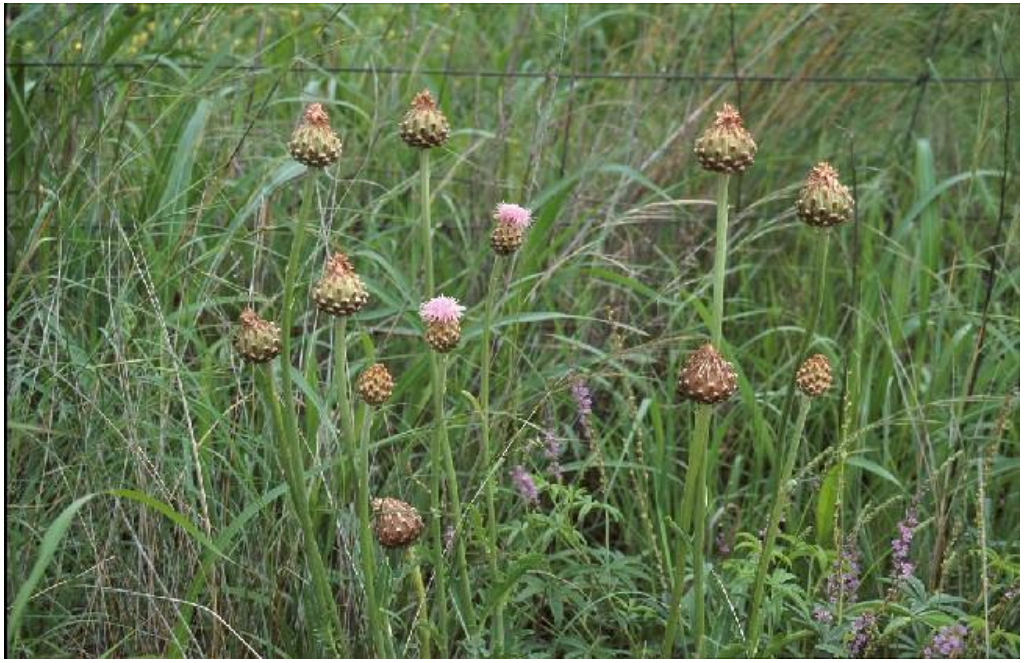
- Compensation for an unavoidable significant impacts
- Can be land-based, payment-based or a combination
- This presentation considers land-based terrestrial offsets



Presentation overview

- What is ecological equivalence assessment?
- Applications in
  - determining offset areas required
  - monitoring progress towards target objectives
- Main limitations
- Questions

What is ecological equivalence assessment?

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	Ecological condition assessment	Ecological equivalence assessment
Measures	Condition / Health	Conservation significance
Attribute examples	Site attributes: - Tree height, breadth and cover - Weed presence & cover Landscape attributes: - Local context values e.g. Size, local connectivity	- Regional significance - Ability to support significant species For offsets, can include: - Ability of offset to be improved - Risk and uncertainty - Temporal factors
Application	Land management review & planning	Assisting decision making for development approvals and investment purposes
Origins	- Forestry - Pastoral industry	- Biodiversity offsets - Protected area prioritisation

Ecological equivalence in Victoria, NSW and Qld

Engineering & Construction

Purpose	Methods		
	Victoria	NSW	Queensland
Ecological condition	Habitat Hectares (Parkes, *et al.* 2003)	BioMetric (Gibbons, *et al.* 2008)	BioCondition (Eyre *et al.* 2015)
↓	↓	↓	↓
Ecological equivalence	Vegetation Quality Assessment Manual (2004)	BioBanking Assessment Methodology (2014)	Original ecological equivalence guideline (2011) Now = Guide to Determining Terrestrial Habitat Quality (2014)

Key legislation and guidelines in Queensland

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Queensland

Environmental Offsets Act 2014

Current as at 2 July 2015

Department of Environment and Heritage Protection

Queensland Environmental Offsets Policy
General guide

Department of Science, Information Technology, Innovation and the Arts

BioCondition

A Condition Assessment Framework for Terrestrial Biodiversity in Queensland

Assessment Manual

Queensland Herbarium, Science Delivery

Version 2.2

February, 2015

Great state. Great opportunity.

Department of Environment and

Queensland Environmental Offsets Policy
(Version 1.2)

June 2016

Guide to determining terrestrial habitat quality

A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy

Version 1.1 December 2014

Great state. Great opportunity. And a plan for the future.

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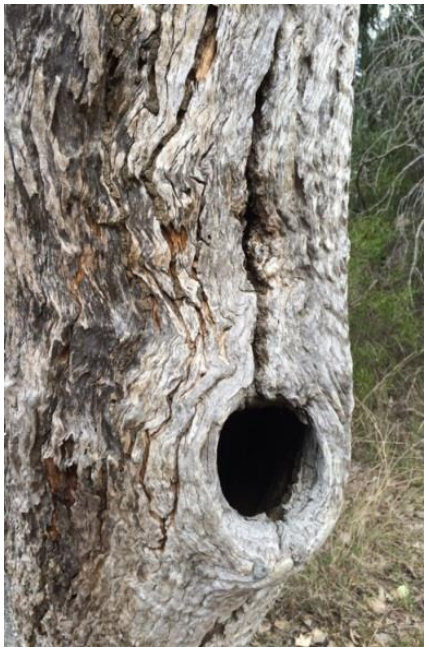
Relationship with Commonwealth EPBC Act offsets

- Queensland is unable to require offsets for impacted values which have already been assessed by the Commonwealth
- Where different State and Commonwealth values overlap, offsets can be collocated
- Assessments undertaken in accordance with the Queensland guidelines generally also acceptable for Commonwealth purposes

1. Habitat quality (HQ)

- ‘Habitat quality’ is the currency
- Site condition + Site context + Spp. habitat = HQ score
- Compares sites and future states
- Is used to assess whether an offset site is:
  - of a suitable quality, and
  - can achieve a habitat quality gain

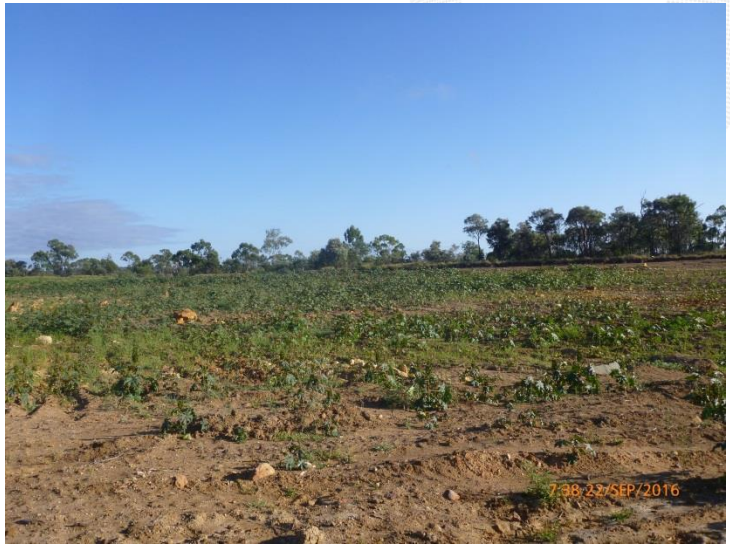
  sufficient to compensate for the impact.

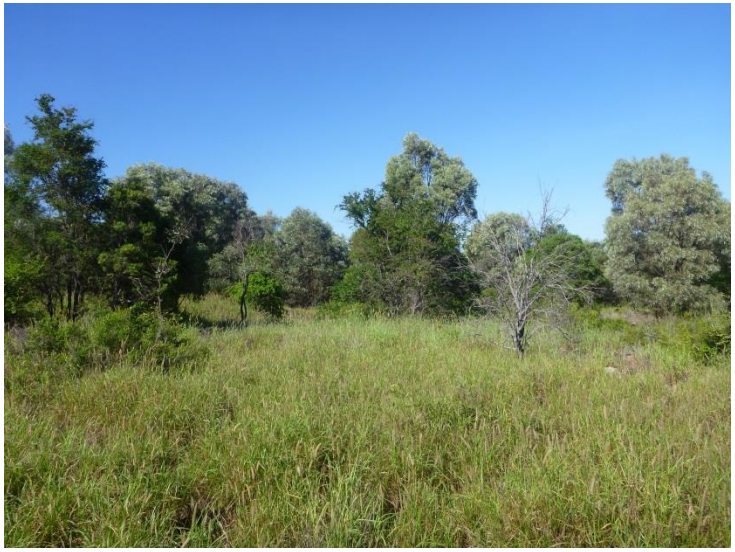


1. Habitat quality

- Habitat quality scores 1-10

1





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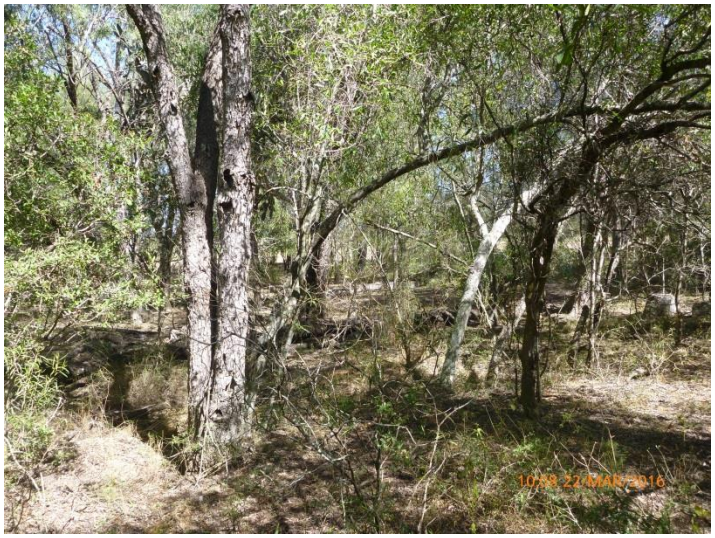


9-10

1. Habitat quality

- Policy stipulates habitat quality score gain:
  - At least 1 point above the impact site score
  - At least 2 points above the offset ‘starting point’ score

2. Multipliers

- Area of impact compared to area of offset
- In Queensland, generally 1:4
- Queensland and Commonwealth provide offset calculators
- Compensate for temporal and risk factors in achieving the target ecological benefits

Steps in determining ecological equivalence

IMPACTS

Impacted values quantified

BioCondition assessments (scores)

Conversion to habitat quality score

OFFSETS

Potential areas identified

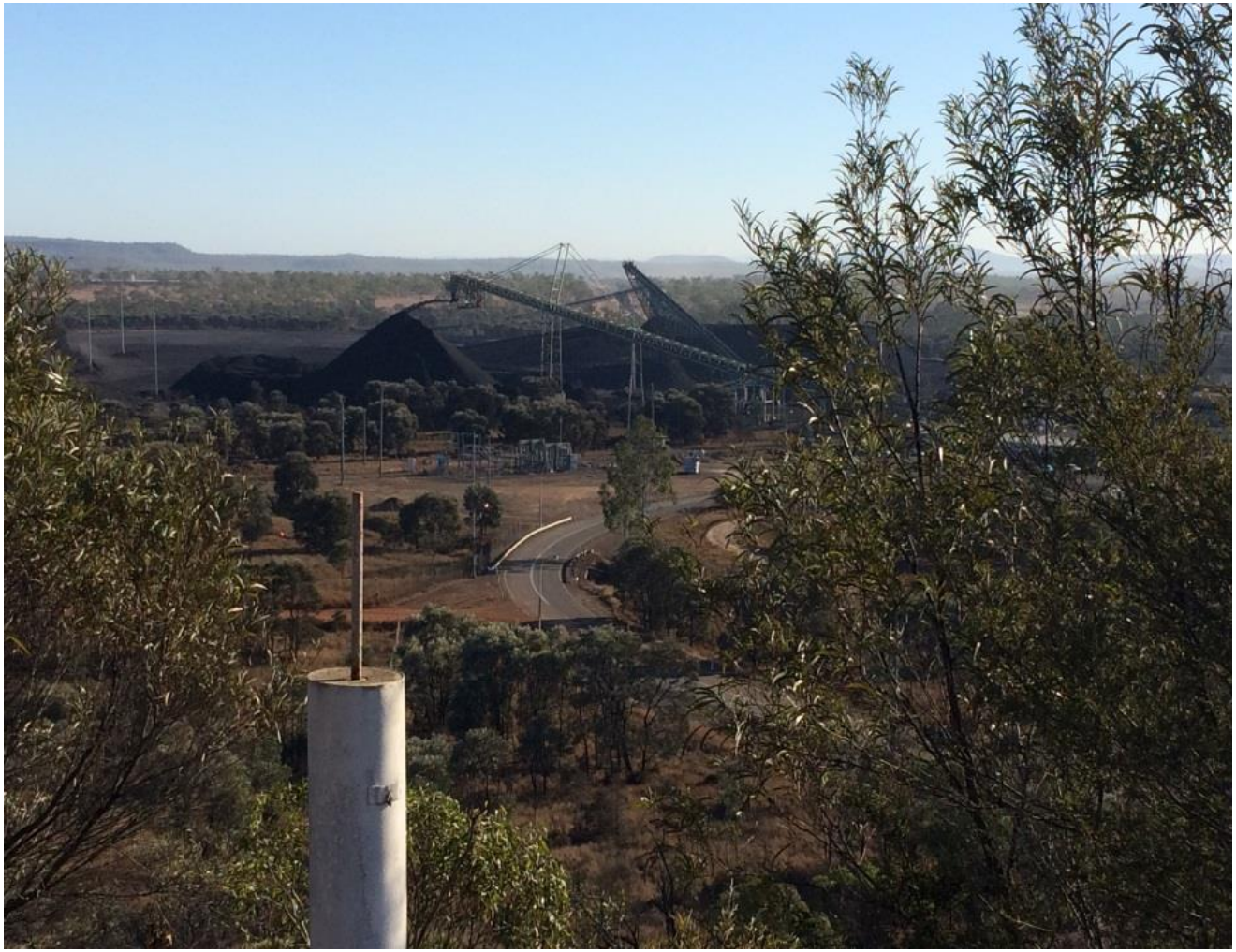
BioCondition assessments(scores)

Conversion to habitat quality score

Qld and C'mwlth Calculators

Negotiate and agree offset areas required

Bowen & Surat Basin coal mines case studies



Impacted values

Regional Ecosystem	VM Act status	Threatened Ecological Communities (EPBC Act)	Impact area (ha)
11.3.1	Endangered	Brigalow	15
11.3.4	Of concern	–	2
11.8.13	Endangered	Semi-evergreen vine thicket	53
11.9.4a	Of concern	Semi-evergreen vine thicket	4
11.9.5	Endangered	Brigalow	189
11.9.10	Of concern	–	51
Watercourses			293
Squatter Pigeon habitat			546

BioCondition scores for impacted areas

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		AU 1 RE 11.3.1	AU 2 RE 11.8.13	AU 3 RE 11.9.4a	AU 4 RE 11.9.5	AU 5 RE 11.9.10
1	Recruitment of woody perennial species	0	3	5	2.2	5
2	Native plant species richness					
	• Trees	5	2.5	2.5	4	5
	• Shrubs	5	2.5	0	3.5	2.5
	• Grasses	2.5	2.5	5	1.5	5
	• Forbs	0	0	0	0.5	5
3	Tree canopy height	5	5	3	4.2	5
4	Tree canopy cover	5	3	2	5	5
5	Shrub canopy cover	3	5	3	3.2	3
6	Native perennial grass cover	5	5	5	4	3
7	Organic litter	3	3	3	4.6	5
8	Large trees	5	15	5	4	5
9	Coarse woody debris	2	2	2	2.4	2
10	Weed cover	5	0	10	5.6	10
11	Size of patch	6.7	4	10	8.4	4.7
12	Connectivity	5	5	2	5	5
13	Context	5	5	4	4.7	5
14	Distance from water	N/A	N/A	N/A	N/A	N/A
Sum of score		62	63	62	63	75

BioCondition scores for offset area

Engineering & Construction

		AU 1 RE 11.3.1	AU 2 RE 11.8.13	AU 3 RE 11.9.4a	AU 4 RE 11.9.5	AU 5 RE 11.9.10
1	Recruitment of woody perennial spp.	5	3	0	3.8	0
2	Native plant species richness					
	- Trees	5	2.5	0	3.5	0
	- Shrubs	5	2.5	0	1.5	0
	- Grasses	0	2.5	0	0	0
	- Forbs	2.5	0	0	0.5	0
3	Tree canopy height	3	5	0	3	0
4	Tree canopy cover	5	3	0	4.6	0
5	Shrub canopy cover	5	5	0	2.4	0
6	Native perennial grass cover	0	5	0	0	0
7	Organic litter	5	3	0	4.6	0
8	Large trees	0	5	0	1	0
9	Coarse woody debris	2	2	0	0	0
10	Weed cover	0	0	0	0.6	0
11	Size of patch	10	4	0	10	0
12	Connectivity	5	5	0	5	0
13	Context	4	4	0	4	0
14	Distance from water	N/A	N/A	N/A	N/A	N/A
Sum of score		57	52	0	45	0

Data sheet under current Qld offset policy (v1.2)

Engineering & Construction

	Site condition	AU3-1	AU3-2		Average Score
1	Recruitment of woody perennial species	3	3		3
2	Native plant species richness				
	'- Trees	5	5		5
	'- Shrubs	2.5	2.5		2.5
	'- Grasses	5	3		4
	'- Forbs	5	3		4
3	Tree canopy height	5	5		5
4	Tree canopy cover	5	2		3.5
5	Shrub canopy cover	0	0		0
6	Native perennial grass cover	5	5		5
7	Organic litter	3	2		2.5
8	Large trees	10	5		7.5
9	Coarse woody debris	2	2		2
10	Weed cover	5	5		5
			Subtotal		49
	Site context				Assessment Unit Score
1	Size of patch	10	4		7
2	Connectedness	5	5		5
3	Context	4	4		4
★ 4	Ecological corridors	0	0		0
			Subtotal		16
	Species habitat index	AU3-1	AU3-2		Average Score
★ 1	Threat to species	10	10		10
★ 2	Quality/availability of food/foraging	1	5		3
★ 3	Quality/availability of shelter	3	3		3
★ 4	Species mobility capacity	7	7		7
★ 5	Role of site location	1	1		1
			Subtotal		24
			Total score		89

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BioCondition site selection traps

- Potential for application of Queensland's ecological equivalence methodology to be biased in relation to:
  - The selection of assessment units
  - The number of BioCondition assessment sites used in different areas
- Standardised application required

Habitat quality score calculation

Engineering & Construction

Calculation/scoring	AU1 Brigalow	AU4 Brigalow	AU2 SEVT	AU3 SEVT
Condition score	62	63	63	62
Average of combined condition score for each TEC	62.5		62.5	
Highest possible condition score (Benchmark score)	85		85	
Average of combined scores as a percentage of the highest possible score	74%		74%	
Percentage converted to quality score range 1 – 10 (score rounded to nearest whole number)	7		7	

EPBC Act offsets calculator inputs

Engineering & Construction

Key input scores and figures	Brigalow TEC	SEVT TEC	Squatter Pigeon
Area to be impacted	204 ha	57 ha	546 ha
Impact calculator quality score	7	7	7
Start quality	5	5	5
Quality without offset	4	4	4
Quality with offset	8	8	8
Risk-related time horizon	20 years	20 years	20 years
Time until ecological benefit	15 years	15 years	15 years
Risk of loss without offset	60%	50%	60%
Risk of loss with offset	10%	10%	10%
Of risk-related time horizon	65%	65%	65%
Of time until ecological benefit	70%	60%	90%
Calculated offset required	480 ha	152 ha	982 ha

Queensland offsets calculator

Engineering & Construction

Impact site assessment tool

Add a matter group to Section 1

Help: Matters of Local Environmental Significance (MLES)

Section 1

Marine or terrestrial?	Terrestrial
Local government area	Central Highlands Regional Council
Bioregion	Brigalow Belt (BRB)
Subregion	Northern Bowen Basin (11.6)
Impact area	189 ha.

Matter group

Regional ecosystem

Which regional ecosystem?

11.9.5 - Acacia harpophylla and/or Casuarina cristata open forest on

Significant residual impact area (ha) for this matter

189

https://environment.ehp.qld.gov.au/offsets-calculator/

Add matter group Clear all and restart

Offsets calculator use tips

- Offset start habitat quality scores need to be not too high
- Attribute improvements considered and justifications recorded
- Check of effect of each improvement and constraining attributes
- Be aware of rounding effects

Key input scores and figures	Brigalow TEC	SEVT TEC	Squatter Pigeon
Area to be impacted	204 ha	57 ha	546 ha
Impact calculator quality score	7	7	7
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Time until ecological benefit	15 years	15 years	15 years
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Risk of loss with offset	10%	10%	10%
Of risk-related time horizon	65%	65%	65%
Of time until ecological benefit	70%	60%	90%
Calculated offset required	480 ha	152 ha	982 ha

		AU 4 RE 11.9.5 Now	AU 4 RE 11.9.5 +5 years
1	Recruitment of woody perennial spp.	0	3
2	Native plant species richness		
	- Trees	5	5
	- Shrubs	5	5
	- Grasses	0	2.5
	- Forbs	2.5	2.5
3	Tree canopy height	3	3
4	Tree canopy cover	5	5
5	Shrub canopy cover	5	5
6	Native perennial grass cover	0	1
7	Organic litter	5	5
8	Large trees	5	5
9	Coarse woody debris	2	2
10	Weed cover	3	3
11	Size of patch	10	10
12	Connectivity	5	5
13	Context	4	4
14	Distance from water	N/A	N/A
Sum of score		57	63

Monitoring tips - seasonal variation

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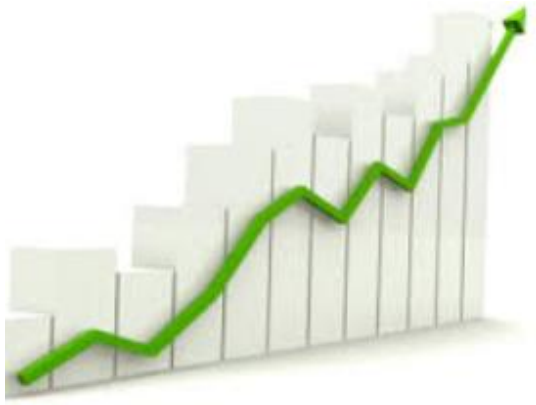
		AU 5 RE 11.9.10 Now	AU 5 RE 11.9.10 +5 years
1	Recruitment of woody perennial spp.	5	5
2	Native plant species richness		
	- Trees	5	5
	- Shrubs	2.5	2.5
	- Grasses	5	2.5
	- Forbs	5	2.5
3	Tree canopy height	5	5
4	Tree canopy cover	5	5
5	Shrub canopy cover	3	3
6	Native perennial grass cover	2.5	1
7	Organic litter	5	2.5
8	Large trees	5	5
9	Coarse woody debris	2	2
10	Weed cover	10	10
11	Size of patch	5	5
12	Connectivity	5	5
13	Context	5	5
14	Distance from water	N/A	N/A
Sum of score		75	66



Monitoring tips - successional variation

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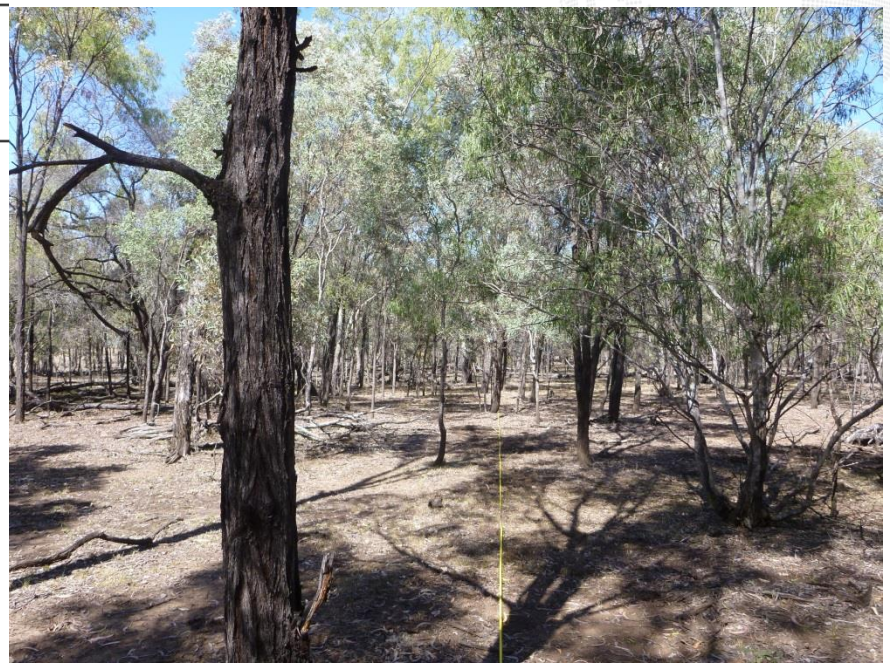
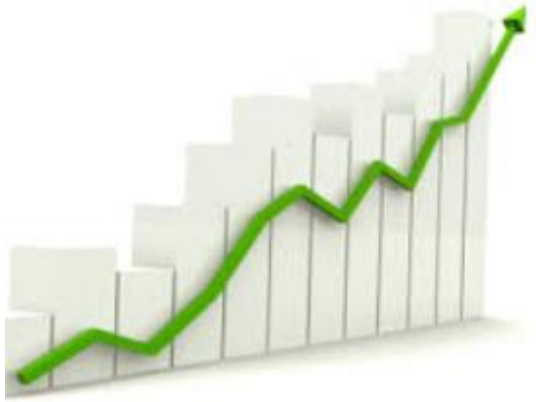
		AU 4 RE 11.9.5 Now	AU 4 RE 11.9.5 +5 years
1	Recruitment of woody perennial spp.	5	5
2	Native plant species richness		
	- Trees	5	5
	- Shrubs	5	5
	- Grasses	0	0
	- Forbs	2	2
3	Tree canopy height	3	3
4	Tree canopy cover	5	5
5	Shrub canopy cover	5	2
6	Native perennial grass cover	0	0
7	Organic litter	5	5
8	Large trees	0	0
9	Coarse woody debris	2	2
10	Weed cover	0	0
11	Size of patch	10	10
12	Connectivity	5	5
13	Context	4	4
14	Distance from water	N/A	N/A
Sum of score		56	53





Monitoring tips - focus on relevant attributes

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Site condition		AU3-1	AU3-2		Average Score
1	Recruitment of woody perennial species	3	3		3
2	Native plant species richness				
	'- Trees	5	5		5
	'- Shrubs	2.5	2.5		2.5
	'- Grasses	5	3		4
	'- Forbs	5	3		4
3	Tree canopy height	5	5		5
4	Tree canopy cover	5	2		3.5
5	Shrub canopy cover	0	0		0
6	Native perennial grass cover	5	5		5
7	Organic litter	3	2		2.5
8	Large trees	10	5		7.5
9	Coarse woody debris	2	2		2
10	Weed cover	5	5		5
			Subtotal		49
Site context					Assessment Unit Score
1	Size of patch	10	4		7
2	Connectedness	5	5		5
3	Context	4	4		4
4	Ecological corridors	0	0		0
			Subtotal		16
Species habitat index		AU3-1	AU3-2		Average Score
1	Threat to species	10	10		10
2	Quality/availability of food/foraging	1	5		3
3	Quality/availability of shelter	3	3		3
4	Species mobility capacity	7	7		7
5	Role of site location	1	1		1
			Subtotal		24
			Total score		89

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Monitoring tips – accurate measurements

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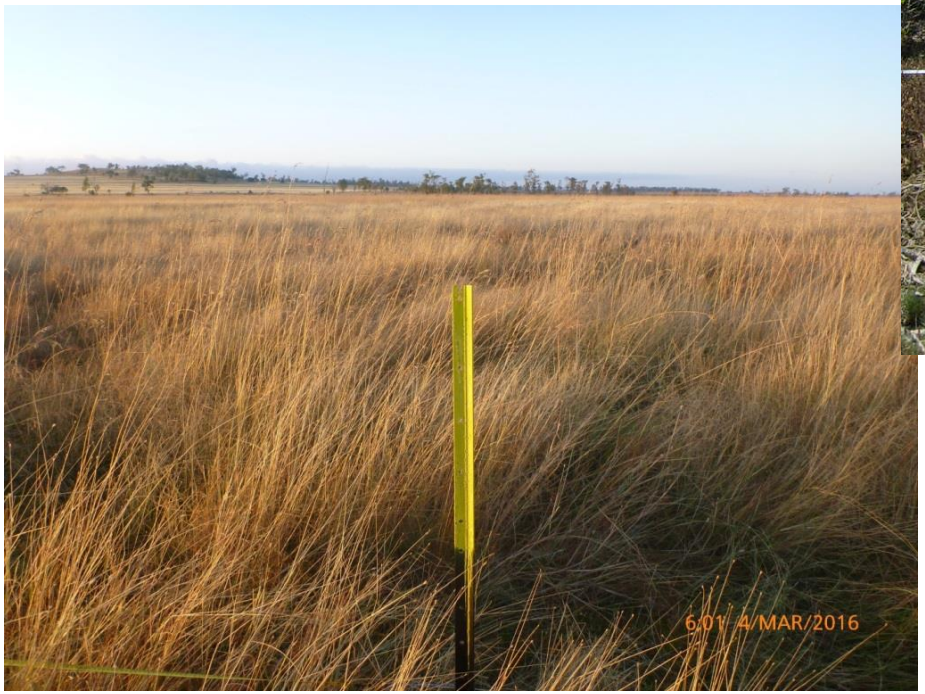
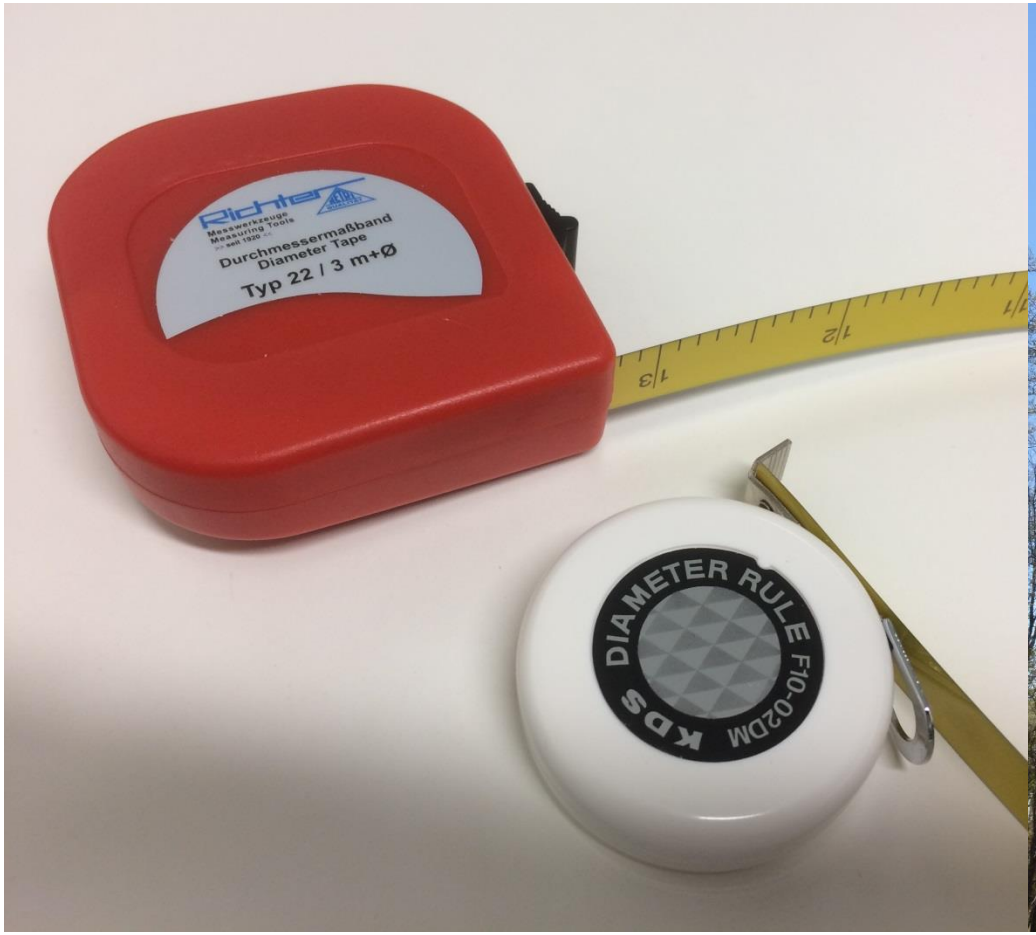
- Site location and dimensions

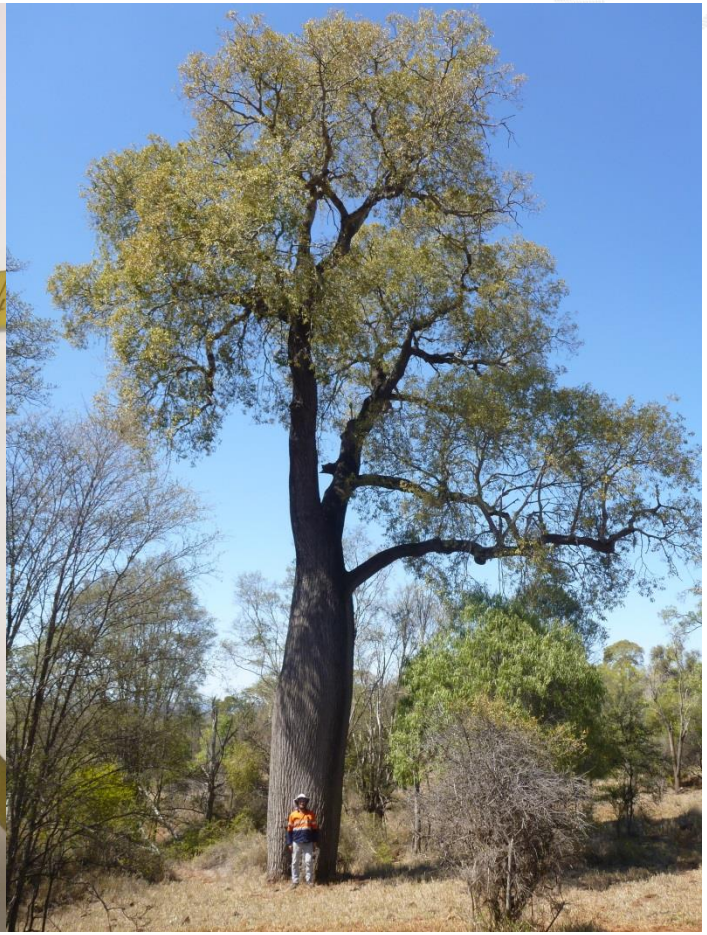


Monitoring tips – accurate measurements

Engineering & Construction

- Specialist tools - diameter tapes





Monitoring tips – accurate measurements

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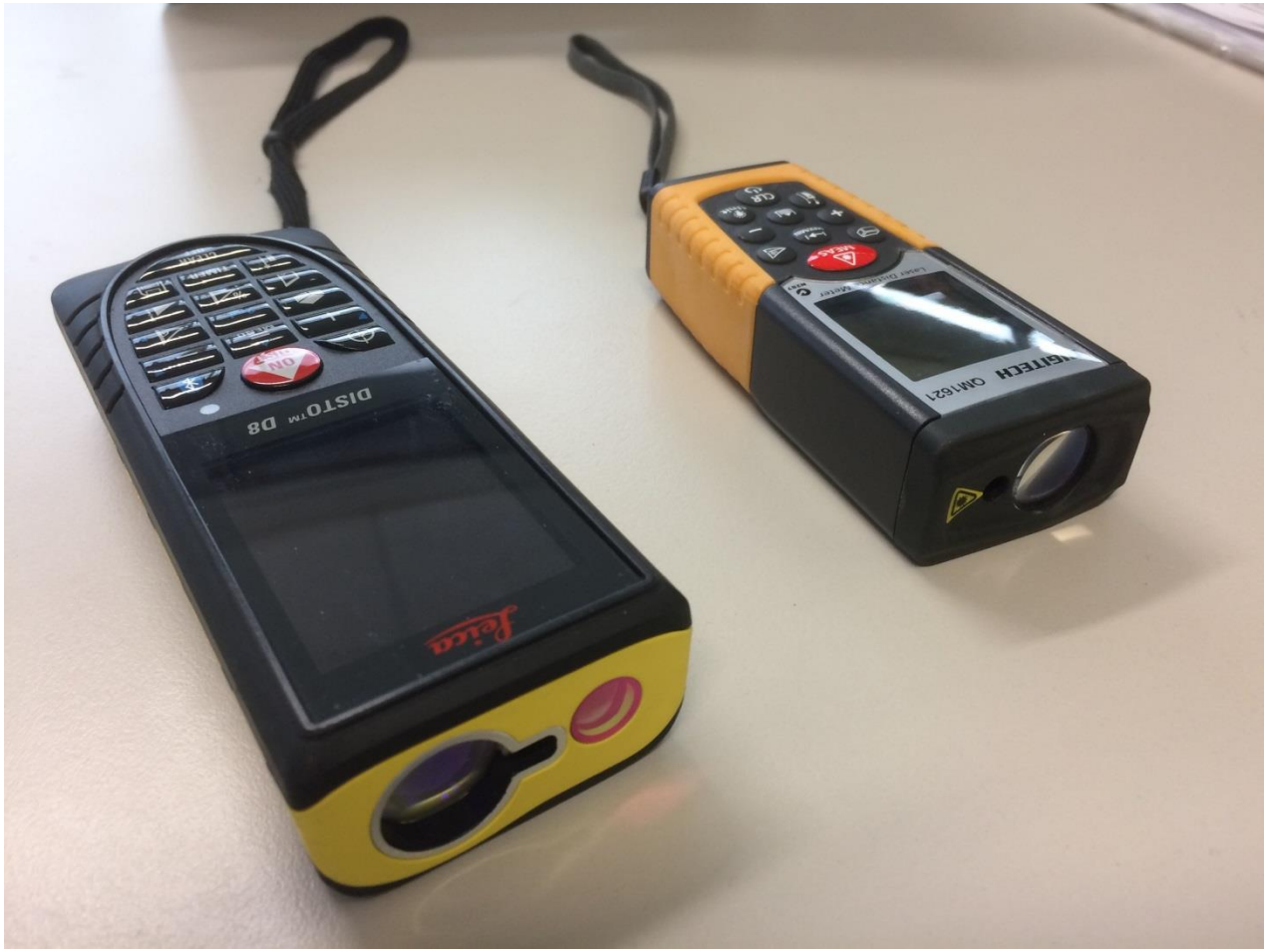
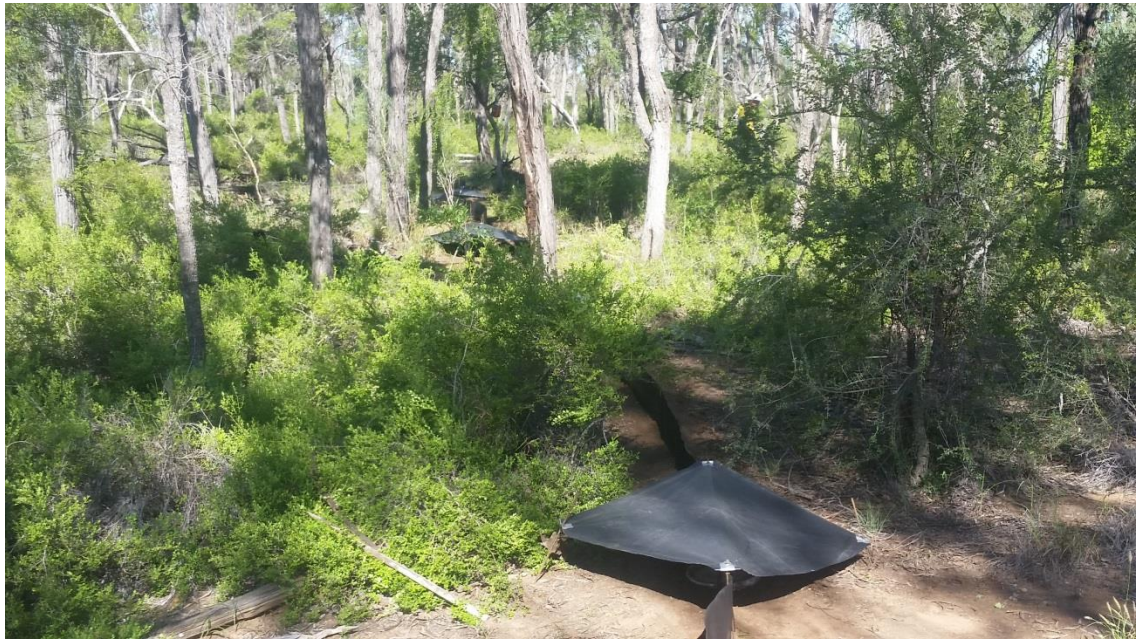
- Specialist tools – clinometer / hypsometer



Limitations for some fauna

- Over-reliance on remnant vegetation as a surrogate for areas of fauna habitat
- No consideration of fauna presence / abundance
- Inadequate assessment of some habitat values



Conclusion

- Ecological equivalence assessment can provide a rapid and transparent method

- Ecological expertise required to:
  - envisage realistic targets
  - quantify risks, timeframes and uncertainty
  - ensure standardised application of methodology
  - interpret natural seasonal and successional variation
  - where necessary, supplement and modify ecological equivalence methods to manage potential limitations

Disclaimer

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Questions?

Acknowledgements:

- Doug Shooter, KBR
- Lauren Crickmore, KBR
- Clair Evans, KBR

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