Department of **Environment** and **Resource Management**

Conserving and managing Queensland's environment and natural resources

Condition Assessment for Biodiversity

BioCondition

Queensland Herbarium

Queensland Government

Introduction

What is CONDITION for biodiversity?

- 'Condition' is context dependant – means different things to different people

- For many years, 'condition' has been used in the context of grazing land management. More recently, definitions of condition for biodiversity have emerged in response to policy and management needs

Vegetation Condition for biodiversity	"..the degree to which the attributes of a patch of vegetation differs from the attributes of the same vegetation type in its reference (unmodified) state"	Eyre et al. (2011) - BioCondition
Land Condition	"The capacity of the land to respond to rain and produce useful forage"	Pickup et al. (2001) – GLM package

Delbessie Agreement

- Duty of Care under *Land Act 1994*
- Requirement to assess condition of lease land
- Combination of pasture, soil & biodiversity condition attributes
- Must be comparable over years, long term monitoring
- Covers rural leasehold land and over 86 M ha (60% of QLD)
- Implemented December 2007

Offsets Policy

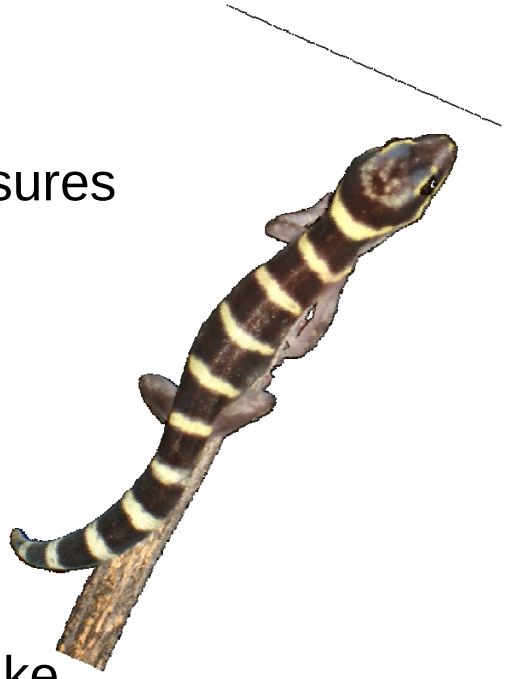
- *Vegetation Management Act 1999*
- Requirement to measure ecological equivalence – condition and ecological values
- Biodiversity Offset Policy released in October 2011

The Reality Check of Policy Regulation and Statewide Implementation…

Condition assessment for biodiversity must:

1. Have proven relationships with biodiversity measures

2. Be robust
   - Minimal observer variation
   - Easy to define, measure, interpret
   - Reliable and consistent to re-measure
   - Legally defensible
   - NOT arduous, ambiguous or boring to undertake



Usual dilemma…. Keep it simple but maintain scientific credibility

Background

Therefore, in response…

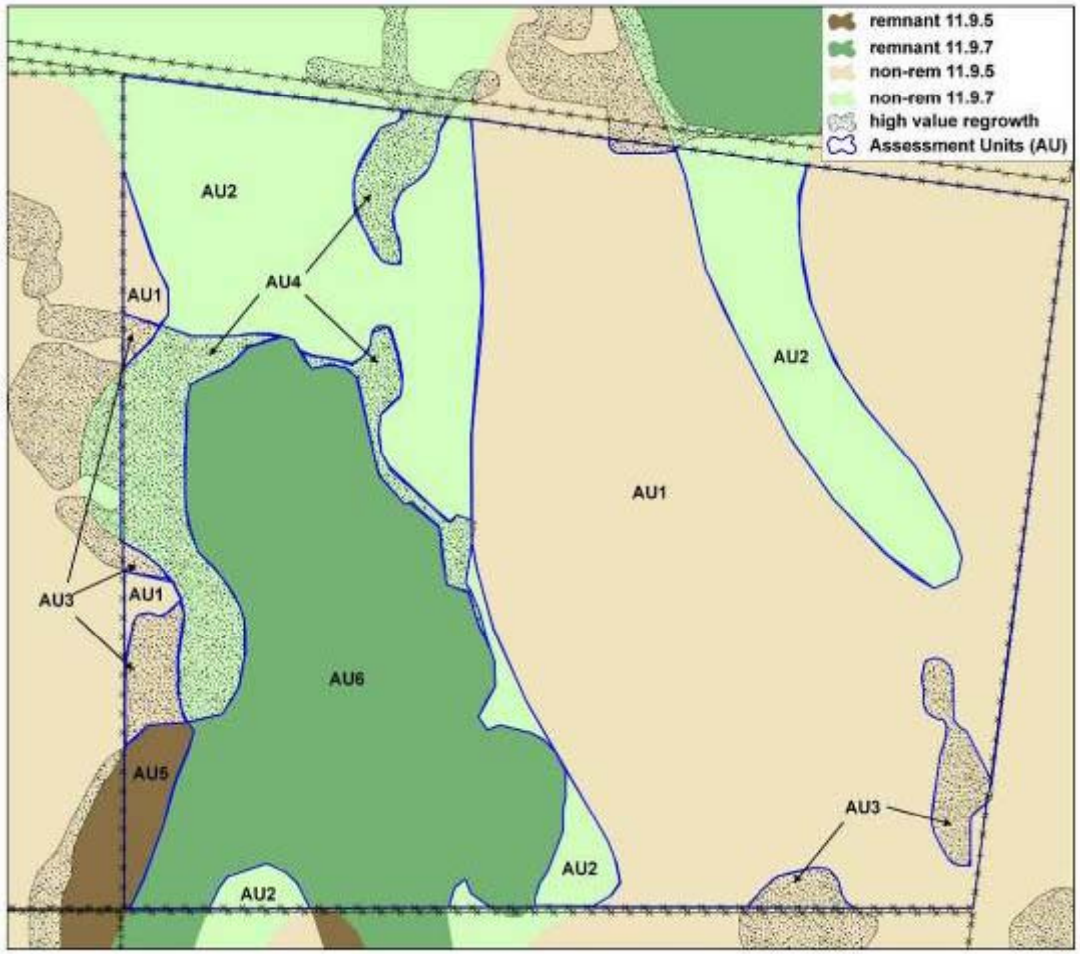
- **BioCondition** (v 1.6, 2006) was designed as a rapid condition assessment method
- The method was then tested and validated with funding from Meat & Livestock Australia and DERM
- Trial of robustness of method undertaken in 2010
- Outcomes from testing and trial led to the release of an amended version of **BioCondition** (v 2.1, 2011)

The primary components of BioCondition are;

1. The assessment unit
2. A suite of site- and landscape scale condition attributes
3. Benchmarks for each of the attributes for each regional ecosystem
4. A scoring system that provides a final "condition" metric or score **along a continuum between 'functional' and 'dysfunctional' biodiversity condition**

1. The assessment unit

- The assessment unit is a homogenous unit defined by a unique regional ecosystem and broad condition state
- Pre-clear and remnant regional ecosystems mapped at 1:100 000 for Qld (or 1:50 000 in SEQ)
- Broad condition states (cleared/disturbed; regrowth and; remnant) also mapped under the *Vegetation Management Act 1999*
- All mapping available from DERM



2. Condition attributes

Research and testing of data to come up with a core set of attributes that are;

- easily and reliably measured in the field
- sensitive to change
- not correlated
- allow discrimination between sites
- educational or instructive
- represent faunal diversity and/or ecological processes

2. Condition attributes

	Attribute	Weighting (%)
Site-based Condition Attributes	Recruitment of woody perennial species	5
	Native plant species richness for four lifeforms	20
	Tree canopy cover (%)	5
	Tree canopy height	5
	Shrub layer cover (%)	5
	Native perennial grass cover (%)	5
	Large trees	15
	Fallen woody material	5
	Weed cover	10
	Litter cover	5
Landscape Attributes (fragmented subregions)	Size of patch	10
	Context	5
	Connectivity	5
OR **Landscape Attributes (intact subregions)**	Distance to permanent water	20
TOTAL		**100**

3. Benchmarks

- Allow quantitative and repeatable (over time and space) comparison of vegetation condition between and within regional ecosystems
- Are specific to each regional ecosystem in Queensland (problem: Qld has > 1300 recognised regional ecosystems – lots to benchmark!)
- Are used by Tas, NSW, Vic condition assessment frameworks
- Are quantitative values for each assessable attribute, based on the average or median measures of a number of 'reference' sites collected during optimal seasonal conditions

3. Benchmarks

Vegetation in its reference state refers to the natural variability in the attributes of an ecosystem that is **relatively** unmodified

In Qld we use a relative, Best-on-Offer (BOO) approach to identify reference sites for benchmark derivation, because truly unmodified or pristine patches of vegetation rarely exist

Reference (BOO) mulga

Non-reference (non-BOO) mulga

3. Benchmarks

Best on Offer Reference sites (BOOs) criteria:

- Remnant vegetation in relatively functional condition
- Dominant threatening processes are minimised
- Water-remote, or with historically low grazing pressure
- Located in intact landscapes with benign fire-regimes
- Minimal removal of woody vegetation or mechanical disturbance
- >1km from contrasting land use
- Zero to low non-native plant cover
- No recent major management change
- Fenced areas (but be mindful of management history and persistence of exotic species)




3. Benchmarks

Benchmarks also derived from;

- Existing suitable data (i.e. from BOO sites)
- Expert opinion

To date benchmark documents available for <300 REs

- Majority in the rangelands (Delbessie)
- Current interest in brigalow REs and coastal forested systems (offsets)
- Download from the DERM website - http://www.derm.qld.gov.au/
- Ongoing program

3. Benchmarks

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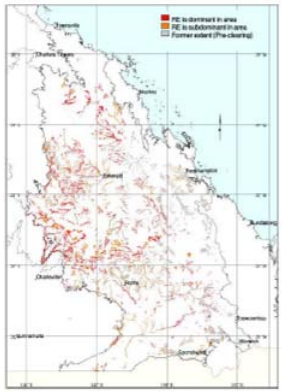
BioCondition benchmark for regional ecosystem condition assessment

Brigalow Belt Bioregion — Regional Ecosystem: 11.3.2

(fragmented landscape)

Photo: Teresa Eyre



Vegetation Management Act class (Nov 2009):	Of Concern
Biodiversity status:	Of concern
Subregion:	26, 31, 24, 11, 21, (8), (32), (27), (13), (20), (7), (6), (15), (25), (16), (36), (18), (35), (9), (22), (14), (19)
Estimated extent:	In December 2006, remnant extent was > 10,000 ha and 10-30% of the pre-clearing area remained
Extent in reserves:	Low
Wetland:	Contains palustrine wetland (e.g. in swales)
Short Description:	*Eucalyptus populnea* woodland on alluvial plains
Regional Ecosystem Description:	*Eucalyptus populnea* woodland to open-woodland. *E. melanophloia* may be present and locally dominant. There is sometimes a distinct low tree layer dominated by species such as *Geijera parviflora, Eremophila mitchellii, Acacia salicina, Acacia pendula, Lysiphyllum* spp., *Cassia brewsteri, Callitris glaucophylla* and *Acacia excelsa*. The ground layer is grassy dominated by a range of species depending on soil and management conditions. Species include *Bothriochloa decipiens, Enteropogon acicularis, Aristida ramosa* and *Tripogon loliiformis*. Occurs on Cainozoic alluvial plains with variable soil types including texture contrast, deep uniform clays, massive earths and sometimes cracking clays.
Protected Areas:	Carnarvon NP, Expedition (Limited Depth) NP, Dipperu NP(S), Homevale RR, Chesterton Range NP, Homevale NP, Expedition RR, Taunton NP(S), Nuga Nuga NP, Isla Gorge NP, Blackdown Tableland NP, Alton NP, Dawson River CP, Narrien Range NP, Bouldercombe Gorge RR, Epping Forest NP(S), Lake Murphy CP, Carraba CP, Lake Broadwater CP, [Highworth Bend CP], [Lake Broadwater RR]
Condition:	Extensively cleared or modified by grazing.

BioCondition benchmark for regional ecosystem condition assessment

Benchmarks

1. Native plant species richness:

○ Tree	2
○ Shrub	2
○ Grass	9
○ Forbs and others	17

2. Trees:

○ Tree canopy height (m):	18	
○ Tree canopy cover (%):	40	
○ Large tree dbh threshold (cm):	40	(Eucalypts etc.)
	N/A	(non-Eucalypts)
○ Number of large trees per hectare:	22	(Eucalypts etc.)
	N/A	(non-Eucalypts)

Typical species:

poplar box	*Eucalyptus populnea*
silver-leaved ironbark	*Eucalyptus melanophloia*

3. Shrubs:

○ Native shrub canopy cover (%):	2

Typical species:

wilga	*Geijera parviflora*
false sandalwood	*Eremophila mitchelii*

4. Ground cover:

○ Native perennial grass cover (%):	35
○ Organic Litter cover (%):	30

Typical species:

Purple lovegrass	*Eragrostis lacunaria*
Slender Chloris	*Chloris divaricata*
Lovegrass	*Eragrostis alveiformis*
Kangaroo Grass	*Themeda triandra*
Tall Windmill Grass	*Chloris ventricosa*
Hairy Panic	*Panicum effusum*
Purple Wiregrass	*Aristida personata*

5. Coarse Woody debris:

○ Total length (m) of logs ≥ 10cm diameter per hectare:	307

6. Typical non-native plants:

Tree pear	*Opuntia tomentosa*[1]
Prickly pear	*Opuntia stricta*[1]
Red natal grass	*Melinis repens*
Spiked malvastrum	*Malvastrum americanum var. americanum*

[1] Class 2 declared pest species in Queensland

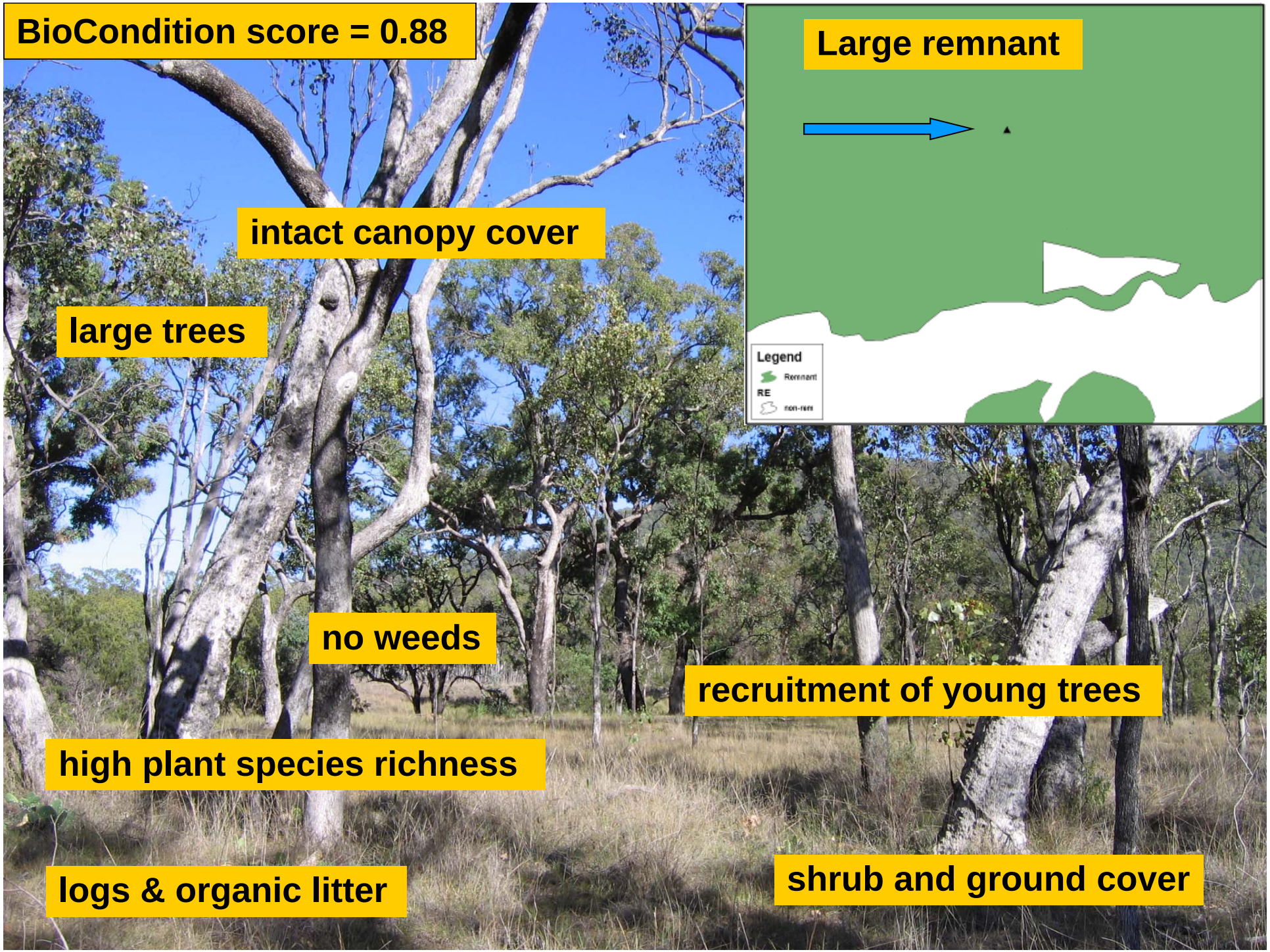
4. BioCondition score

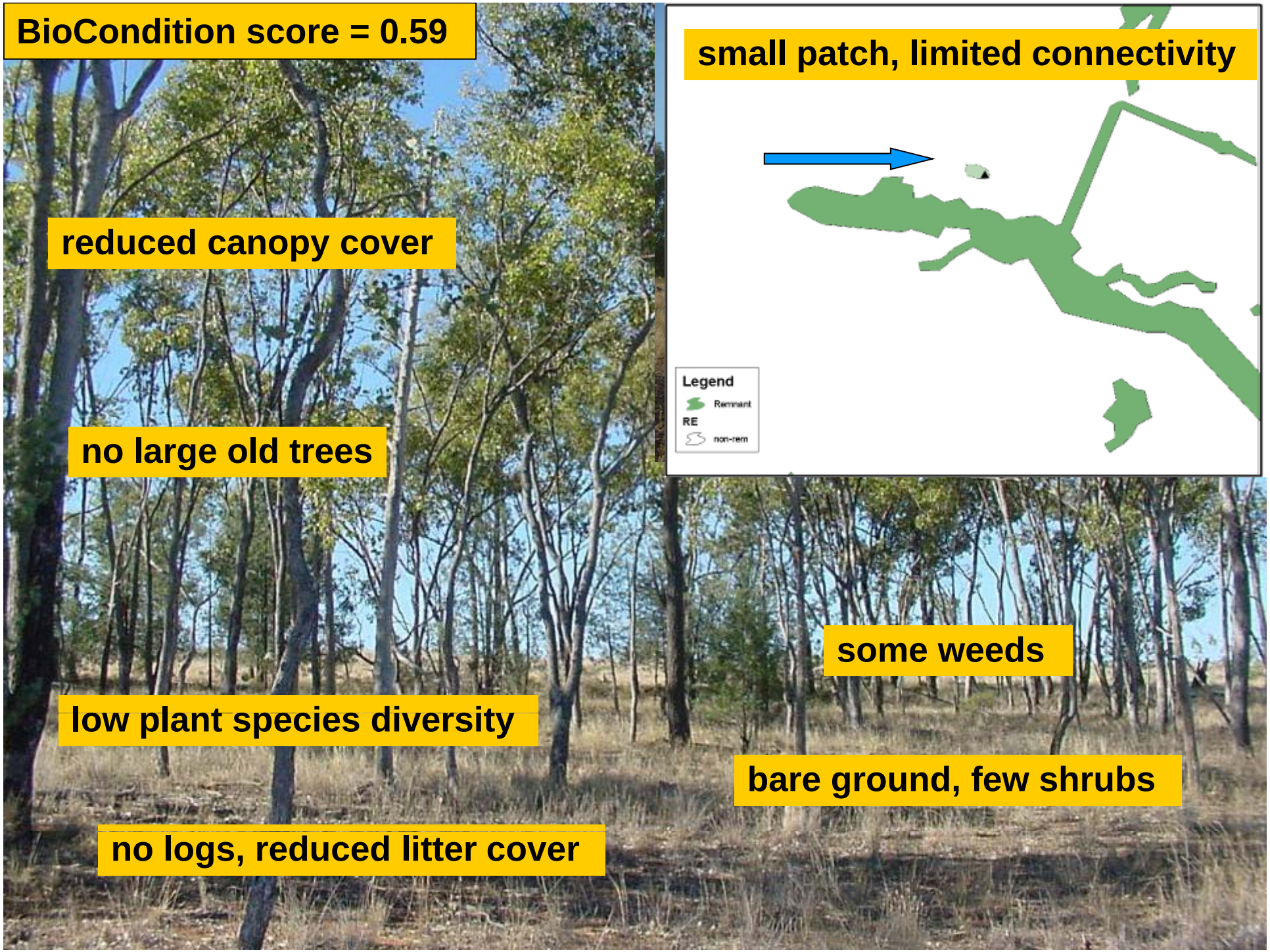
The scoring system;

- provides a final "condition" metric or score that allows comparison between patches of vegetation.

- Final score obtained by adding each attribute score and dividing by the maximum possible score for the RE i.e. 100 for wooded RE's; 50 for grassland; 65 for shrubland; or 85 for mangrove ecosystems.

- This standardises the score between 0 and 1, allowing equivalence between different ecosystems such as grasslands, for which the benchmark value of some attributes is zero.


BioCondition score = 0.88
Large remnant
intact canopy cover
large trees
Legend
Remnant
RE
non-rem
no weeds
recruitment of young trees
high plant species richness
logs & organic litter
shrub and ground cover


BioCondition score = 0.59
small patch, limited connectivity
Legend
Remnant
RE
non-rem
reduced canopy cover
no large old trees
some weeds
low plant species diversity
bare ground, few shrubs
no logs, reduced litter cover

Observer variability

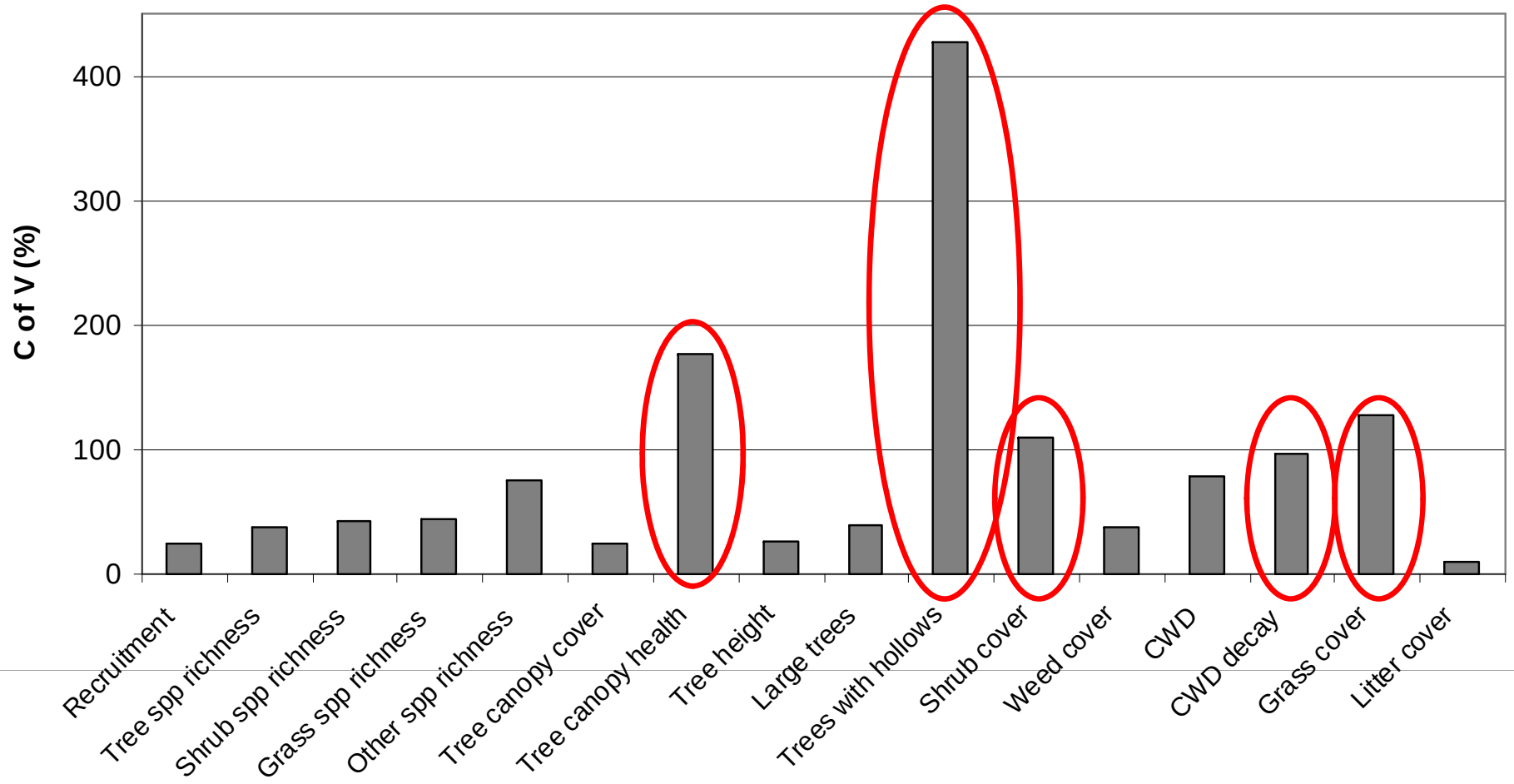
- 77 observers with variable ecological field experience (zero to 25 years) assessed
- Each undertook the site-based field component of the BioCondition assessment following initial training in measuring techniques
- All assessments done at the one site

See Kelly, A.L., Franks. A.J. and Eyre, T.J. (2011) Assessing the assessors *Ecological Management and Restoration*

Observer variability

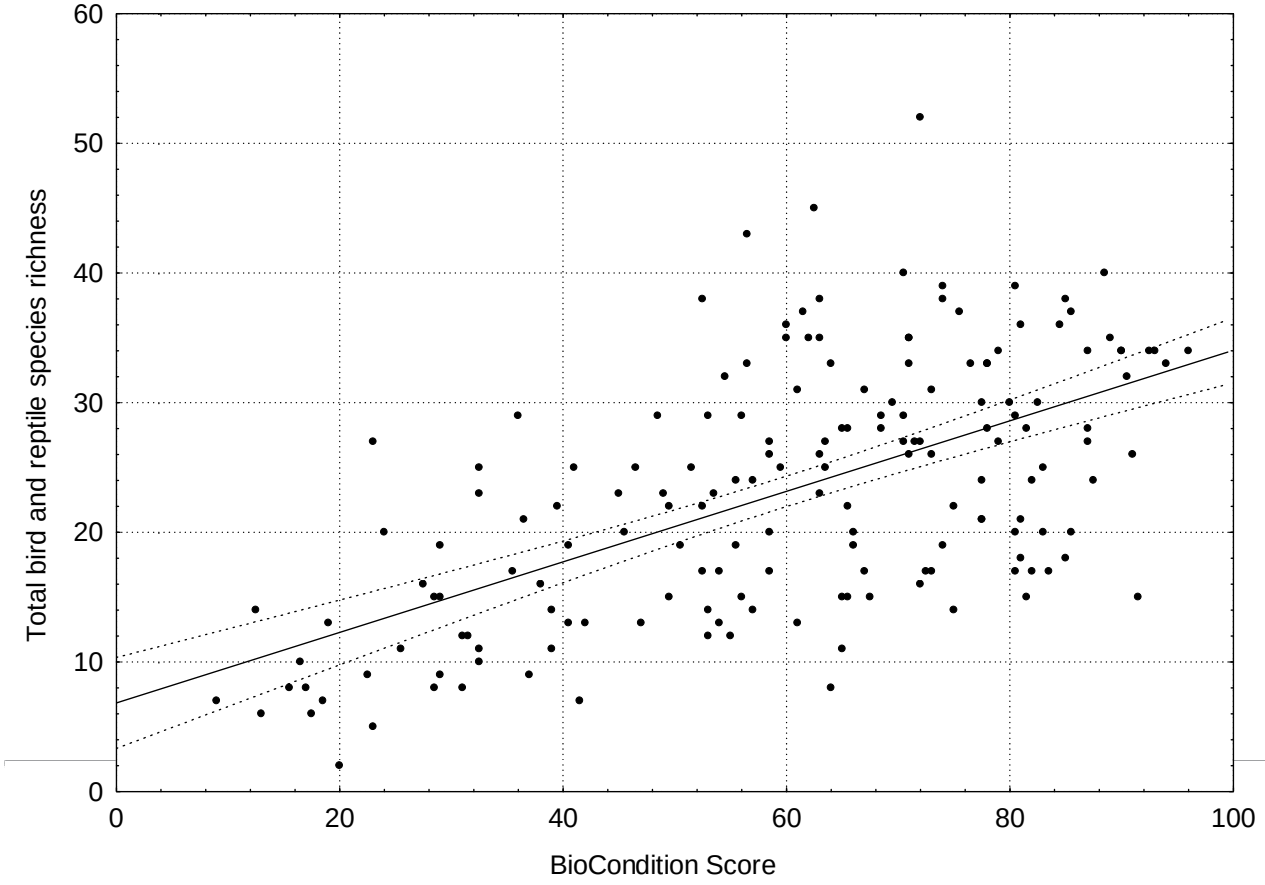
Indicators measured with too much variation:

- Tree canopy health & Trees with hollows
- Shrub cover, CWD decay and grass cover - marginal



Observer variability

Therefore, hollows, canopy health and CWD decay also dropped, training to improve assessment of shrub cover (and other indicators)….



..which actually improves (slightly) the relationship between the BioCondition score and bird and reptile species richness

Before: $r^2 = 0.25$

After: $r^2 = 0.41$

Conclusion

- **LESS IS MORE – reducing complexity of measures does not affect r'ship with 'biodiversity', but reduces variation in measures by different observers.**

- **Training is essential**

Undertaking a BioCondition V 2.1 assessment is now;

- **quicker**
- **less complicated, and hopefully**
- **less boring**

Everyone is happier.