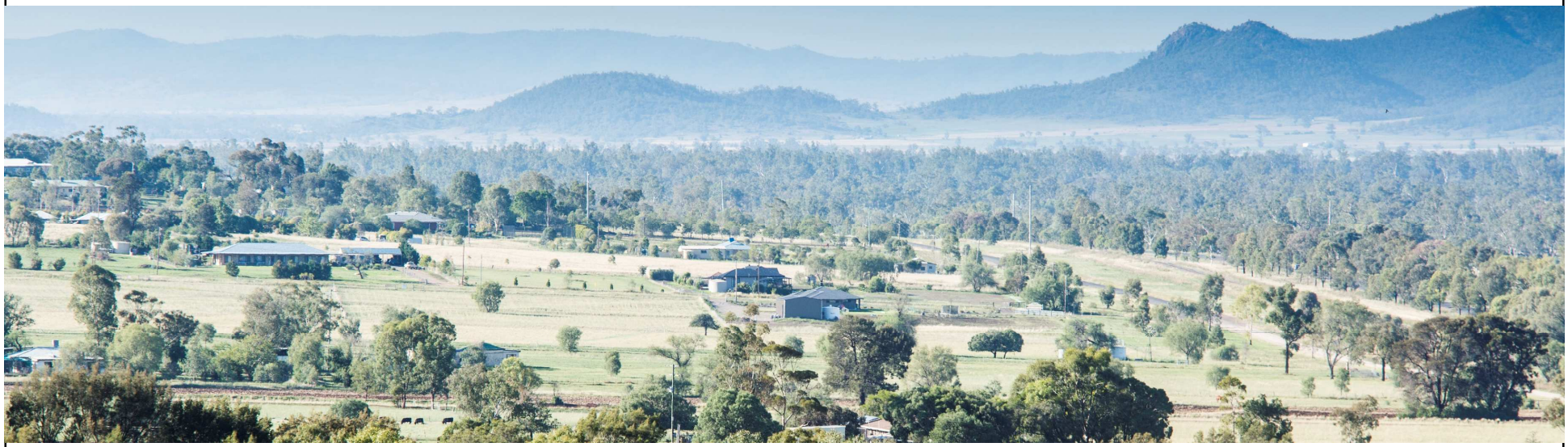
DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

BAM Support for Accredited Assessors

A series of webinars to support the role of accredited BAM assessors in the Biodiversity Offset scheme (BOS)



For more information, go to the BAM Support Webinar webpage or contact us via the BOS Online Enquiry Form

Department of Planning, Industry and Environment

BAM SUPPORT WEBINAR 4

Vegetation Integrity Assessment & Vegetation Condition Benchmarks

Dr Ian Oliver
Senior Team Leader
Restoration Science Team
Science Division, DPIE

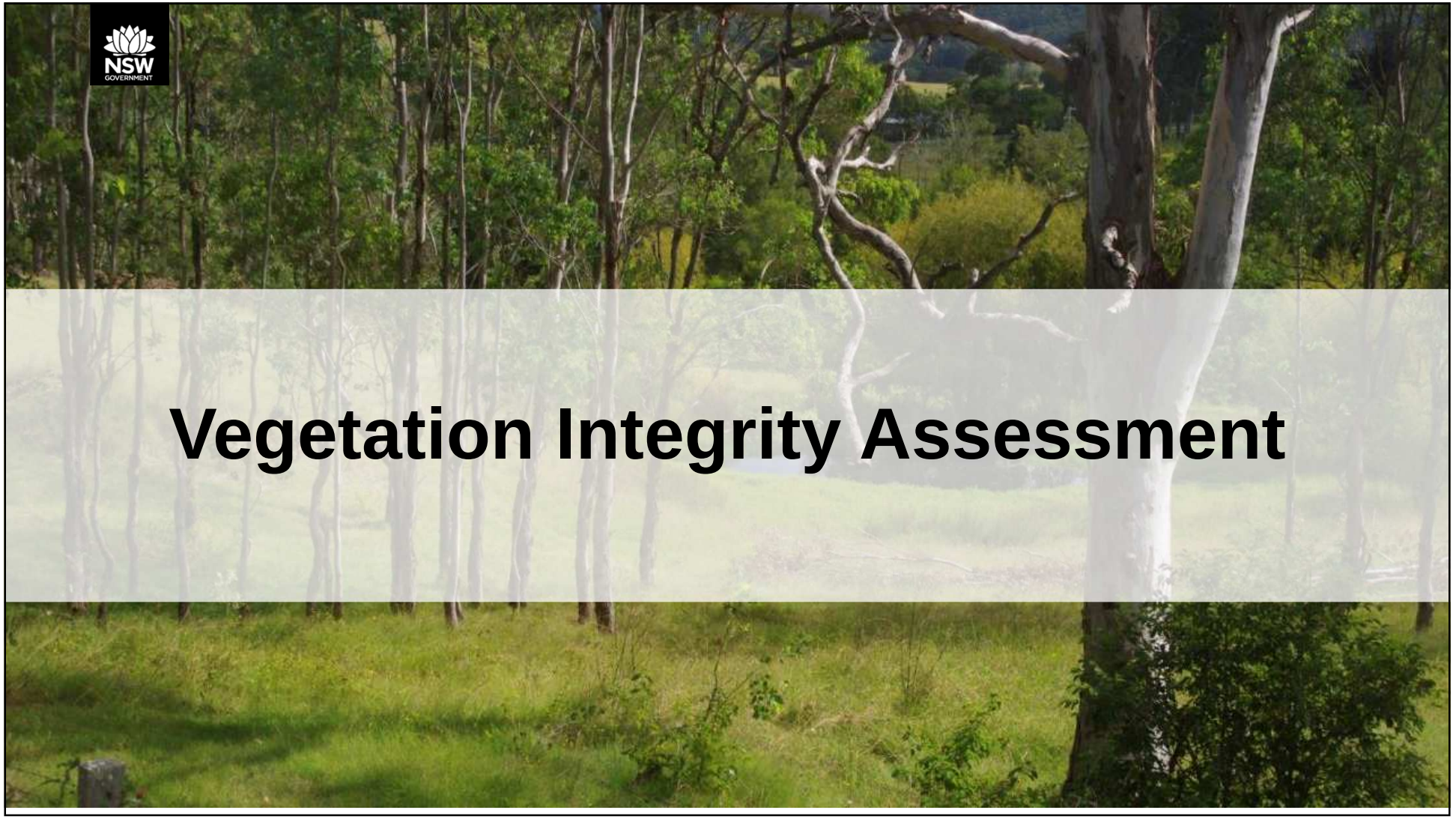
Monday 21st October 2019
1:00 pm - 2:00 pm

For more information, go to the BAM Support Webinar webpage or contact us via the BOS Online Enquiry Form

Overview

TIME	ITEM	DESCRIPTION	DURATION
11:00	Introduction	Acknowledgment of Country Introduction and house keeping	10 mins
11:10	Content Presentation	Vegetation Condition Assessment & Vegetation Condition Benchmarks	25 mins
11:35	Q & A session	Presenter and SME panel address participants' questions	20 mins
11:55	Wrap-up and Close	Upcoming sessions Access to webinar recordings Post-webinar feedback	5 mins

This webinar will be recorded and published for future reference



Vegetation Integrity Assessment

Vegetation Integrity - Intent

- Biodiversity offsetting is mandatory in 37 countries and voluntary in 64[1]
- BOS are dependent on transferable biodiversity currencies underpinned by aggregate measures of biodiversity values
- A growing need for practical aggregate measures of biodiversity values
- VI is an measure designed to quantify **overall biodiversity values**

capacity of a site to provide habitat and other resources for the range of indigenous plant and animal species that may be reasonably expected to use the site[2]

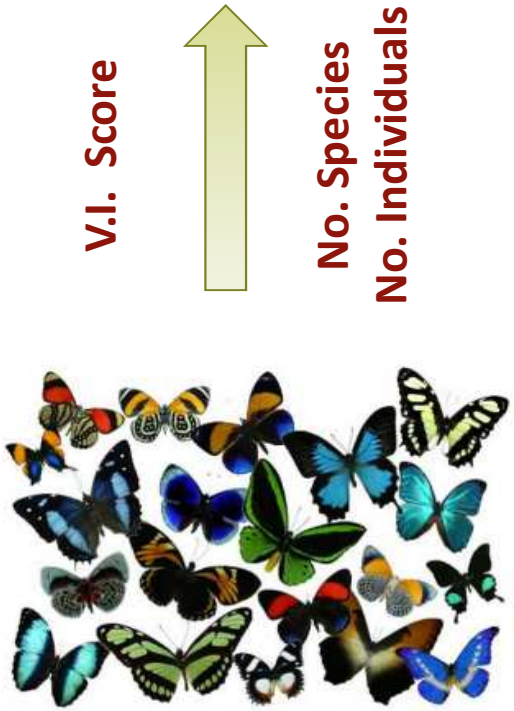
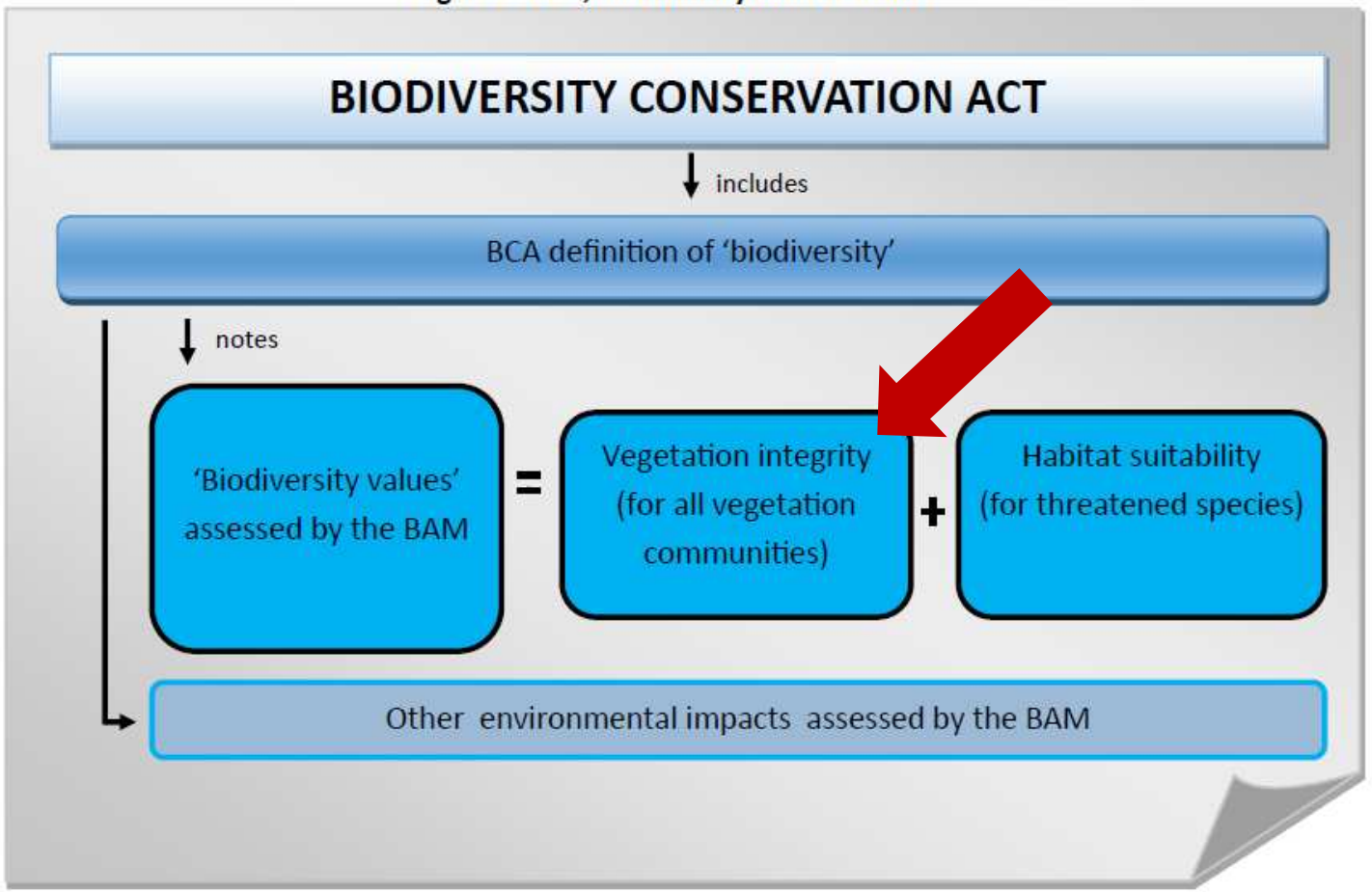


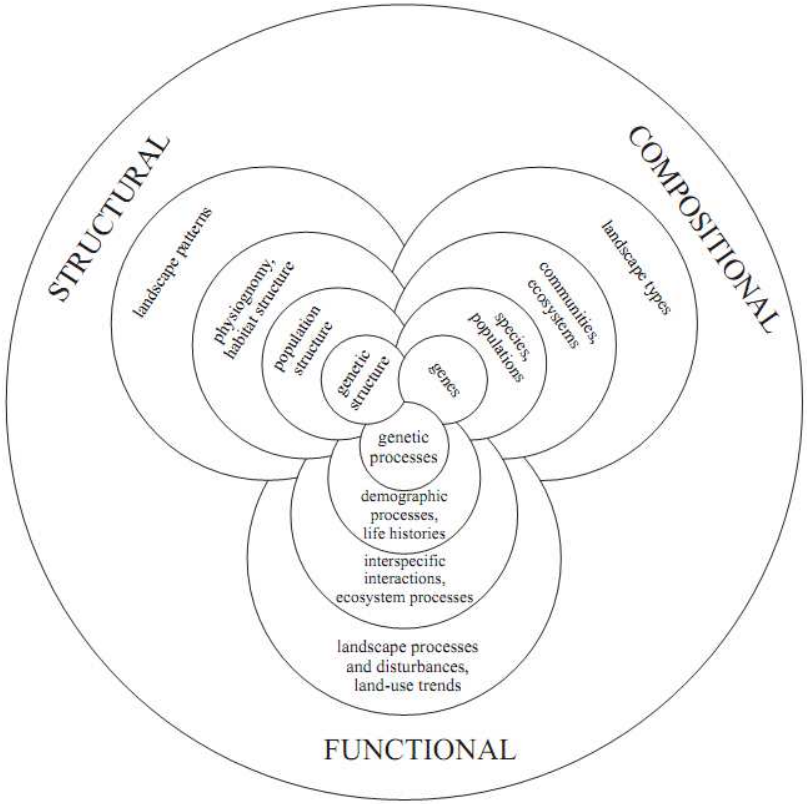
Figure 1: BCA, biodiversity and the BAM



Vegetation Integrity - Construction

- Noss' primary attributes of biodiversity – Composition, Structure and Function[3]
- **Composition** – types of entities, e.g. species, functional groups
- **Structure** – arrangement of entities, e.g. abundance, cover, complexity
- **Function** – roles of entities, e.g. regeneration, resilience

$$VI = \sqrt[3]{Composition \quad t \quad ct \quad e \quad F \quad nction}$$



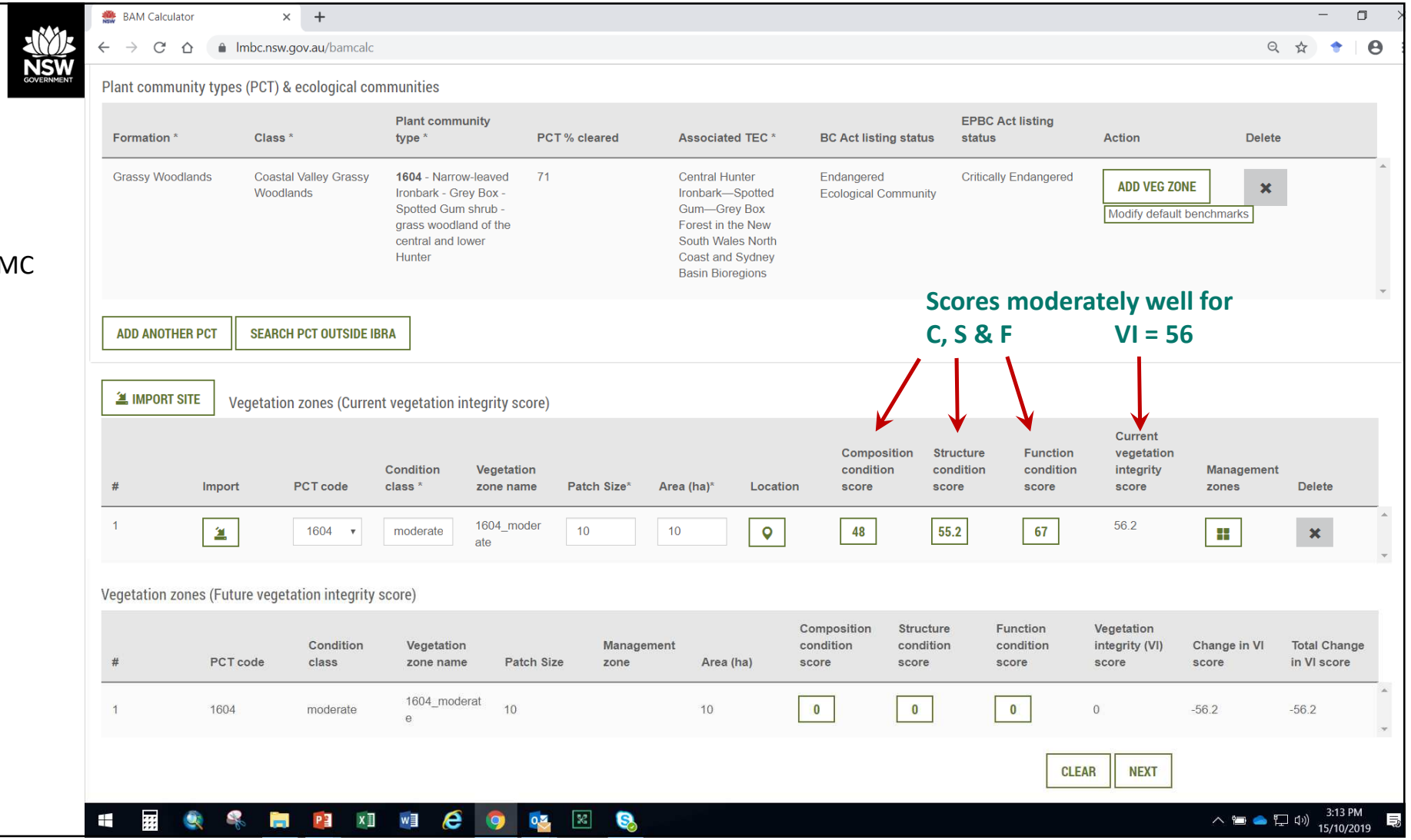
Noss (1990) Indicators for monitoring biodiversity[3]

Vegetation Integrity – Construction using geometric mean of C, S, F Sub-indices

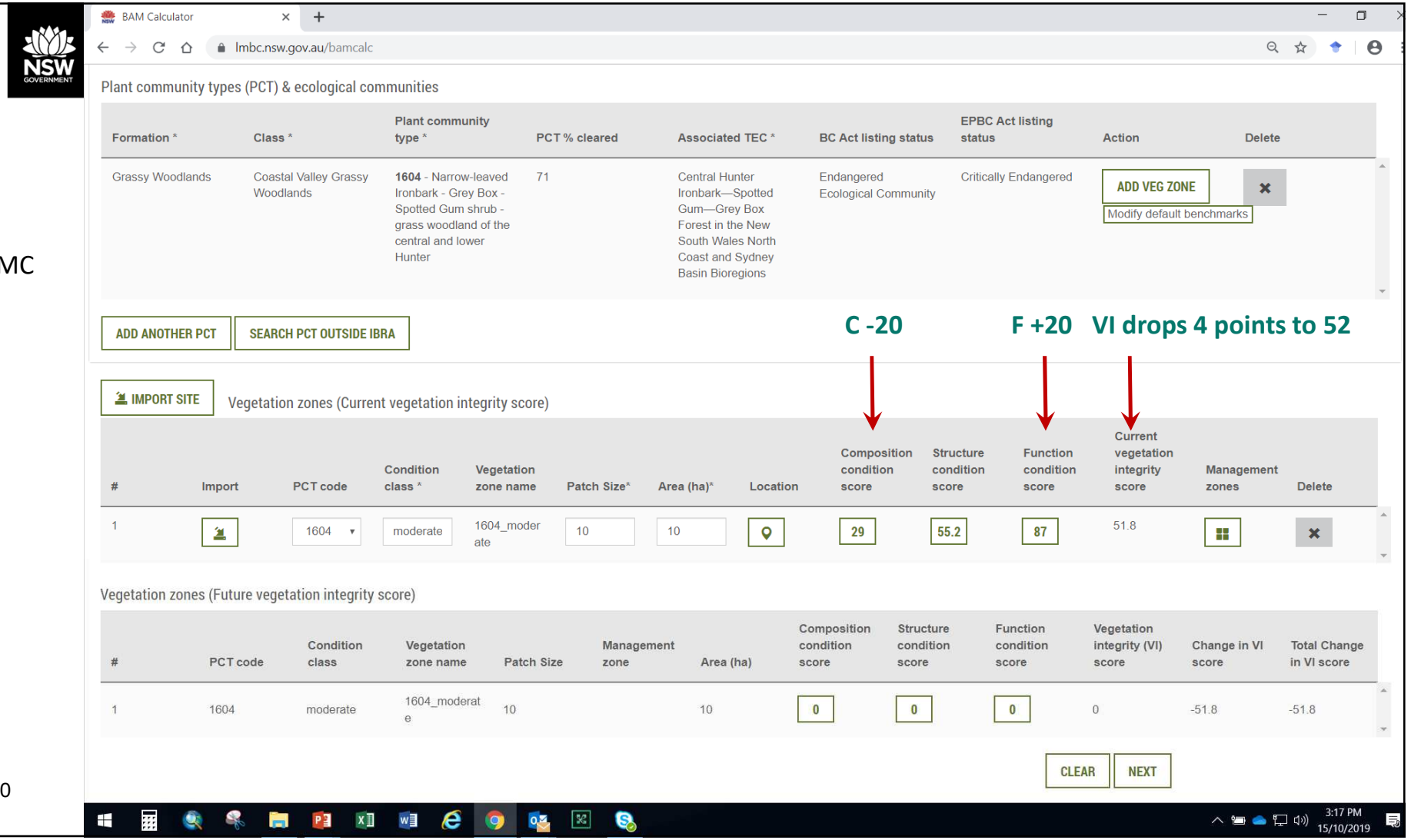
- VI = $\sqrt[3]{Composition\ x\ Structure\ x\quad unction}$
- Criticism of “eclipsing” or of one high scoring attribute substituting for a poor scoring attribute

	SITE 1	SITE 2
	59	
	80	
	56	91
Geometric mean $\sqrt[3]{CxSx}$	***64 /100***	***55 / 100***

BAMC


BAM Calculator
lmbc.nsw.gov.au/bamcalc
Plant community types (PCT) & ecological communities
Formation * | Class * | Plant community type * | PCT % cleared | Associated TEC * | BC Act listing status | EPBC Act listing status | Action | Delete
Grassy Woodlands | Coastal Valley Grassy Woodlands | 1604 - Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter | 71 | Central Hunter Ironbark—Spotted Gum—Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions | Endangered Ecological Community | Critically Endangered
ADD VEG ZONE
Modify default benchmarks
ADD ANOTHER PCT
SEARCH PCT OUTSIDE IBRA
Scores moderately well for
C, S & F
VI = 56
IMPORT SITE
Vegetation zones (Current vegetation integrity score)
| Import | PCT code | Condition class * | Vegetation zone name | Patch Size* | Area (ha)* | Location | Composition condition score | Structure condition score | Function condition score | Current vegetation integrity score | Management zones | Delete
1 | 1604 | moderate | 1604_moderate | 10 | 10 | 48 | 55.2 | 67 | 56.2
Vegetation zones (Future vegetation integrity score)
| PCT code | Condition class | Vegetation zone name | Patch Size | Management zone | Area (ha) | Composition condition score | Structure condition score | Function condition score | Vegetation integrity (VI) score | Change in VI score | Total Change in VI score
1 | 1604 | moderate | 1604_moderate | 10 | 10 | 0 | 0 | 0 | 0 | -56.2 | -56.2
CLEAR
NEXT
3:13 PM
15/10/2019

BAMC


BAM Calculator
lmbc.nsw.gov.au/bamcalc
Plant community types (PCT) & ecological communities
Formation *
Class *
Plant community type *
PCT % cleared
Associated TEC *
BC Act listing status
EPBC Act listing status
Action
Delete
Grassy Woodlands
Coastal Valley Grassy Woodlands
1604 - Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter
71
Central Hunter Ironbark—Spotted Gum—Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions
Endangered Ecological Community
Critically Endangered
ADD VEG ZONE
Modify default benchmarks
ADD ANOTHER PCT
SEARCH PCT OUTSIDE IBRA
C -20
F +20
VI drops 4 points to 52
IMPORT SITE
Vegetation zones (Current vegetation integrity score)
#
Import
PCT code
Condition class *
Vegetation zone name
Patch Size*
Area (ha)*
Location
Composition condition score
Structure condition score
Function condition score
Current vegetation integrity score
Management zones
Delete
1
1604
moderate
1604_moderate
10
10
29
55.2
87
51.8
Vegetation zones (Future vegetation integrity score)
#
PCT code
Condition class
Vegetation zone name
Patch Size
Management zone
Area (ha)
Composition condition score
Structure condition score
Function condition score
Vegetation integrity (VI) score
Change in VI score
Total Change in VI score
1
1604
moderate
1604_moderate
10
10
0
0
0
0
-51.8
-51.8
CLEAR
NEXT
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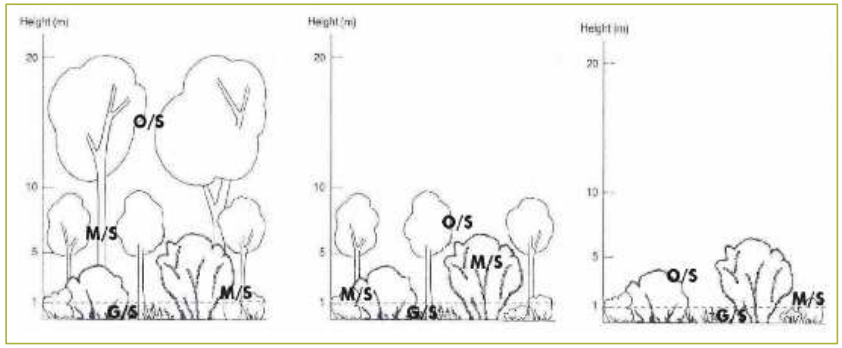
15/10/2019

Vegetation Integrity – Composition and Structure Attributes



- **Prior system based on**
  - Total number of native species (Composition)
    - Site richness benchmarking only
  - Cover of vegetation strata (Structure)
    - Assessment and repeatability issues

Growth form groups Oliver et al. (2019a) [4]

➢ Trees	815 spp
➢ Shrubs	2704 spp
➢ Grass & grass-like inc. sedges, rushes, lilies, restios	915 spp
➢ Forbs	2187 spp
➢ Ferns	210 spp
➢ Remaining 'others' inc. palms, cycads, vines, epiphytes & grass trees	434 spp

- Richness (Composition) and cover (Structure) assessed against Growth Form benchmarks
- Improved repeatability through fixed links
- NOTE: cover is summed among species within a growth form and may be > 100%

Vegetation Integrity – Composition and Structure Scoring
Dynamic Weighting of Growth Forms

- Character of the vegetation (benchmark) drives the weights
- Applies equally to growth form group cover and richness

- Hypothetical example

STRUCTURE (cover)	*Benchmark value*	*Dynamic weight*
Tree cover	25 %	25/115 = 0.22
Shrub cover	5 %	5/115 = 0.04
Grass & grass-like cover	70 %	70/115 = 0.61
Forb cover	10 %	10/115 = 0.09
Fern cover	2 %	2/115 = 0.02
Other cover	3 %	3/115 = 0.03
TOTAL	**115 %**	**~ 1.00**

Vegetation Integrity – Composition and Structure Scoring
Dynamic Weighting of Growth Forms

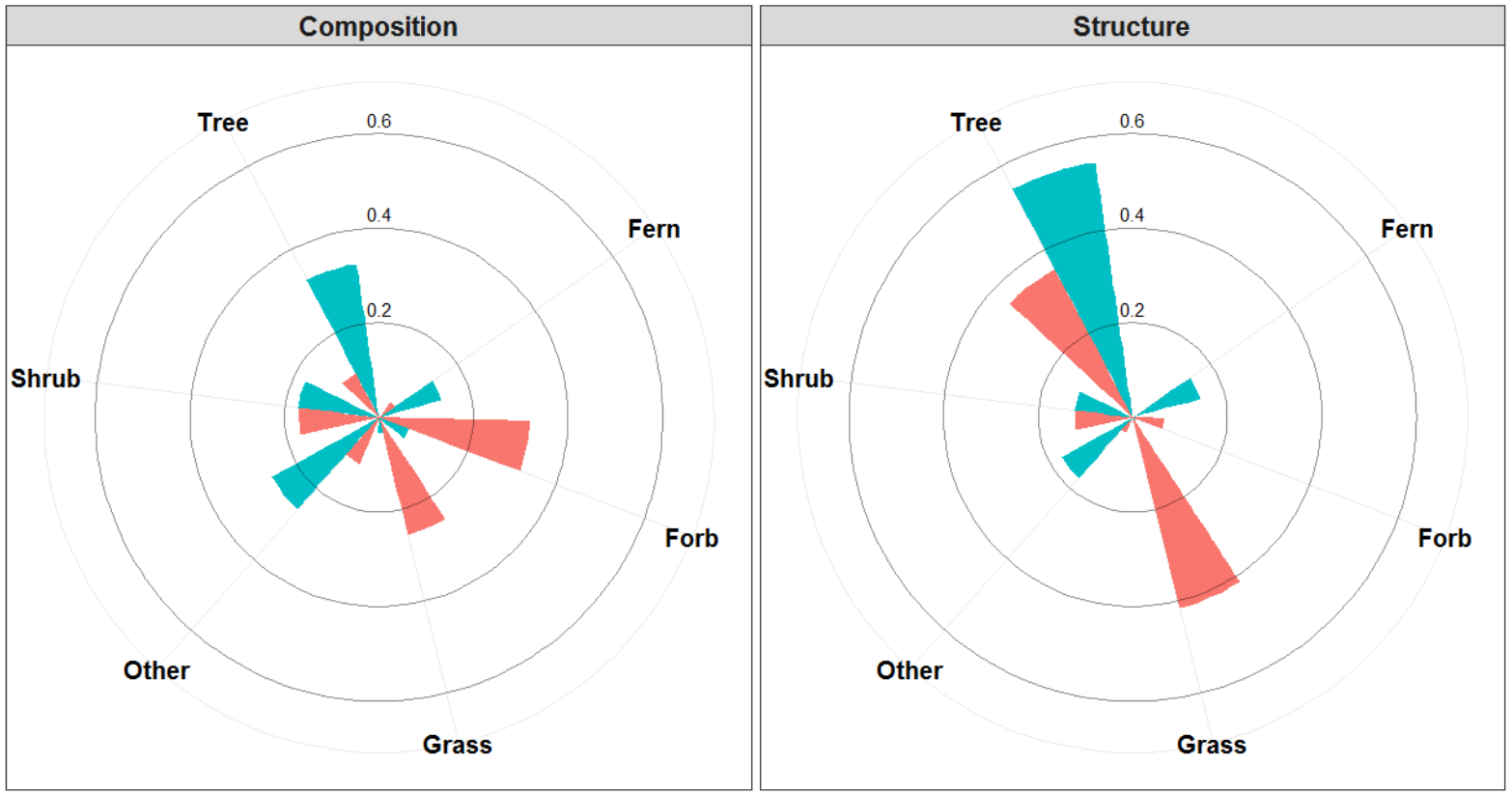
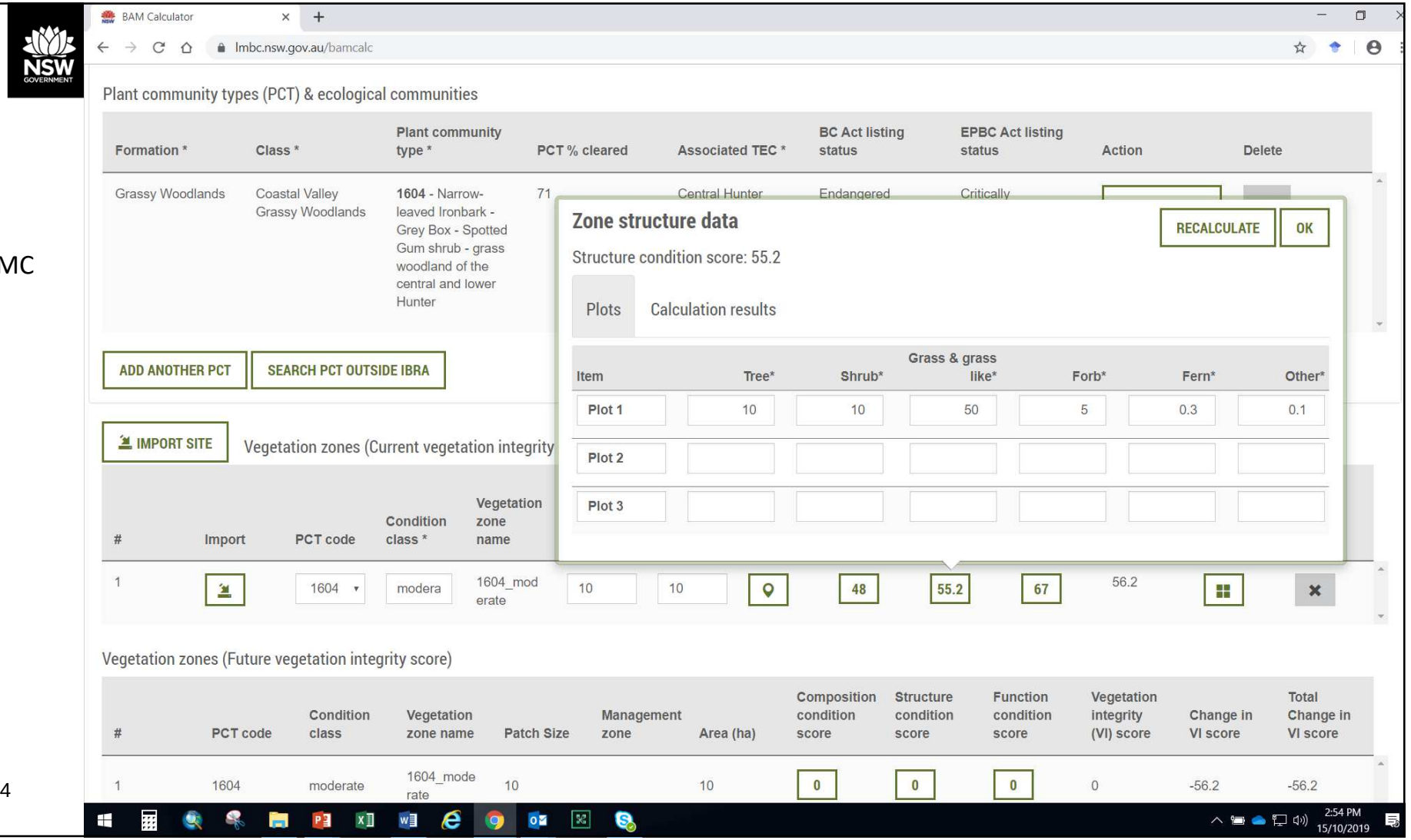
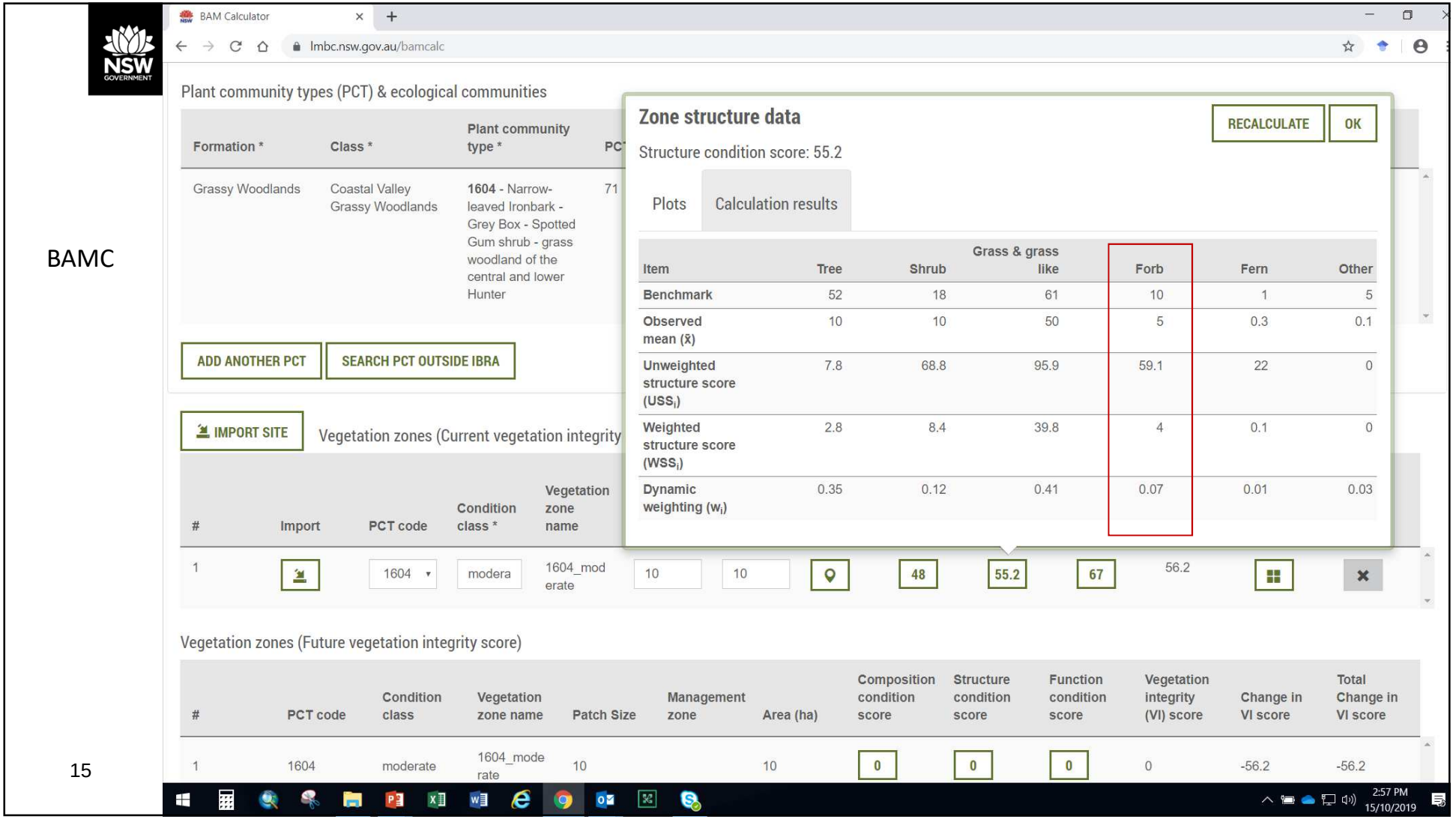


Figure by Josh Dorrough, DPIE

BAMC


BAM Calculator
lmbc.nsw.gov.au/bamcalc
Plant community types (PCT) & ecological communities
Formation *
Class *
Plant community type *
PCT % cleared
Associated TEC *
BC Act listing status
EPBC Act listing status
Action
Delete
Grassy Woodlands
Coastal Valley Grassy Woodlands
1604 - Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter
71
Central Hunter
Endangered
Critically
ADD ANOTHER PCT
SEARCH PCT OUTSIDE IBRA
IMPORT SITE
Vegetation zones (Current vegetation integrity
Zone structure data
RECALCULATE
OK
Structure condition score: 55.2
Plots
Calculation results
Item
Tree*
Shrub*
Grass & grass like*
Forb*
Fern*
Other*
Plot 1
10
10
50
5
0.3
0.1
Plot 2
Plot 3
#
Import
PCT code
Condition class *
Vegetation zone name
1
1604
modera
1604_moderate
10
10
48
55.2
67
56.2
Vegetation zones (Future vegetation integrity score)
#
PCT code
Condition class
Vegetation zone name
Patch Size
Management zone
Area (ha)
Composition condition score
Structure condition score
Function condition score
Vegetation integrity (VI) score
Change in VI score
Total Change in VI score
1
1604
moderate
1604_moderate
10
10
0
0
0
0
-56.2
-56.2
2:54 PM
15/10/2019

BAMC


BAM Calculator
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Plant community types (PCT) & ecological communities
Formation *
Class *
Plant community type *
Grassy Woodlands
Coastal Valley Grassy Woodlands
1604 - Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter
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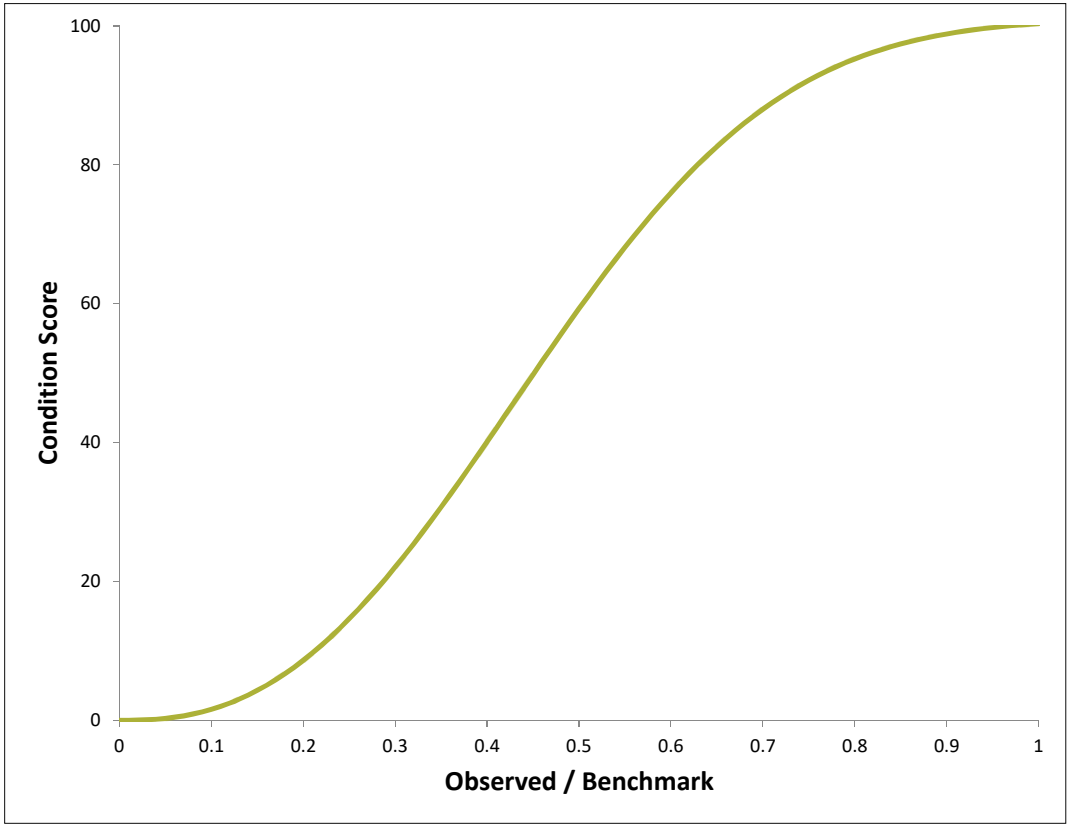
ADD ANOTHER PCT
SEARCH PCT OUTSIDE IBRA
IMPORT SITE
Vegetation zones (Current vegetation integrity
Zone structure data
RECALCULATE
OK
Structure condition score: 55.2
Plots
Calculation results
Item
Tree
Shrub
Grass & grass like
Forb
Fern
Other
Benchmark 52 18 61 10 1 5
Observed mean (x̄) 10 10 50 5 0.3 0.1
Unweighted structure score (USSi) 7.8 68.8 95.9 59.1 22 0
Weighted structure score (WSSi) 2.8 8.4 39.8 4 0.1 0
Dynamic weighting (wi) 0.35 0.12 0.41 0.07 0.01 0.03
Import PCT code Condition class * Vegetation zone name
1 1604 modera 1604_moderate 10 10 48 55.2 67 56.2
Vegetation zones (Future vegetation integrity score)
PCT code Condition class Vegetation zone name Patch Size Management zone Area (ha) Composition condition score Structure condition score Function condition score Vegetation integrity (VI) score Change in VI score Total Change in VI score
1 1604 moderate 1604_moderate 10 10 0 0 0 0 -56.2 -56.2
2:57 PM
15/10/2019

Vegetation Integrity – Function Attributes

Function (woody systems only)	Benchmarked	Static weight
Number of large trees	Yes	0.35
Total length of logs	Yes	0.20
Litter cover	Yes	0.15
Tree stem-size diversity	No	0.15
Tree regeneration	No	0.15

- NOTE: large trees replace trees with hollows
- Exotic cover not included in current condition assessment

Scoring of all attributes



- Continuous non-linear
- Maximises discrimination between sites
- Avoids sharp thresholds
- Range of natural variability

Vegetation Condition Benchmarks

BAM Vegetation Condition Benchmarks: a paradigm shift

Pre BAM and elsewhere

- Pre-European, pre-clearing, long-undisturbed, minimally or least disturbed
- Generally unknowable due to lack of long-term disturbance data
- Often expert derived – not transparent or easily updateable
- Potentially unachievable in contemporary landscapes
- Focus on minimal disturbance not maximum biodiversity conservation outcomes

BAM

- Does not explicitly consider disturbance history for benchmark development
- Focus on maximum biodiversity conservation outcomes
- “Best-on-offer” in contemporary landscape

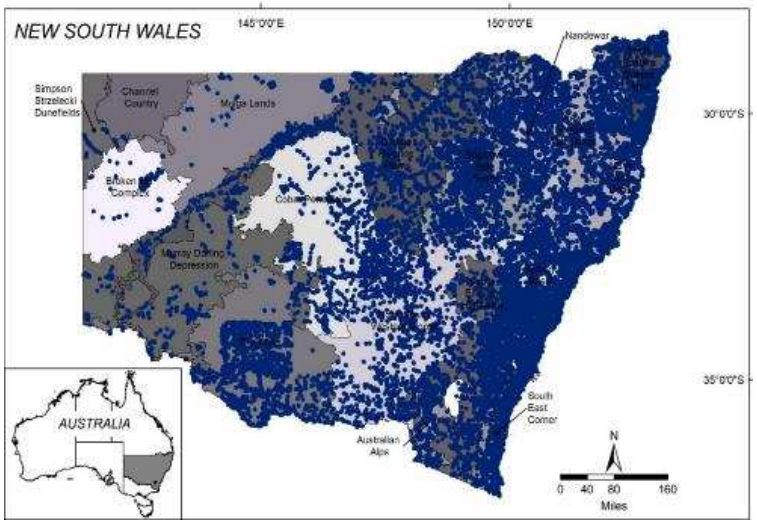
Best-On-Offer - sites within the contemporary landscape with higher numbers of native plant species, greater structural complexity and replete with functional components, relative to other sites of the same vegetation type within the same bioregion

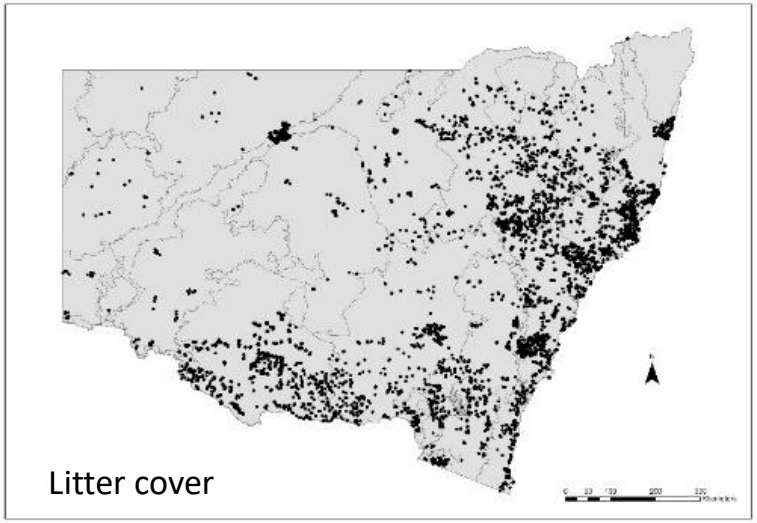
BOO enables data-driven benchmarks

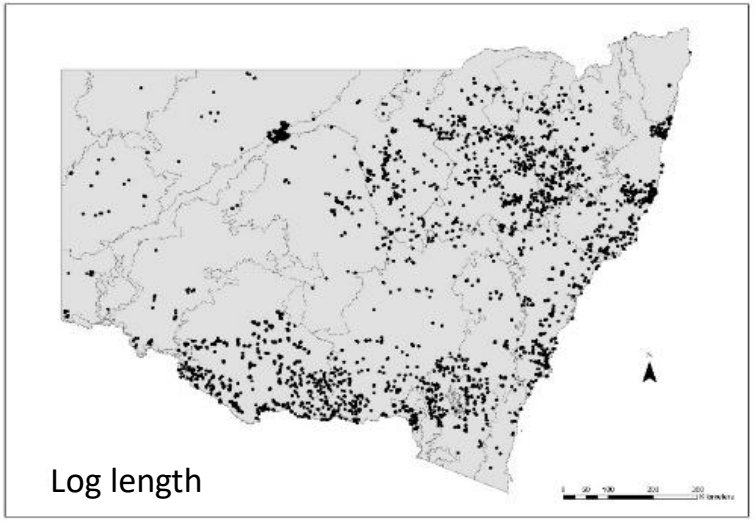
Comp & Struct > 36,000 plot surveys

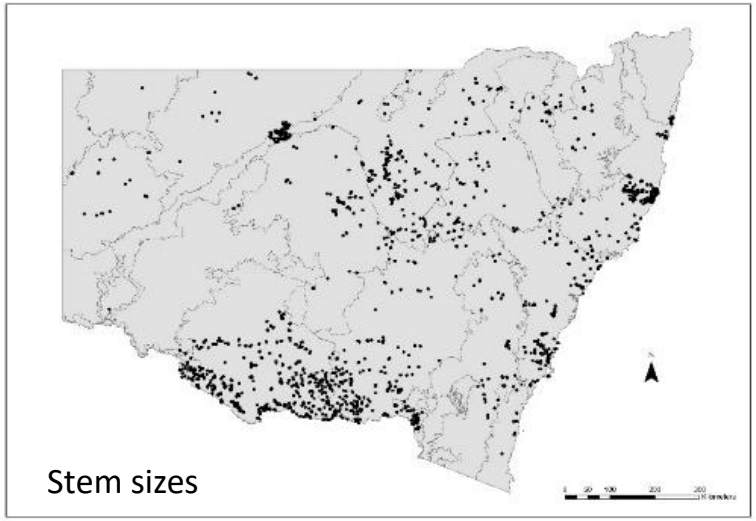
Function > 39,000 records

~ 650 Regional Vegetation Class BOO benchmarks









Transparent, repeatable data-driven best-on-offer benchmarks

- Oliver et al. (2019b)[5]
- Yen et al. (2019)[6]
- Approximate the 75th percentile of observed data
- Available now – assume average rainfall conditions (50th rainfall percentile, median)
- Available soon –
  - Dry (< 10th rainfall percentile)
  - Wet (> 90th rainfall percentile)

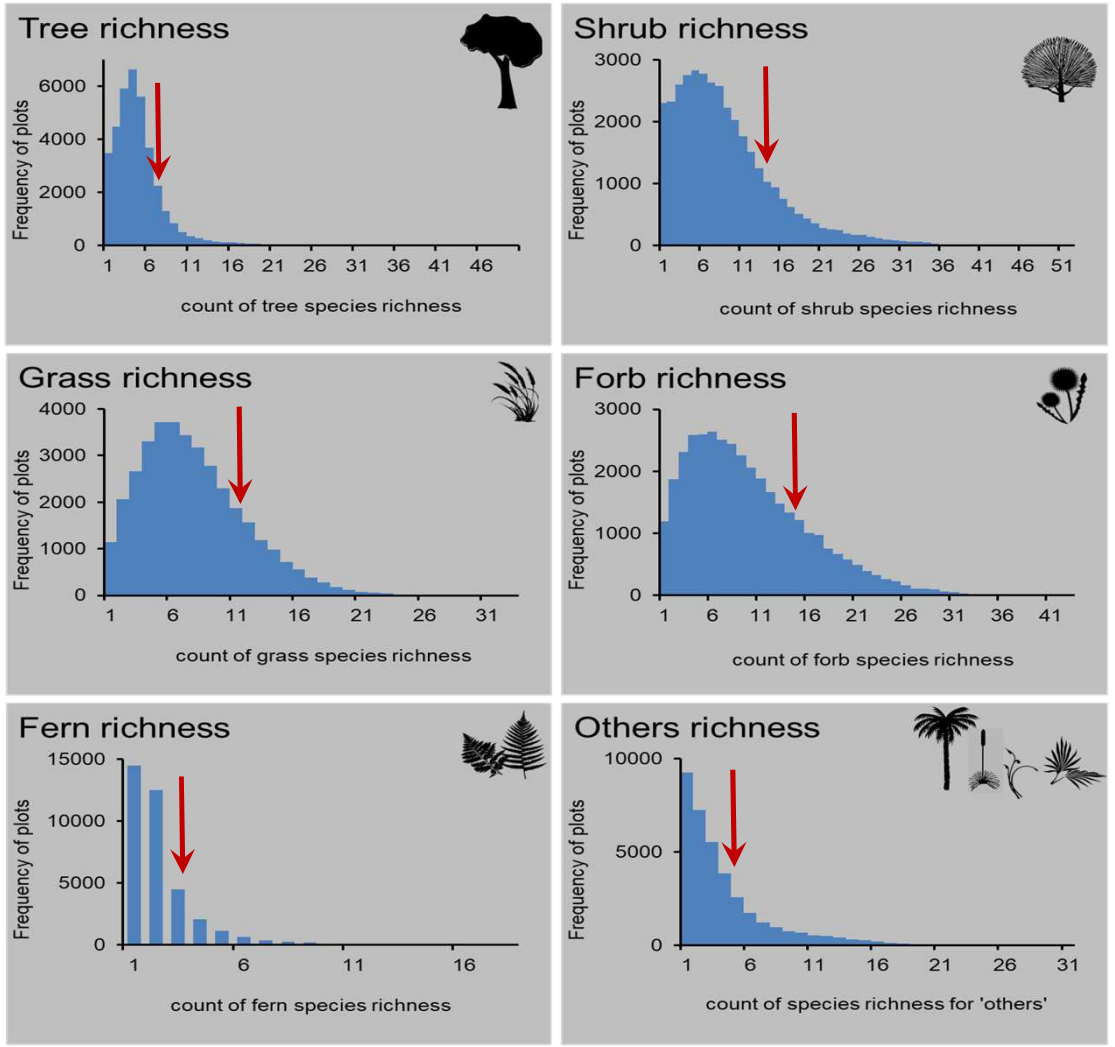
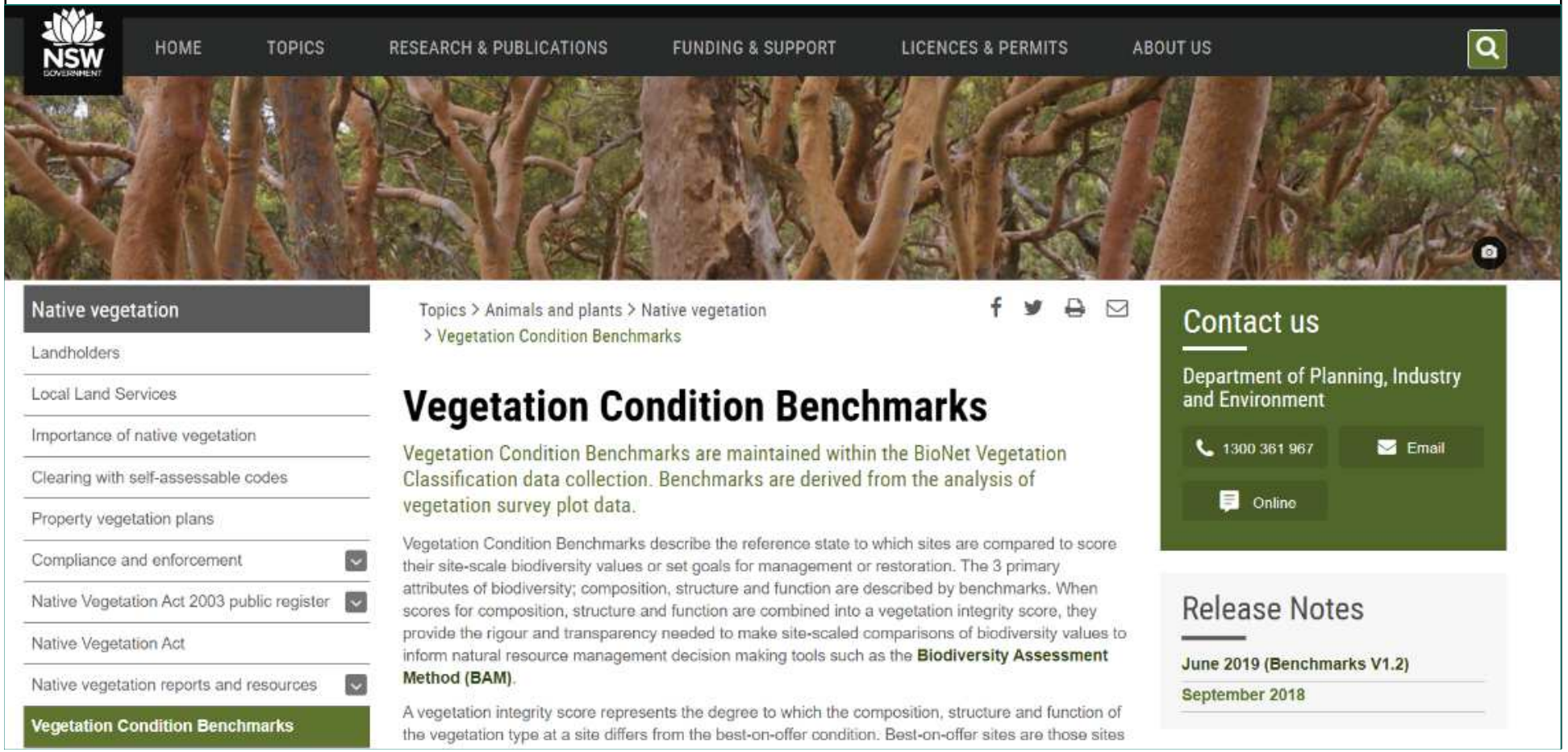


Figure by Megan McNellie, DPIE

Vegetation Benchmarks Webpages



Bionet

V1.2 benchmarks
- revised
- Minimal change Comp & Struct
- Some larger changes for Function

NEW Confidence
- Comp – H
- Struct – M, L
- Funct – VH – VL

- Consult prior to assessment for local benchmark consideration

Plant community

View plant community

Use this page to view a vegetation community.

Print PCT

PCTID : 564 VCAID : 564 Common name (community) : White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion

Classification Type : Qualitative

PCT Definition Status : Approved PCT Benchmark Calculation level : Class/IBRA Status : 3 out of 3 IBRA regions Approved

PCT % Cleared Status : Approved PCT Threatened Ecological Communities Association Status : 13/08/2010 Tool Ready : Yes

Classification confidence level : 2 High Authority : VCA 1.1 - archive

Vegetation community details | Scientific description | Distribution information | Extent | Threatened Biodiversity, TECs & Benchmarks | Spatial information | Image management | Status and lineage

Threatened Biodiversity

Community Condition Benchmarks

Vegetation Class	North-west Slopes Dry Sclerophyll Woodlands	North-west Slopes Dry Sclerophyll Woodlands	North-west Slopes Dry Sclerophyll Woodlands
IBRA	New England Tablelands	Nandewar	Brigalow Belt South
Benchmark Calculation Level	Class/IBRA	Class/IBRA	Class/IBRA
Tree Richness	6	5	5
Shrub Richness	9	7	8
Grass and Grass Like Richness	11	10	9
Forb Richness	13	13	12
Fern Richness	2	2	1
Other Richness	4	4	3
Tree Cover	61.0	54.0	60.0
Shrub Cover	19.0	21.0	22.0
Grass and Grass Like Cover	59.0	38.0	30.0
Benchmark Confidence	Composition: High | Structure: Moderate | Function: Logs-High; Litter-High; Large Trees-Low	Composition: High | Structure: Moderate | Function: Logs-High; Litter-High; Large Trees-Low	Composition: High | Structure: Moderate | Function: Logs-High; Litter-High; Large Trees-Low

Local Benchmarks (Appendix A Revised BAM)

Appendix A: Guidelines for collecting benchmark data from local reference sites or published sources

A.1 When may local benchmark data be appropriate?

When the assessor considers that the local data better reflect the local conditions.

Benchmark data from local reference sites may be used when:

a. existing benchmark confidence is low for an attribute, or suite of attributes; or
b. local data better reflect the local environmental conditions, or
c. benchmarks at the Class by IBRA level are demonstrably unsuitable for the PCT.

need written permission from consent authority so discuss early in the assessment process

Local Benchmarks (Appendix A Revised BAM)

A.2 How do you locate best-on-offer reference sites?

- Must be the same Plant Community Type
- Must satisfy the definition of “best-on-offer” in the current landscape
  - Must have high numbers of native plant species within growth form groups
  - Must have high summed foliage cover of growth form groups
  - Must have high values of function values, relative to other sites in the same PCT
- Must sample multiple sites to calculate local best-on-offer benchmarks

References and Resources

[1] GIBOP (2019) Global inventory of biodiversity offset policies. International Union for the Conservation of Nature. The Biodiversity Consultancy, Durrell Institute of Conservation and Ecology. https://portals.iucn.org/offsetpolicy/.

[2] Parkes D, Newell G, Cheal D. (2003) Assessing the quality of native vegetation: the 'habitat hectares' approach. *Ecological Management & Restoration,* 4, S29-38.

[3] Noss R. (1990) Indicators for monitoring biodiversity: a hierarchical approach. *Conservation Biology*, 4, 355-364.

[4] Oliver I, McNellie MJ, Steenbeeke G, Copeland L, Porteners MF, Wall J. (2019a) Expert allocation of primary growth form to the New South Wales flora underpins the biodiversity assessment method. *Australasian Journal of Environmental Management*, 26, 124-136, https://doi.org/10.1080/14486563.2019.1595186.

[5] Oliver I, Dorrough J, Yen JDL, McNellie MJ and Watson CJ (2019b) Native Vegetation Integrity Benchmarks: Technical details supporting Static Benchmarks June 2019 (Version 1.2). Department of Planning, Industry and Environment, Sydney. https://www.environment.nsw.gov.au/research-and-publications/publications-search/native-vegetation-integrity-benchmarks-technical-details

[6] Yen JD, Dorrough J, Oliver I, Somerville M, McNellie MJ, Watson CJ, Vesk PA. (2019) Modeling biodiversity benchmarks in variable environments. *Ecological Applications,* https://doi.org/10.1002/eap.1970.

Vegetation Benchmarks Pages
https://www.environment.nsw.gov.au/topics/animals-and-plants/native-vegetation/vegetation-condition-benchmarks

Bionet Benchmarks
https://www.environment.nsw.gov.au/research/Visclassification.htm

Question:

How do the benchmarks account for having the total number of species for the Growth Form Group across a vegetation zone when only recording the total number of species per plot?

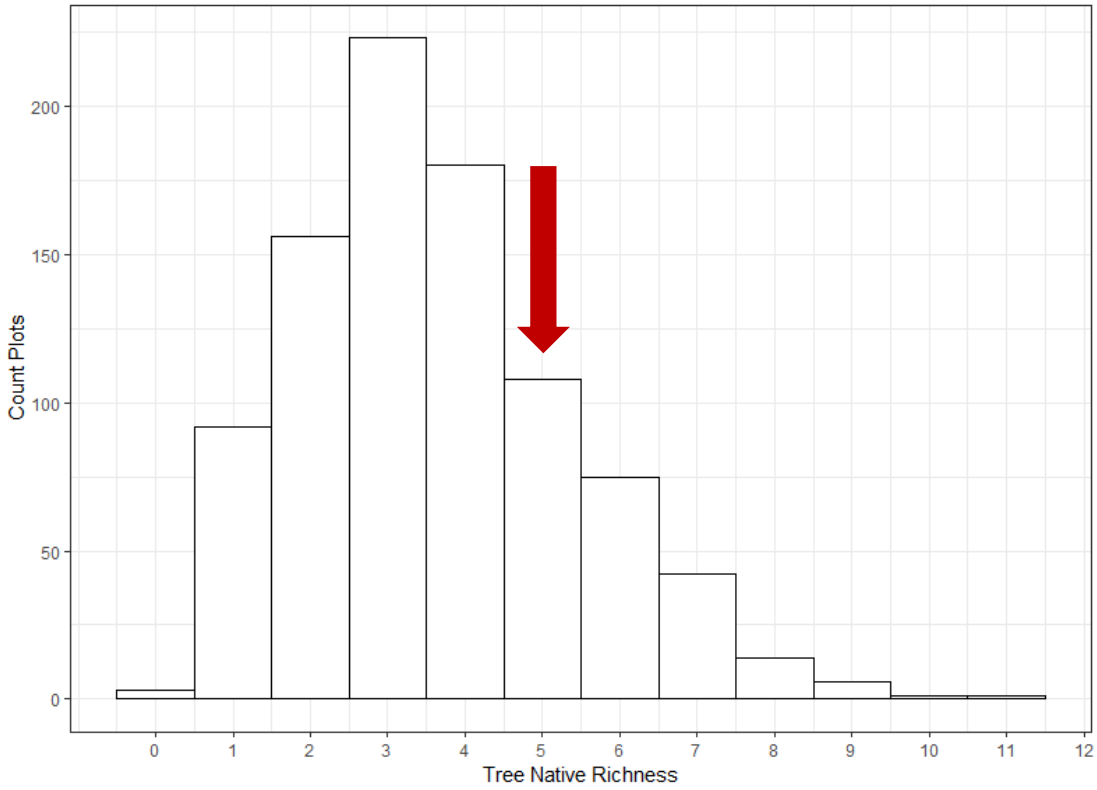
For example, if the Tree GFG benchmark is 5 species for a grassy woodland PCT, and you have all those 5 species across all your plots but not at any single plot?

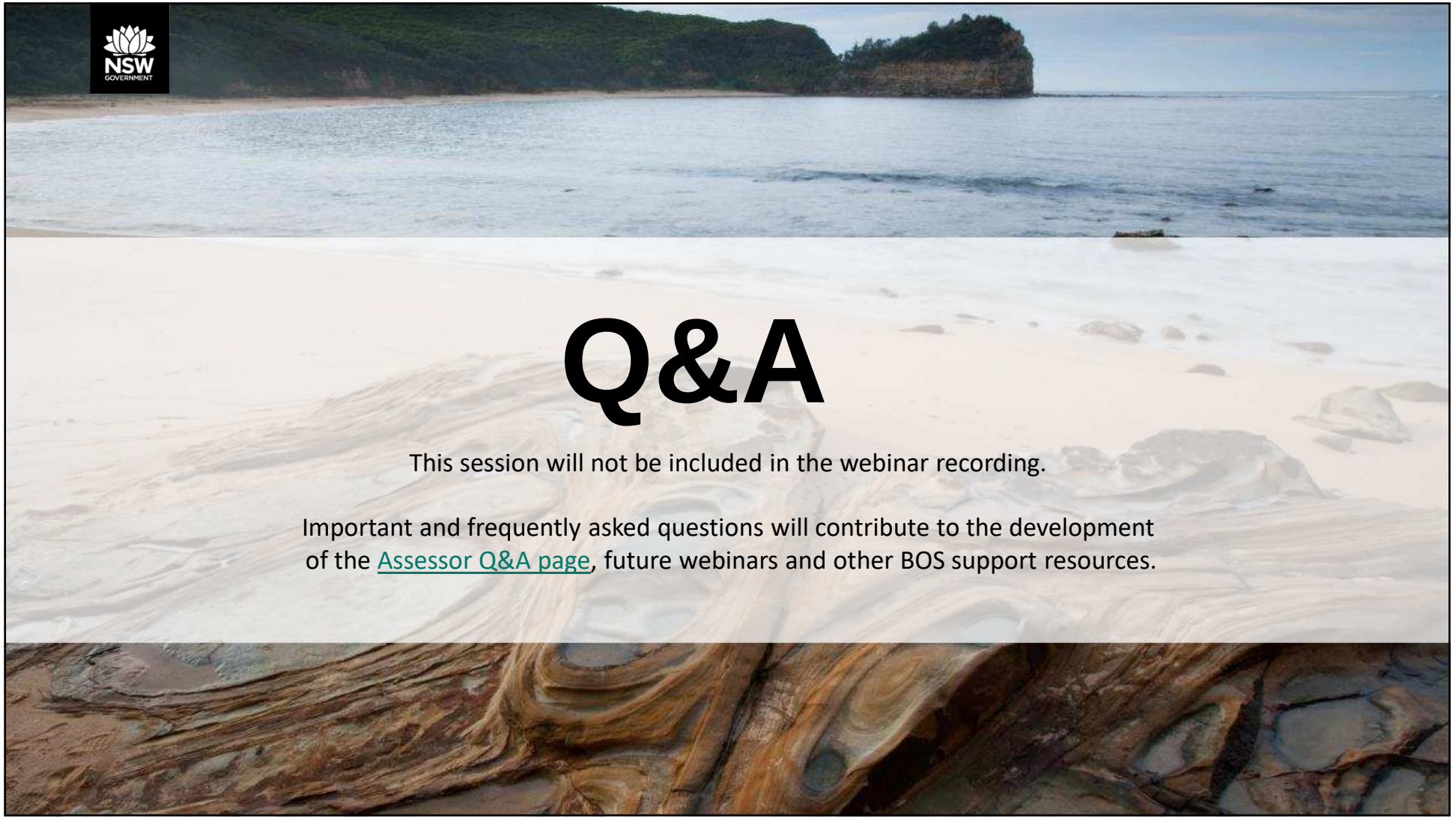
In a grassy woodland, you are unlikely to be able to get all 5 tree species in a 20 m x 20 m plot.

Native tree richness in Grassy Woodlands

Benchmark = 5

901 20m x 20m plots drawn from Bionet





Q&A

This session will not be included in the webinar recording.

Important and frequently asked questions will contribute to the development of the Assessor Q&A page, future webinars and other BOS support resources.

Thank you for your participation

Webinar recordings will be available to view online on the BOS Vimeo Showcase at vimeo.com/showcase/6271450 and via the BAM Support Webinar webpage

Contact us at www.environment.nsw.gov.au/biodiversity/bos-help-advice