**Appendices to the manuscript (06-57):**

# Expert panel assessment of attributes for natural variability benchmarks for biodiversity

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**Appendix 1.** Guide presented to experts showing the order in which they were to complete the hierarchy (node order), and brief node and attribute definitions (see Figure 1 in Oliver et al.)

| Node Order | Node or Attribute definition |
|---|---|
| 3 | FOCAL TAXA |
| 1 | *increaser/decreaser:* evidence or presence of a species or group of species known to increase or decrease due to a threatening process, for example, over-grazing or too frequent or infrequent burning;<br>- *plant species*<br>- *animal species* |
| 2 | *rare:* evidence or presence of rare and/or threatened;<br>- *plant species*<br>- *animal species* |
| | *nectivore food plants:* presence of known nectivore food plants. |
| | *palatable plant species:* the presence of plant species palatable to domestic grazing stock |
| 7 | NATIVE RICHNESS |
| | *trees:* the richness of native species that when mature are normally taller than 4 m |
| 4 | *guests:* the richness of native species that are;<br>- *climbers*<br>- *epiphytes*<br>- *mistletoes* |
| 5 | *shrubs:* the richness of native species that are;<br>- *tall shrubs (2.0 – 4.0 m)*<br>- *short short (0.5 – 2.0 m)* |
| | *chenopods:* the richness of native species from the family Chenopodiaceae |
| 6 | *grasses:* the richness of native species that are;<br>- *perennial grasses*<br>- *annual grasses* |
| | *other:* the richness of native legumes and forbs |

10 EXOTIC COVER

8 *shrubs:* the cover of exotic species that are;
- *tall shrubs (2.0 – 4.0 m)*
- *short shrubs (0.5 – 2.0 m)*

9 *grasses:* the cover of exotic species that are;
- *perennial grasses*
- *annual grasses*

*other:* the cover of exotic legumes and forbs

11 ABIOTIC COVER

*dead trees:* the density of standing dead trees
*tree hollows:* the density of tree hollows
*wood load:* the density or wood load of fallen timber
*litter:* the cover of litter which includes, leaves, twigs, etc.
*rock:* the cover of rock
*bare ground:* the cover of soil or bare ground

14 BIOTIC COVER

*trees:* the cover of species that when mature are normally taller than 4 m

12 *shrubs:* the cover of native or exotic species that are;
- *tall shrubs (2.0 – 4.0 m)*
- *short shrubs (0.5 – 2.0 m)*

*chenopod:* the cover of species from the family Chenopodieaceae

13 *grasses:* the cover of native or exotic species that are;
- *perennial grasses*
- *annual grasses*

*other:* the cover of native and exotic legumes and forbs

15 HETEROGENEITY

*dead trees:* the variability in size of standing dead trees (e.g. counts by size class)
*tree hollows:* the variability in tree hollow sizes and positions
*wood load:* the variability of sizes of fallen timber
*litter:* the variability in the cover, depth and type of litter

*rock:* the variability in type of rock cover
*stem sizes:* the variability in stem sizes of living trees
*perennial grass butts:* the variability in perennial grass butt sizes

17 FLOWS

16 *recruitment:* the prevalence of plant recruitment evidenced by the presence of
- *flowers*
- *fruit*
- *seedlings*
- *saplings*

*bioturbation:* evidence of bioturbation (the movement of soil by microfauna)
*landscape function measures:* landscape function measures and analysis (LFA) of Tongway (1994) and Tongway and Hindley (1995). LFA incorporates multiple fine-scale soil and ground vegetation attributes into three indices that reflect soil habitat quality; 1) stability or resistance to erosion, 2) infiltration/water holding capacity, and 3) nutrient cycling.

20 THREATS (CURRENT)

18 *grazing:* evidence of current grazing by;
- *sheep*
- *cattle*
- *feral vertebrates*
- *native vertebrates*

19 *disease:* evidence of current stresses on tress from;
- *dieback*
- *mistletoe*

*salinity:* evidence of salinisation or surface salt
*pasture improvement:* evidence of current fertiliser application or sowing of exotic species

21 THREATS (PAST)
*drought:* the history of drought in the local area
*flooding:* the history of flooding in the local area
*fire:* the history of burning in the local area
*clearing:* the history of clearing in the local area

*grazing:* the history of grazing in the local area
*cultivation:* the cultivation history of the local area
*years since disturbance:* years since past disturbances

22 **VEGETATION CONDITION**

| | |
|---|---|
| FOCAL TAXA: | the presence or evidence of particular species (see above) |
| NATIVE RICHNESS: | the richness of native structural/functional plant groups |
| EXOTIC COVER: | the cover of exotic plants, by structural/functional group |
| ABIOTIC COVER: | the cover or density of abiotic habitat components |
| BIOTIC COVER: | the cover or density of biotic habitat components |
| HETEROGENEITY: | the heterogeneity or variability of habitat components |
| FLOWS: | the flows of water, soil, nutrients and plant recruitment |
| THREATS (CURRENT): | the presence or evidence of current threatening processes |
| THREATS (PAST): | the history of past threatening processes |

23 PATCH
*size:* the size of the patch of native vegetation
*shape:* the shape of the patch of native vegetation (e.g perimeter:area ratio)
*km from water:* the distance from the patch to the nearest permanent water
*km from small patch (<10 ha):* the distance to the nearest small (~10 ha) patch of native vegetation
*km from large patch (>100 ha):* the distance to the nearest large (>100 ha) patch of native vegetation
*km from caves, tunnels:* the distance from the patch to the nearest cave, tunnel
*years since isolation:* the number of years since the patch became fragmented

24 MATRIX
*IBRA region vegetation cover:* the cover of native vegetation in the ecoregion (from Interim Biogeographic Regionalisation for Australia)
*surrounding landuse:* the type of landuse surrounding the patch of native vegetation
*invasive species adjacent:* the presence of invasive plant species adjacent to the patch
*road density:* the road density within and surrounding the patch
*connectivity:* the degree to which the patch is biologically connected with other vegetation. Whether or not areas of native vegetation are connected depends on the taxon of interest, its breeding system, and dispersal abilities of individuals, their gametes or propagules

*structural contrast:* the structural contrast between the patch and the matrix. That is, how different is the vegetation structure within the patch compared with outside the patch. For example, a remnant with dense tree cover and moderate condition ground cover surrounded by open woodland with moderate condition ground cover may have a low structural contrast. However, if the same remnant was surrounded by treeless pastures in moderate condition the structural contrast may be assessed to be higher

**25 LANDSCAPE CONTEXT**

PATCH:

MATRIX:

What is the relative importance of assessing landscape context attributes relevant to the patch of native vegetation, compared with landscape context attributes relevant to the land surrounding the patch of native vegetation (the matrix)?

**26 WITHIN-VEGETATION-TYPE BIODIVERSITY SIGNIFICANCE ASSESSMENT**

VEGETATION CONDITION:

LANSCAPE CONTEXT:

What is the relative importance of assessing vegetation condition attributes, compared with landscape context attributes, to act as operational surrogates for comprehensive biodiversity survey?

REFERENCES

Tongway, D. J. 1994. Rangeland Soil Condition Assessment Manual. CSIRO Publishing, Melbourne, Australia.

Tongway, D. J., and N. Hindley. 1995. Manual for Soil Condition Assessment of Tropical Grasslands. CSIRO Wildlife and Ecology, Canberra, Australia.

Appendix 2. Vegetation condition expert panel members, their affiliations, occupations and expertise.

| Expert | Affiliation* | Occupation | Taxon-general | Taxon-specific | Spatial scale |
|---|---|---|---|---|---|
| Law, Brad | NSW State Forests | researcher | animals | birds, bats | site |
| van der Ree, Rodney | Royal Botanic Gardens, Melbourne | researcher | animals | other mammals | both |
| Brown, Geoff | DSE, Vic. | researcher | animals | herps, inverts | both |
| Oliver, Ian | NSW DLWC | researcher | animals | herps, inverts | site |
| Wilke, Lance | The Australian Museum, NSW | researcher | animals | herps, inverts | both |
| York, Alan | University of Wollongong, NSW | researcher | animals | herps, inverts | both |
| Bennett, Andrew | Deakin University, Vic. | researcher | animals | animals (general) | both |
| Ellis, Murray | NSW NPWS | both | animals | animals (general) | both |
| MacNally, Ralph | Monash University, Vic. | researcher | animals | animals (general) | both |
| Mazzer, Terry | NSW DLWC | practitioner | animals | animals (general) | landscape |
| Shelly, Darren | NSW DLWC | researcher | animals | animals (general) | site |
| Spark, Phil | Consultant, NSW | both | animals | animals (general) | both |
| Eldridge, David | NSW DLWC | researcher | plants | plants (non-woody) | site |
| Horner, Gillis | NSW DLWC | practitioner | plants | plants (non-woody) | landscape |
| Lunt, Ian | Charles Sturt University, NSW | researcher | plants | plants (non-woody) | site |
| McIntyre, Sue | CSIRO, Qld. | researcher | plants | plants (non-woody) | both |
| Whalley, Wal | University of New England, NSW | researcher | plants | plants (non-woody) | both |
| Peacock, Ross | NSW DLWC | practitioner | plants | plants (woody) | both |
| Binns, Doug | NSW State Forests | both | plants | plants (general) | both |
| Lewer, Steve | NSW DLWC | both | plants | plants (general) | both |
| Nadolny, Chris | NSW DLWC | both | plants | plants (general) | both |
| Oxley, Roger | NSW DLWC | practitioner | plants | plants (general) | both |
| Val, James | NSW DLWC | practitioner | generalist | animals (general) | site |
| Ede, Alan | NSW DLWC | practitioner | generalist | generalist | both |
| Gibbons, Phil | NSW NPWS | both | generalist | generalist | both |
| Hawes, Wendy | NSW DLWC | practitioner | generalist | generalist | both |
| Reid, Nick | University of New England, NSW | researcher | generalist | generalist | site |
| Smith, Peter | NSW DLWC | both | generalist | generalist | both |
| Tap, Pat | NSW State Forests | both | generalist | generalist | both |
| Turner, Ken | NSW DLWC | practitioner | generalist | generalist | both |
| Kelly, Annie | DNR, Qld. | researcher | generalist | plants (woody) | both |

* Affiliation at the time of contribution.
NSW-New South Wales, Vic.-Victoria, Qld.-Queensland, DSE-Department of Sustainability and Environment, DLWC-Department of Land and Water Conservation, NPWS-National Parkes and Wildlife Service, CSIRO-Commonwealth Scientific and Industrial Researcher Organisation, DNR-Department of Natural Resources, herps-(herpetofauna) frogs and reptiles, inverts-invertebrate