

Pre-1750 vegetation, naturalness and vegetation condition: What are the implications for biodiversity conservation?

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Despite widespread acknowledgement of the importance of maintaining, managing and improving the condition of native vegetation, accepted standards for site-based assessment remain elusive. The present paper raises two 'positions' for discussion that are relevant to this problem: (i) methods for assessing vegetation condition are best developed within, and applied to, a single clearly defined context; and (ii) the current focus on 'pre-1750 vegetation' and 'naturalness' concepts may, in some circumstances, limit efforts to deliver site-based methods for assessing vegetation condition for 'biodiversity conservation'.

A single clearly defined context: All-species biodiversity conservation

Vegetation condition is a context-dependent concept (Tongway & Ludwig). Examples of different contexts in which vegetation condition assessments are conducted include: sustainable production capability (Wilson 1984), ecological function (Ludwig *et al.* 1997) and biodiversity conservation (Jenkins *et al.* 2000). The approaches used, attributes measured, and results generated, necessarily vary among each of these contexts. We argue in the present paper that this is a necessary consequence of

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working with context-dependent concepts because a clear definition of the context leads to the choice of indicators appropriate to the particular application (Noss 1990; Saunders *et al.* 1998; Oliver in press). However, recently, there has been an attempt to build a single vegetation condition framework that caters for different contexts. Towards this aim, Hopkins (1999) proposed to define vegetation condition hierarchically and suggested the '1750 condition' be the primary benchmark against which all vegetation might be assessed. 'Naturalness' condition ratings would then be assigned relative to this benchmark. These ratings would aim to describe how similar the current vegetation is to that which may have existed on-site in 1750; that is, prior to European development. His paper then proposes that secondary ratings would apply to conditions within particular land-use contexts, for example, pastoralism, agriculture or horticulture. This work guided the development of the *National Framework for Assessing Vegetation Condition* for the National Land and Water Resources Audit (Environment Australia 2000a, 2001a). It is our position, that despite recognizing the need to assess vegetation condition within different contexts, the hierarchical approach suggested does not go far enough in recognizing the different needs of different contexts and, consequently, cannot realize the benefits that can be gained by developing approaches within a single, clearly defined context.

For example, past approaches to condition assessment have tended to be taxon driven rather than all-species driven and have often used structural complexity of vegetation as a key predictor of condition (Catling & Burt 1995; Briggs *et al.*, unpubl. data, 1999; Freudenberger 1999). Consequently, structurally complex vegetation has become synonymous with 'good' condition vegetation. However, although structurally complex vegetation has been shown to correlate with bird and mammal abundance and species richness (Catling & Burt 1995; Freudenberger 1999; Seddon *et al.* 2001; review by C. McElhinny, unpubl. data, 2002), few data exist to show that structural complexity, assessed in this way, correlates with non-avian or non-mammalian biodiversity. In addition, in a wide range of structurally simple

vegetation types, this approach may mislead by ascribing poor condition to what may, in fact, be the normal or best possible condition. As part of a recent study that is developing a condition assessment methodology relevant to all-species biodiversity conservation, an expert panel found that structural attributes alone are unlikely to be sufficient predictors of condition. In fact, two-thirds of the attributes identified represented compositional and functional aspects of the vegetation (Oliver 2002; Oliver *in press*). We, therefore, stress here that without single context, clearly defined, purpose-driven frameworks, such insights may go undetected and vegetation condition assessment methodologies will fail to meet their objectives (Environment Australia 2000b).

Limitations of 1750 and naturalness benchmarks for the biodiversity conservation context

Assessment of the condition of a site's native vegetation requires a benchmark against which the existing vegetation can be assessed. As discussed earlier, it has been suggested that the primary benchmark might be pre-1750 condition (Hopkins 1999).

We suggest, however, that the use of a pre-1750 basis for deriving benchmarks may have limitations for site-based assessment of vegetation condition for a number of reasons. First, the models are likely to be least accurate for those vegetation types of most concern for biodiversity conservation; that is, those that are geographically restricted or have been most heavily degraded, cleared and fragmented (NPWS 1999). Second, routine adoption of the pre-1750 condition/distribution and naturalness concepts, at the site level, may lead to a devaluing (from the point of view of biodiversity conservation) of native vegetation that differs in type from that predicted to have existed on-site in 1750. Third, the use of pre-1750 benchmarks and vegetation mapping at particular locations may lead to attempts to restore a modelled vegetation type to what may now be an unsuitable location due to significant and effectively irreversible changes in fire regime, soil structure, fertility, salinity, flooding regime and/or ground-water level (Smith 2000; Andreasen *et al.* 2001; Environment Australia 2001b). Fourth, naturalness concepts are philosophically complex. For example, Peterken (1981) describes four kinds of naturalness: 'original naturalness', 'present naturalness', 'future naturalness' and 'potential naturalness' (see also Andreasen *et al.* 2001). Finally, naturalness concepts were developed for application to large unmodified landscapes (Hoerr 1993; Angermeier 2000) and are, therefore, not necessarily consistent with the most effective biodiversity conservation outcomes in highly modified landscapes.

The above comments are not intended to criticize pre-1750 mapping *per se*. Instead, we wish to highlight the existence of two distinct (although related) objectives: First, the need to benchmark post-settlement changes in ecosystem features at the regional scale (e.g. amount of each vegetation type remaining in the landscape) and, second, the need to assess vegetation

condition as one surrogate for the status of species biodiversity at the site scale. Pre-1750 mapping may be a valuable and practical tool for achieving the first objective, but we suggest it requires additional considerations to contribute to the second objective.

Two examples are used to illustrate the relevance of these problems to condition assessment of extant native vegetation within the context of biodiversity conservation. Lunt (1995, 1997) suggests that many of the original communities in Australia's agricultural zone have been severely modified by management (see also Prober *et al.* 2001). Remnant native communities of high conservation value may now be clearly different from those that existed on-site prior to agricultural development. Lunt (1995, 1997) suggests that where once grassy forests and woodlands of the Gippsland Plain formed a continuous ecosystem, two very different management pressures on this original system have led to two quite different communities, both of high value for regional biodiversity conservation. One community, restricted to the woodland remnants associated with the rail network and cemeteries, has resulted from regular burning, domestic stock exclusion and sapling removal. The second community, found in most of the remaining grassy forests and woodlands, has resulted from continuous grazing by domestic stock. Therefore, where once a single community probably existed, two demonstrably different communities with different management requirements now need to be conserved. This example highlights the value of a regional understanding of post-settlement vegetation changes, and the factors contributing to those changes. However, it also highlights the need to appraise vegetation condition and management requirements in relation to existing ecosystems and our conservation aspirations for them, as well as historical benchmarks.

Within NSW, the Department of Land and Water Conservation (DLWC) recognizes this limitation in its assessments of vegetation condition, which are used (among other factors, see DLWC 1999; Oliver 2002) to guide decisions on applications to clear native vegetation. Field officers ask the question, 'Given the native vegetation type under assessment, what condition is it in?' In other words, condition is assessed relative to the current native vegetation type rather than what may have existed on the site prior to European settlement. This reference to the current native vegetation type is important because, as demonstrated by the earlier example, vegetation that may score poorly in terms of naturalness assigned relative to a pre-1750 benchmark may still provide significant habitat and resources for important components of the State's biodiversity. This scenario is commonplace in the variegated open woodlands in the wheat-sheep belt of northern NSW where past clearing has resulted in many areas of derived native grasslands. Where these derived native grasslands are in good condition we argue that it is undesirable to downgrade their value to biodiversity conservation simply because they lack the woodland attributes defined by a pre-1750 woodland benchmark.

We cannot turn back the clock on 200 years of development and degradation. Given today's highly modified landscapes we

need to assess the value, for biodiversity conservation, of what we have rather than what we once had. In other words, we need to determine the most practical and appropriate biodiversity conservation objective for the site under consideration. Consequently, we argue that determining the appropriate benchmark for a site on the basis of modelled pre-1750 data may under some circumstances lead to undesirable outcomes for biodiversity conservation. Historical ecological information and pre-1750 maps may be useful for guiding the setting of vegetation retention and restoration targets. However, existing vegetation characteristics and their potential to provide optimal biodiversity outcomes will be an important additional determinant of the current status of biodiversity, and of planning and managing for future ecosystem changes.

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