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Pastoral management

Key issues include:

- assessing the geographic extent, and rate of woody structural change, especially thickening, in north Australian savanna landscapes over recent decades;
- assessing the role and significance of a range of environmental (e.g. climatic, soil type) and management (e.g. stocking rate, fire history) factors that are likely to contribute to woody structural change; and
- examining and demonstrating feasible management options for maintaining productive pastoral systems under different environmental and ecological conditions.

Woody Thickening

In various pastoral regions of northern Australia there is growing evidence for marked changes in woody structure, especially woody thickening, with attendant major impacts on pasture, hence pastoral production. In northern, and especially eastern Australia such thickening is attributed typically to high stocking densities of cattle (and sheep in more southern areas), often in combination with reduced use of intense, shrub-killing fires (e.g. Burrows *et al.* 1990; Hodgkinson 1991; Scanlan *et al.* 1991; Craig 1997, 1999; Grice and Slatter 1997; Crowley and Garnett 2000). Thickening is emerging as a major issue in regional vegetation management planning for a established by the Queensland Government to inform the policy settings around the issue of vegetation management (a.k.a. tree clearing). Queensland graziers are arguing for the option to use mechanical clearing in northern Australia to combat thickening. Clearly policy development in this area needs to be informed by more rigorous assessment of the magnitude and causes of the phenomenon. Similar issues doubtless will emerge, in time, in other parts of northern Australia also.

Evidence of thickening in many areas is accruing for some regions (e.g. Burrows *et al.* 2002; Fensham *et al.* 2003; Fensham and Fairfax 2003a), although there are unresolved issues relating to the magnitude of this phenomenon with seven-fold discrepancies being reported in the recent literature (Fensham *et al.* 2003). There are relatively few detailed studies describing the likely processes involved (e.g. north-east QLD—Fensham and Holman 1999, Fensham *et al.* 2003; Crowley and Garnett 2000; Victoria River District (NT)—Lewis 2002; Fensham and Fairfax 2003b). Further, despite such trends, Fensham (1998) and Fensham and Holman (1999) document significant die-back of woody components related to drought events in Queensland, and suggest that competition for soil moisture may play a regulatory role in limiting woody biomass, especially under severe soil moisture deficit conditions. Woody thickening applies both to native (e.g. *Acacia*, *Eucalyptus*, *Terminalia*, *Eremophila*, *Melaleuca*) and exotic species (e.g. *Acacia nilotica*, *Cryptostegia grandiflora*, *Parkinsonia aculeata*).

Evaluating Discrepancies

The cause of the discrepancy in the Queensland estimates of vegetation thickening needs to be evaluated. It is proposed that this be conducted by comparing and calibrating existing assessment procedures including permanent monitoring plots and aerial photograph assessments. The actual extent, and rate(s) of woody thickening, across northern Australia also need to be determined. For example, evidence is required on the extent to which this is a problem in WA and NT. We propose to undertake this assessment using two approaches. First, by assembling/collating existing ground-based and remotely sensed data, data from soil-based carbon signatures, relevant experimental sites, local knowledge, and photographic records. This work would focus initially on QLD, but would include representative examples from NT and WA as well. An excellent example of the use of historical photos for addressing woody change in the VRD region of the NT is given in the recent book, *Slower than the eye can see*, by Darell Lewis (2002).

Detailed Analysis of Thickening

To provide more detailed analysis of likely changes in vegetation structure at selected sites across northern Australia, we will assemble available historical vs. contemporary aerial photos especially for major regional pastoral regions. These will be analysed employing the random point sample methodology as recommended in Fensham and Fairfax (2002) and outlined in Fensham and Holman (1999), Fensham *et al.* (2002) and Fensham and Fairfax (2003b). Such regional assessments will be stratified, wherever possible, using land surface mapping coverages (e.g. land systems, land units, geology, soils, surface roughness, vegetation), but may also be limited by the availability of photography. Further, in some situations it may be possible to undertake direct comparisons between properties (or paddocks) with similar land surface features, but otherwise with known different land use histories (e.g. heavily stocked vs. lightly stocked; regularly burnt vs. long unburnt). In suitable situations contrasting management histories will be developed through involvement of pastoralists and other land managers, and linked to the collation and analysis of other property data outlined above. These will be used to inform the processes of woody vegetation change determined by detailed assessments of aerial photography as has been done to great effect in Texas, U.S.A. (see Asner *et al.* 2002).

These above assessments will be integrated into a major report, at the end of Phase 1. This report will include regional case studies of woodland change, including its likely impact on environmental and economic sustainability. As such, the report will provide an objective basis for informing the need for: (a) further possible descriptive studies; and (b) expanding proposed demonstration activities (see below).

A major fire and woody plant management demonstration project has recently commenced in the QLD Gulf region (Normanton-Georgetown), funded principally by Meat & Livestock Australia (MLA), and undertaken under the auspices of the Northern Gulf Resource Management Group (NGRMG) and Tropical Savannas CRC. The project (*Developing, implementing and evaluating fire management of woody vegetation in the Gulf region*) is currently due to run for 4 years. Anecdotal evidence indicates that woody thickening is a major issue in this area (and for extensive areas of the Einasleigh Uplands, Desert Uplands, northern Brigalow Belt), and is incurring significant impact on pastoral enterprise sustainability. To complement that project, we propose to investigate woody thickening in the Northern Gulf Region in detail, as part of the overall assessment of woody thickening across northern Australia (see above). Collectively, this assessment will help inform the potential expansion of fire and pastoral management demonstration activities in Phase 2, both in the Northern Gulf, and other areas of northern Australia as appropriate.

Phase 2—The above assessment of woody structural change provides an objective basis for assessing requirements for potential expansion of demonstration activities; for example, stakeholders involved with the Southern Gulf Catchment Management Group (QLD), the Barkly

Tablelands region of the NT, and the Fitzroy River region of WA, have expressed interest in such work.