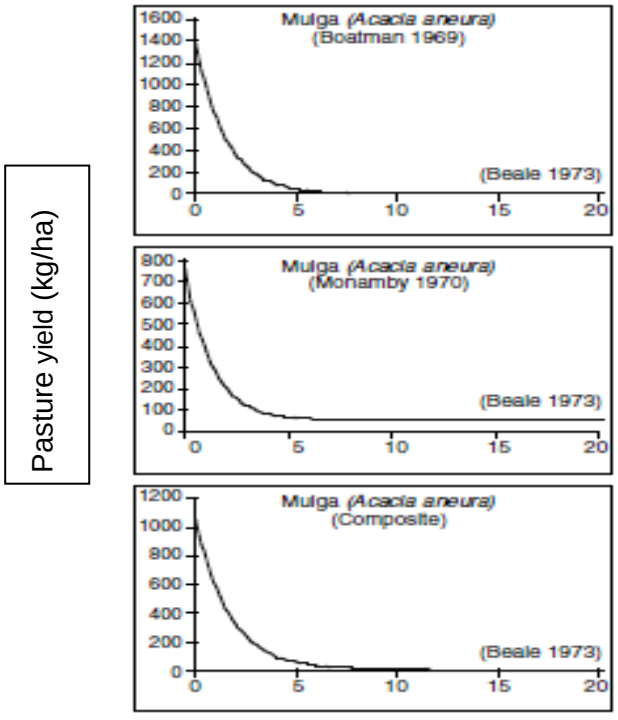
Ebersohn and Lucas (1965) and Christie (1975) have both shown how deep rooted poplar box trees act as ‘nutrient pumps’ on the notoriously infertile kandosol soils typical of this area on ‘Alpha’. The benefit to native pasture production from retaining box canopies and their attendant “islands of fertility” is obvious in the above photo, even though a few false sandalwood shrubs (again now widespread on this holding) can be seen also tapping the box tree ‘drip ring’ effect. The Queensland Department of Agriculture and Fisheries has been recommending the retention of box trees in these communities since the 1960’s, and the active planting of buffel grass (under the box canopies) to enhance livestock production since the 1970’s. Christie (1975) found that under a box tree density of 16-40 trees/ha, up to 7% of each hectare would comprise tree microhabitats. But because of their higher pasture production these sites have the potential to produce c. 20% of the available forage per ha, to the benefit of both local fauna and domestic livestock.

On the other hand woody shrubs can also exploit these box tree “islands of fertility” as evidenced by the dense false sandalwood beneath box canopies on an analogous undisturbed site on ‘Alpha’. Getting the balance right between invasive native shrubs (woody weeds) and understorey pasture is a constant challenge to the

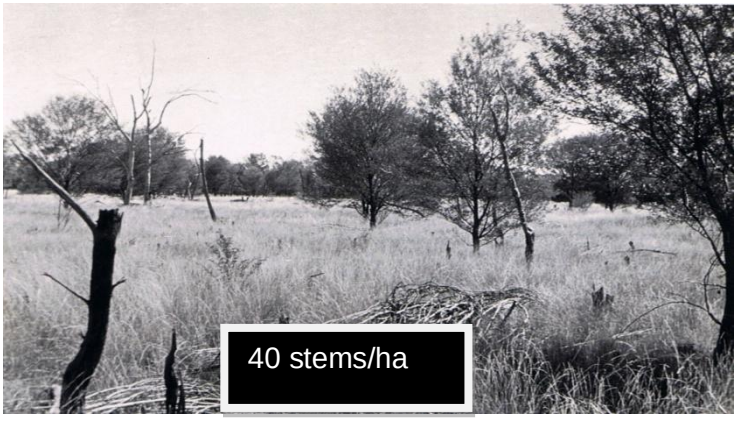
landholder/lessee in these environments. There is little doubt that, where native species such as green turkey bush and false sandalwood have actively thickened on pastoral lands, this has been associated with increases of canopy cover on these shrubs much greater than 30% (the trigger for the issuing of 'thinning permits'). But the same result is not restricted to shrubs, as the dominant trees on 'Alpha' are also capable of thickening up under the appropriate conditions, and especially in the absence of fire. [See earlier photo sequence (p.12) of thickening mulga on 'Wongalee' – 40 km east of 'Alpha'].

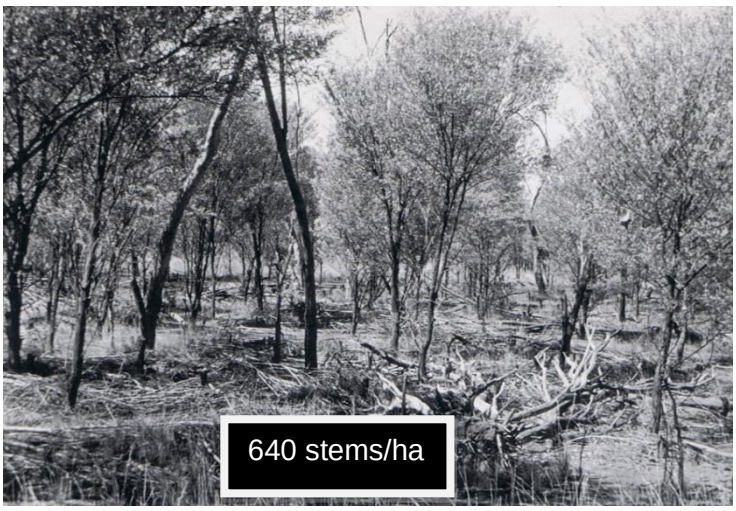
Tree/shrub thickening effects - The impact of increases in tree-shrub density/canopy cover in mulga –box woodlands can be profound – not only for pastoral holding lessees, but for conservation interests as well. Put simply, domestic livestock and all those organisms preferring an 'open' or grassy woodland habitat – as seemingly existed on 'Alpha' at the time of initial survey in 1895, and which remained apparent in the 1952 aerial photo of the property - would be seriously disadvantaged by a pronounced invasion and thickening of native trees and shrubs. Consider:

The effect of increasing tree/shrub basal area or canopy cover on the productivity of associated pasture (grasses and forbs) is vividly illustrated by the following woody plant-pasture relationship curves. All the woody species depicted occur on 'Alpha' and the robustness of these relationships has been tested over a wide area. [Note: basal area is a term employed by foresters and ecologists to highlight the competitiveness of woody plants, *inter alia*. It depicts the area of woody stem which covers the ground in a plant community and is usually expressed in m^2/ha units. As such it integrates both the size and number of stems present per unit area, to truly reflect the degree of plant competition expressed by the woody species].

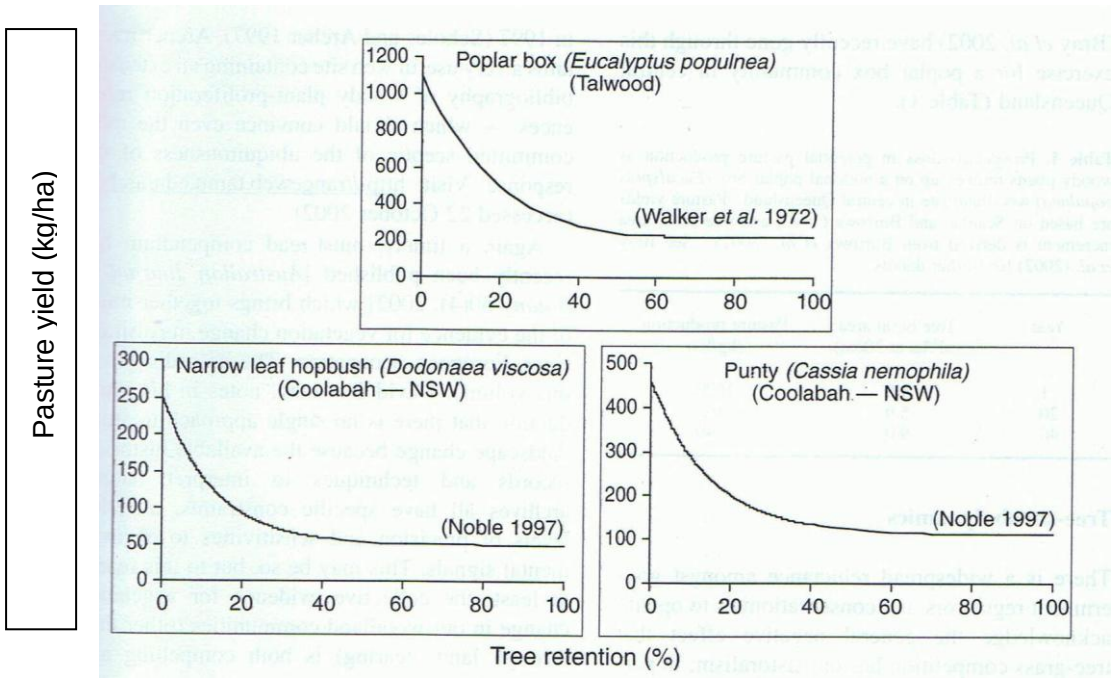


Tree – pasture relationships in mulga woodland



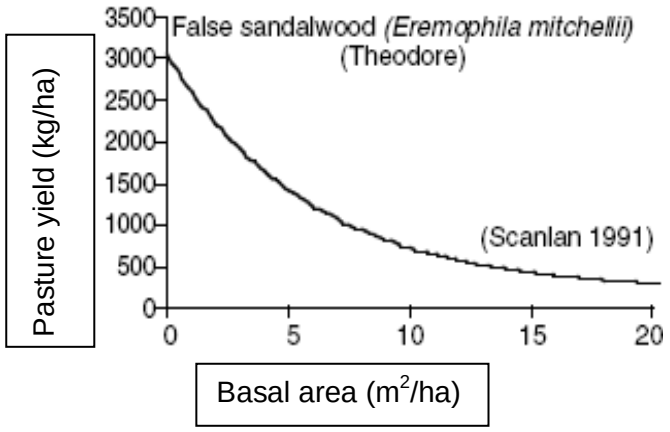


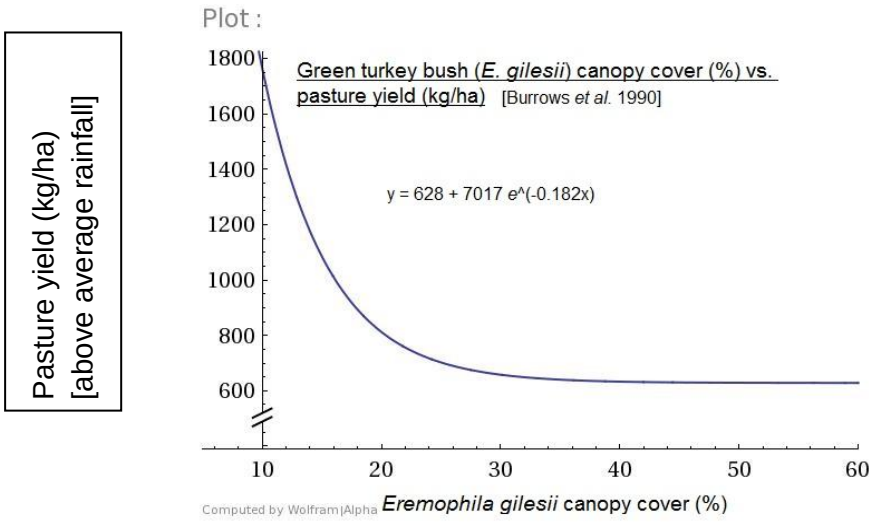
Three plots from the long term mulga thinning trial established at Boatman Station (c. 60 km east of 'Alpha') in 1963-64 (See Beale 1973). The photos depict the marked decrease in pasture production and herbage biomass as tree density increases - in line with the negative exponential relationship shown on the previous page.



An alternative measure of the competitive effects of trees and shrubs with the understorey pasture is to gauge this in terms of the % of trees or shrubs retained on a plot. Again there is a strong negative exponential relationship exhibited for these widespread woody plants (above), which are also common to 'Alpha'.

The final two shrub- pasture competition curves presented are for false sandalwood and green turkey bush. Both these species have reached high population densities on 'Alpha' and seriously threaten the viability of the lease as a livestock grazing business. Even though the reference curve for false sandalwood was obtained from a site with a much higher rainfall than 'Alpha', and the green turkey bush curve was based on results obtained in an above average rainfall season, both responses exhibit the strong negative exponential pattern common to all woody species shown.





The most notable feature of all these tree/shrub – pasture relationship curves is that only a small increase in woody plant basal area (or canopy cover, or tree/shrub retention) rapidly lowers potential pasture production on the landscape. Therefore, the lessee's ability to maintain the productivity of his pastures under these conditions is greatly compromised. This point is emphasized when the pasture is being encroached upon by native trees or shrubs, or such woody species are quickly re-establishing themselves on previously cleared areas. 'Alpha' itself provides good examples of this:

An area on 'Alpha', cleared in 2007, showing rapid regeneration of trees and woody shrubs in March 2013.

Another March 2013 view of a cleared area on 'Alpha', demonstrating the rapid recovery of mulga and understorey shrubs, after the 2007-09 clearing event. Once established, woody plant seedlings/saplings (> 2 years old) will generally continue to grow out and complete their life cycle, unless subject to re-clearing. Fire rarely kills established woody plants in semi arid/arid environments (e.g. 'Alpha') unless fuel to carry fire can build-up close to the stems of fire susceptible species[2].

Other data suggest that the cost of tree/shrub thinning on grazing land would need to be recouped quickly, before woody plant basal area or canopy cover once again strongly suppressed the productive potential of understorey pasture plants (Burrows 2002). For example, during the four year period 1966 – 1970 mulga thinned to 640 stems/ha at 'Boatman' increased its' mean basal area from c. 2.8 to 4.3 m^2/ha – an increase of 54% (Beale 1971). Likewise 160 stems/ha plots increased mean basal area from 0.8 to 1.83 m^2/ha – a 129% increase. Such a rapid recovery will strongly depress potential pasture yield in line with the response curves for mulga presented on p. 20. So whether the composition of the ground flora changes under different overstorey structures or not (see Fensham *et al*. 2012) it is clear that production potential will decline greatly as tree/shrub basal area rapidly recovers. Similar observations were made for poplar trees following thinning in a more favourable rainfall zone (Dingo, CQ) by Back *et al*. (2009).

The structure and composition of the vegetation will also influence soil moisture relationships in these land systems. In an analogous study to that undertaken by Beale (1971), Pressland (1976) found that the difference between soil moisture used

[2] A notable success has been the use of fire to control invasive green turkey bush at Andrew and Kathy Schmidt's property 'Cairns', NW of Charleville.

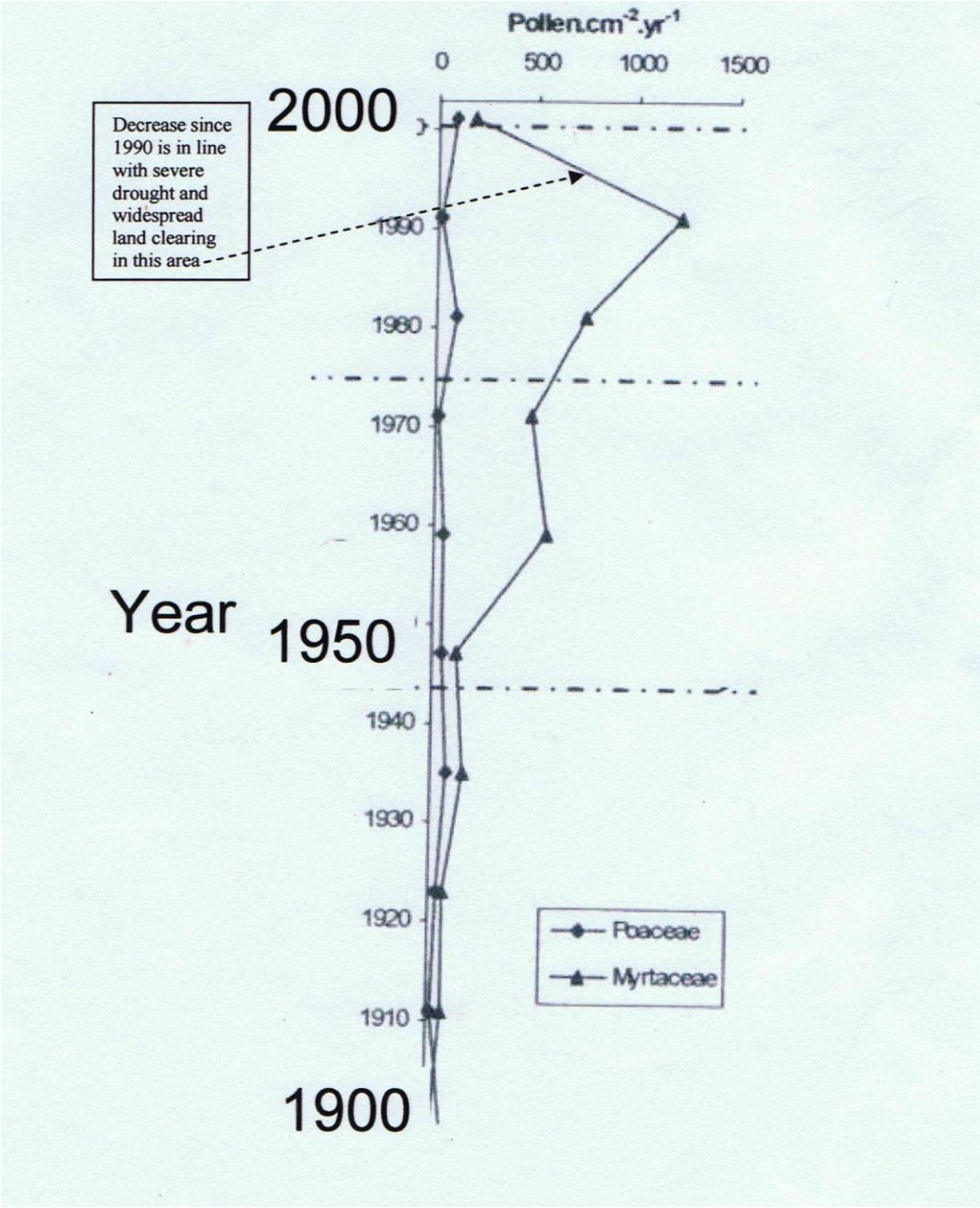
by 0 and 40 mulga trees/ha is sufficient to warrant the complete removal of trees on areas required for pasture production. He also noted that it was important to ensure that total clearing was not so extensive as to deplete the mulga reserve required for future drought fodder.

Glanville and Mills [1990] suggest that 50 per cent or more surface cover is required to markedly reduce runoff in the 'hard' mulga lands west of the Warrego river. Runoff is not a feature of the land surface on 'Alpha' because of its flat topography (<1-2% slope) and sandy red earth soils (kandosols). Nevertheless Miles and Granville [1990] found that on mulga lands grassed areas have the highest rainfall infiltration rates over all ranges of percentage vegetation cover. This was followed by turkey bush and mulga respectively. These authors concluded that grass cover appeared to encourage soil fauna which maintain soil macropores and consequently improve soil structure and infiltration.

It is unusual to speak of the native fauna in the mulga – box woodlands in terms of soil fauna. Yet no one would question the need to optimize water use in semi arid areas that are typified by the plant communities on 'Alpha'. A focus on the readily visible plants and fauna to the detriment of less obvious organisms, which have a key role in maintaining ecosystem processes, is therefore not necessarily good ecology. And if it is accompanied by a poor appreciation of the landscape and its structure and composition, dating back to pre-european management, this can lead to completely misleading conservation outcomes as well.

For example, Donald Franklin (1999) utilized reliable RAOU records, going back to the 1800's, to show that the marked decline in granivorous - grass seed eating - bird assemblages in Queensland's northern savannas, including the Desert Uplands, preceded any land clearing activity. However woodland thickening over a centennial time scale is well documented for this Desert Uplands environment in the State's central west (see p. 15 for relevant citations and p. 26 for the Lake Dunn 20th century record). Meanwhile, as previously demonstrated increasing tree/shrub cover severely depresses understorey grass production – especially on dry, infertile sites. In other words – more trees, less grass, fewer granivorous birds.

It is of particular interest that the Lake Dunn pollen record (pp. 15, 26) not only mirrors the woodland thickening that followed the commencement of livestock grazing, but it also captured (through the sharp decline in the presence of eucalypt family pollen from 1990) the widespread tree clearing that took place in the area after that time. [This was motivated by the demonstrable benefits for pastoralism and the widely anticipated and telegraphed clearing bans that culminated in the VMA 1999]. Now here's the rub. A 2009 IBRA report has noted a recent increase in grassland birds in this region "*possibly reflects the increase in cleared land*". *Ipso facto* **land clearing is helping to restore biodiversity values, lost as a consequence of past tree thickening.**



Increase in Myrtaceace (eucalypt) family pollen in Lake Dunn sediments, central west Queensland, over the past 100+ years (Sim *et al*. 2004). The grass (Poaceae) pollen remains relatively constant. This increase in woody plant pollen, especially since the 1950's corresponds well with other studies in this area (see text), as well as the encroachment of gidgee into Mitchell grasslands over similar timeframes. Decreases in Myrtaceae pollen since 1990 coincided with serious drought and the rapid expansion of tree clearing in this district (in anticipation of tree clearing bans).

Comments on Expert Opinions provided to the Court (Case ID No:3680 – 2009 Hindman)

1. Comments on a Report on Regional Ecosystem Map Assessment (Andrew Franks, Senior Botanist)

In making the following comments I accept all plant identifications provided in the above Report, as well as the final Regional Ecosystem (RE) descriptions as provided for the 'Alpha' holding by the Senior Botanist. However, in doing so it is noted:
Line 10[3]– that 'the remnant status and RE extent' across Lots 4 & 2 (as defined) 'prior to October 2006' [1] was
Line 13 - 'revised'-------'in August 2010' [2], and once again with
Line 19 - 'an additional revision of the RE mapping covering the lots in October 2011 [3].

In short, over the five year period, 2006 -11, the Senior Botanist indicates that certain RE's and mapping specific to the 'Alpha' holding may have had a different designation on three different occasions. The last iteration of this process seems to have led to the large RE 6.5.10 on Lot 4 being changed to RE 6.5.3 (see Lines 167 – 186) and Appendix E (p.33) of the Senior Botanist's report. This was apparently based on 2006 Landsat TM imagery (Line 197).

I was provided with a Regional Ecosystem and Remnant Map (Version 6.1), also based on 2006 Landsat TM imagery and centered on Lot on Plan: 4 P533, following a request to VMEnquiries@dnrm.qld.gov.au on 9 February 2013. An annotation on the map states – "All datasets are updated as they become available, to provide the most current information as of the date shown on this map". However this map clearly indicates that the area mapped as RE 6.5.3 by the Senior Botanist is once again mapped as 6.5.10! The RE classifiers are seemingly changing their minds faster than a child in a lolly shop. Of course none of this bodes well for the assessment and mapping of RE's in this region, given its critical role in classifying RE's as being 'Endangered', 'Of Concern' or 'Least Concern' as defined in the VMA 1999.

Line 37 – Table 1 lists all the aerial photography used in the assessment of remnant status and remnant extent on Lots 2 & 4. It is notable that the earliest image listed as accessed, was flown in 1969. Yet in my present report (p. 14) I provide an image of these lots that was flown in 1952. This begs the question – why were earlier runs ignored? Could it be that the 1952 image reveals that a completely different vegetation structure existed on the

[3] Line numbers refer to lines as numbered in the Franks report.

northern half of Lots 2&4, than can be deduced from the 2006-11 imagery? This open grassy woodland community (1952 imagery) also matched the description applied to Lot 4 by the Lands Department surveyors, prior to this block being taken up as a Grazing Farm in 1895.

Regional Ecosystem classification in Queensland is founded on the premise set out in "The Conservation Status of Queensland's Bioregional Ecosystems" (Sattler and Williams 1999). Remnants are classified on the basis of the percentage of the 'original' or pre-European' extent that remains today - (see p. 1/11 of Sattler and Williams). This is now changed to 'pre-clearing' extent in the VMA 1999. The dilemma confronting the classifiers is obvious – for 'Alpha' there is an admission in Court evidence that the RE classification has changed three times in just five years, combined with compelling imagery and initial survey records that strongly suggest the true RE status has still not been captured.

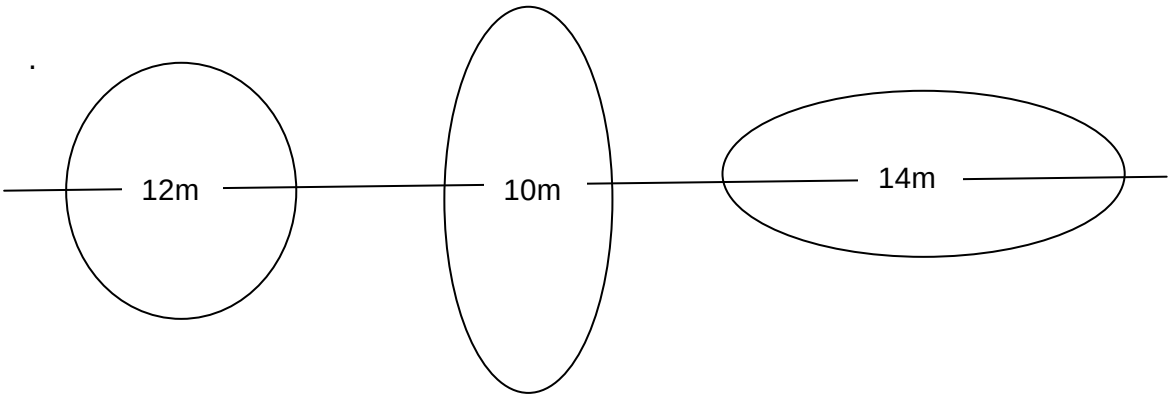
Line 50 – The Senior Botanist further acknowledges this predicament by stating that "the most appropriate images used to confirm remnant status and extent prior to October 2006, were chosen by the closest date available to October 2006! One would have to seriously question whether this was the intention of the framers of the VMA 1999? To put it kindly, in bushman's fencing parlance – fencers who line up their fence by looking backwards to the nearest preceding post, end up with a fence that goes around and around in circles.

Line 78 – The "line intercept transect" method of determining species composition and vegetation cover is a statistically questionable tool when used in woody vegetation surveys. For example,

Line 82 – "The remnant/non-remnant status of native vegetation on the Lots was determined by the existing predominant canopy recorded along a line intercept transect and compared with the normal or undisturbed state".

Consider the following possible intercepts of a single tree canopy, for trees of the same canopy area, but of varying canopy shape and alignment, as would be determined by line intercepts.

.



A circular canopy of 6m radius would give a 12 m intercept on the line. An ellipse shaped canopy (10m x 14 m) would provide the same canopy area, but give line intercepts of 10 or 14 m, depending on whether it was aligned along or at right angles to the intercept line. For a hypothetical 50 m line length this gives a potential canopy cover estimate ranging from 20 – 28%, or a +/- 16% error cf. a canopy that was perfectly circular. Obviously the number of trees intercepted (canopy edges 'projected' onto the line) using this methodology would determine the cumulative error that could ultimately arise.

Line 84 – It is noted that the "predominant canopy is defined as that layer of vegetation which contains the most above ground biomass".

Line 90 – States that "species composition" was recorded by the 'line intercept transect' (Line 88). This method is subject to the same errors as outlined above for the estimate of cover. The method cannot be used to accurately quantify species frequency.

Lines 100 -103 – This is no more than a wish list. There is no evidence that the Senior Botanist carried out all of this research.

Line 147 – 'Woody vegetation is mapped as remnant where the predominant canopy has:

- >50% of the predominant canopy cover that would exist if the vegetation community was undisturbed
- >70% of the height of the predominant canopy if the vegetation community was undisturbed; and is
- composed of the same floristic species that would exist if the vegetation community was undisturbed [the '50 – 70 –species rule']'

To avoid ambiguities I have copied the definition of remnant directly from the VMA 1999 Schedule p. 177, current as at 1 Feb 2013:

> ***remnant vegetation*** means vegetation, part of which forms the predominant canopy of the vegetation—
>
> (a) covering more than 50% of the undisturbed predominant canopy; and
>
> (b) averaging more than 70% of the vegetation's undisturbed height; and
>
> (c) composed of species characteristic of the vegetation's undisturbed predominant canopy.

Presumably these rules, as outlined above, governed the Senior Botanist's decision when he changed the existing RE classifications on 'Alpha' in August 2010, and once again in October 2011?

Lines 171 – 182 – This section establishes unequivocally that poplar box (*Eucalyptus populnea*) formed the undisturbed predominant canopy on all sites sampled in the reclassified RE 6.5.3 by the Senior Botanist during his field inspection of 'Alpha'; and for all reference and impact (disturbed) transects sites in all of the clearing areas sampled (Line 176).

Line 203 – "Remnant Status" – I found this section to be especially instructive. Consider Figure 2 (Line 221):

Inspection of the graph shows that the height of the predominant canopy for the 'cleared' or disturbed impact transects **exceeded** the height of the predominant canopy in the undisturbed, reference transects!

Further, while there is more "noise" in the predominant canopy cover data (Line 225) this has to be viewed within the perspective of potential measurement errors (see previous page), when estimating canopy cover using the line intercept method. The Senior Botanist indicated that the latter was his adopted field methodology.

In any event, as Line 235 states – "**All** transects assessed during my field surveys can be described as supporting the definition of remnant vegetation". Note that this comment applies to **both** the disturbed (cleared) transects and the undisturbed (uncleared) transects! What game is being played here? Trent Hindman has been convicted of illegal clearing, yet just two years after the last clearing event the assessing Senior Botanist has declared that both the cleared and uncleared portions of Lots 2 & 4 each support a description which would classify them as remnant vegetation !

"Yesterday upon the stair,

I saw a remnant that wasn't there,

It wasn't there again today

Oh, how I wish it'd go away."

[Apologies to William Hughes Mearns]

Now as I understand it Mr Hindman did not deny clearing the identified areas in 2007-9 without a legal permit. So for the Senior Botanist to state that the vegetation in both cleared and uncleared areas is equally supportive of it being characterised as remnant - within c. two years of the last clearing - suggests that either he is incompetent or, rather, the methodology/definition adopted by him is hopelessly inadequate or inappropriate to the task in hand.

Of course there is a third and final criterion which the VMA 1999 states must be satisfied to conclude that vegetation is remnant viz. that it is "composed of species characteristic of the vegetation's undisturbed, predominant canopy"

(VMA 1999 Schedule p. 177, current as at 1 Feb 2013). But since poplar box is defined by the Senior Botanist as *the* "undisturbed predominant canopy" one can only agree that, as he has applied the VMA 1999 concept, **both** the cleared and juxtaposed uncleared land on 'Alpha' were indeed in the remnant condition when the Senior Botanist inspected 'Alpha' in October 2011.

There is no mention made of cover in this third criterion for defining remnant vegetation, either in the VMA 1999 or in the Senior Botanist's interpretation of that criterion (see Line 147 comment above). Nevertheless the Senior Botanist introduces this measure as he applied it to sub-canopy layers in Line 237. However the fact that there was no canopy of these layers recorded along the impact (= disturbed) transects, does not indicate that species characteristic of the sub-canopy were not present in the disturbed RE's. Seedlings have no effective canopy. Moreover, photos (see following pages) of these areas taken only 18 months after the Senior Botanist's inspection/field sampling show widespread and vigorous sub-canopy/canopy species present over all the disturbed (cleared) sites.

In my experience of this semi-arid region's vegetation it is inconceivable, based on their current size, that the plants apparent in March 2013 were not also present in October 2011. One has to conclude that the reason he did not record these woody species as present, is simply because he used the wrong methodology to record the presence/absence (frequency %) of the sub-canopy layer. Furthermore the photos, taken of recovering vegetation on the cleared (disturbed) areas on 7 March 2013 (see over), are highly suggestive of vegetation that would also have been present when the Senior Botanist undertook his field sampling - October 2011. [Also see Photos on pp. 23-24]

Recovery of 'cleared' RE 6.5.3 with mulga and ironwood seedlings in the open, along with a cluster of *Senna* bushes beneath the box canopies [Looking in from northern boundary, Lot 4 'cleared' area] – 7 March 2013.

Another view of recovering ‘cleared’ RE 6.5.3 with a *Senna* and *Eremophila gilesii* shrub layer. Box and false sandalwood regrowth is also present. [centre of main ‘cleared’ area, Lot 4]. – 7 March 2013.

Widespread establishment of box tree seedlings, with green turkey bush and *Senna* bushes [RE 6.5.3, south access track, main ‘cleared’ area Lot 4]. – 7 March 2013.

Good establishment of understorey shrubs and emergent mulga and box trees in ‘northern’ ‘cleared’ area of Lot 2 [RE 6.5.3]. – 7 March 2013.

Massive regeneration of mulga, with box and green turkey bush in the south-west ‘cleared’ block, Lot 2 [RE 6.5.10]. – 7 March 2013.

Lastly, the Senior Botanist's Conclusions are especially germane. On Line 250 he acknowledges that he observed 'regrowth' – but apparently he just did not record these species in his line transect sampling, as it was set down on the 'disturbed' sites. This suggests that he may well have been biased in the way he sited or laid down his line transects. Rather, one is left with the distinct impression that the rapid recovery of the vegetation species mix and structure on the cleared/disturbed areas, certainly does not support contentions that the affected RE's were irredeemably damaged by the disturbance.

---

2. Comments on a Report of Environmental Impact Assessment – Vegetation and Flora Assessment (Andrew Franks, Senior Botanist)

Executive summary (p. 4) –

(i) The most notable comment is that all the RE's 'disturbed'[4] on 'Alpha' were classified as "Not of Concern". Given this assessment there is no evidence presented to substantiate the claim that this disturbance 'has had an adverse impact on RE's in the area and on native flora values associated with the property at the bioregional, subregional and local levels'.

(ii) The Senior Botanist lists the Not of Concern RE's affected by the disturbance. The total area disturbed is actually dominated by RE 6.5.3, with remaining Not of Concern RE's mainly impacted at the margins, each accounting for only small areas of disturbance.
All of the Senior Botanist's descriptions go on to list the percentage of the particular RE previously cleared. Whatever this figure is, it should have no bearing on any penalty imposed on Mr Hindman because the threatened status of any RE is, or can be, updated on a daily basis as I understand it, in line with the flux in 'pre-clearing extent' remaining i.e. 'previously cleared' is already factored into the nominated RE status so that listing the percentage of an RE 'previously cleared' is simply trying to apply an unwarranted level of gravitas – 'double dipping' if you like. In any event Mr Hindman is not responsible for any clearing that might have occurred outside of his GHPL, which most likely also occurred with the full knowledge/endorsement of the government of the day.

(iii) It is not a fault of Mr Hindman that any nominated RE is not in the protected area estate. The tenure of 'Alpha' is a GHPL. The purpose of the lease is for grazing and agriculture. Ministerial approval is required before the lease can be used for any other purpose. The fact that any particular RE is not in the protected area estate is a matter for the government, not a fault, if any, of a lessee.

(iv) Asserting that a particular RE is a potential habitat for rare and threatened flora species is pure speculation, especially when none is even listed to occur within many km of 'Alpha'. Rather the thoughtful ecologist would suggest that endemic organisms have had ample time to find and occupy their niche, during the long evolutionary history of this continent. If they have not occupied a certain space naturally by

[4] The Senior Botanist prefers to describe these areas as 'cleared' in this particular Report, but we need to remind ourselves that in his previous Report (discussed on pp 30-31 here) he described both the disturbed and undisturbed RS's sampled in October 2011 as supporting their classification as remnant vegetation. It simply defies common sense to ascribe the same RE (e.g. 6.5.3) area on 'Alpha' in one Report as "remnant" an in a separate Report as "cleared" – especially when the defining predominant canopy has remained 10-20 m tall and intact/untouched by Mr Hindman throughout the period of interest to the Court – and right up to the present day as well.

now, they are unlikely to do so, in the absence of human management intervention.

Habitat for threatened flora species (p.5) – This is another long bow. Conservationists are notoriously 'glass half full' people and the Senior Botanist is doing his best to fit that mould. It clearly disappoints him that there are no rare or threatened species on 'Alpha". He makes the motherhood statement that "the loss of habitat and other effects associated with clearing of native vegetation are known issues that relate to the survival of species in the region" – but provides no supporting citations and lists no species specific to 'Alpha'. Meanwhile he studiously ignores the fact that green turkey bush (*Eremophila gilesii*), false sandalwood (*E. mitchellii*) and butter bushes (*Senna* spp.) have become serious woody weeds encroaching into most of the understorey habitats on 'Alpha' over the past 50 years or so (Don Moody[5], *pers comm.* 7 March 2013). Further evidence of this switch was provided by the 1952 aerial photo and initial 1895 property survey report for Lot 4. [Also see earlier reference citations in the present Report].

Ignoring the ingress of invasive native shrub species (woody weeds) into open savanna woodland habitats (such as was clearly evident on 'Alpha' in the first 50-60 years of its operation as a grazing farm or GHPL), is tantamount to believing that the grasses and other herbaceous plants in our grazed woodlands have no relevance to conservation. This is nonsensical. Mr Hindman readily admitted that what he had done was unlawful. But the Court needs to be equally mindful that the Senior Botanist has described both the uncleared and cleared areas as still fitting the definition of "remnant" (Schedule of the VMA 1999), when he assessed these areas in 2011.

So it can be reasonably argued that, by disturbing the invasive native shrubs, while still retaining all the predominant canopy cover (box) trees, Mr Hindman was doing more for vegetation/flora conservation than leaving the RE in its undisturbed state. His actions[6] might have been presently illegal, but they were an attempt to restore the vegetation and especially its ground layer, to what he believed to be its 'pristine' state - rather than a community more and more engulfed by woody weeds.

[5] As earlier advised Don Moody was a station hand/manager on 'Alpha' from 1956 to 1971. He is also a person who has engaged in on-property work in the Wyandra- Charleville 'mulga country' all his working life. His family knowledge of this district goes back to the early 1900's

[6] See Reference citations (p. 52), as well asmy personal publication list (Appendix 2) for a catalogue of published studies (largely government funded) setting out methods for controlling invasive native shrubs in SW Queensland.

It is sad that a Senior Botanist seeks to make childish statements such that sub-regions are the 51st or 67th most cleared of Queensland's sub-regions. Mr Hindman is solely responsible for the management of 'Alpha' and he should be principally judged on that. Foremost amongst those responsibilities are to only use the GHPL for the purpose under which the original lease was issued by the Crown, and to remain cognisant of his Duty of Care in managing the lease according to the Land Act 1994. I have seen no evidence that Mr Hindman has been bereft in his Duty of Care as set out in that Act.

Finally the Senior Botanist is adept in the use of throwaway lines in the hope of impressing the less informed. He employs broad generalities in an attempt to compound Mr Hindman's guilt. (which include the heinous crime of "a range of other effects" (last sentence p.6 of his Report). This is why I devoted the initial section of the present Report to try to give the Court a broad understanding of the dynamics of grazed woodlands in eastern Australia; highlighting wherever possible examples from 'Alpha' itself, and/or from nearby properties with analogous landscapes and vegetation communities. If I was successful in this endeavour the Court should well understand that there is a strong tendency for tree/shrub populations to be increasing ("thickening") in our intact grazed woodlands.

These factors certainly contribute to habitat loss (and reduced pasture production), but not in the manner that the Senior Botanist wants to depict it. And native (woody) weed invasion can be just as problematic for grazing leases as certain exotic shrubs and herbaceous weeds can be. Landscape fragmentation is equally a value dependent on the eye of the beholder e.g. Granivorous (grass seed eating) birds prefer well maintained pasture communities on 'Alpha', while many insectivorous (insect eating) birds prefer a closed woodland habitat.

'Alpha' is located on very flat terrain with limited external drainage. Potential soil loss is not a concern. Woody plants are certainly better at cycling scarce nutrients on infertile soils such as those on 'Alpha'. But all this does is make them more successful at competing with the underlying pasture for growing space, by outcompeting the herbaceous layer for that even more scarce commodity – soil moisture. Yes, in the absence of fire and imposed management the woody plants must inevitably win, as first became apparent with the NSW Royal Commission (1901). But claiming that clearing 'exacerbates' conservation in this environment is more hyperbole than fact.

The Senior Botanist's final claim, that removal of the invading woody shrubs and other woody understorey plants in this environment will

lead to increased greenhouse gas emissions, is not supported by any factual evidence. Quantifying the carbon cycle requires knowledge of carbon fluxes below, as well as above ground. I have considerable research experience in this subject area and am not aware of any study that accurately measures below ground carbon fluxes over a paddock scale in semi arid regions such as 'Alpha'. An indication of above ground carbon flux changes is given in the height growth spurt which the predominant canopy cover box trees registered in the disturbed cf. undisturbed sites (see Fig 2, p. 16 of the RE Map Assessment Report). This strongly suggests that, after ground layer disturbance, the predominant canopy trees were acting as a larger carbon sink than their 'undisturbed' counterparts. [Tree biomass is c. 50% carbon].

Flora Values (p.12) -

It is especially noteworthy that **no** species listed under either State or Commonwealth Conservation Acts "are known or predicted to occur within 20 km of the Lot on Plan in question". Likewise there are "no records of threatened flora species".

But these inconvenient facts do not deter the Senior Botanist. So he implies that if we look hard enough we will surely find a threatened species – somewhere? [Actually he points out that no systematic flora surveys were carried out to determine whether threatened species were present, either prior to or after the unlawful clearing event. This simply begs the question about the accuracy of the description of all plants present in the areas cleared/disturbed, because of this lack of any pre-clearing survey records].

Impacts of Vegetation Clearing on RE's and Flora Values (p. 13)

It needs to be reiterated here that 'Alpha' is a Grazing Homestead Perpetual Lease, set aside by the Queensland Government for the Purpose of (domestic livestock) grazing and agriculture. The Government also sets out the lessee's Duty of Care to the lease through the Land Act 1994.

The Senior Botanist devotes the first page of this section to providing a litany of responses that might result in undesirable outcomes if land is cleared of woody vegetation. A text on land and soil catastrophes, from the viewpoint of a 'green' pessimist, if you like. He concludes "that all of the (above) issues relate directly to the unlawful clearing carried out on the Lots in question here, and directly contribute to the environmental problems caused by land clearing". However he fails to identify any of these theoretical disasters as actually occurring on

'Alpha'! One is left with the distinct impression that the Senior Botanist's aim in compiling his list was to simply impress upon the Court his personal view that anything that could go wrong, would go wrong. And he was successful – as the Magistrate noted (p.5 of his Decision) that "clearing of the land has had an adverse ecological impact which I have referred to above". This data free statement based on the Senior Botanist's litany is simply destroyed by re-visiting the land in question in 2013.

Amongst his list of "serious issues that have been related to vegetation clearing and its effect on vegetation communities" is the introduction of exotic plant and animal species. This statement, more than any other, epitomises the attitude of rabid conservationists to the management of our rangelands. In the case of 'Alpha' there seems to be no concept that the land in question is a GHPL. There is no concept that cattle and/or sheep raising is the only possible viable enterprise that the lessee could engage in - an enterprise that matches the potential of the land and the Purpose of the lease set out by the government (land owner). There appears to be no concept that cattle and sheep are exotic animal species.

It goes further than that. The Senior Botanist is the author of a paper (Franks 2002) that attempts to demonise buffel grass, which is the most widespread, productive and drought tolerant exotic pasture grass planted in Queensland. This grass has been so successful that Hannah and Thurgate (2001) claim that it was now naturalised over 30-50 m ha. There is a huge potential available to increase the pastoral production of 'Alpha' by sowing buffel grass under box tree canopies (see Christie 1975). But in his paper the Senior Botanist states that "there is a need for realistic strategies to be implemented to control Buffel Grass expansion, protect remnant native vegetation and to assist in the off-reserve (i.e. pastoral land) management of endangered flora and fauna across Queensland".

This attitude appears to have been conveyed to the Magistrate during the course of Hindman's trial. In his decision the Magistrate noted that "Mr Hindman agreed that he did plant buffel grass which is not a native grass" and further on he again states "Mr Hindman planted buffel grass which is an introduced (exotic) species". For the benefit of the Court I should point out that buffel grass is **not** a Declared Plant in any State or Territory in Australia. It is **not** illegal to plant this species on grazing land and it has been in this country for well over 100 years and continues to be a highly recommended species for the State's pastoral areas. Along with colleagues in QDPI (now DAFF) I was personally involved in the evaluation of 300+ buffel grass accessions in the

1970's. In my opinion it is preposterous that a Magistrate should allude to the planting of buffel grass as being undesirable on a GHPL, in reaching a Decision on a penalty attributable to a clearing offence.

Not of Concern Regional Ecosystems – I have canvassed most of the issues raised here in my comments on the Executive Summary. However a brief comment on the effect of Mr Hindman's clearing on the remaining extent of these Not of Concern RE's in existence seems warranted. The proportion of the eight existing RE's cleared (or 'disturbed') by Mr Hindman's activities are listed as 0.02, 0.002, 0.02, 0.006, 0.56, 0.07, 0.03 and 0.003 % respectively. One should congratulate the Aerial Photo Interpretation staff on their precision, (tempered by the knowledge that the Senior Botanist has reclassified the largest RE area (1117.89 ha) cleared/disturbed by Mr Hindman at least 2-3 times). In other words, the proportion of the RE's still remaining after Mr Hindman's efforts ranged from 99.008 to 99.44%.

Please note these comments are not an attempt to condone Mr Hindman's unlawful activities, but rather to place them in true perspective. The environmental consequences that the Senior Botanist attributes to Mr Hindman are no more than sweeping platitudes, with no documented effect on 'Alpha' itself. Unfortunately the Magistrate seems to have accepted the Senior Botanist's opinions at face value, and to the ultimate great cost of Mr Hindman.

Flora Values – The Senior Botanist is again in speculative mood. He seems disappointed that there are no known threatened flora species on 'Alpha', but seems to imply that if he was able to look hard and long enough he might find one. One thing I believe the Senior Botanist can be assured of, is that all the perceived habitat losses that he spoke about following his 2011 inspection are well on the road to full recovery on 'Alpha' in 2013. In particular, claims that the removal of the majority understorey and shrub layer simplified the structure of the vegetation would once again be allayed by a quick site visit.

In truth, the Senior Botanist and the Court, which appeared to base the size of the penalty imposed for environmental consequences on the former's evidence, both need a reality check. And so does Mr Hindman for that matter. Mr Hindman's unlawful activities did not destroy the "understorey and shrub-layer native vegetation", it has actually stimulated it and enhanced it. The sad thing is that Mr Hindman has gone to considerable expense and not raised the mid-term livestock carrying capacity of his land, which was his fervent hope. The dumb thing is that the Senior Botanist and his like minded colleagues have no appreciation of the dynamics of the tree-shrub-

grass layer in this environment. They are not protecting the original native organisms and ecosystems on these grazing lands, but destroying them by fostering the ascendancy of woody plants at the expense of the herbaceous layer. The pattern was well described in the Royal Commission (1901). It ought to be compulsory reading for all those trying to restructure our SW Queensland pastoral lands right up to the present day. If this is too much (what would our great grandfathers/grandfathers know of the history of the box-mulga lands?), Jim Noble's (1997) "The Delicate and Noxious Scrub" provides a readily available and possibly more readable alternative.

Above and below are more examples of the shrub and sub-canopy layer "**Bounce Back"** on 'Alpha'.(also see pp.23-24, 32-34). Box seedling swarms also prominent – 7 March 2013.

Well recovered *Senna* and green turkey bush shrubland – ‘Alpha’ clearing - 7 March 2013

Rapidly recovering mulga overstorey with an understorey of green turkey bush in mid-background – ‘Alpha’ clearing – 7 March 2013. For all these images (and those on previous pages) take special note of the flatness of the land and lack of any signs of erosion.

3. **Comments on Environmental Impact Report – Biodiversity (Geoff Lundie- Jenkins and Clare Davies, Resource Assessment & Information Unit [RAIU])**

Any reviewer of this Report would raise a '**Beware!**' flag as early as the second sentence of the Executive Summary, which announces that the Report is based on a desktop assessment. One of the consistent features of RE classifications has been their propensity for reclassification once a suitably qualified person actually makes a ground inspection. The Senior Botanist exemplified this by his desktop to desktop to field inspection to desktop changes of RE 6.5.3/6.5.10 on 'Alpha' (see p. 27of this present Report). On page 14 of his Vegetation and Flora Assessment Report the latter identified eight different remnant RE's that were cleared. However, in this Biodiversity Report (p.5) the RAIU staff nominated only six remnant RE's as occurring in the clearing zone. Further they identified one RE (6.5.7) which was not included in the Senior Botanist's list, while the Senior Botanist included three RE's (6.3.12; 6.3.11b; 6.3.18) that the RAIU staff presumably either disagreed with, or apparently did not recognise!

One arm of government was clearly not communicating, or was communicating very poorly, with another arm of government, when both were providing Expert witness Reports concerning the identical area of ground on 'Alpha'!. One can only conclude that Regional Ecosystem assessments were applied inconsistently by all the parties charged with providing evidence of environmental impacts – from the 2007- 09 disturbance event on the lease.

This raises interesting questions. Were the various government agencies cherry picking RE's (ascribed to the various disturbed areas), based on how those chosen or nominated as being affected by the disturbance event best fitted their particular argument, centred on either a flora or fauna perspective? There is no evidence that the Magistrate recognised this inconsistency or took it into account when determining Mr Hindman's penalty. The whole point of RE status classification is to help achieve better management outcomes. Yet separate government agencies have clearly presented to the Magistrate's Court different classifications for the same areas of land on 'Alpha'. Had he been aware of this "status fluctatus" would the Magistrate's penalty have been far less severe? I certainly think so.

Further evidence of confusion lies with the RAIU staff stating on p.4 of their Report that the land in question is freehold, when it is actually a GHPL. This may appear to be of no particular moment to the bureaucrats, but it is highly significant to the lessee as his landlord (the Crown) requires him to use the Lease for the sole Purpose of grazing and agriculture. Further, under his Duty of Care (Land Act 1994) he is to "maintain pastures dominated by perennial

and productive species". [Note that this stricture does not exclude the use of introduced pastures such as buffel grass]. Pastures in this region are not productive – far from it - when they are forced to compete with vigorous and thickening overstorey, sub-canopy or dense shrub layer woody plants (see tree/shrub – pasture yield curves on pp. 20 - 23 of the present Report).

It is of special note that the RAIU staff point out (p. 4) that during the second 'clearing'[7] episode in 2009, "at least 365 ha of the area cleared during the first clearing episode, was re-cleared". In other words, regrowth of the vegetation disturbed in 2007 was sufficient to warrant re-clearing in 2009 (i.e. within 2 years). This resilience in the vegetation does not indicate it is removed or lost from the area by the simple action of a one or two pass ground disturbance. This resilience is further emphasized by the photos taken of the 'cleared' areas on 7 March 2013, and highlighted elsewhere in the present Report.

Inspections, examinations or experiments relied upon – It is noted in the first sentence (p.7) that "this report (only) assesses the **possible** (my emphasis) environmental impacts associated with the clearing of regional ecosystems on Lot 4 on Plan P533 and Lot 2 on Plan P5353". One may well ask when does a possibility morph into speculation or conjecture? And is this a sound basis for determining a penalty?

The RAIU staff caution is further highlighted by Para 3 on p.8 of their Report. Here they conclude by stating that "database records have been used to only indicate the species that **may** (my emphasis) have been affected by illegal clearing".

Analysis of the potential impacts on Regional Ecosystems and their associated values.

RE 6.5.3 - The net area cleared in 2007/09 is discussed as Cleared Area A and B. It is stated that a total area of 0.4 ha (0.03% of this RE 6.5.3) was removed. On the other hand, on p. 15 of the Senior Botanist's Vegetation and Flora Report it is stated that 1117.89 ha of RE 6.5.3 was cleared. The government agencies charged with providing Expert advice to the Magistrate's Court were obviously at sixes and sevens! Are either one or both of the Agencies credible when it comes to RE assessment?

[7] See Footnote 4 p. 35

Analysis of the potential impacts on terrestrial environmental values according to the Biodiversity Planning Assessment

Cleared Area A:

The total area listed in Cleared Area A (2007 event) = **675.7** ha (see Table p. 5 of the RAIU Report). Of this:

636.6 ha was of State significance
671 ha was rated Very High for context and connection
625 ha was rated Very High for relative RE size
671 ha was rated as High for tract size
39.8 ha was rated High for ecosystem diversity
6.1 ha was given State significance for expert panel criteria
39.8 ha was given Regional significance

Total = **2018.3** ha

In summary, the RAIU staff have (intentionally or not) double or triple counted areas on the same cleared block and this gives the false impression that Mr Hindman caused much more environmental harm (challengeable in its own right) than he actually did. If this had the effect of influencing the Magistrate's opinion on penalty, it would appear to have been quite misleading.

Cleared Area B:

The same double /triple dipping is evident in the Cleared Area B analysis.

Cleared Areas A and B:

The same double/triple dipping is evident in the combined Cleared Area A and B analysis. However this double/triple accounting is further exacerbated by the initial double/triple accounting of A, being superimposed on the initial double/triple accounting of B.

In summary, one is left with the distinct impression that the RAIU staff are trying to make a mountain out of a molehill! Why?

Analysis of the potential impacts on threatened and priority fauna and flora species and their habitats

The first two sentences of this section need highlighting:

"No records of protected native wildlife species either on, or within 4km of the property were detected from a search of the WildNet database. **No** areas identified as threatened species' habitat were identified on the property."

The disappointment in the paragraph that followed the preceding statement is palpable. [The same disappointment that was evident in the Senior Botanist's admission that there were no known threatened species on 'Alpha']. However this failure to discover protected wildlife, or threatened species habitat is not going to deter the RAIU team – they will instead "**infer"** the presence of native flora and fauna**!!**

Frankly, is this last statement a joke? Perhaps the words of former US Defence Secretary, Donald Rumsfeld, could help out - "There's another way to phrase that and that is that the absence of evidence is not the evidence of absence. It is basically saying the same thing in a different way. Simply because you do not have evidence that something does exist does not mean that you have evidence that it doesn't exist."

Analysis of the potential impacts on aquatic environmental values

I must admit to being flabbergasted by this biodiversity Report. It amazed me that the Report writers were prepared to put their name to this Report without actually inspecting the property. The perils of desk based assessment are becoming more and more obvious to anyone with local knowledge. Yet an enormous fine has been imposed on Mr Hindman, not only for his admitted unlawful 'clearing', but seemingly for environmental damage, real and imagined, or even 'inferred' based on desk top assessments, *inter alia,* by the Senior Botanist and his RAIU colleagues.

For those who know and live in the area, 'Alpha' is part of the western Neebine country. This area is well known as a large zone of internal drainage. So while the RAIU team can truly say that this zone is contained within part of the Condamine-Culgoa catchment of the MDB, very little water actually leaves the area in creek or river channels.

No one who actually knew the country or had actually visited 'Alpha' would make the risible statement that "a number of **canals** run through the property"! The implication presumably being that such would support an aquatic biota. Did the Magistrate attach any credibility to the evidence put forward by the RAIU team? [Incidentally the bore on 'Alpha' has been capped and piped under the Artesian Basin rehabilitation scheme. Because the now old drains were in existence for around 90 years they have left a vegetation trace, obviously discernible on a desktop image. In defence of the RAIU staff 19th century astronomers thought there were canals on Mars also].

The palustrine "waterbodies" detected by the desktop assessment are also a stretch. Seasonally inundated claypans (when it rains) – part of the internal drainage mentioned above – would be a more descriptive term understood by local landholders. Removal of woody vegetation in surrounding areas would enhance ground water recharge, if anything, and is thus likely to have a

beneficial impact on species utilising these sites. The comments by the RAIU team appear to be implying a detrimental effect.

Summary of the potential impacts of the vegetation clearing

As I have covered the issues summarised in this Biodiversity Report already, I will only add brief comments.

It is very misleading to claim that the "values associated with a particular RE have been lost as a consequence of the clearing activity". I have presented ample evidence of good recovery, by March 2013, of RE's disturbed by the 2007-09 actions of Mr Hindman.

This resilience would have been less obvious at the time of Court proceedings in 2011, but any ecologist with sound local knowledge would have known even then that recovery was inevitable and would probably be rapid (it was). 'Lost' is a good emotive term, but 'disturbed' would have been far more appropriate.

I again point out that the method of multi-counting of the same areas by superimposing them with a range of biodiversity values is, in my view, nothing more than a veiled attempt to add unwarranted gravitas and magnification to Mr Hindman's actions.

"No actual threatened species have been recorded in the cleared areas". It says it all really. The driving plant and fauna habitat in this environment is the poplar box tree. It is the predominant canopy tree and because of its longevity and deep rootedness creates a distinctive 'island of fertility' below its canopy (see Christie 1975). Mr Hindman purposely retained **all** of the box trees in all areas affected by his disturbance activities. As a consequence the Senior Botanist found from his field recordings on 'Alpha' in October 2011 that the box trees in the disturbed areas had grown taller than the box trees in the undisturbed areas (see p.16 of his Map Assessment Report). Given the key role of box trees in these ecosystems this is hardly a signal of biodiversity destruction.

The RAIU staff seem especially upset that a small area of a Spinifex community was cleared. During my 7- 8 March field inspections on 'Alpha' it was apparent that this area had been disturbed (lightning fire?), but was not cleared by mechanical means. Is this another interpretation error resulting from desktop assessment via aerial photography?

Calling parts of the cleared remnant a 'floodplain community' is also a considerable stretch. No doubt it conjures up more emotive images than the locally descriptive - claypan. The implication that the affected area is subject to "floods of varying duration and intensity, so rating high as a wildlife refuge"

is simply nonsensical. How does one determine whether the Magistrate was influenced by silly statements such as this? It is brought about simply because the boffins made their assessment by desktop. One would have to seriously question the admissibility of such evidence, when is not backed up by field inspection.

Conclusion

The authors have listed what are, in their opinion, undesirable consequences for native fauna and flora as a result of Mr Hindman's activities. They fail to acknowledge the strong evidence for vegetation thickening and the ingress of invasive native shrubs into these communities and especially on 'Alpha' itself. This change in vegetation community structure over the past 50 – 60 years is backed up by the aerial photographic record and by the personal recollections of Don Moody, who was a station hand/manager on 'Alpha' from 1955 – 1971 (see p.14 of the present report).

What Mr Hindman did, whether intentional or not, was to temporarily reconstruct his vegetation communities to a structure more closely aligned with the 1895 surveyor's description. In doing so he set up conditions favourable to flora and fauna present on the property at that time. In my view this is a positive conservation outcome commonly ignored by today's biologists and the framers of the VMA 1999, who seem to only "see" what is here now, while displaying little perception of what was here then.

Nevertheless it can be confidently asserted that Mr Hindman was spectacularly unsuccessful in his endeavours. The woody vegetation disturbed is well on its way to full recovery to its pre-clearing condition. Associated flora and fauna on the disturbed areas may have been displaced or killed in the initial process. But the affected RE's will be indistinguishable from their undisturbed counterparts in 10 years time, along with all the organisms that help define them.

General Discussion/Conclusions

Trent Hindman was fined for unlawfully clearing woody understorey and sub-canopy vegetation from his Grazing Homestead Perpetual Lease (GHPL) holding, 'Alpha', Wyandra. It is noteworthy that he has subsequently been issued with a thinning permit to remove a similar layer of woody plants on an adjacent 'undisturbed' area of this holding.

The Purpose of his GHPL, as set out in his lease documentation, is for grazing and agriculture. In exercising the Purpose of the Lease the lessee has to be mindful of his Duty of Care. Amongst the standard provisions listed in the Land Act 1994 is a requirement to maintain pastures dominated by perennial and productive species.

Considerable research has now been carried out on the ecology and productivity of grazed woodland communities in Queensland. These mostly reveal that a pronounced increase in the cover of trees and shrubs has occurred in the 'intact' (uncleared) communities since domestic livestock grazing first commenced. The research also shows that there is a consistently strong negative exponential relationship between woody plant cover/stem basal area/plant density and potential pasture production. In other words the presence of only a few woody plants per hectare can markedly depress pasture productivity.

When he acquired 'Alpha' Mr Hindman was new to this district. So he sought out the advice of many locals who had known this pastoral area for a great many years. He was especially fortunate to locate Don Moody, a semi-retired pastoral worker who had been employed on 'Alpha' from 1955-1971 and whose family had a long history in the district. Mr Hindman was astounded to learn that "Alpha' had only a minor population of understorey shrubs present in the 1950's – 60's when Moody worked the property.

During the latter period the holding consistently supported c. 7000 dry sheep equivalents. Today the property is judged to only be capable of carrying a third to half that number of equivalent stock, depending on seasonal conditions. Mustering is also made difficult by the increasingly thick timber and shrub layer. The decline in stock carrying capacity has undoubtedly been brought about by the rapid ingress of unpalatable woody shrub species. – substantially reducing potential pasture productivity on 'Alpha'.

Mr Hindman obtained the first Lands Department survey records when Lot 4 was to be opened up as a 'grazing farm' lease in 1895. (The adjacent Lot 2 remained Vacant Crown land). He noted that the northern half of the block was described on the survey as an open grassy box tree woodland. Subsequent examination of a 1952 aerial photo confirmed that impression. So in Mr Hindman's eye removing the

understorey invasive shrubs from his pasture would help to restore the original condition of the land and enhance his Duty of Care to it. I completely agree with this assessment.

However Mr Hindman then proceeded to remove the invasive shrub layer from areas on his holding without first obtaining a permit to do so. Therefore he was charged with unlawful clearing under the relevant laws and policies operating at the time. This charge was supported by expert opinion submitted to the Court to assist it in its deliberations.

Perusal of these opinions has revealed some astounding conclusions. Firstly, poplar box trees were identified as being the predominant undisturbed canopy species, as set out in the Schedule of the VMA 1999. Secondly, Mr Hindman did not remove any of these box trees from either 'disturbed' or 'undisturbed' areas on the property. [His activities were aimed primarily at removing the much thickened understorey shrub layer]. The import of this was profound. In the opinion of the Senior Botanist the vegetation on both 'disturbed' and 'undisturbed' sites continued to support the VMA 1999 definition of each being remnant vegetation – even after the clearing event!

The experts providing Reports to the Magistrate's Court were employees of the same State Government Department, although from different sections within it. Nevertheless it is obvious from the combined Reports that there was no consistency in the classification/number of Regional Ecosystems said to have been on the disturbed land on 'Alpha'. Further, during the time he was preparing the Report the Senior Botanist appears to have changed his RE classification of the principal area 'disturbed' at least three times.

Both vegetation and biodiversity experts gave the distinct impression that they were very disappointed that they could not identify any at risk or threatened flora/fauna on 'Alpha'. This did not deter them however and they both pointedly implied that if they had the time to look hard enough they ought to be able to find one or two. The biodiversity experts were even prepared to "infer" the existence of threatened species, if they could not find any. This is understandable in a way since these experts completed their synthesis and Report via a desktop analysis in Toowoomba. There is no indication that they visited the property. This led to conclusions that there were "canals" on the 'Alpha' and it was also implied that a low lying ("claypan") area was subject to "floods of varying duration and intensity, so rating high as a wildlife refuge". The Magistrate should have dismissed their Report out of hand.

In fact the methodologies employed in all these series of Reports are quite questionable. This seriously detracts from all claims of environmental harm that were alleged to have resulted from Mr Hindman's actions.

It is now 16 months since the Magistrate handed down his decision. I inspected 'Alpha' on 7-8 March 2013 as part of the process of preparing the present Report. A large number of photographs were taken of the areas disturbed by Mr Hindman, many of them included in this current document. They all attest to the rapid recovery occurring in the vegetation. Portents of vegetation armaggedon advanced by the vegetation and biodiversity expert Reports would seem to be completely unfounded.

In my opinion there will be little evidence of this clearing episode within 5-10 years, depending on seasonal conditions. One could say that Mr Hindman's attempts to reconstruct his understorey vegetation to a composition and structure that was more in keeping with that prevailing when his Lots were first surveyed, and as apparently existed in the 1950's, has been a spectacular failure. But this is not to say that Mr Hindman did any environmental harm. Rather to his chagrin he has actually stimulated the woody population he was trying to remove because he merely altered its age structure. His aim to enhance his ability to meet the Purpose of the Lease and to satisfy his Duty of Care to it, have proved equally frustrating.

I would urge Mr Hindman to not give up. By not removing the poplar box trees during his 'clearing' Mr Hindman was unknowingly at one with the Senior Botanist, who identified these trees as being the predominant undisturbed canopy. In other words poplar box trees drive ecosystem processes in these systems. Ebersohn and Lucas (1965) and Ted Christie (1975) recognised this fact when they described the "islands of fertility" under the box tree canopies.

Presently these islands of fertility have been largely 'captured' by invasive, unpalatable woody shrubs. Mr Hindman will be doing the right thing by his grazing enterprise and the environment if he gets a future permit to remove these invasive native plants from all these box tree drip ring habitats. If this eventuates I would highly recommend that he plants buffel grass in this zone also. For as Christie (1975) pointed out box tree drip rings accounting for just 7% of a paddock area, can contribute 20+% to pasture productivity in this semi arid environment.

Above all else I would advise Mr Hindman to ignore the Magistrate's silly implied suggestion that buffel grass should not be planted on 'Alpha', because it is an introduced species. If such an ill informed attitude influenced the penalty imposed on Mr Hindman, I believe a great injustice may have been done to him.

References

Back, P.V., Anderson, E.R., Burrows, W.H., Kennedy, M.J.J. and Carter, J.O. (1997). TRAPS – Transect recording and processing system (Manual and software package) (QPDI: Rockhampton)

Back, P.V., Burrows, W.H. and Hoffmann, M.B. (1999). TRAPS: A method for monitoring the dynamics of trees and shrubs in rangelands. Proc. VI International Rangeland Congress, Townsville. Pp. 742-744.

Back, P.V., Anderson, E.R., Burrows, W.H. and Playford, C. (2009a) Woody plant responses to various clearing strategies imposed on a poplar box (*Eucalyptus populnea*) community at Dingo in central Queensland.*Tropical Grasslands* **43**: 37-52.

Back, P.V., Anderson, E.R., Burrows, W.H. and Playford, C. (2009b) Research note: Poplar box (*Eucalyptus populnea*) growth rates in thinned and intact woodlands in central Queensland. *Tropical Grasslands* **43**: 188-190.

Beale, I. F. (1971) The productivity of two mulga (*Acacia aneura* F. Muell.) communities after thinning insouth west Queensland. M. Agr. Sc. Thesis, U. of Q.

Beale, I F. (1973) Tree density effects on yields of herbage and tree components in south west Queensland mulga (*Acacia aneura* F. Muell.) scrub. *Tropical Grasslands* **7**: 135-142.

Blainey, G. (1982) Triumph of the Nomads (Sun Books: Melbourne).

Blake, S. T. (1938) The plant communities of western Queensland and their relationships, with special reference to the grazing industry. *Proceedings of the Royal Society of Queensland* **49**: 156-205.

Burrows, W.H. (2002). Seeing the wood(land) for the trees – An individual perspective of Queensland woodland studies (1965-2005). *Trop. Grassld*s **37**: 202-217.

Burrows, W.H., Carter, J.O., Scanlan, J.C. and Anderson, E.R. (1990). Management of savannas for livestock production in north-east Australia: contrasts across the tree-grass continuum. *J. Biogeog.* **17**: 503-512.

Burrows, W.H., Henry, B. K., Back, P.V., Hoffmann, M.B., Tait, L.J., Anderson, Menke, N., Danaher, T., Carter, J.O. and McKeon, G.M. (2002) Growth and carbon stock change in eucalypt woodlands in northeast Australia: ecological and greenhouse sink implications. *Global Change Biology* .**8**: 769-784.

Christie, E. K. (1975) A note on the significance of *Eucalyptus populnea* for buffel grass production in infertile semi arid rangelands. *Tropical Grasslands* **9**: 243-246.

Crowley, G.M. and Garnett, S.T. (1998) Vegetation changein the grasslands and grasst woodlands of east-central Cape York Peninsula, Australia. *Pacific Conservation Biology* **4**: 132-148.

Domin, K. (1911) Queensland's plant associations: some problems of Queensland's botanogeography. *Proceedings Royal Society of Queensland* **23**: 63-67.

Ebersohn, J. P. and Lucas, P. (1965) Trees and soil nutrients in south-west Queensland. *Queensland Journal of Agricultural and Animal Sciences* **22**: 436-445.

Fensham, R. J., Dwyer, J.M., Eyre. T.J., Fairfax, R.J. and Wang, J. (2012) The effect of clearing on plant composition in mulga (*Acacia aneura*) dry forest, Australia. *Austral Ecology* **37**: 183-192.

Fensham, R.J. and Fairfax, R.J. (1996) The disappearing grassy balds of the Bunya Mountains, south-eastern Queensland. *Australian Journal of Botany* **44**: 132-148.

Fensham, R.J., Low Choy, S.L., Fairfax, R.J. and Cavallaro, P.C. (2003) Modelling trends in woody vegetation structure in semi-arid Australia as determined from aerial photography. *J. Environmental Manage.* **68**: 421- 436.

Franklin, D.C. (1999) Evidence of disarray amongst granivorous bird assemblages in the savannas of northern Australia, a region of sparse human settlement. *Biological Conservation* **90**: 53-68.

Franks, A. J. (2002) The ecological consequences of buffel grass (*Cenchrus ciliaris*) establishment within remnant vegetation of Queensland. *Pacific Conservation Biology* **8**: 99-107.

Gasteen, W.J. (1986) Historical trends in the mulga lands of south west Queensland, In: "The Mulga Lands" (ed P. S. Sattler). (Royal Society of Queensland: Brisbane). pp. 72-78.

Glanville, S. and Mills. J.[1990] Preliminary observations on runoff from mulga lands in different condition states. Mulga Lands Strategy 1991-1994. (QDPI Internal Report) pp. 15-18.

Hannah, D. and Thurgate, N. (2001) Lands of strips and patches. iWildlife Australia **31**: 38-39.

Harrington, G. N. And Sanderson, K.D. (1994) Recent contraction of wet sclerophyll forest in the wet tropics of Queensland due to invasion by rainforest. *Pacific Conservation Biology* **1:** 319-327.

Interdepartmental Committee (1969) Report of the Inter-Departmental Committee on Scrub and Timber Growth in the Cobar-Byrock District and Other Areas of the Western Division of New South wales (Government Printer: Sydney).

Krull, E.S., Skjemstad, J.O., Burrows, W. H., Bray, S.G., Wynn, J.G., Bol, R., Spouncer, L. and Harms, B. (2005) Recent vegetation changes in central Queensland, Australia: evidence from $\delta^{13}C$ and ^{14}C analyses of soil organic matter. *Geoderma* **126**: 241-259*.

Krull , E., Bray, S., harms, B., Baxter, N, Bol, R. And Farquhar, G. (2007) Developmet of a stable isotope index to assess decadal-scale vegetation change and application to woodlands of the Burdekin Catchment, Australia. *Global Change Biology* **13**: 1455-1468.

Leichhardt, L. (1847) Journal of an overland expedition in Australia (London).

Miles, R.L and Glanville, S. [1990] The influence of vegetation type on runoff in the mulga lands of south west Queensland. Mulga Lands Strategy (1991-1994) (QDPI Internal Report).

Noble, J.C. (1997) The Delicate and Noxious Scrub. (CSIRO: Canberra).

Mitchell, T.L. (1848) Journal of an expedition into the interior of tropical Australia, in search of a route from Sydney to the Gulf of Carpentaria. (Longman, Brown, Green and Longmans: London).

Pressland, A. J. (1976) Effect of stand density on water use of mulga (*Acacia aneura* F. Muell) woodlands in south-western Queensland. *Australian Journal of Botany* **24**: 177-191.

Purdie, R.W. (1986) Development of a National Park System for Queensland's Mulga Region. In: "The Mulga Lands" (ed P.S.Sattler). Royal Society of Queensland: Brisbane). pp. 122-127.

Purdie, R.W. and McDonald, W.J.F. (1990) Vegetation. In: Western Arid Region land Use StudyPart 3. Tech Bull 29, Division of Land Utilisation (QDPI: Brisbane) pp. 69-103.

Rolls, E.C. (1981) AMillion Wild Acres. (Nelson: Melbourne)

Royal Commission (1901) Royal Commission to Inquire into the Conditions of Crown Tenants – Western Division of NSW. (Government Printer: Sydney).

Sattler, P.S. and Williams, R.J. (eds) (1999) The Conservation Status of Queensland's Bioregional Ecosystems. (EPA: Brisbane). p1/11.

Scanlan, J.C. (1991) Woody overstorey and herbaceous understorey biomass in *Acacia harpophylla* (brigalow) woodlands. *Australian Journal of Ecology* **16**: 521-529.

Scanlan, J.C. and Burrows, W.H. (1990). Woody overstorey impact on herbaceous understorey in *Eucalyptus* spp. communities in Central Queensland. *Aust. J. Ecol.* **15**: 191-197.

Scholes , R.j. and Archer, S.R. (1997) Tre-grass interactions in savannas. *Annual Review of Ecology and Systematics* **28**: 517-544.

Sharp, B.R and Whittaker, R.J. (2003) The irreversible cattle-driven transformation of seasonally flooded Australian savanna. *Journal of Biogeography* **30**: 783-802.

Sim, A., Heijnis, H. and Mooney, S. (2004) Use of the pollen record to investigate vegetation thickening in central Queensland over the last 120 years. Proc. AQUA Conf.: Hobart,

Tieszen, L.L. and Archer, S (1990) Isoyopic assessment of vegetationchanges in grassland and woodland systems. Ecological Studies **80** (Springer-Verlag, New York) pp. 293-321.

Van Auken, O.W. (2000) Shrub invasions of semiarid grasslands. *Annual Review of Ecology and Systematics* **31**: 197-216.

Walker, J., Moore, R.M. and Robertson, J.A. (1972) Herbage response to tree and shrub thinning in *Eucalyptus populnea* shrub woodlands. *Australian Journal of Agricultural Research* **23**: 405-410.

Wright, J. (1981) *The Cry for the Dead* (Oxford UP: Melbourne).

Affirmation by expert

I hereby confirm:

a) the factual matters stated in this report are, as far as I know, true; and

b) I have made all enquiries considered appropriate; and

c) the opinions stated in the report are genuinely held by me; and

d) the report contains reference to all matters I consider significant; and

e) I understand my duty to the Court ; and

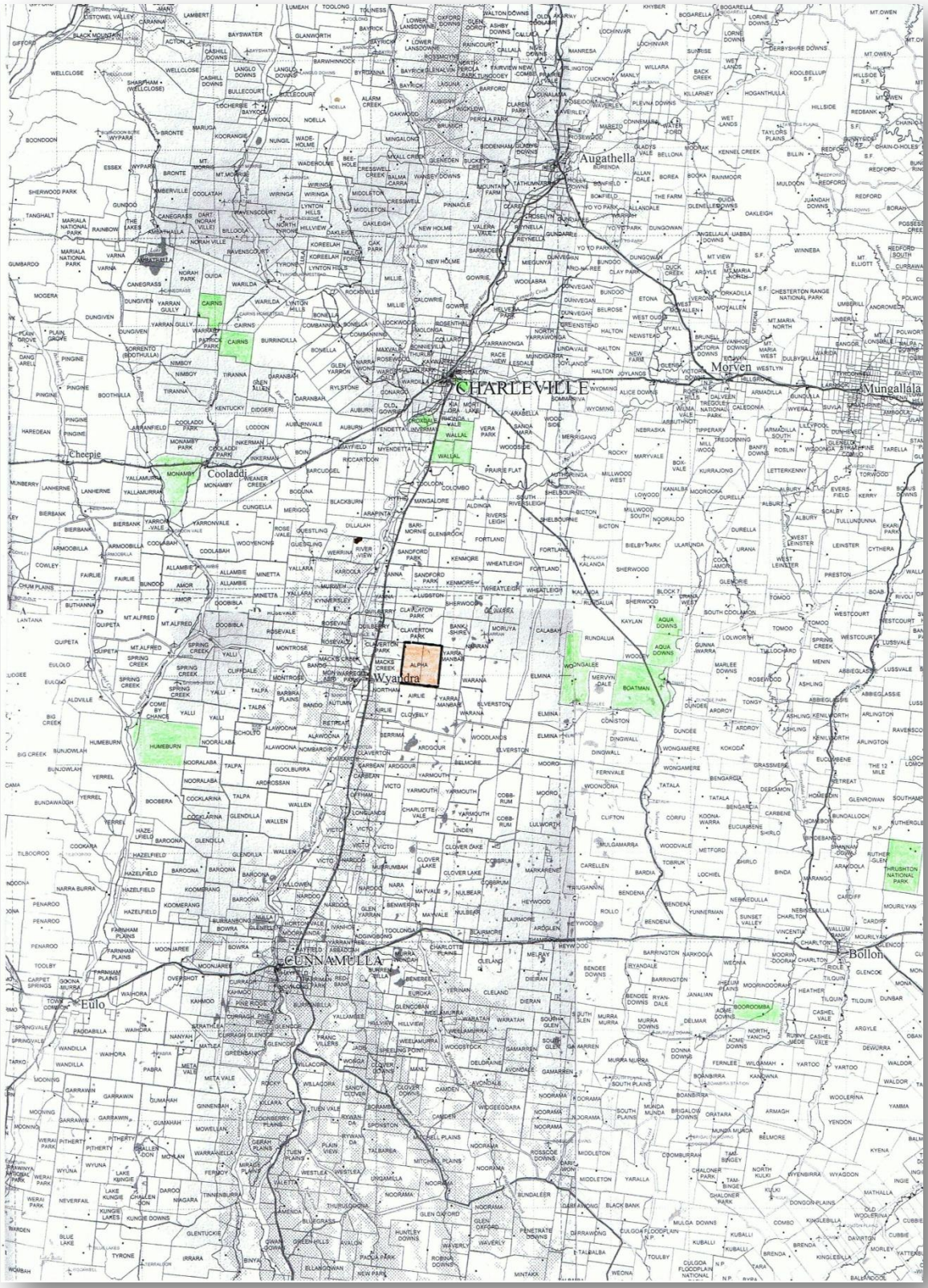
f) I have complied with that duty.

This Report was signed on 27th March 2013

.....

William Henry Burrows

Appendix 1



Map of SW Queensland showing the location of 'Alpha' (brown) and some of the nearby properties (green) from which research information and observations were drawn for this Report - [Map copyright Terence Alick 2008].

Appendix 2

Publications : W.H. Burrows

Burrows, W.H. (1965). Woody weeds on run-on and run-off areas in south west Queensland. *Proc. 2nd Aust. Arid Zone Conf.*: C.16 - C.17.

Burrows, W.H., Cull, J.K. and Ebersohn, J.P. (1966). Water redistribution for increasing pasture and forage production. *Arid Zone Newsletter* pp. 78-85.

Beale, I.F. and Burrows, W.H. (1968). Productivity of mulga scrubs in south west Queensland. *Aust. Grassland Congr.* **1 (2b)**: 22-23.

Burrows, W.H. and Beale, I.F. (1969). Structure and association in the mulga (*Acacia aneura*) lands of south western Queensland. *Aust. J. Bot.* **17**: 539-552.

Burrows, W.H. and Beale, I.F. (1970). Dimension and production relations of mulga (*Acacia aneura* F. Muell.) trees in semi arid Queensland. *Proc. XIth Int. Grassld Congr.*, Surfers Paradise, Australia. pp. 33-35.

Burrows, W.H. (1970). New pasture plants in the mulga zone. *Qld agric. J.* **96**: 321-324.

Beale, I.F. and Burrows, W.H. (1970). Density of native grasses in mulga communities of south west Queensland. *Proc. 3rd Aust. Arid Zone Conf.*, Broken Hill. pp. 6.26-6.28.

Burrows, W.H. (1971). Studies in the ecology and control of green turkey bush (*Eremophila gilesii* F. Muell.) in south-west Queensland. M. Agr. Sc. Thesis, U. of Q., Brisbane.

Burrows, W.H. (1972). Productivity of an arid zone shrub (*Eremophila gilesii*) community in south west Queensland. *Aust. J. Bot.* **20**: 317-329.

Burrows, W.H. (1973). Studies in the dynamics and control of woody weeds in semi arid Queensland I. *Eremophila gilesii. Qd J. Agric. Anim. Sci.* **30**: 57-64.

Batianoff, G.N. and Burrows, W.H. (1973). Studies in the dynamics and control of woody weeds in semi arid Queensland II. *Cassia nemophila and C. artemisioides. Qd J. Agric. Anim. Sci.* **30**: 65-77.

Burrows, W.H. (1973). Regeneration and spatial patterns of *Acacia aneura* in south west Queensland. *Trop. Grasslds.* **7**: 57-68.

Burrows, W.H. (1974a). Trees and shrubs in mulga lands. *Qld agric. J.* **100**: 322-329.

Burrows, W.H. (1974b). A study of the phenology and germination of *Eremophila gilesii* in semi arid Queensland. *USDA Miscl. Publ.* **1271**: 150-159.

Macauley, B.J. and Burrows, W.H. (1975). Multivariate analysis of fungal succession on decomposing leaves - a preliminary study. *Proc. 3rd Aust. Specialist Conf. in Soil Biol.*, Adelaide. pp. 75-76.

Burrows, W.H. (1976). Aspects of nutrient cycling in mallee and mulga communities. Ph.D. Thesis. ANU, Canberra.

Burrows, W.H. and Beale, I.F. (1976). Techniques for studying vegetation in the semi arid pastoral zone. In: "Native Pastures Methods Workshop". (DPI mimeo).

Burrows, W.H. (1976). Condition assessment in woodland/shrub-land. In: "Native Pastures Methods Workshop". (DPI mimeo).

Burrows, W.H. (1978). A Handbook of Research by the Charleville Pastoral Laboratory. (DPI: Charleville).

Burrows, W.H., Scott, B.J. and Campbell, D.A. (1979). Pasture establishment in poplar box communities. *Proc. Poplar Box Symposium,* Cobar (CSIRO, Canberra).

Burrows, W.H. (1979). Vegetation management decisions in Queensland's semi arid sheeplands. In: "Rangeland Ecosystem Evaluation and Management" (ed. K.M.W.Howes). (Australian Rangeland Society: Perth). pp. 202-218.

Burrows, W.H. (1980). Range management in the dry tropics with special reference to Queensland. *Trop. Grasslds* **14**: 281-287.

Burrows, W.H. (1981). Vegetation analysis in natural grazing land studies. In: "Desertification of arid and semi arid natural grazing lands" (ed. E.K.Christie). (Griffith University: Brisbane). pp. 99-107.

Johnson, R.W. and Burrows, W.H. (1981). *Acacia* open forests, woodlands and shrublands. In: "Australian Vegetation" (ed. R.H.Groves). (Cambridge University Press: London). pp. 198-226.

Burrows, W.H. and Scanlan, J.C. (1982). Report on regrowth problems - Central Western Queensland. (QDPI: Brisbane). (Internal report).

Burrows, W.H. (1983). The Western Division. In: "The Grasses of Southern Queensland" (J.C.Tothill and J.B.Hacker). (University of Queensland Press: Brisbane). pp. 22-32.

Scanlan, J.C. and Burrows, W.H. (1983). The woody regrowth situation in pastoral lands of Central Queensland. *Proc. of a Workshop on Woody Weeds of Northern Australia,* Rockhampton. (Dept. of Lands: Brisbane).

Burrows, W.H. and Scanlan, J.C. (1983). Managing eucalypt woodlands and open forests as grazing lands in north-eastern Australia. *Proc. of a Workshop on Woody Weeds of Northern Australia*, Rockhampton. (Dept. of Lands: Brisbane).

Burrows, W.H. (1984). Trends in land use for beef and crop production. In: "Integrated Beef and Crop Production in Central Queensland: Past, present and future" (ed. A. Macqueen) (C.Q. Sub-branch A.I.A.S.: Rockhampton). pp. 2.1-2.9.

Burrows, W.H. and Scanlan, J.C. (1984). The current extent of clearing and some resultant effects in Queensland's eucalypt woodlands. In: "Clearing the Woodlands of Northern Australia". (N.Q. Sub-branch A.I.A.S.: Townsville). pp. 1-17.

Burrows, W.H., Beale, I.F., Silcock, R.G. and Pressland, A.J. (1985). Prediction of tree and shrub population changes in a semi arid woodland. In: "Ecology and Management of the World's Savannas" (eds J.C. Tothill and J.J. Mott). (Australian Academy of Science: Canberra). pp. 207-211.

Smith, F.T., Crowther, D.E., Bowly, P.S., Evenson, C.J., Lehane, K.J., Beale, I.F., Roberts, B.R. and Burrows, W.H. (1985). A photographic record of vegetation changes in two semi arid woodlands. In: "Ecology and Management of the World's Savannas" (eds J.C. Tothill and J.J. Mott). (Australian Academy of Science: Canberra). p. 212.

Burrows, W.H. (1985). Woodland management in south-east Queensland. *Trop. Grasslds* **19**: 186-189.

Burrows, W.H., McIvor, J.G. and Andrew, M.H. (1986). Management of Australian savannas. *Tropical Grasslands Society, Occasional Publication* No. **3**. pp. 1-10.

Burrows, W.H., Carter, J.O., Anderson, E.R. and Bolton, M.P.(1986). Prickly acacia (*Acacia nilotica*) invasion of Mitchell grass (*Astrebla* spp.) plains in central and north-west Queensland. *Proc. Australian Rangeland Soc. 4th. Biennial Conf*., Armidale.

Burrows, W.H. (1986). Potential ecosystem productivity. In: "The Mulga Lands of Australia". (ed. P.S. Sattler) (Royal Society: Brisbane). pp. 7-10.

Wildin, J.H. and Burrows, W.H. (1987). Permanent pastures with trees in Northern Australia. In: "Proceedings of the International Symposium on Grasslands in Forest Areas" (Harbin: China).

Burrows, W.H. (1988). Lessons of history. *Range Management Newsletter* No. **88/1** p. 11.

Lloyd, P.L. and Burrows, W.H. (1988). The importance and economic value of native pastures to Queensland. In: "Native Pastures in Queensland: The resources and their management" (eds W.H. Burrows, J.C. Scanlan and M.T. Rutherford). (DPI: Brisbane). pp. 1-12.

Burrows, W.H. (Script ed.)(1987). Clearing eucalypt country. Video.(DPI/AMLRDC: Rockhampton).

Burrows, W.H., Scanlan, J.C. and Anderson, E.R. (1988). Plant ecological relations in open forests, woodlands and shrublands. In: "Native Pastures in Queensland: The resources and their management" (eds W.H. Burrows, J.C. Scanlan and M.T. Rutherford). (DPI: Brisbane). pp. 72-90.

Burrows, W.H., Scanlan, J.C. and M.T.Rutherford (eds) (1988). Native Pastures in Queensland: The resources and their management. (DPI: Brisbane).

Burrows, W.H. (ed.) (1988). Workshop on woodland management and woody weed control. (QDPI & AMLRDC: Rockhampton).

Pressland, A.J., Burrows, W.H., Scanlan, J.C. and Anderson, E.R. (1988). Woodland management. In: "Management of Pastures for East and Southern Africa" (ed. B. Walker). (Course manual- FAO).

Burrows, W.H., Scanlan, J.C., Anderson, E.R. and McKeon, G.M. (1988). COWS: A computer based management aid for Capricornia open woodland systems. *Proc. Decade of the Tropics Symposium on Responses of Savannas to Stress and Disturbance* (ed. P.A. Werner). p. 33.

Burrows, W.H. (1989). Problems of overclearing. *The Pasture* **1(2)**: 3.

Burrows, W.H. (1989). Keeping trees and making room for cattle too. *Prime Beef Producer* **2**: 4,20.

Burrows, W.H. (1989). Management of grazed woodlands for pastoral production in Queensland. In: "Management for Sustainable Farming" (ed. R.J. Hampson). (Aust. Farm Management Soc: Gatton). pp. 191-201.

Burrows, W.H. (1990a). Prospects for increased production in the north-east Australian beef industry through pasture development and management. *Agric. Sci.* **3**: 19-24.

Burrows, W.H. (1990b). Conservative rangeland management in Australia: a personal view-point. *Proc. 6th Australian Rangeland Soc. Conf*., Carnarvon, W.A. pp. 22-37.

Scanlan, J.C. and Burrows, W.H. (1990). Woody overstorey impact on herbaceous understorey in *Eucalyptus* spp. communities in Central Queensland. *Aust. J. Ecol.* **15**: 191-197.

Burrows, W.H., Carter, J.O., Scanlan, J.C. and Anderson, E.R. (1990). Management of savannas for livestock production in north-east Australia: contrasts across the tree-grass continuum. *J. Biogeog.* **17**: 503-512.

Burrows, W.H. (1991). Tree clearing in Australia - a question of balance. *Search* **22**: 46-48.

Burrows, W.H. (1991). Sustaining productive native and improved pastures - an ecological perspective. *Trop. Grasslds.* **25**: 153-158.

Burrows, W.H., Carter, J.O., Scanlan, J.C. and Anderson, E.R. (1991). Management of savannas for livestock production in north-east Australia: contrasts across the tree-grass continuum. In: "Savanna Ecology and Management: Australasian Perspectives and Intercontinental Comparisons" (ed. P. Werner). pp. 159-168. (Blackwells: London). (Note: Also published in *J. Biogeog*).

Galloway, I.D. and Burrows, W.H. (1991). Land Protection Branch - Queensland Department of Lands - Research Unit Business Plan (Queensland Department of Lands, Brisbane). pp 21.

Burrows, D.M. and Burrows, W.H. (1992). Seed production and litter fall in some eucalypt communities in Central Queensland. *Aust. J. Bot.* **40**: 389-403.

Burrows, W.H. (1992a) Cell grazing: overseas experience less than favourable. *Prime Beef* **4**: 54-56.

Burrows W.H. (1992b) Conservative rangeland management in Australia: A personal viewpoint (with a Queensland bias and additional notes on cell grazing). *Proc. North West Australia Pastoral Conf.*, Katherine, N.T. pp. 103-127.

Burrows, W.H. (1993). Deforestation in the savanna context: problems and benefits for pastoralism. *Proc.XVIIth International Grassland Congress*. pp. 2223-2230.

Burrows, W.H. (1993). Deforestation in the savanna context: problems and benefits for pastoralism. In: "Grasslands for our World" (ed. M.J.Baker). SIR Publishing: Wellington. pp. 839-846. (Note: Also presented as an invited paper at the XVIIth International Grassland Congress).

Burrows, W.H. and Back, P.V. (1993). The role of fire in timber regrowth control. In: "The Burning Question" (ed. G. Elphinstone). (S.E. Region Landcare: Gympie). pp. 17-19.

Partridge, I.J., Burrows, W.H. and Weston, E.J. (eds) (1994). "Sown Pastures for the Brigalow Lands". (QDPI: Brisbane).

Jones, P. and Burrows, W.H. (1994). State and transition models for rangelands 13. A state and transition model for the mulga zone of south west Queensland. *Trop. Grasslds* **28**: 279-283.

Burrows, W.H. (1994). Summative Address - 8th Biennial Conference, Australian Rangeland Society. *Range Management Newsletter* **94/3**: 8-10.

Burrows, W.H., French, A.V. and Robbins, G.B. (1994). Managing sown pastures. In: “Sown pastures for the brigalow lands” (eds I.J.Partridge, W.H. Burrows, E.J. Weston). (QDPI: Brisbane). pp. 39-42.

Johnson, R.W. and Burrows, W.H. (1994). *Acacia* open-forests, woodlands and shrublands. In: "Australian Vegetation" 2nd edit. (ed. R.H. Groves) (Cambridge University Press: London). pp.257-290.

Burrows, W.H., Anderson, E.R. and Back, P.V. (1995). Management of woodland systems in Queensland with special reference to the beef industry. In: "Queensland: The State of Science". (eds R.W. Johnson and C.R. King) (Royal Soc.: Brisbane). pp.149-157.

Burrows, W.H. (1995). Greenhouse revisited - an alternative viewpoint on land use change and forestry from a Queensland perspective. *Climate Change Newsletter* **7**: 6-7.

Burrows, W.H. and Vercoe, J.E. (1995). Sustainability of stocking and grazing in Northern Australia. *Focus* **88**: 8-12.

Vercoe, J., Burrows, B. and Anderson, E. (1995). Friendly farming. *New Scientist* **147** (1994): 51.

Burrows, W.H. (1995). Dynamics of the tree-grass balance in Queensland's grazed woodlands. In: "Proc. Queensland Landcare Conference, Longreach" (eds G. Penton, B. Rutledge, B. Peterkin) (QDPI: Brisbane). pp. 83-85.

Back, P.V., Burrows, W.H. and Anderson, E.R. (1996). The effect of increasing tree basal area on pasture production following various woodland development strategies at "Wandobah", Dingo. *Trop. Grasslds* **30**: 161.

Burrows, W.H., McKeague, E.J., Newman, S., Sillence, M.N. and Vercoe, J.E. (1996). Innovation and responsiveness will be the hallmarks of the tropical beef industry. *Proc. Aust. Soc. Anim. Prod.* **21**: 48-54.

Burrows, W.H. (1996). Queensland's grazed woodlands - an enormous anthropogenic carbon sink demanding recognition. Technical Report 'Vegetation Thickening' Workshop. (DEST International Panel Review: Canberra) October 1996.

Chamberlain, J., Filet, P. and Burrows, W.H. (1996). Pasture management. In: "Sown Pasture Notes - Central Queensland" (eds G. Lambert and G. Graham). (QDPI: Rockhampton). pp. 71-72.

Jones, R.J., M^{c}Ivor, J.G., Middleton, C.H., Burrows, W.H., Orr, D.M. and Coates, D.B. (1997). Long term botanical changes and their implications in grazed stylosanthes pastures. *Trop. Grasslds.* **31**: 482-493.

Anderson, E.R., Burrows, W.H., Back, P.V. and Hoffmann, M.B. (1997). Land clearing practices and associated impacts on the land use change and forestry inventory. IPCC Workshop on Biomass Burning, Land-use Change and Forestry, Rockhampton, Australia - Working paper. (IEA/OECD: Paris).

Burrows, W.H., Anderson, E.R., Back, P.V. and Hoffmann, M.B. (1997). Regrowth and woody plant thickening/invasion impacts on the land use change and forestry inventory. IPCC Workshop on Biomass Burning, Land-use Change and Forestry, Rockhampton, Australia - Working paper. (IEA/OECD: Paris).

Back, P.V., Anderson, E.R., Burrows, W.H., Kennedy, M.J.J. and Carter, J.O. (1997). TRAPS – Transect recording and processing system (Manual and software package) (QPDI: Rockhampton).

McKeon, G.M., Stafford-Smith, M., Ash, A., Burrows, W.H., Clewett, J.F., Rebgetz, Z., Scanlan, J. and Silburn, M. (1997). Simulation of grazing strategies for beef production in north-eastern Queensland. Drought Plan Working Paper No. 8, Queensland Department of Natural Resources, Brisbane.

Orr,D.M., Burrows, W.H., Rutherford, M.T. and Myles, D.J. (1997). Seca stylo pastures require special management. Proc. 10th Biennial Conference, The Australian Rangeland Society. pp. 56-57. (Gatton College, U. of Q.: Gatton).

Burrows, W.H., Anderson, E.R., Back, P.V., Rutherford, M.T. and Hoffmann, M.B. (1998). Monitoring and managing native vegetation in the grazing lands of the Fitzroy Basin catchment. Proc. Fitzroy Basin Sustainable Futures symposium, Rockhampton. (CQU Press). pp. 140-149.

Carter, J.O., Danaher, T.J., Burrows, W.H. and Brook, K. (1998). The statewide landcover and trees study (SLATS) – Monitoring greenhouse gas emissions in Queensland (Proc. National Carbon Accounting System Workshop) (AGO: Canberra). 15pp.

Burrows, W.H., Compton, J.F. and Hoffmann, M.B. (1998). Vegetation thickening and carbon sinks in the grazed woodlands of north-east Australia. Proc. Australian Forest Growers Conf., Lismore. PP. 305-316.

Burrows, W.H. (1998). Sinks down under. *New Scientist* **157** (2122): 53.

Hall, W.B., McKeon, G.M., Carter, J.O., Day, K.A., Howden, S.M., Scanlan, J.C., Johnston, P.W. and Burrows, W.H. (1998). Climate change in Queensland's grazing lands. II. An assessment of the impact on animal production from native pastures. *Rangel. J.* **20**: 177-205.

Back, P.V., Burrows, W.H. and Hoffmann, M.B. (1999). TRAPS: A method for monitoring the dynamics of trees and shrubs in rangelands. Proc. VI International Rangeland Congress, Townsville. Pp. 742-744.

Burrows, W.H. (1999). Tree clearing - rehabilitation or development on grazing land? In: "Practical Rangeland Ecology" (D.M. Orr, Convenor). Professional Workshop - VI International Rangeland Congress, Townsville. pp.24-41.

Burrows, W.H. (1999). Carbon sequestration in forests and woodlands (savannas). In: "Practical Rangeland Ecology" (D.M. Orr, Convenor). Professional Workshop - VI International Rangeland Congress, Townsville. pp. 65-79.

Burrows, B. (contributing author) (2000). Additional human-induced activities - Article 3.4. In: "Land Use, Land-use Change and Forestry" (eds R.T.Watson, I.R.Noble, B.Bolin *et al*.) pp. 181-250. Cambridge University Press, Cambridge.

Burrows, W.H., Hoffmann, M.B., Compton, J.F., Back, P.V. and Tait, L.J. (2000). Allometric relationships and community biomass estimates for some dominant eucalypts in Central Queensland woodlands. *Aust. J. Bot*. **48**: 707-714.

Eamus, D., McGuinness, K. and Burrows, W. (2000). Review of allometric relationships for estimating woody biomass for Queensland, the Northern Territory and Western Australia. National Carbon Accounting System Technical Report No. 5a. (Australian Greenhouse Office: Canberra). 56pp.

Burrows, W.H. (2001). Deforestation for pasture development - has it been worth it? *Proc. XIXth International Grassland Congr.*, Brazil. pp. 913-918.

Burrows, W.H., Hoffmann, Compton, J.F. and Back, P.V. (2001) Allometric relationships and community biomass stocks in white cypress pine (*Callitris glaucophylla*) and associated eucalypts of the Carnarvon area - South Central Queensland (with additional data for scrub leopardwood - *Flindersia dissosperma*). Technical Report No. 33 National Carbon Accounting System.. (Australian Greenhouse Office: Canberra).

Orr, D.M., Burrows, W.H., Hendricksen, R.E., Clem, R.L., Rutherfoed, M.T., Conway, M.J., Myles, D.J., Back, P.V. and Paton, C.J. (2001) Pasture yield and composition changes in a Central Queensland black speargrass (*Heteropogon contortus*) pasture in relation to grazing management options. *Aust. J. Exp. Agric.* **41**: 477-485.

Burrows, W.H., Henry, B. K., Back, P.V., Hoffmann, M.B., Tait, L.J., Anderson, Menke, N., Danaher, T., Carter, J.O. and McKeon, G.M. (2002) Growth and carbon stock change in eucalypt woodlands in northeast Australia: ecological and greenhouse sink implications. *Global Change Biology* .**8**: 769-784.

Snowdon, P., Raison, J., Keith, H., Ritson, P., Grierson, P., Adams, M., Montagu, K., Bi, H., Burrows, W. and Eamus, D. (2002) Protocol for sampling tree and stand biomass. Technical Report No. 31 National Carbon Accounting System.. (Australian Greenhouse Office: Canberra).

Henry, B.K., Danaher, T., McKeon, G.M. and Burrows, W.H. (2002). A review of the potential role of greenhouse gas abatement in native vegetation management in Queensland's rangelands. *Rangeland Journal* **24**: 112-132.

Burrows, W.H. (2002). Seeing the wood(land) for the trees – An individual perspective of Queensland woodland studies (1965-2005). *Trop. Grasslds* **37**: 202-217.

Raison, John, Keith, Heather, Barrett, Damian, Burrows, Bill and Grierson, Pauline (2003) Spatial estimates of biomass in 'mature' native vegetation. Technical Report No. 44 National Carbon Accounting System. (Australian Greenhouse Office: Canberra).

Krull, E.S., Skjemstad, J.O., Burrows, W.H., Bray, S.G., Wynn, J.G., Bol, R., Spouncer, L., Harms, B. (2005) Recent vegetation changes in central Queensland, Australia: evidence from $\delta^{13}C$ and ^{14}C analyses of soil organic matter. *Geoderma* **126**: 241-259.

Back, P.V., Anderson, E.R., Burrows, W.H. and Playford, C. (2009) Woody plant responses to various clearing strategies imposed on a poplar box (*Eucalyptus populnea*) community at Dingo in central Queensland.*Tropical Grasslands* **43**: 37-52.

Back, P.V., Anderson, E.R., Burrows, W.H. and Playford, C. (2009) Research note: Poplar box (*Eucalyptus populnea*) growth rates in thinned and intact woodlands in central Queensland. *Tropical Grasslands* **43**: 188-190.

Orr, D.M., Burrows, W.H., Hendricksen, R. E., Clem, R.L., Back, P.V., Myles, D.J. and Conway, M.J. (2010) Impacts of grazing management options on pasture and animal productivity in a *Heteropogon contortus* (black speargrass) pasture in central Queensland. 1. Pasture yield and composition. *Crop & Pasture Science* **61**: 170-181.

Burrows, W.H., Orr, D.M., Hendricksen, R.E., Rutherford, M.T., Myles, D.J., Back, P.V. and Gowen, R. (2010) Impacts of grazing management options on pasture and animal productivity in a *Heteropogon contortus* (black speargrass) pasture in central Queensland. 4. Animal production. *Animal Production Science* **50**: 284-292 .

Orr, David and Burrows, Bill (2011) Keeping your speargrass pastures productive – don't overgraze.Department of Employment, Economic Development and Innovation, Brisbane. 26pp.