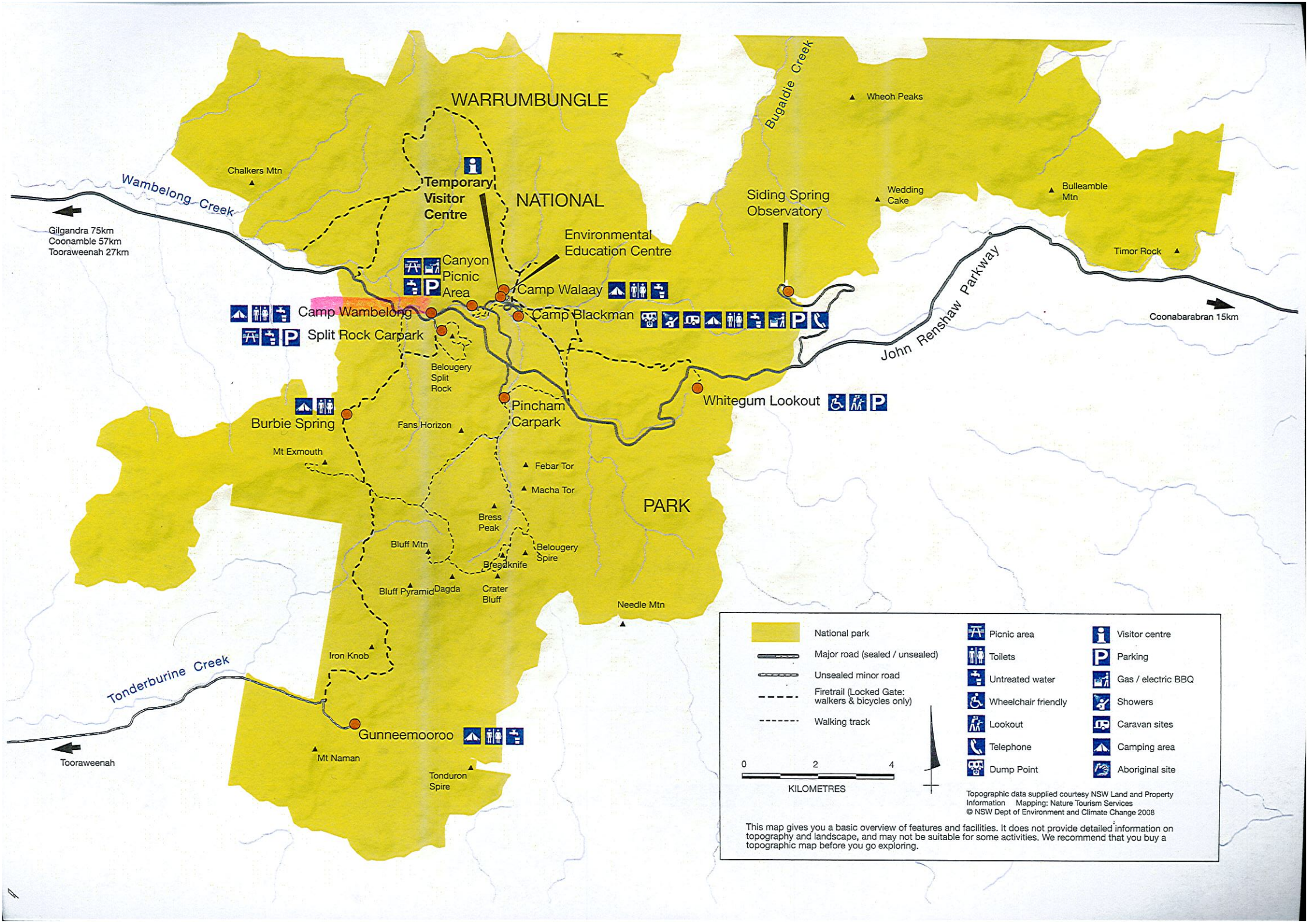
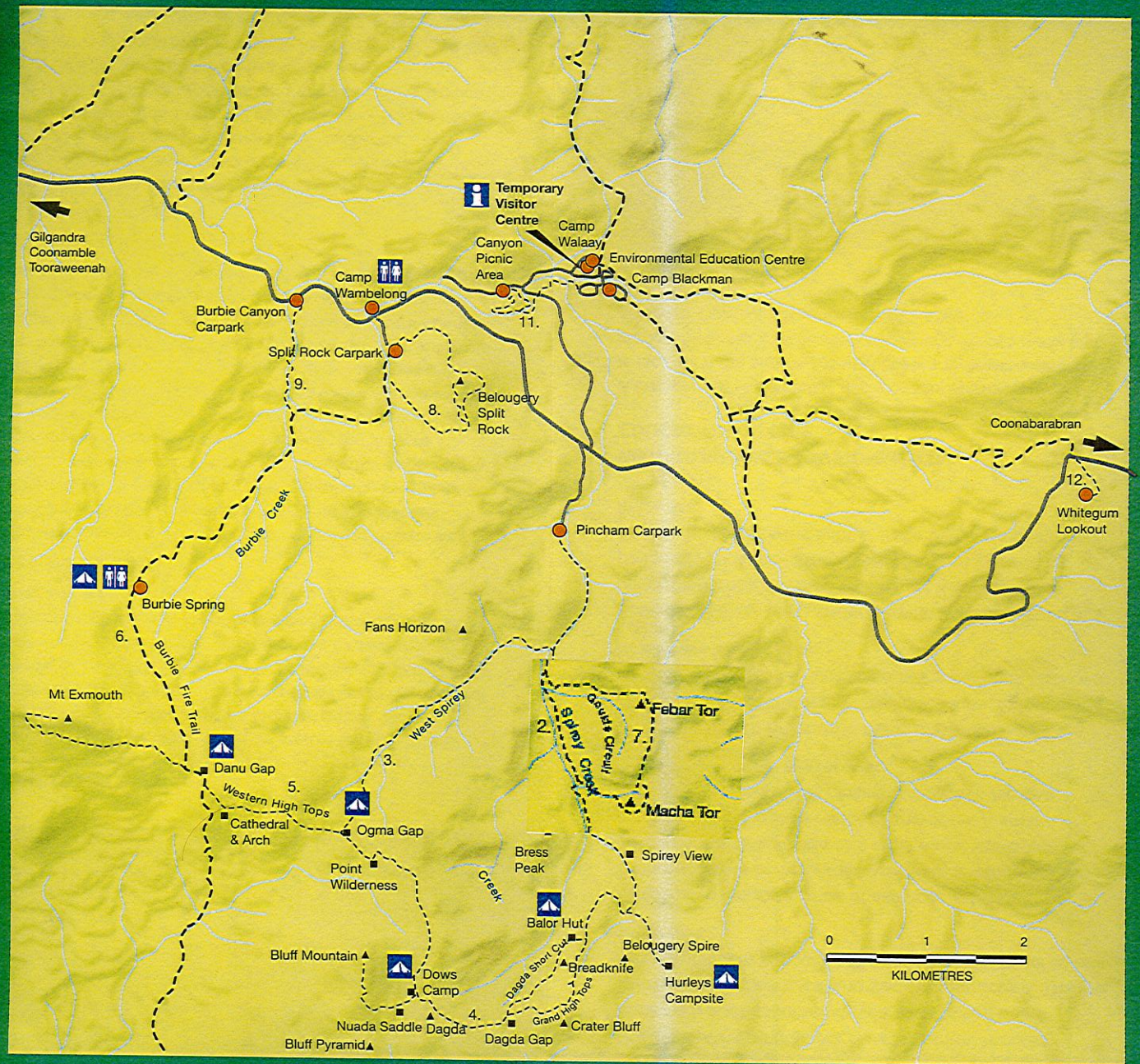


Topographic data supplied courtesy NSW Land and Property Information Mapping: Nature Tourism Services

This map gives you a basic overview of features and facilities. It does not provide detailed information on topography and landscape, and may not be suitable for some activities. We recommend that you buy a topographic map before you go exploring.



WALKS INSET

1 **Fans Horizon (currently closed for restoration)**
Track not currently shown on map

2 **Breadknife and Grand High Tops (Pincham Trail)**
Grade: moderate to steep
Distance: 12.5 km return Time: 4–5 hr

3 **Breadknife and Grand High Tops Circuit (via West Spirey Creek)**
Grade: steep
Distance: 14.5 km circuit Time: 5–6 hr

4 **Bluff Mountain (via Grand High Tops)**
Grade: steep
Distance: 16.9 km return (via West Spirey Creek) Time: 7–8 hr

5 **Mt Exmouth (via West Spirey Creek)**
Grade: steep (fit, experienced walkers only)
Distance: 16.8 km return Time: 5–7 hr

6 **Mt Exmouth (via Burbie Fire Trail)**
Grade: moderate to steep
Distance: 17.3 km return Time: 5–7 hr

7 **Goulds Circuit**
Grade: moderate to steep
Distance: 6.3 km circuit Time: 3 hr

8 **Belougery Split Rock Circuit**
Grade: steep to very steep and rough in sections
Distance: 4.6 km return Time: 3 hr

9 **Burbie Canyon**
Grade: easy to moderate
Distance: 2 km return Time: 40 min

10 **Gurianawa Track (currently closed for restoration)**
Track not currently shown on map

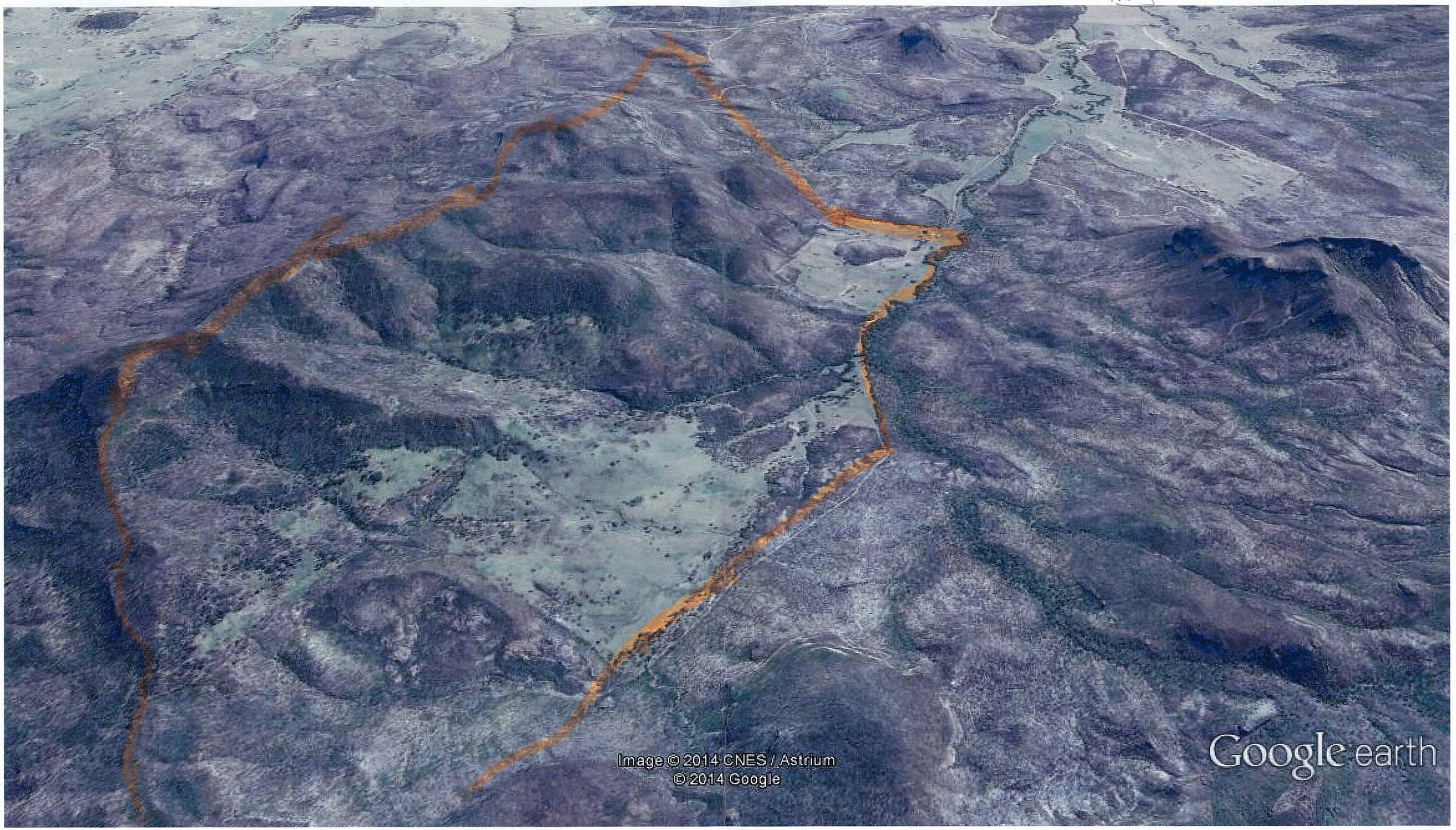
11 **Wambelong Nature Trail**
Grade: moderate
Distance: 1.1 km circuit Time: 45 min

12 **Whitegum Lookout**
Grade: easy — sealed path suitable for wheelchairs and prams
Distance: 1 km return Time: 30 min

Tara Cave (view via Aboriginal Discovery program recommended) (currently closed for restoration)
Track not currently shown on map

MORE DETAILED INFORMATION ON WALKS IS AVAILABLE FROM THE VISITOR CENTRE

John Thring



Google earth

miles 2
km 3

tendered by Mr. John Thring
4 September 2014

Why the Pilliga Forest needs a different type of environmental management than that available under a National Park regime

Ted Hayman

The forests of the Pilliga today are very different from the forests first seen by early explorers and the first settlers. The dramatic structural changes that have taken place since that time have had a big impact on every aspect of the forest.

While it is obvious the forest can not be returned to the original pre-European state, the question now is what form of environmental management will deliver the best outcomes into the future. While the high cost National Park model has value, we would argue it is not necessarily the best conservation method in these highly changed forests.

However, to discuss these issues further, an understanding of what the pre-European forest was like, as well as the impact early settlement has had in creating the forest that exists today is needed.

The following is a very brief and by no means complete outline that argues why a different management regime that is result driven and cost effective is needed.

History of the Forest

The explorer John Oxley in 1818 described the Pilliga as "clear and open, and as favorable for traveling over as could be wished". He also described other areas in the east as "so thick was the forest that we could hardly turn our horses".

Clearly the forest varied in density. However, it was likely that for the most part it was open and well grassed. This is born out by the attraction of the area to European settlers and their grazing stock.

Pastoralists sought and developed open grassy woodlands and forests. They did not bother with shrubby forests because these had little or no grazing value. (Ryan *et al.* 1995, Lunt 1997, Benson and Redpath 1997, Jurskis 2000).

By the 1830s and 40s European settlement had increased and much of the Pilliga Forest had been taken up for grazing (van Kempen 1997, Land Office Maps 1881). By1875 the Pilliga area was estimated to be carrying 25,000 sheep, 30,000 head of cattle and 10,000 horses. (van Kempen, J Maiden, J Burton Cleland, and Gorden Burrow,1920). This is an obvious indication of the pasture that must have been available in the forest at that time.

Using accepted native grassland carrying capacity figures for the area today suggests the area would have been around 60% grassland at that time.

The arrival of the Europeans precipitated the end of Aboriginal burning and slowly their stock usurped much of the prolific fauna of the region and disarranged the floristic composition (JR Whitehead John Oxley's Journey to the Warrumbungle Mountains).

Following the reduction of grass by stock and the cessation of Aboriginal burning, the very wet years in 1879 and the early 1880s set the conditions for the mass germination of pine.

The speed at which change to the forest happened was described in land inspector's reports. In 1887 Inspector Charles Battye reported on one property as "The whole area is all inferior scrub country. The scrubs are young ironbark, pine, oak, wattle and other scrubs". Yet this land just ten or more years earlier had been open enough for sheep to be shepherded on grassland while watching for dingos for long distances between the trees. Reports on other properties in the forest were similar.

In1890 the botanist F Turner, in a paper delivered to the Conference of Delegates in Agricultural Societies warned, "The more valuable herbage will gradually give way and a more worthless one, that is, from an economic point of view take its place. An instance of this is already taking place in the interior were the pine scrub has already taken possession of what was at one time splendid pastoral country".

Over this period inspectors downgraded leases and stock returns showed a big drop in stocking rates.

By the mid 1890s because of the encroachment of pine scrub the forest was largely depopulated.

The Timber Industry

Up until the 1870s the only cutting of timber had been for local use for building and fences. (van Kempen) Most of this was from very large trees as fence posts and rails for yards were split rather sawn, large diameters being best for this.

In 1876 the first forest Reserve was dedicated for the preservation and growth of timber. Pilliga timber had been recognized as a marketable resource. The dedication of other reserves followed with limitations placed on the size of the trees that could be taken.

In 1877, Forest Ranger James Ward was appointed for the area south of Narrabri. In his survey of this area he estimated one to two mature trees and ten young ones to the acre (4 and 25 to the hectare). (Land Inspectors Reports, 1880s and 1890s,AO NSW) If we accept that at the time of the survey it was likely that 60% of the forest was open grassland then these numbers would be quite accurate.

The first forest reserve was dedicated in 1877, just two years before the first wave of pine germination in the wet year of 1879, the start of the trees that are being harvested today.

From the mid 1940s almost all pine harvested was coming from the mass germinations of the late 1870s and until the Brigalow decision in 2005 the sustainable yield was coming from just one and a quarter percent of the forest per year with an 80 year rotation. (NSW State Forests)

Today the cypress industry is the only economical management option that contributes to the mitigation of increased density.

The Forest Today

A lot of environmental thinking in the past has assumed there was massive tree loss across the region. However, more recent measured studies support the documented history that the Pilliga forest at the time of settlement was open and increased in density as a result of changed fire regimes and grazing.

The forest today by all accounts is nothing like the forest first seen by the early settlers.

Following what was likely excessive grazing and the cessation of Aboriginal burning, the heavy rains of 1879 started the excessive growth that changed the forest in every way. Since then occasional very wet years have produced more germinations of pine increasing the density of the forest. In the report Changes in forest structure over the 60 years from 1945 to 2005, by R. K Whipp *et al*. this continued increase in density is confirmed.

Using measurements taken over the same transects as used in the1945 assessment, the research found that forest density had increased three to four fold in the sixty years from 1945 to 2005. The increase was both in stem count and basal area. This result supports the anecdotal information from long time residents.

The report goes on to state that "the results illustrate a continuation of forest encroachment that was initially documented in the late 1800s. In the absence of disturbance, ongoing increases in stand stocking maybe expected."

Another measured assessment by Lunt, *et al,* has shown the huge structural changes that have occurred in the forest, not only through the increased density of pine but also through the proportional reduction of Ironbark trees.

Part of the data collection for the research included recording all evidence of pre-settlement trees, including stumps, stags and veteran trees across a wide area.

This research showed that the proportional representation of Eucalyptus and Cypress has changed completely. The results show, that at the time of settlement stands were dominated by Eucalyptus (78% basal area) whereas stands are now dominated by Cypress (74% basal area). Also at the time of settlement 83% of crown cover was from Eucalyptus.

These two reports illustrate the great structural change that has occurred in the forest since European settlement. Both reports used measured information rather then assumptions and is strongly supported by the historical records.

The evidence in both these reports is critical in assessing the real conservation needs of the forest.

Other research has shown that Cypress saplings beneath tree canopies were less dense, smaller and less likely to fruit than trees in the open. While trees in the open that were the more prolific seeders had their density controlled by natural grass fires. (JS Cohn *et al)* Changes in the historical fire regime have contributed most to the increase in Cypress Pine density as well as reduced canopy cover from eucalyptus trees. These dense stands suppress groundcover and under storey vegetation and precipitate the death of older remnant trees (Cameron 2002).

The Impact of Change

Clearly the impact of these changes on wildlife through the loss of habitat trees and under-story grass land has been huge.(Cameron 2002) Apart from these obvious effects, the increase in regrowth pine has also had an effect on other aspects of the forest by changing water flow and increasing the potential for extreme fire.

The loss of under storey grass has perhaps had the greatest effect on the native wildlife. A fact accepted by many environmentalists and supported by a considerable body of science.

In the Fauna Survey for the BBS assessment, Paull and Date (1999) stated that of the 11 non-flying species thought to be extinct most were ground dwelling grassy under storey dependant species.

In a paper delivered to the Birds Australia Conference in 2003 titled, Current Status of the Pilliga Vertebrate Fauna, David Paull, said that "Of the bird species that have declined or become extinct, 16 are reliant on mature trees, while 32 are reliant on grassy under storey for nesting and/or foraging".

This was the very type of habitat that existed before the 1870s.

Mr. Paull an environmental scientist and a ranking member of the Western Conservation Alliance concluded his paper by challenging the belief that the forest as it is today is saving wildlife and states. "Far from saving our wildlife, the high levels of cypress pine and forest oak regrowth now prevalent seems to have contributed to this species decline, as it tends to suppress the grassy understory and other vegetation for a long time".

During a survey taken in the 1990s, 140 bird species were detected out of a known historical count of 165. Of the 165, 31 are known to have declined, 17 are thought to have declined and 8 appear to have become extinct. All these declining or lost species needed an environment more open than what we have today.

Another consequence of increased density is the effect it has had on water movement and fire intensity.

Before European settlement, fires were started by lightning strike or the Aboriginal people as they moved around the forest. These fires because of their frequency would have been low intensity fires that moved through the grass killing pine seedlings within a few years of germination. These fires preserved the structural integrity of the forest by maintaining a mosaic of open under storey grass and scrub. (Jurskis *et al,* 2005)

However, what we have today is a forest that is very much denser, with fire now having the potential to be ecologically destructive rather than beneficial. The effect of this increased density and fire can be seen in the results of the 2007 fire in the east Pilliga. This fire was the coming together of a dry season and very high levels of standing fuel. These high fuel loads generated a fire so hot that the whole ecology has been changed and almost every hollow bearing tree has been lost. Many of these big old hollow trees were over 400 years old and had been the habitat for countless generations of arboreal wildlife. The fact these trees had survived for so long before being destroyed is a strong indication that the structure of the forest and the fire regime has changed.

Increased density also affects water flow (WH Burrows) however; this is more difficult to see with changers taking place over a great amount of time.

While the only reference to wildlife and water in the BBS surveys relates to the importance of moist gullies, the relationship between regrowth and water flow perhaps needs more consideration. There is however, anecdotal information from living memory that suggests there has been a reduction of constant (subsurface) water in the creeks. A simple indication of this are wells and old stock water holes in creeks that had traditionally been permanent going dry and water holes where wildlife would scratch to drink drying out much quicker after rain.

This reduction in water over time has likely contributed to the decrease in the population of a number of species, but particularly the seed eating birds which have shown a marked decline in population over the last 30-40 years. (D Johnston 2005 pers. comm.)

While the densification of the forest will always be contested by some, the realities as regards to Cypress Pine are simple and can be understood by what happens routinely on farms today. One Cypress Pine tree in an open field will seed and given the right rainfall conditions will sprout countless thousands of pine seedlings. In time the landowner, will either plow the field or let enough grass grow to carry a low intensity fire that will destroy all but a few seedlings. Before European settlement this routine density management was what happened naturally with Aboriginal burning and lightning strike fires.

To Thin or Not to Thin

The increasing density of forests and woodlands is not something isolated to the Pilliga its happening in a great many other areas across the whole country. (Lunt 2011, Burrows)

However, many in the environment movement are against thinning but none can give a logical reason as to why. Even when confronted with research based evidence as to the environmental value of thinning some still hold a negative view.

This view is naïve and appears to be based on idealism rather than anything tangible. Many take the simplistic view that large volumes of biomass are equal to more biodiversity. This is obviously untrue and a view that runs the risk of further species loss.

Rather than see cypress pine and the other species of invasive native scrub as trees they should be seen as pollution like any other organism or material that has an adverse effect on the environment.

In the BBS surveys relating to habitat condition (WRA 31, 36, 15) it is mentioned a number of times the value of thinning or reducing the density of the forest.

In the project WRA 36, (by the Technical Working Group under the WRA steering committee), Development of Conservation Criteria, it states that "not all management necessarily leads to the degrading of condition (e.g. Cypress pine management)" and that "disturbance of itself is not antagonistic to conservation, and some disturbances are ecologically appropriate". The paper also supports pursuing the "active adaptive management" strategy and points out that "conservation management and production management are not exclusive and can be integrated". As part of an active adaptive management regime the report suggests that "rather than exclude logging, that logging be treated as an experiment, implementing monitoring systems and feedback mechanisms to management".

Other than the BBS surveys there has been considerable research done looking at adaptive management and the value of thinning invasive native species, particularly cypress pine.

Thinning trials carried out at Western Plains Zoo by P Cameron over an eight year period from 1994 to 2002 showed an improvement in all environmental measures in the thinned sites. With only one animal the non native house mouse benefiting from the unthinned areas.

Most notable was the increase in birds, both in species diversity and abundance.

An assessment of the trial sites in 2002, found both diversity and abundance was lowest in the unthinned areas but increased with the age of the thinning with the eight year old thinned areas having over double the species richness of the unthinned areas. (28-59)

Small ground mammals, reptiles and arboreal mammals also showed a strong preference for the thinned areas. Radio tracking of a female sugar glider showed that it nested in the hollow branches of red gum trees and foraged in the eight year old thinned areas. The glider sheltered in the thinned pine but did not use the areas of unthinned pine.

Other evidence of the effect of increased forest density is a study by JK Webb *et al* on the endangered Broad Headed Snake and the amount of sunlight reaching the ground and increasing ground temperature. Although this study was outside the region the situation is similar in as much as it dealt with increased forest density through changed fire regimes.

Although this trial was carried out in what was said to be pristine wildness the species was still showing a decline towards extinction.

The trial involved removing shade from around rocky outcrops allowing sunlight to increase the rock temperature to benefit the nocturnal reptiles.

The results of this trial showed that thinning excess vegetation not only improved the environment for the endangered Broad Headed Snake but many other reptile species that were their prey. The increase in reptiles suggests that if vegetation encroachment continues unchecked, the abundance of thermally suitable rocks available to reptiles will decrease. (Schlesinger and Shine, 1994)

HR Bustard in his five year study of reptiles in the Pilliga Forest found similar results in the clearings created by the old sleeper cutter work sites.

A number of other works have all shown that the encroachment of cypress pine and other invasive native species has caused a loss of biodiversity and had a degenerating effect on habitat. (Central West and Western CMA, McHenry *et al,* 2006
L Sutherland *et al,* 2004, JS Cohn *et al*)

From the trial work mentioned and from what can be observed in areas of thinned commercial forest, thinning and adaptive management does deliver tangible benefits to biodiversity in what is a highly altered landscape.

Discussion

Accepting that the conservation requirements of a highly altered forest like the Pilliga are unique, the question that needs to be asked is whether a sedentary National Park management regime is adequate in achieving the stated goals.

The ill considered assumption made by the government that for these forests a simple change of tenure to National Park will improve the biodiversity must be questioned.

In 2004 less than a year before the decision on the Brigalow forests, the NSW Auditor-General in his performance audit of parks management noted that the parks service had yet to develop an adequate information base to measure its success. Nor had it defined what would constitute success. At the disaggregated level, park plans of management do

not focus on performance indicators or timeframes. He concluded that the parks service could not judge its progress in conserving our natural and cultural heritage.

As with all other land tenures National Parks are continuing to lose biodiversity, a problem noted by many environmentalists and a problem likely exacerbated by the restrictions placed on their management systems.

While naming an area as National Park is appealing to the general public and politically useful, it has no point, if the management systems don't achieve the desired environmental outcomes.

In this case, the simple facts are that the integrity of the pre European forest has been lost and cannot be fully recovered. However, a management system that is able to, and aims at restoring the landscape with active and adaptive management can achieve changes in habitat that will reduce the risk of losing more species.

When looking at what conservation management regime is needed in these forests a number of points should be considered.

- The first is structural change.
- The second is the effect that structural change has had on wildlife.
- The third is consideration of an active adaptive management regime.
- The forth is what the long term aim for forest condition is.

There is ample evidence regarding the structural changes that have happened to the forest since European settlement. The change from a predominantly ironbark dominated open forest to a landscape conquered by the invasion of cypress pine with an increased density of perhaps ten times the original. The effect of this has been extreme and has altered the entire function of the forest. These extreme changes can not be addressed with a non invasive management system.

The effect this structural change has had on the fauna has been high. With eleven of the non flying vertebrae species thought to be extinct and forty eight bird species that have either declined or become extinct being directly impacted by the structural changes. Most through the replacement of open grassy understory forest with dense pine growth.

In considering an active adaptive management system the one question that needs to be asked, is whether the forest in its current state of increasing density sustainable under a passive management regime. The answer is clearly no. With measured increases in density over the last sixty years of three to four hundred percent passive management can only make the problem worse.

Active management such as reducing tree density will be more precautionary in this situation than passive management where the deliberate non-intervention approach is very likely to perpetuate the changes that have occurred in the landscape since European settlement.

Active adaptive management is a tool which should be used not only to change a system, but also to learn about the system.

An active management regime is sugested in WRA Project 36, (Development of Conservation Criteria) and they conclude that an active adaptive management approach integrating research, monitoring and management should be adopted to test the validity of principles such as stand complexity, connectivity, and heterogeneity. The report goes on to state that the best approach is, for example, to treat logging as an experiment and implement monitoring systems and feedback mechanisms to management. This would provide new knowledge to managers and improve the effectiveness of management strategies.

As the forest cannot be returned to it's original condition the long term aim for forest condition must be the creation and maintenance of a sustainable forest structure that increases habitat values. To what degree that will be, will be decided by the development of knowledge, management options and cost.

Production and conservation do not always have to be adversaries. In that regard the Cypress Pine industry today based on regrowth can be a profit generating management tool offsetting conservation costs.

Conclusion

"Far from saving our wildlife, the high levels of cypress pine and forest oak regrowth now prevalent seems to have contributed to this species decline, as it tends to suppress the grassy under storey and other vegetation for a long time". (Environmental scientist David Paul)

The conversion of so much of these forests to a passive management regime seems to have been driven by something other then good science or logic. The evidence is quite clear that apart from the cutting of old growth ironbark, increases in forest density have been the main driver for most of the habitat loss and species decline. It is also clear that densification is continuing, increasing the probability of more losses in the future. To remedy this a management approach based on active adaptive principles is required.

Conservation should come from measured improvement rather than politics and simple name changes.

Ted Hayman

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