Supplementary Submission No 204a

INQUIRY INTO MANAGEMENT OF PUBLIC LAND IN NEW SOUTH WALES

Name: Mr Barrie Dexter

Date received: 15/11/2012

B D Dexter

Thursday, 8 November 2012

The Director,
General Purposes Steering Committee No. 5
Inquiry into the Management of Public Land in New South Wales
Parliament House
Macquarie Street
SYDNEY NSW 2000

Dear Director,

INCONSISTENCIES RAISED IN HEARINGS AND SUBMISSIONS.

As a contributor to the Inquiry, I continue to follow its progress with great interest.

I note some inconsistencies in people's interpretation of the literature for which some clarification for Committee members would perhaps be helpful. For example, Report of a Public Forum [uncorrected proof] at Deniliquin on Wednesday 1st August 2012. P.5 the Hon Luke Foley ... *"One of the problems for politicians in issues like this is that different facts and figures are thrown at us from different sides of the argument in issues like this ..."*

An important issue is: **Did the floodplain river red gum forests exist only as scattered veteran trees prior to white settlement?**
What are the implications for the Inquiry?

I appreciate submissions to the Inquiry closed on 31st August 2012 and I am not sure of the protocol for further communication with you. However, I simply wish to attempt to shed some light on those questions in a note to the Secretariat.

The attached document extensively draws on the work of diligent historians and other authors. I suggest that their work may not have been considered in sufficient depth to support some of the propositions put in some submissions and at hearings. To do justice to their work, the extracts might be considered lengthy, perhaps a reasonable finding, but done to cover the 'devil in the detail' and portray the author's research and views in their own words, particularly the context in which they were expressed at the time.

I hope this proves useful in your analysis.

Yours sincerely,

Barrie Dexter.

Notes for Secretariat, Legislative Council General Purpose Standing Committee No.5

INQUIRY INTO THE MANAGEMENT OF PUBLIC LAND IN NEW SOUTH WALES

From: Barrie Dexter 8 November 2012

SUMMARY

These notes analyse the different interpretations of historic reports and literature concerning the presence or absence of river red gum forests, as distinct from scattered veterans, on the central Murray floodplain bounded by Tocumwal, Deniliquin and Echuca, in the 19th Century.
Widely differing interpretations of the records of early explorers and squatters have been expressed at Inquiry hearings and in submissions. They are tested by a detailed examination of the work of various historians and knowledge of the inherent growth characteristics of river red gum.

It is concluded that there were dense stands of river red gum on some sections of the floodplain with a favourable flood regime for tree establishment and growth, particularly on shelves and in bends along some reaches of the river.

The 19th and early 20th Century records are important for identifying the origin of the present maturing forest. Originally enabled by radical changes in the land form, the Cadell Tilt, the forests have always been impacted on by human intervention manipulating its structure and composition over many centuries.

Some implications for the Inquiry of this finding are also discussed.

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INQUIRY INTO MANAGEMENT OF PUBLIC LAND IN NSW – SOME INCONSISTENCIES RAISED IN HEARINGS AND SUBMISSIONS.

Did the floodplain river red gum forests exist only as scattered veteran trees prior to white settlement?

What are the implications for the Inquiry?

BACKGROUND

The Hon. Luke Foley raised the following matter reported in – R*eport of a Public Forum* [uncorrected proof] at Deniliquin on Wednesday 1st August 2012.

P.5 *"... One of the problems for politicians in issues like this is that different facts and figures are thrown at us from different sides of the argument in issues like this ..."*

The most important of these issues concerns the existence or absence of well-stocked maturing stands of river red gum forest, as distinct from veteran trees in a more open forest/woodland setting on the of Barmah-Millewa Forest floodplain bounded by Tocumwal, Deniliquin and Echuca [Figure 1] prior to white settlement.

As the 1917 flood breached the then existing protection works, the boundaries of the carefully mapped flood (Bren 1988) provide a good indication of the extent of the floodplain in this region prior to European settlement.

Knowledge gained on the issue leads to the question: What are the implications of findings for the Inquiry?

These notes are confined to the region bounded by Tocumwal, Deniliquin and Echuca [Figure 1] and so encompass both the Millewa [NSW] and Barmah [Vic] forests. In considering the early history of exploration, squatting and selection, it is necessary to consider both forests, the floodplain of which afterall has a common geological genesis; the Cadell Tilt. For this review, it is important to remember that originally what is now known as the Barmah Forest [National Park (NP)] was two separately named forests known as Barmah [western section] and Yielima [eastern section].

Firstly, in the following paper, transcripts of evidence [uncorrected proof] given by Mr Crump and Mr Joss – Public Forum, Deniliquin, 1st August 2012 are considered and then two submissions:

* Mr David Joss – Submission No. 23;
* National Parks Association of New South Wales – Submission no. 406.

These extracts are all indented and shown in italics.

The sections following contain extensive extracts from the work of diligent historians and other authors [see Bibliography]. This is necessary in order to portray each author's views in their own words at the time and, hopefully, the context in which they were expressed. These extracts are also shown in italics and are indented. Where the historians quote others, these quotes are double indented for clarity.

Finally, the summation of these writings under Discussion and Conclusion will expand on information so far provided to the Inquiry in submissions and hearings on what the floodplain forests and wetlands were most probably like in the 19th Century.

1. Extracts from: UNCORRECTED PROOF – REPORT OF A PUBLIC FORUM – DENILIQUIN 1ST AUGUST 2012 [page number identified]

(i) **Mr Chris Crump, - sawmiller Mathoura on the matter of RRG forests on public land in the region, particularly the Millewa group of forests.**

P8. ***Mr Crump****: The fact of the matter is that Millewa, Gulpa Island and Moira forests were not there; as the NRC said in its report. It was not ancient. We handed a map around that showed it was not there. Obviously they did not know or they lied about it being ancient—that's what I cannot work out. We are talking about something that occurred through the process of white settlement. That is why they took it up as grazing leases. It is through cattle coming, grazing and eating it down and settlement that the trees grew. It was not a forest. You are paying for something out there that is virtually a plantation.*

The Moira forest is the youngest forest of the lot. It was called the Moira plains as you went down to Bama forest. That sprung up in the 50s [1850s?]. *Let us start with the truth on the history to see what has happened. Let us tell the truth.*

(ii) **Mr David Joss, - member of Mathoura Community appearing in the capacity of a private individual.**

Pp21/22 ***Mr Joss:*** *As I explained on the bus this morning the landscape we saw on the river was nothing like the landscape that is reported in the historical literature. There is no evidence that the river red gums were here when white explorers first came to this region although there were certainly some red gum trees here. They were not growing in the massive forests that we have today. Charles Sturt, who came down the river in 1838, obviously did not encounter more than a few although he stood at the centre of today's Millewa forest. If you remember what the bush looked like out at Picnic Point, where we turned the bus around and headed back, that is pretty dense bush.*

Sturt got as far as the Edward River, looked across, and said the country on the other side was open and covered in reeds. It was all reed beds. He had been battling through reeds to get to that point. He met a group of Aborigines at the Edward River. He did not speak their language of course but they made him understand with sign language that he would not get any further because there was too much water ahead of him. He sent a man out to scout and the guy came back and confirmed it. He said the reeds hid creeks which ran everywhere and were full of rotten timber. He said, "Well never get the drays through." He had two drays with him carrying his supplies. He crossed the Murray at that point into what is now Victoria. It took him two days to find the river again.

Getting back to the river, he said it was issuing from a vast marsh. About four years later a gentleman named Edward Kerr [Curr], *who was a squatter, took up a run on the Goulburn River, not very far from Barmah. The Goulburn runs almost parallel to the Murray for some distance before it joins the Murray. He was not too far from Barham* [Barmah], *so he and his brother went across and inspected the river flats to see if there was any good food there because he had 3,000 head of sheep that he had to feed. He wrote of mostly grasslands and lots of reed beds. He did mention riding past some what he called fine old gums from which we know that many of them were stripped in the old days, so that was the Aboriginal use of the resource, but he did not mention vast forests, or anything resembling that.*

Looking at the map that we passed around today, it was in 1848, which was 15 years after Sturt came down on the Government's layout by the sounds of it. That map shows a lot of trees. He has very carefully and painstakingly drawn lots of trees, but they are all in what we call box country, and very few red gums grow in that higher ground which is beside the Cadell Tilt. He obviously did not see any vast forests either in the red gum country. What he did draw on the map quite clearly

were lots of sandhills and lots of reed beds. The reed beds that he shows are of much greater extent than they are today and that is largely because the red gums invaded the area where they were growing. There were red gums present, but they had not formed forests and you have to wonder why. I certainly do. When you look at the growth habit of red gums, you find that they are shade intolerant. They will not germinate unless the seeds are exposed to full sunlight. Lots of plants are like that.
What had happened was that the Aborigines maintained a regular burning program. Kerr [Curr] *mentions that: he said that there was a pattern in the reeds that he saw, depending on the year and the season in which they were burnt. The trees really could not get going and any that did would have been burnt in the fires. They could not get going because the grass was too long. Kerr* [Curr] *tells us that. He said that the couch grass over at the Barham* [Barmah] *area was a foot deep. He was delighted. Sturt tells us the grass that he saw, and this was before he got to the river, his stock was travelling through grass that was up to their necks. So there was long grass and very little opportunity for the sun to get at the seed. The Aboriginal burning program controlled the spread of the trees. Once Edmund Kerr* [Curr] *and his mates crossed the river and put their sheep and cattle on the river flats, the trees had their opportunity. The next flood that came through provided plenty of moisture for germination, so it woke up the forest. That was the beginning of it.*
There has been some discussion trees 300-year-old trees. They are regarded as 300 years old because they are a metre wide. But in those early days, those trees, being regularly flooded, grew at a much, much faster rate than that. They grew at phenomenal rates.

P22. *The New South Wales Government in 1875 was so impressed with the potential of the forests as a resource that they employed a man and sent him down here to look after the forests and see that they were not cleaned out. They were certainly being felled at that stage for railway sleepers. John Manton started looking at the trees. Five years earlier than that, the forest had had the biggest flood that, even until now, has been recorded at Echuca wharf. The 1870 flood was massive. It was a very, very wet year everywhere. Everyone was bogged down. Overlanders trying to get cattle through, some of them only made a mile a day because they had to keep digging their cattle out. The forest got this enormous drink and that started a huge regeneration.*
I think it is generally accepted that there are more trees germinated by the 1870 flood than by any flood since then. Manton got down here and realised that the trees would grow very, very quickly. He had all these skinny little saplings on his hands and he immediately started lobbying the Government to have some thinning done. Eventually, that happened. In about1890 financial circumstances had changed a bit. We had a major depression on our hands then, probably at least as bad as the 1930 Depression of the Great Depression, and Manton managed to persuade the Government to put some money into thinning the forest. ...
.... This is thinning the forest in 1896, and there's hardly a big tree to be seen. They are obviously very young trees. ...

P24. ***The Hon. Rick Colless:*** *In relation to the map you showed us this morning; the description of that area initially by Hume and Hovell when they moved through it and then Sturt some years later, what year was that?*

Mr Graham: *Hume and Hovell were exploring in 1824 but they did not come through this area.... I use them as a reference just to show that the line of thinking that the early settlers cleared massive amounts of trees from the Murray valley was wrong. Hume and Hovell found that the country near Albury was mostly open and Hovell wrote that in some places there were scarcely six trees to 100 acres. This was wide open country. Other people who explored the Murray wrote much the same thing; they kept coming across these vast plains that ran back from the river where today we have a lot of forests.*

2. Extracts from: SUBMISSION NO.23, MR DAVID JOSS

Introductory – *"I began researching the origins of the forests. What I discovered convinced me that the forests were an accidental result of white settlement".*

P2. *Summary: The national park "protects" a forest that was not here until European settlers' stock began grazing down the large, grassy plains and reed beds found along the Murray by people like Charles Sturt (in 1838) and Edward Curr (in 1841). Sturt wrote that the grass was up to the bellies of his cattle; Curr wrote that the couch grass was a foot deep. Neither mentioned red gum forests, although Curr did mention a stand of mature gums and Sturt a thicket of tall slender unidentified eucalypts. River red gum seeds cannot germinate in the shade provided by long grass. They need full sun. Aboriginal burning had limited the number of trees and promoted the growth of grass and reeds. Heavy grazing and the cessation of burning liberated the trees.*

P3. *The NRC claimed many of the trees in the forests pre-dated European settlement apparently unaware that (a) the forests did not exist prior to European settlement (point 1) and (b) trees which pre-dated the great 1870 flood were routinely culled as part of a forest improvement program which began about 1890. Almost all the trees in these forests are less than 150 years old.*

Pp5&6.
1. The Murray valley river red gum national park is a fraud, built on a myth
The Millewa group of forests is not the landscape the first white men in the area saw.
Believing the romantic notion that it represents ancient Australia is an entirely understandable error because the evidence, buried in history books, is still emerging. The documents and maps which support the view have however been with us for quite some time.

A diligent study of silvicultural practices documented by Forests NSW would have told them that from about 1890 there had been a deliberate policy of felling — or killing by ringbarking — any tree that pre-dated the great 1870 flood. In fact the NRC listed in its bibliography one document that should have told them about this. In A History of the Millewa Group of River Red Gum Forests, commissioned and published by Forests NSW in 1997, history consultant Peter Donovan quoted forester Neville Davies describing the forest management plan in operation during the 1950s:
—All other trees above 6ft. [180 cm] *d.b.h. (Diameter at Breast Height) not required for future crop were either felled or ringbarked in logging operations." (Page 66)*
The reason for this policy, introduced in 1890, was that the forest was being managed as a commercial resource. The removal of old, commercially useless trees made more water, nutrients and sunlight available to the younger, straighter, more vigorous trees.
Had the NRC researchers read on they would also have found this statement on page 80:

> *The activities of the timber industry and the management practices of the Forestry Commission means that the forests comprising the Millewa Group are certainly younger than they were in 1750. They are virtually all new growth forests with stock grown since the 1870s. In the process of silvicultural management of the forests most of the old and deformed stock was removed in order to encourage healthy regrowth. This has also meant that with the culling of unhealthy trees and others unlikely to develop into merchantable timber that the forests are generally healthier than they were in the period before white settlement in the region, except for those parts of the forest that have been drowned by summer flooding during the past fifty years.*

Peter Donovan, the historian who wrote those words, had not read all the history either. He too assumed the existence of the forests before white settlement and seems confused about

the date (1750?) of first white settlement. On page 14 he wrote: Sturt was the first to record descriptions of the Millewa red gum forest. Well no, he was not. A careful reading of Charles Sturt's 1838 journal and of his published reports fails to reveal anything that could be construed as a description of a red gum forest.
Sturt, by 1838 a pastoralist, brought a mob of cattle down the Murray from near where Albury now stands.
He was bound for Adelaide.
At the time the region between Albury and the Murrumbidgee junction was a blank space on the map.

Although Sturt in his handwritten journal — a copy of which resides in the State Library of Victoria — recorded that he had seen a new variety of eucalypt and travelled beside "a wood of tall, slender gum trees", he wrote that the area on the western side of the Edward river was "a broad open space covered with reeds" as was most of the country over which he had travelled upstream from the junction. If there was a forest along the Murray between Tocumwal and the Edward, Sturt was evidently unaware of it. This is not to say there were no river red gums at all. Others have recorded their presence but they were not in such numbers as to be noteworthy.

As an explorer Sturt was aware of the need to record details of landscape including resources. Like all graziers he had a keen eye for good country. His handwritten journal says that the river flats near the Edward had "a superabundance of pasture... Vegetation is most luxuriant upon it [the rich soil] in so much that our cattle walk through beautiful green feed up to their middles in grass..."
Sturt crossed the Murray [1][June 1838] [Figure 4] *at that point and spent two days battling through tall reeds until he eventually came upon the river again. He said it was flowing out of "a vast marsh". That area is now occupied by the Barmah and Moira forests.*
Several years after Sturt had passed through the area a young squatter named Edward Micklethwaite Curr settled on the Goulburn River close to the Barmah area.
He recorded his impressions of his first inspection of the Murray near present-day Barmah (and near where Sturt saw "a vast marsh") in his book Recollections of Squatting in Victoria:

> *"Looking around, on one side of us we saw extensive reed beds intersected by the Murray, which (an unusual feature in colonial rivers) flowed here almost without banks, and on the level of the plain. The other half of the circle was occupied by open, grassy forest land, which extended we did not know how far..."*
> *"But we were just then intent on sheep-feed and not on scenery;...*
> *To this solitary old giant we accordingly forced our horses, with considerable difficulty, ...*
> *A sea of reeds, of several miles in extent, as far in fact as the eye could reach, met our view on two sides, flanked by some grand old trees,...*

The map which is dated 1848 shows other box forests too, but none of red gum.
In 1842 another squatter, Henry Sayer Lewes, established Moira Run on the west bank of the river, opposite the pastoral leases which Edward Curr had by then taken up along the Murray. In 1883 he forwarded a submission to a NSW government enquiry into public lands, telling parliament about the conditions he found when he first occupied Moira.

P8. *"The low tract between the plains and the river Murray, now being flooded, was mostly clear swamp, where afterwards it became covered in impenetrable reed beds. The small strips of plain near the swamp were covered with*

[1] Hibbins 1991 *Barmah Chronicles* Page 9 [Figure 4]

mesembryanthemum and salt-bush. The higher plains were entirely bare of any vegetation whatever but occasional salt-bushes. The box forests skirting the plains had here and there a few tufts of dry grass, which might have been in the same state for years."

Lewes, Henry Sayer in Report of Inquiry into the State of Public Lands and the Operation of the Land Laws. Instituted 8th January, 1883 Journal of the Legislative Council, 1883, Vol. 34, pt. 1

The "low tract between the plains and the river" is now covered in trees — the Moira forest.

Curr in fact was so excited by the prospects of the grasslands now occupied by the Barmah forest that he immediately applied for and was granted extensive river frontage grazing leases.

Curr (1883) remarked that Australia had:

> *"over a great portion of its area, the inestimable advantage of being ready for immediate use without the outlay of a sixpence" He originally described 'fire-stick farming" (Curr, 1883) and the terminology was "reinvented" by Jones (1969) a century later. Howitt (1891) noted that Aboriginal fires "tended to keep the forests open, and to prevent the open country from being overgrown, for they not only consumed much of the standing and fallen timber, but in a great measure destroyed the seedlings which had sprung up since former conflagrations".*

Further confirmation that there were no great forests of red gums in the area is found in another map from 1848; that of Thomas Townsend, a New South Wales government surveyor. On his map of the country between the Wanderer Inn, where Deniliquin now stand and Maiden's Punt (Moama) he carefully drew the area now occupied by the Millewa, Gulpa Island and Moira forests.

<u>P8/9.</u> *Near Mathoura the word "forest" appears only on the higher country west of the Gulpa creek, sometimes preceded by the word "scrubby". River red gums do not grow in that area. It is part of the uplifted block of land known as the Cadell Tilt. In fact Townsend's only mention of gums is in an area which is now the southern portion of the Moira forest. It is labelled "Gum Swamp". Townsend, like Sturt, Curr and Lewes obviously saw no forests worth recording in an area today acclaimed as "the largest red gum forest in Australia".*

Centuries of Aboriginal burning along the Murray had kept the banks largely free of trees but there was another factor holding back the red gum invasion.

River red gums are shade intolerant. That means their seeds will not germinate unless exposed to direct sunlight.... Once the grass was short enough the tiny red gum seeds were able to germinate. Red gums are thirsty trees and it did not take the newly-emerged invaders long to pump much of the water out of the wetlands, with well documented and spectacular growth rates matched by huge rates of transpiration. This is evidenced on the Townsend map mentioned above. The reed beds occupy a much greater area than they do today.

These forests are the result of white settlement and are less than 200 years old!

<u>P10.</u> *While I was researching the origins of the forest, and completely unbeknown to me, Professor Bill Gammage ... argues that the first Australians had actually created the park-like landscape recorded by early artists, explorers and settlers all over Australia. In fact it is subtitled How Aborigines Made Australia.*

They did it by the strategic use of fire which resulted in large areas of grasslands often edged with belts of trees which afforded shelter to the animals they wished to hunt.

His is a very persuasive argument backed with sound reasoning and much evidence.

He writes:
"We know too little about 1788 to measure these changes [to vegetation] and our attempts are disabled by contemporary preferences and assumption..."

3. Extracts from: SUBMISSION NO. 406, NATIONAL PARKS ASSOCIATION OF NSW

NPA does not believe that this Inquiry should focus on revisiting previous public land use decisions of government. Regularly revisiting major public land use decisions will prove a significant waste of public funds that have already been used to establish national parks and to provide industry adjustment; undermine the value of national parks; create international embarrassment for Australia and NSW, particularly in the lead-up to NSW hosting the 2014 IUCN World Parks Congress, which is a major international conservation event and will focus international attention on the management of protected areas in NSW; break a long-standing bipartisan commitment to the establishment of a CAR reserve system; and create business uncertainty by reopening previously-settled issues.

5.2. National park case studies
River Red Gum State Forests in the Southern Riverina
The Murray Valley National Park was gazetted on July 1st 2010. This park covers an area of 41,601 ha, and incorporates the former Barooga, Boomanoomana, Corowa, Cottadidda, Gulpa Island (part), Millewa (part), Moira (part), Native Dog, Niemur, Noorong, Tholobin, Thornley, Tuppal, Wetuppa, Whymoul and Woperana State Forests (Office of Environment and Heritage, 2012c). It includes part of NSW Central Murray Forests Ramsar Wetlands, which were listed in 2003.

The River Red Gum forests that have now been incorporated into the Murray Valley National Park meet several of the priority themes identified by the National Parks Establishment Plan 2008 for building the NSW reserve system over the next decade, including poorly reserved ecosystems and habitats; wetlands, floodplains, lakes and rivers; and culturally important places.

Surveys conducted for NPA by an independent ecologist, funded by Taronga Conservation Society of Australia, confirmed the exceptional conservation significance of the Millewa block of forests.

Management issues
History of the River Red Gum Forests
There have recently been a few highly inaccurate claims made about the red gum forests. A number of people, including industry representatives, assert that the River Red Gum forests were not present before European colonisation, due to the burning practices of the Traditional Owners of the land. They argue that the River Red Gum forests have only come into existence in the last few hundred years, as a result of European land management, and characterise them as "white man's weeds". Mr David Joss presented such an argument at the Inquiry Hearing in Deniliquin on August 1st, 2012 (Joss, 2012).

This argument is not correct, and the oral history of the Traditional Owners, along with many massive tree stumps from trees that were hundreds of years old when felled, provide clear evidence that there were always Red Gum forests present in the area. During the Inquiry hearing on August 2nd, evidence was presented by Mr Neville Atkinson, Chair of the Yorta Yorta Nation Aboriginal Corporation, that:

Scientific evidence also says, and even Aboriginal knowledge says that just from the story I gave you, the forests are 10,000 to 15,000 years old. There is a description of red gum being in the landscape and being associated with the wetland. That is a natural tree for that type of environment (Atkinson, 2012).

Ms Debbie Flower, Member and Traditional Owner, Yarkuwa Indigenous Knowledge Centre Aboriginal Corporation, in response to a question from the Hon. Luke Foley about whether "forests in this region were grown by the white man", gave evidence that:

I would respond by saying that the stories that have been passed down from the Elders for generations tell us otherwise. We have burial grounds that are thousands of years old and midden sites that are at least 10,000 years old. The evidence is there (Flower, 2012).

In addition to traditional knowledge, there is western scientific evidence suggesting that prior to European settlement, forest structure was dominated by large, spreading trees, some over 500 years old, interspersed with a mosaic of mixed and even-aged patches (Jacobs 1955, cited in MacNally et al. 2011).

4. Extracts from: BILL GAMMAGE (2011) THE BIGGEST ESTATE ON EARTH – HOW ABORIGINALS MADE AUSTRALIA. ISBN 978 1 74331 1325

Page numbers identified from Gammage index.

River red gum	pp 113
Riverina	pp 110-111
Murray River	pp 2, 106, 110, 158, 194/195, 337

(1) - River red gum.

P113. *Sturt knew how important soil – plant associations were. He cited river red gum on flood land beside box off it, 'though the branches of these trees might be interwoven together, the one never left its wet and reedy bed, the other never descended from its more elevated position'.*

He [Sturt] *pointed to the open grassy park-like tracts ... The trees most usual on these tracts, were the box, an unnamed species of eucalyptus, and the grass chiefly of that kind called the oat or forest grass, which grows in tufts at considerable distances from each other and which generally affords good pasturage.*

(2) - Riverina

P110-111 *On Moira on the Murray Lewes recalled, "The small strips of plain near the swamp were covered with mesembryanthemum and salt bush. The higher plains were entirely bare of any vegetation whatever but occasional salt bushes. The box forest skirting the plains had here and there a few tufts of dry grass... the same appearance of intense drought and sterility pervaded the whole".*

(3) - Murray River

P2. *Edward Curr glimpsed this. Born in Hobart in 1820, pioneer squatter on the Murray, he knew people who kept their old customs and values, and he studied them and their country closely in the decades on their dispossession. After 42 years in Victoria he wrote, "it may perhaps be doubted whether any section of the human race has exercised a greater influence on the physical conditions of any large portion of the globe than the wandering savages of Australia". He knew that linking "wandering savages" to an unmatched impact on the land*

startlingly contradicted everything Europeans thought about 'primitive' people. He deliberately defied a European convention that wanderers barely touched the land, and were playthings of nature.

Records show that early Europeans crossed rivers and creeks via fallen trees, including rivers like the Murray [Hume] and Goulburn. Open areas were interspersed with dense scrubs, a term sometimes describing stands of eucalypts.
Scrub is more likely a term to describe vegetation that impedes the progress of drays and horses. For example, in 1832 Mitchell stated, *"bush or scrub consists of trees and saplings, where little grass can be found"* [8 Jan 1832 Mitchell 1839, Vol 1, 71n from Gammage (2011)] while in 1834 Breton wrote:

> *"Open Forest" is that description where there is no underwood and the trees in general are far asunder". "Scrub" is dense forests with much underwood and bad soil"* [Gammage (2011).
>
> *In Leichhardt's time people called "forest" what we might call woodland.* [2] *[p337]*

A plausible explanation post 1788 in the era of the first explorers and then squatters is a bias for country that could be traversed with horse and dray where grass was plentiful and water not too difficult to access. Trees per se were not the overriding consideration for either the explorer, the first drovers taking cattle and sheep to Adelaide market nor the first squatters whose major concern was for abundant feed for sheep and cattle.

Fenshaw (2008) as reported in Gammage Appendix 1 assumes that early reports can be used as baselines for tracking changes in vegetation density over time. Gammage agreed, and as he states he and others have elsewhere found evidence of vegetation thickening since 1788. The changes can be extensive and obvious suggesting that they began when Aboriginal management burning ceased: certainly, apart from random fire, presumably naturally sourced from lightning strikes no-one has yet proposed an alternative.

With respect to RRG floodplain forest there are other factors which promote or preclude seedling establishment. [See Discussion]

> P106. *The Murray pioneer Henry Lewes recalled of near Moama (NSW), "the low tract between the plains and the Murray ... was mostly clear swamp, where afterwards it became covered by impenetrable reeds beds*[21]. [Donovan 15]
>
> P110. *In 1788, saltbush and perennial grasses mitigated salinity; now it is spreading.*
> *On Moira on the Murray, Lewes recalled, "The small strips of plain near the swamp were covered with mesembryanthemum and salt bush. The higher plains were entirely bare of any vegetation whatsoever but occasional salt bushes. The box forests skirting the plains had here*

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[2] Compare with today's terminology: The National Forest Inventory uses three broad crown cover classes. Crown cover is defined as the area of ground covered by tree canopies. A line around the outer edge defines the limits of an individual canopy. All the area within that line is counted a "canopy", irrespective of gaps and overlaps.

- Woodland forest: 20% - 50% crown cover;
- Open forest: 51% - 80% crown cover;
- Closed forest: 81% - 100% crown cover.

A closed forest is one in which the tree crown cover ranges from greater than 80 to 100 per cent of the land area when viewed from above. An open forest is one in which the tree crown cover ranges from greater than 50 to 80 per cent of the land area when viewed from above. A woodland forest is one in which the tree crown cover ranges from greater than 20 to 50 per cent of the land area when viewed from above. [Source: DAFF 2012, Australia's *agriculture, fisheries and forestry at a glance 2012,* Canberra, May. CC BY 3.0.]

and there a few tufts of dried grass ... the same appearance of intense drought and sterility pervaded the whole". [Donovan 15]

P158 *(6) How was the land managed?*
On the Murray [locale not described by Gammage] *Sturt saw where fire had scorched trees "to their very summits and the trunks of those which had fallen were smoking on the ground".*
5 (Jul 1838. Sturt 1838, 37);
6 Clean up fires: J R Ford 17; Fox 16; Haynes et al 64; Keast et al 42; Roseman 44.

P 194/195. *Sturt nominated three inland landscapes: first, plains of considerable extent wholly destitute of timber; secondly open undulating woodlands; and, thirdly open unprofitable tracts. The first almost invariably occur in the immediate neighbourhood of some river ... The open forests through which a horseman may gallop ... over the whole secondary ranges are generally ... excellent grazing tracts ... The barren tracts ... may be said to occupy the central spaces between all the principal streams.* 40 Latz 1995, 30. Also Burrows and Albert 129-33.

Gammage concluded that while generally true of the first in 1788, though not now; this was only partly true of the third. Explorers found both grass and dense timber off rivers. Hume and Hovell met *vegetation changes in northern Victoria ... a patterned landscape.*

5. Extracts from: EDWARD M. CURR, RECOLLECTIONS OF SQUATTING IN VICTORIA, SECOND EDITION, RESET, 1965. MUP. Then called the Port Phillip District [from 1841-1851]

P76. ... *It so happened, however, that my brother Richard, who resided at Tongala in my absence, had seen and taken a fancy to a tract of country on the south side of the Murray, which was known to the Blacks by the name of Moira. In a flying visit made to it some short time previous, he had found that, under water for several months of the winter and spring, it abounded in summer in excellent sheep feed, in the shape of couch grass, young reeds, and so on, and was usually as green as an emerald from November til March, when other pastures were withered and dry; whilst there was quite high land enough about it to ensure a retreat for the sheep in the case of sudden inundation. As characteristic of the Moira, he mentioned that it abounded beyond all belief in unusually fat fish, swarmed with leeches and snakes, and the ducks were so numerous that I cannot tell now how many he bowled over at one shot. As we learned afterwards, its extensive reed-beds were the great stronghold of the Bangerang Blacks,...*

P77/78. *In consequence of my brother's representation he and I started before sunrise on morning to make a thorough examination of this country, and decide whether or not we should take it up. Mounted, I remember, on two vigorous rowdy horses, we trotted merrily along the Towro sand-hill, which leads from Tongala Station to Madowla Lagoon ... So we cantered on, crossed the Tiia Creek at its mouth, and sped along the Blacks' track to Pama, and thence, keeping on the edge of the fine old red gums [odd which we noticed many a canoe had been stripped in old days], to the Moira itself, at the mouth of the Baala Creek, some fourteen miles from home. After wading the creek we dismounted to light our pipes and rub off numberless leeches which had attached themselves to our horses' legs and bellies as we passed through the water. On this, my first visit to the Moira, I thought the place had a very pleasant aspect, of a mixed Australian and semi-tropical character. It happened that there were no Blacks there at the moment; but some camp fires smouldering under the shade of a spreading tree, and the bags and nets which hung from its branches, showed that*

they were not far away. Looking around, on one side of us we saw extensive reed-beds intersected by the Murray, which [an unusual feature in colonial rivers] flowed here almost without banks, and on the level of the plain. The other half of the circle was occupied by open, grassy, forest land, which extended we did not know how far. The grass under foot, as yet undefiled by flock or herd, was as green and fresh as Eden, and the landscape generally bathed in a soft, hazy, sunlight, such as Monsieur Buvelot would love to depict. But we were just then intent on sheep-feed, and not on scenery; so, after a brief delay, we remounted and rode over a plain of green couch grass of some length, and on through a narrow opening in the reeds into what proved to be a charming little savannah of perhaps half a square mile in extent. The grass in it was about a foot high, and so thick that the tread of our horses was as noiseless as that of a camel.

Through the reeds, which stood considerably higher than our heads, a light breeze was playing intermittently, with a sound which reminded one of the gentle wash of the ocean in a sandy bay. The isolated meadow, into which we had found our way, proved, as I have said, of but trifling extent, so that in less than a mile, we found ourselves confronted by a wall of old reeds. They were about ten feet high and grew only a few inches apart, the interstices being occupied by the debris of those that had fallen, couch grass, and numerous convolvuli. Some fifty yards off, amongst the reeds, however, was a gnarled and spreading gum-tree, from the branches of which a view of the neighbouring country might be obtained. To this solitary old giant we accordingly forced our horses, with considerable difficulty, and clambering up its short trunk took our seats amongst its branches some forty feet from the ground, when we were enabled to overlook the country for a considerable distance around, and discuss its capabilities at our leisure. A sea of reeds, of several miles in extent, as far in fact as the eye could reach, met our view on two sides, flanked by some grand old trees, amongst whose branches, no doubt, long generations of Blacks had hunted the opussum and flying-squirrel, the Murray, broad and bright, coming into view here and there. The reeds were by patches and strips of different hues and growth, in accordance with their ages and the periods at which they had been last burnt;... On a closer examination we also noticed several patches of good open country, such as we had just left, and that the whole could be made available, with little trouble, by burning. As from our elevated seats we watched the smoke, which curled here and there from the distant camps of the Ngarrimowra,...

P79. *Having delayed some time, and satisfied ourselves that the Moira would suit our purpose, we retraced our steps to the mouth of the Baala, where we found some Blacks who had returned to camp, and were grilling fresh caught fish, in the disposal of which we gladly assisted them, giving them a little tobacco in return. As I wished to see the river frontage between the Baala Creek and the Pama, which appeared too rough for riding, and might contain a reed-bed, I persuaded one of the Blacks, with whom I was acquainted, to take me in his canoe to the latter place, where my brother agreed to meet me with the nags.*

The canoe in which Tommy and I embarked, like those commonly in use at the Moira, of which there were about thirty, was of very thick red-gum bark, something over twenty feet long, with a small fire – on which a fish or a duck might be grilled- burning on a hearth of clay in the bows.... Stately and hushed, old Tongala [Murray] *flowed on through his trackless woods!*

P82. *...we again floated silently down our liquid road, between grand old gum trees, abundance of couch-grass, and clumps of reeds, up which climbed convolvuli in waste luxuriance. Here and there crowds of ducks, and swans occasionally, took wing at our approach; the white crane, the blue crane, and the nankeen-bird, with outstretched necks, looked at us inquisitively from many a branch a hundred and fifty feet overhead.*

... Being satisfied with what I had seen, I shortly after applied for, and obtained, about eighty miles of Moira country, which turned out very valuable.
Since that day, some five –and-thirty years [1877] *only have passed, and Blacks, reeds, and bell-birds are gone. Of the first scarce one remains; his cooey is heard no more in those parts, whilst the old forest itself is fast being converted by steam sawmills into railway sleepers.*

6. Extracts from: HIBBINS G. (1978) - A HISTORY OF NATHALIA SHIRE. THE GOOD HELMSMEN. ISBN 0 7256 0232 5

Page numbers identified.

Chapter 2, Exploration pp 11-26

P16. *It was therefore decided that we should cross the Hume at the most convenient place near the camp* [see Figure 4] *but as the banks of the river were perpendicular on both sides it would be necessary to take the Cattle up the Stream to a better place, and where a sandbank would afford them good landing on the opposite side.*

P17. *The scene at a short distance from the Camp was well worthy the pencil of our Wilson. The broad expanse in the foreground was covered with our cattle. The more distant flats looked like wheat fields ready for the sickle, the reeds being of a light yellow colour. A line of Forest was in the background, and trees scattered her and there, had a most pleasing effect in marking the course of the River. From our Tents the Channel of the Hume was visible and over a near wood there was a long line of Smoke hanging over one of the Camps of the Natives, whose laughter and merriment we could plainly hear.*

Pp19/20. *Here Sturt paused to review the country over which the party had travelled, commenting that 'feed continues abundant to the banks of the Delangen, and that very spot with many others we passed would make a splendid cattle station'.*
He continued: "Our course, the morning we left our Camp opposite the Delangen was very much to the SW. The River bent away in that direction, and the beds of Reeds stretched far inwards from its banks. After leaving there we traversed splendid and open flats of right light loam. They were so large as almost to deserve the name of plains. At noon we came to the western part of the anabranch of the River.

P21. *'At about 5 miles we [illegible] on a channel which at the time I thought merely a branch of the River, but which subsequent observation has led me to consider the principal and only one....*
'From this point, the reeds gain checked our progress and obliged us to alter our course still more to the Eastward of South. The Country to our left was subject also to flood, but was destitute of reeds, and was bounded in the distance by low scrub. To our right the ground fell, the nearer trees showing the marks of inundation four feet on their trunks, and beyond them reeds of great height stretched as far as the vision extended. At three miles we again struck on the River where it had assumed its usual appearance with steep earth banks and broad channel but muddy water and here we stopped for a time to rest our animals. On resuming our journey, we found the Country on both sides of the river free from reeds, but heavily timbered, and the soil a poor clay'.

P22. *'We started on the 13th on a course of W by S bending occasionally into [the bank] on the River, but holding that general line. The River itself wound thru perfectly even ground and [had] so little appearance of a River, more especially of so large a one [as] was there, that at fifty yards it was wholly imperceptible. Its Eastern banks were nevertheless from twenty to thirty ft .high. ... The soil at length became totally destitute of vegetation. It was a cold white clay, the surface of which, having cracked in every direction by solar heat, appeared as if it*

had been trodden underfoot by Cattle. The whole country was heavily timbered, and that on our Left seemed more particularly [illegible] as of the growth of flooded lands. I rode away with Finniss about a mile & a half to the Eastward, but this dismal region extended as far as we could see'.

P25. *It would seem that the main river channel where Sturt crossed at the junction of the Edward was not wide, and the river had eroded many creeks on both sides. These overflowed periodically, spreading the flood water, sometimes feet deep, into a forest of river red gums, some of which had grown to enormous heights over the years, and drained the forest dry again days or weeks later. Generally, extensive flooding between May and August occurred in wet winters, whereas spring floods from rain and melting snow in the mountains took place in all but drought years. The edge of the river gums marked the extent to which the river flooded, for the trees needed the water for the periodic transportation and germination of seeds. The lowest few feet of each grey trunk was darkened, a mute reminder on the height to which the river could rise.*

P26. *Further down the river, the water moved through a narrow channel and overflowed to fill two lakes in flood times, but sometimes leaving them dry and grassy in the summer.*
Beyond the river the land was very flat except for isolated hillocks, or ridges of sand, maybe three hundred yards wide and rising to forty feet above the surrounding land. Many of these supported dense groves of Murray pine, and between the Murray and the Goulburn grew forests of box eucalypts, banksia, buloke, sweet quandong, grey mulga, cherry ballart and wattles[3].
Interspersed amongst the forests and the scrub were tussocky grass plains, varying in size from one hundred to several thousand acres, their edges dark green from the Murray pines and scrub she-oaks, but cracked and dry, when Sturt saw them, from the severe drought of the previous two summers.... In the winter evenings will-of-the-wisp fires glimmers above the marshy depressions[4]. Along the many creeks which flowed into the two rivers, more red gums flourished, free of water when the creeks dried up and the rivers themselves had become a series of water-holes, until replenished once more in the spring by the water from the melting alps.

Chapter 3, Arrival of the Squatters. Pp 27-44.
P30. *The head station of Kotoopna was situated on the right bank of the Goulburn, east of Tongala by some fifteen miles. A sand-hill provided a rise which would keep the buildings, it was hoped, safe from floods ... The homestation of Strathmerton was south of the Murray on an anabranch which formed as area called Ulupna Island. A track came from near the junction of the Goulburn and Broken Rivers, crossed the Nine Mile Creek, and led to Ulupna Island....*
The homestead at Yielima was established on the south bank on a bend of the river, west of the Strathmerton homestead, and close to a ford, easily crossed when the river ran low in the summer. Here the banks provided some small security from floods, in contrast to further down the river where the river inundated the land and encouraged thick red-gum growth. Most of the land around was lightly timbered, and tall coarse grass grew well on the alluvial soil.

Chapter 4, The Eighteen – Fifties.
P51. *Yielima was not without its change of ownerships also. In 1855 Redfern and Alexander transferred Yielima to Roderick McDonell who had gone originally to help his brother*

[3] J.P. Barnes, *Two Puffs and a whistle, p. 21.*
[4] C. Hodgkinson, 1 April 1856, *Report on Murray River District,* Parl. Papers, 1856, vol. 4.

Alexander at Upper Moira. Roderick and Charles McDonell had been living at Yielima at least since early 1854....
Roderick McDonell made the first claim in the area for a pre-emptive right of six hundred and forty acres, allowed by the orders-in-council of 1847, and he did so in February 1854. Two years later flood made a survey of these acres on the bank of the river impossible, and it was not until January 1857 that the surveyor, Philip Chauncy, was able to recommend the granting of the pre-emptive right after visiting the slabbed homestead with its kitchen and stable, and viewing the stockyard, seven-acre garden, and thirty acres of grazing paddock ...
The McLaurin boys, ... owned Cornalla on the New South Wales side of the river opposite Upper Moira, Moroco in New South Wales opposite Yielima, ...

Chapter 5, The Eighteen – Sixties. Pp55-67.
P58. *Lower Moira changed hands also. In 1862 Robert Hill Kinnear was the licensee, ... At Lower Moira he built up a reputation for cattle, and butchers at Echuca knew and respected the RHK brand.*
... Although the squatters remained as yet unchallenged, the river and forest were beginning to attract a small population un-connected with farming.

P60. *In September the* [railway] *line was finished at Echuca, much to the excitement and satisfaction of the residents who soon benefitted from the boom in population and building. The contractors for this last stage of the railway, Collier and Barry, were not slow to appreciate the fine timber available north of Echuca. In 1864 they set up a sawmill on the Murray near the Goulburn River., to cut sleepers for more railways. In the same year Amos & Co began milling in the same area*[5]*; it was probably this mill that the entrepreneur from Echuca, James Macintosh, took over. He expanded the business by building a bridge over the Goulburn to link the mill with Echuca, and by adding another at Barmah.*
The constant sound of axes and crash of great trees resounded through the forest *where mostly the shrill stridency of the green-veined cicadas, the cries of water-fowl and the wind through the reeds had been heard. Many men with bullocks came to haul the logs over the boggy ground, or with sturdy horses when drought made fodder scarce.*

P61. *Soon there were so many men in the forest that there was sufficient demand to lay out a township on a high rise close to the River Murray, at the Barmah punt, the main crossing between Echuca and Yarrawonga. ... Barmah made an ideal river outlet for the wool from the nearby stations of Upper Moira, Kaarimba and Kotupna and those even further away, Ulupna, Bajanna and even Peedchelba. It also developed a small industry in boat-building; the William Randell was built there in 1870, and the Canally in 1874*[6].

P61-63. *By this time* [1869] *Macintosh was using steamer enterprise to take a barge twice a week to Barmah where logs were lashed to outriggers and the barge allowed to clash and clang its way down the river to Echuca with perhaps one man aboard to pull it into the bank when a steamer approached. The barge could cart thirty thousand super feet* [90m^3] *a voyage, and the mills turned out railway sleepers for the Victorian and Indian Governments, felloes and naves for wheels, which went to Melbourne and New Zealand, and timber for piers at Sandridge [Port Melbourne] and Geelong*[7]*. The year before, Macintosh had found it more convenient to shift his original Goulburn Sawmill to Echuca rather than cart the sawn*

[5] D. Forrest, 4 July 1878, in M. Carver, *Forestry in Victoria,* vol. D, p. 172.
[6] Shipping register of 1914 in P. Phillips, *River Boat Days,* p. 130.
[7] *Riverine Herald,* 5 June 1869.

timber from the Goulburn especially as the junction of the rivers was prone to flooding and the Murray River had been extensively snagged since 1865[8]....
Macintosh was not without his competitors, Robert 'Redgum' Barbour, whose saw-milling ownership had begun at Mount Macedon in 1863, had a mill near Barmah, and planned to build another at Yielima on the river. Edward Whiteley from Echuca had ordered the machinery for a mill from Melbourne, and it had just arrived on the train, when, to the consternation of all the mill-owners, the Government on 16 July 1869, proclaimed an area of 19,600 acres [7840 ha] *north of Barmah as a reserve for the preservation and growth of timber. The Clerk of Petty Sessions and Echuca received an order to issue no more timber licences in the area, and the owners agonised until Ferguson, the Inspector of State forest, arrived in November to report on the forest, and the system of licences was renewed, subject to certain terms and conditions. Relieved, the mill owners went ahead with their plans; Whiteley engaged John Martin Webb, Echuca boat-builder, who had learnt his trade at the Plymouth shipyards, to build a red-gum barge, eighty-two feet, at Barmah for him[9].*
In June 1870, the Government proclaimed a further forty-five thousand acres [18,000 ha] *as State Forest at Moira and Yielima; adjoin the Barmah Reserve and north of the Five Mile or Tullah Creek. Each of the mills was now cutting ten thousand to twenty thousand super feet* [30 – 60 m^3] *of timber a week for railway sleepers. Some of the cutters in the forest did not bother to obtain a licence, and the Crown Lands Bailiff at Echuca, a rather officious man called Stephenson, was instructed to pursue the offenders with vigour. Not all the timber workers were employed by the mills. Some provided wood for the boilers of the river steamers, which the stacked on the river bank and were paid for, in a gentleman's agreement, by the river boat-owners.*

P65. *The latter years of the 'sixties were not kind to the squatters. There was a severe drought in 1865, and the floods in October 1867 reached 34' 5'' on the Echuca gauge and washed some of Kinnear's sheep down the Murray; another dry summer in 1868-69 made the Murray fordable in many places.*

P66-67. *A more immediate problem for the squatters between the Murray and Goulburn Rivers that year of 1870 was the weather – once more. A wet winter brought floods in September and, a month later, the Murray broke away from its banks at Koonoomoo and spread south-west, covering the flat land with water, meeting the flooding Broken Creek and the spreading Goulburn,[10] until it joined the waters from the Campaspe, to give real force to the meaning of the name Echuca, 'a meeting of the waters', and to inundate the town.*
The land was covered with shallow water except for an island here and there, a ridge of box or sandhill of Murray pine where emus, kangaroos, brumbies and wild-eyed sheep huddled uneasily. Legends of its invasion, such as a Mrs Murphy's row from Yielima to Kotupna through drowned trees and bloated carcasses, would still be told a hundred years and more later. At Kaarimba 3640 points of rain were measured that year[11]. The Murray reached 24' 10'' at the Tocumwal gauge, and is supposed to have reached 38' 9'' at Echuca[12]. So great was the volume of water coming down the Goulburn and the Deep Creek, that the flow of the Murray reversed and logs floated upstream from Barmah to the Edward River. When finally the water went down, leaving mud and great tangled piles of wood, men went out and ruefully counted their losses, turning their faces from the stench of burning or putrid carrion.

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[8] V&P (L.A.), 1964-65, vol. 1, *Clearing the Murray.*
[9] *Riverine Herald,* 1869, passim.
[10] C. Catani, Evidence to *Royal Commission on State Forests and Timber Reserves,* 1899.
[11] *Nathalia Herald,* 2 Feb. 1932, supplied by A. Wishart.
[12] Evidence to SRWSC to *Northern Rivers Flooding Inquiry,* 1973. Echuca figure considered doubtful.

But in February 1871, a year after the new Land act had been proclaimed, the northern plain could be seen at its best, green and lush.

Chapter 6, The Selectors. Pp68-90.

Pp88-89. *For a selector with strapping sons, the timber industry with its felling and carting employment may well have helped to save the family from real hardship. There were four sawmills along the Goulburn and two more being built, according to Joseph Parker, the first forester to be appointed, after he arrived in 1875. The best timber, including all of the Murray pine stands, as almost gone from Barmah Island, he reported. However, further north around Yielima the forest was 'completely beset with men' felling and removing logs*[13]*. The trees were cut in the summer, tied to pontoons, and floated out during the floods in winter....*

... Parker more than earned his salary in hunting after the unlicensed timber-getters, the result of which, he wrote, 'an addition to the revenue cost £1.5.0 a quarter, that meant one hundred and sixty cutters without a licence. David Forrest, who replaced Parker as forester in January 1877, reported in 1878 that the river bank and back into the forest for an average of two miles had been partly or entirely worked. The rest of the forest, because its swampy terrain and distance from the river made it too expensive to work, was still virtually untouched except for a few of the finest trees. The forest on both sides of the Goulburn was partially worked out in 'every bend and swamp' by the mills along the river,[14] *including the mille at Kotupna around which the little village had formed.*

So great were the number of men removing timber that the government mover to protect the supply.

7. Extracts from: MANAGEMENT PLAN FOR MURRAY MANAGEMENT AREA. FORESTRY COMMISSION OF NSW. 1985

Chapter 1.4 Silvicultural Considerations

l.4.1 History of Silvicultura1 Development

Reports from early settlement days indicate that, except for low river bend shelves, the Red Gum forests were open woodland stands of veteran trees. Aboriginal management appears to have maintained the forests in an open, savanna-like condition by frequent burning. The disappearance of

tribal Aboriginal life, a sequence of good years for regeneration in the 1870s, and the fact that at this stage domestic stock and rabbits were not yet ubiquitous, resulted during the 1870s in widespread regeneration. Regeneration development was hampered by large trees that were quite useless to the demanding standards of the time, and from the I890s work started on ringbarking these culls and in thinning out the regrowth. Much of this work was achieved under Improvement Lease conditions and reached a peak in the depression years of the 1890s when large gangs were employed.

Stands of Black Box were also treated at this time by ringbarking close to the ground to promote suckering, leading to multiple stems suitable for round fence posts.

Since 1870, regeneration has occurred fairly regularly, although not necessarily to acceptable stockings or on a reliable basis. Fairly extensive regeneration was associated with the heavy flood years of 1917, 1931, 1939, 1956, 1970, 1973, 1974 and 1975, particularly on higher ground.

Good regeneration occurred in 1981 but was killed by drought in 1982.

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[13] Report on Murray Forest, 1875, in Carver, op. Cit., vol. D pp. 103, 113-114.

[14] Parl. Papers, 1878, vol. 3, *Report on ... Redgum Forests of Gunbower and Barmah.*

From the earliest days of logging until about 1947, logging in Red Gum was on a very selective basis; only the best trees were taken leaving a large proportion of old and defective trees. Logging was mainly concentrated along the rivers which were used to transport logs to mill by barge. Thus areas within easy distance of rivers or mills for bullock or horse-team snigging tended to be more thoroughly logged. Even so, the system was selective and resulted in severely restricted openings for regeneration and only limited freeing of potential sawlogs from non merchantable competition. Only small amounts of post-logging silvicultural treatment and thinning were carried out over this period.
The Murray Management Survey, to overcome this problem, introduced the "Improved Utilisation" (I.U.) system in 1947 and more organised silvicultural improvement began.

8. Extracts from: DONOVAN, P (1997). A HISTORY OF THE MILLEWA GROUP OF RIVER RED GUM FORESTS. ISBN 07310 9131 0

This history, concentrates on River Red Gum forests that comprise the Millewa group of forests near Deniliquin; namely to: describe the distribution and condition of the forests in 1750 as accurately as possible; and to list and describe the processes and events which have modified these forests and their distribution between 1750 and 1996.

Specifically the emphasis has been on description rather than analysis. ... contemporary descriptions have been included at length, rather than simply by means of a footnote reference. These extracts use the following Donovan headings:

- Executive Summary
- More intensive use of the forests
- Free Selection
- Chapter Two, The Era of Regulation
- The Pastoral
- The forest industry
- Management of the Forests
- Chapter Three Forest Management

Executive Summary
The Millewa group of red gum forests of the River Murray - which includes the Gulpa Island, Moira and Millewa State Forests - along with the Barmah Forest on the southern side of the river make up the largest river red gum community in the world. ... These forests are relatively young in geological time, having been formed following the major geological developments about 15,000 BP[15] that caused the uplift known as the Cadell Tilt. ... [which] effectively defines the western boundaries of the Gulpa Island and Moira State Forests.

The specific natural conditions and environmental determinants required for the growth of the red gum forests, most particularly the seasonal flooding, have proved unsatisfactory for commercial exploitation other than forestry. This has helped to protect the forests and has ensured that their extent and distribution is similar to that which existed prior to white settlement of the region, although the sharply defined boundaries reflect subsequent pastoral development in the region. Indeed, the forests may even be marginally larger in

[15] Usage of BP. Beginning in 1954, metrologists established 1950 as the origin year for the BP scale for use with radiocarbon dating.

extent than several hundred years previously because of the red gum colonisation of some of the earlier grasslands on the margins.

It is not possible to give a detailed description of the appearance of the forests or to describe in detail the manner in which Aboriginal people modified the forests before European settlement in the area. However, it is certain that the regular firing of the undergrowth within the forests during the course of thousands of years would have had a significant impact.

The lack of detailed and scientific descriptions of the forests at the time of European settlement also means that it is not possible to directly contrast the appearance of the forests before and since European occupation of the area. However, it is possible to make some deductions based upon an appreciation of the many changes wrought since that time...

Aboriginal occupation of the region may have extended back 13,000 years although the earliest date for a site in the Barmah and Millewa forests is 1500 BP[16]. The archaeological evidence suggests that the most intense of the early human activity took place on the margins of lagoons in the western portion of the forests. The margins of the rivers and creeks also have high site densities, though densities were low on the flood plain, box plain and sandhills. Most sites have been found to the west of the Edward River[17].

Curr indicated that two groups occupied the red gum forests on the north bank of the river, the Moitheriban, who lived in the vicinity of the Edward River, and the Ngarrimowra, whose territory adjoined and extended to the east The area occupied by both groups included the major water courses but also extended back to higher ground beyond.

The areas inhabited by the Moitheriban and Ngarrimowra included the dense river gum forest adjacent to the main rivers, lakes and lagoons and extended to more open higher ground characterised by stands of box trees.

... over the many years of their occupation of the forests it is certain that the Aboriginal inhabitants had a major impact upon their appearance, although the precise extent is impossible to deduce.

Reports of early white visitors and settlers of the river red gum region suggest that the Moitheriban and Ngarrimowra used fire to clear undergrowth, to promote the growth of grasses and seeds, to flush out game, and to facilitate hunting and movement through their areas. Charles Sturt observed in 1838 that 'The reeds had been burnt by the natives and in burning [they] had set fire to the largest trees and brought them to the ground'[18]. Curr observed that 'the blackfellow was constantly setting fire to the grass and trees, both accidentally and systematically for hunting purposes'[19]. ... In addition to the deliberate firing of the undergrowth, it is highly likely that wild fires also occurred after camp fires that grew out of control.

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16 Kathryn Lyons, 'Aboriginal Significance of the River Red Gum Forests in the Central Murray Region', Thesis submitted in partial fulfilment of the requirements for the degree of bachelor of Science (Forestry)(Honours), Department of Forestry, Australian National University, 1988, p.21. See also Craib pp. 129, 149.

17 John L. Craib, 'Archaeological Survey in the Moira-Millewa State Forests: Submitted to National Parks& Wildlife Service', 1991, p. 133

18 Lesley Head, 'Prehistoric Aboriginal Impacts on Australian Vegetation: An assessment of the Evidence', in *Australian Geographer*, vol. 20, no. 1, May, 1989, pp. 37-46. See also Porteners, p. 70.

19 Quoted in Leslie, p. 95.

Given the lack of detailed or scientific records it is impossible to determine the extent of the changes made by the practice of firing the undergrowth that may have continued for several thousand years. Nor is it possible to differentiate the extent of change wrought by the deliberate or accidental burning of the forests by Aborigines and that occasioned by fire from lightening strikes or other natural causes. However, it is certain that the regular firing of the forests had a major impact because of the lack of tolerance of red gum to fire. A major fire in January l99O killed between fifty and seventy-five per cent of trees, the difference being determined by the soil moisture[20].

The same lack of detailed evidence means that it is not possible to provide an accurate indication of the appearance of the forests at the time of European settlement of the continent. However, the susceptibility of young red gum to fire damage suggests that the forests before white settlement probably contained many mature trees damaged and deformed by fire.

Beginning in January 1838 from the region of the Goulburn River, Joseph Hawdon and Charles Bonney overlanded stock to Adelaide, keeping Hume's river on their right. Four months later, Captain Charles Sturt led another party of overlanders droving 430 head of stock to South Australia. He chose to follow the river discovered by Hume and Hovell to determine if it was the same river that he had discovered. He followed the northern bank of Hume's river from Albury to the Edward where he crossed over to the south side. [See Figure 4]

Sturt wrote of this journey on different occasions and included descriptions of the regions through which he passed. In a letter to Lord Stanley of the Colonial Office in 1843 he wrote of the features of the red gum, particularly drawing attention to the flood prone nature of the country:

> *About five and twenty miles below the junction of the Ovens, [140 km east of the forest] however, the flats along its banks expanded, and appeared subject to inundation – and detached masses of reeds were scattered over them. These at length almost covered the primary levels, and by the increasing height of the rings upon the trees we judged that we were pressing into a region subject at times to deep and extensive flood. Accordingly as we advanced the reeds closed in upon us, and we moved through them through narrow lanes, or openings which the Natives had burnt, the reeds forming an arch over our heads and growing to the height of eighteen or twenty feet. Our progress was impeded by hollows, and the flats were intersected by channels for carrying off the back waters from the extremity of the Alluvial Flats*[21].

The report which Sturt sent to Governor Gipps on 30 October 1838, immediately after his journey, elaborated upon the region of what became the Millewa Forest in the vicinity of the Edward River:

> *On the 7th of June, whilst rapidly entering, a still more swampy region, with immense bodies of Reeds of great height on every side of us, we were suddenly checked by a junction from the N.E., falling into the Hume, on the bank on which we were travelling. To this Junction, the Natives, who thereabouts are numerous, gave the name of 'Delangen' which, I have retained. They intimated to use by signs, that, we*

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[20] P.E. Bacon, C. Stone, D. Binns, D. Edwards, and D. Leslie, 'Development of Watering Strategies to maintain the Millewa Group of River Red Gum (*Eucalyptus Camaldulensis*) Forests' Technical Publication No. 56, Forestry Commission of New South Wales, Sydney, final draft, p. 4.

[21] Charles Sturt [1838], *An Account of a Journey to South Australia,* Sullivans Cove, Adelaide, 1990, pp. 34-35

could no longer keep the right bank of the River, the Country in front of us, and round to the N.E. being under water. To ascertain the correctness of this intelligence I sent a man to the Northward, who found the country intersected by deep creeks, full of decayed timber, and marked by bull rushes and reeds, and assuming, as he advanced more and more the appearance of inaccessibility. We found it necessary, therefore, to cross the Hume at this place, which, we did on the 9th[22]. [See Figure 4]

Sturt was the first to record descriptions of the Millewa red gum forests. In the two examples noted above he made particular note of the abundant reeds existing at the time. Also he made particular mention of the amount of timber lying on the forest floor which made travel difficult.

Closer settlement took place in the district after surveyor Thomas Townsend selected the site for Deniliquin on the stock crossing site on the Edward River in 1848. ... The township of Mathoura, originally called Redbank, was established on the high western bank of the Gulpa Creek in 1851.

The first significant impact upon the forests took place during this early stage of white settlement as timber was sought for dwellings and station improvements. The earliest logging was associated with the sandhills in the forests which were accessible at all times and which had stands of Cypress pine...

The Pastoral Times which was first published in Deniliquin on 26 May 1859, noted in August of that year the building of a substantial post and rail fence between Moira Station, owned by Lewes and Throsby, and Mathoura Station, owned by Peter Stuckey. The feature of the fence was that it was made of local timber which was cut in the local saw mill. The fence was about thirteen miles long. The Pastoral Times believed it to have been 'the first extensive trial of sawn timbers for posts and rails of red gum in the Australian colonies'[23].

When preparing to leave Moira in January 1861, Lewes commented upon the vast changes that he had witnessed in nearly twenty years. As far as the Moira Plains were concerned, he claimed to have seen:

...what was then a barren desert, heart-breaking to look upon, transformed into well-grassed plains, the pasturage on them thickening from year to year as the grass seeds continued to be trodden into the ground by the cattle and sheep, and 'bush fires' carefully guarded against:

Moira Box Forests

... The box forest, between the Murray River and the Moira Plains, though on several occasions covered with flood waters, continued to be entirely barren, as though the box-trees prevented any other kind of vegetation, which was made singularly manifest where they had been cut down to make way for the telegraph line – 'Moama and Deniliquin - when amongst their stumps and branches a line of grass at once grew up where not a blade had ever been seen before; and travelling stock were driven along the line for the purpose of browsing on the grass[24].

The experiences on Moira Station were reflected on the other pastoral stations that included large areas of red gum forest. Each comprised two very distinct areas, with those areas on the flood plains being useful for grazing only during summer months. The physical conditions of the flood plains also meant that cattle fared better than sheep.

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22 Sturt, pp 9-10.

23 *Pastoral Times*, 18 August 1859.

24 *Votes and Proceedings of the Legislative Assembly,* 'Report of Inquiry into the state of Public Lands Inquiry', vol. 2, 1883, p. 75

Aratula had also been improved significantly by 1866, when it carried 2000 cattle. This, too, was described in the Pastoral Times:

> *Aratula has a frontage of about eight miles on the north bank of the Murray River, with an area of about fifty-six square miles, and adjoins the stations of Messrs. M 'Laurin and Hennessy. The country consists of fine open plains and good forest land - .... It is abundantly watered all over, having the Bullatella Creek running through the centre, and. the Nyrang Tuppal at the back;*[25] ...

More intensive use of the forests

Although taken up and used initially for pastoral purposes, the forest areas of these runs were also an early source of timber for other pursuits. ... Timber was used primarily for local purposes in the building of dwellings in the towns and on the stations, the erection of fences ... and the construction of bridges over the various waterways and wharves at the river towns. Demand for red gum increased with the development of navigation on the River Murray and the discovery of gold in Victoria. The red gum was used in the construction of many of the riverboats that plied the Murray and other inland waterways; it was used to fuel all of them.

Many of the later boats and barges used in the river trade were built of red gum taken from the forests. These riverboats were steam driven, and the red gum which lined the Murray was also used for fuel.

The navigation of the Murray also called for the removal of snags. This desnagging continued from the 1860s to the 1930s. Indeed, the South Australian government built a snagging boat, the Grappler, in 1858 to clear the main channel.

For the most part, though, this demand was satisfied by forests on the southern side of the river. Nevertheless, as the timber industry developed, so sawmills were established in the district to cut the timber taken from the forests. One of the earliest was the Edward River Steam Sawmill Co. which began at Deniliquin in 1859[26]*. The company continued in operation until the 1880s, when it was burnt down.*

Free Selection

The nature of occupation of the district about Deniliquin changed markedly in the mid-1860s following the passage of the Robertson Land Act in 1861.

One strategy of the pastoralists was to urge the government to reserve selected portions of land from selection. For instance, in late 1865 a petition circulated in the district for signatures asking the government to reserve Gulpa Island and Wakool Island from free selection. The Pastoral Times described the area as:

> *.:. part of the Mathoura run lying between the Edward River and Gulpa creek, and bounded on the south by the Murray'. on this island the permanent water frontage is about forty or fifty miles ... Those taking an active part in getting up the petition assign as a reason their desire to preserve the timber for the use of the townspeople; but others allege that the timber will not be wanted for building unless the land is selected*[27]*.*

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25 *Pastoral Times*, 10 March 1866.

26 *Pastoral Times,* 24 November 1859.

27 *Pastoral Times,* 2 December 1895.

For the most part, though, the Robertson Land Act did not create great demand for land within the forests.

The dense forest and annual flooding of the forest floor made the low-lying regions of the pastoral runs unsuitable for farming without extensive drainage works – and clearing of the land. As the editor of the Pastoral Times suggested, there was more suitable land for selection available elsewhere, particularly in Victoria.

However, there were selectors who made claims on the flats with a River Murray frontage precisely so that they could exploit the timber resources. Alfred Jameson, a land agent of Deniliquin, admitted this later, even indicating that he had helped particular selectors in this. 'They obtained the timber for its commercial value', he said, 'and then abandoned the selections after the timber was removed'[28].

There were particular instances of this in the area immediately east of the Edward River. Here, the Pastoral Times of 23 January 1869 recorded that Robert Barbour had made a conditional purchase of sixteen hectares situated on the Murray in the County of Cadell, ... Barbour ultimately made several selections on the banks of the Murray, in his own name and those of members of his family, in order to cut and log timber from these areas.

Barbour's timber business expanded to include seven sawmills, five river steamers and seven barges which were used to transport logs to his mills and sleepers to the railhead at Echuca. His business included the exporting of timber to India and England.

Although selection was not a major issue in the Deniliquin district generally, the activities of Barbour and others who sought to exploit the red gum forests encouraged the government to take measures to regulate the timber industry and to conserve these resources.

Chapter Two, The Era of Regulation

> *The hard wood of the River Murray red gum forests proved particularly suitable for the construction of wharves and piles, and later for sleepers for the developing Victorian railway network. Indeed, railway development in Victoria was the chief factor in hastening the exploitation of the red gum forests on both sides of the River Murray. The building of the railway from Melbourne to Echuca, which was completed in 1864, had a major impact upon settlement in the southern Riverina and the development of the forests on both sides of the Murray. Red gum was taken for sleepers during the construction of the line. Afterwards, this railway was used to supply timber from the forest to worldwide markets through the port of Melbourne. Later a bridge was constructed across the Murray and the railway continued northwards to Deniliquin in New South Wales. This railway extension was opened on 16 June 1876 and further facilitated the exploitation of the forests.*

There was no control over the early logging within the forests. Timber cutters took the most suitable timber that was easiest to cut. This was generally timber in the low shelves close to river bends and close to the river banks generally. Here the trees were felled, the logs cut and stockpiled to await transport by water to saw mills downstream. Timber not suitable for sawlogs was used as firewood for the river steamboats. Other timber was cut or hewn while in the forest for sleepers. Some of the oldest and largest trees were felled by sleeper cutters. These trees were too large to be taken to landing stages for transport to saw mills and were

[28] Votes and Proceedings of the Legislative Assembly, Royal Commission of Inquiry on Forestry, 1908, p. 546.

generally cut to size and hewn in the forests. The smaller diameter timber and much of the residue was suitable for fuel, particularly for the riverboats.

In some readily accessible areas, particularly along the banks of the Murray, parts of the forests were virtually clear felled. Concern about the unrestricted logging of the forests became evident in 1870 when the editor of the Pastoral Times complained of the virtual destruction of the forests. He noted that 'Around Lake Moira and along the Murray (New South Wales' side) thousands of trees of gum and pine are cut down yearly' and sent to Melbourne by means of the Echuca railway.[29]

The New South Wales government had introduced a system of licences from I January 1851 to regulate the cutting of timber: there were eight licences issued in the Deniliquin district in the half year ending 31 December 1862, for instance.[30]

Largely because of the hitherto unrestricted logging activities ... the New South Wales government ... on 3 March 1871, in accordance with the provisions of the Crown Lands Act, the government established Timber Reserve No. 524 over 13,468 hectares of the River Murray red gum forests: this was extended to about 25,770 hectares on 16 June 1871 for the purpose of preserving the timber, as well as reserving the forest from sale.[31]

Other reservations followed. On 18 August 1871, the Murray River Forest Reserve No. 524 was extended yet again to about 41,958 hectares, and on 5 February 1875, the Gulpa Island Forest Reserve was proclaimed.

The Pastoral

Timber cutting on the reserves continued, but in accordance with permit licences issued under the authority of the Minister or the Executive Council.

By this time [1875] the first forest inspectors had been appointed with a brief to oversee the cutting of timber in the forest reserves.[32] *John Manton was appointed ... at Moama. Soon afterwards Osborne Wilshire was appointed to assist him. Their task remained an onerous one as the Pastoral Times indicated:*

> *There are no less than ten sawmills at work on the Murray, and a new one is going up. In each of these mills between forty and fifty men are believed to be employed, and the trade is increasing. Good timber on the Victorian side of the river is getting scarce, while on the New South Wales side it is estimated that there are between three and four million trees fit for cutting. To protect these from being cut down without proper licences being held by those so engaged, the Forest Ranger should be able to go into the bends and small creeks abutting the stream.*[33]

The forest industry

The timber industry provided employment for a considerable number of people. ... William Quiggin operated a sawmill at Mathoura in the early 1870s to take advantage of the forests nearby. This small town flourished with the completion of the railway to Deniliquin. The Mathoura Saw Mills was taken over by Charles Opitz in 1876 and continued in operation for another thirty years, before it was destroyed by fire.

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29 *Pastoral Times*, 19 March 1870.
30 *Pastoral Times*, 4 April 1863.
31 T.C. Grant, *History of Forestry in New South Wales 1788-1988*, T.C. Grant, 1989, p. 60.
32 *Pastoral Times,* 18 November 1876.
33 *Pastoral Times,* 4 December 1875.

... A few miles further on there was a mill owned and operated by George Sayers:

> *Mr Sayer's mill is situated on the left bank of the Edwards about five or six miles from Mathoura and about the same distance from the Hill Plain siding on the Deniliquin and Moama Railway line and about sixteen or seventeen miles from Deniliquin. The business gradually enlarged... until ... there are about thirty or forty men directly and indirectly employed on the works. ... The timber is obtained from both sides of the Edwards and is practically inexhaustible, but the floods in the Murray greatly interfere with the continuity of the work.*[34]

There were other sawmills in the major towns of Deniliquin and Echuca.

Management of the Forests

What was close to the final form and extent of the river red gum forests was determined in September and October 1884 when the several forest reserves were dedicated... The Moira Forest Reserve was notified on 22 September 1884: the Millewa and Gulpa Island Forest Reserves were notified on 20 October 1884.

Following the notification of the reserves ... the Forestry Branch introduced the first management practices to the forests in accordance with new timber regulations. Under the supervision of Forestry Branch officers, pastoralists were encouraged to clear scrub and to ringbark trees that were considered to be useless, the idea being that this would encourage the growth of better timber.[35]

More extensive and concerted silvicultural management of the forests was introduced into the red gum forests by the government ...was initiated in April 1891 at the suggestion and under the supervision of forester John Manton.[36]

As far as the River Murray forests were concerned, this thinning was considered particularly necessary because of extensive regrowth of the forest during the preceding twenty years ... In the absence of continued burning of the forest by Aborigines and as a result of successive wet years with regular flooding during the 1870s, there was particularly abundant regrowth on the areas of forest close to the Murray, such as Potts Point, which had been heavily logged in the period to that time.

> *Manton described the extent of works undertaken during the early 1890s as being primarily concerned with the ringbarking of trees considered useless for milling purposes and the thinning of new growth to encourage the growth of timber suitable for milling. ... When the contractors had been discharged before the flooding in winter 1895, the total area thinned in the several reserves to that time amounted to about 20,000 hectares.*

Chapter Three Forest Management

Beyond the River Murray, the boundaries of the forests have been determined by those of the freehold titles under which the land is held. In large part these boundaries correspond to the natural limits of the red gum and which have been determined by the flooding regime.

Only scraps of evidence of Aboriginal use of the forests remain and it is difficult to give a detailed description of the appearance of the forests prior to white settlement in the region.

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34 *Pastoral Times,* 4 December 1875

35 Grant, p 94.

36 Grant, p 93, see also the 1885 report by John Manton.

Moreover, early European descriptions of the forests lack detail and precision. However, it is possible to make deductions about the appearance of the forests based upon the known changes that have taken place in their use since European colonisation of the continent.

The suggestion is strong that the early forests were in appearance scattered woodland with scant understorey apart from the taller native shrubs. This appearance would have followed centuries of firing of the undergrowth by Aborigines. Many of the earliest European settlers testify to this practice which continued into the 1840s. As well as clearing undergrowth, the uncontrolled fires, including those which occurred naturally, would have killed many of the youngest trees, damaged others and left the forests composed of trees of all ages and condition with a large amount of debris and dead timber on the floor.

The activities of the timber industry and the management practices of the Forestry Commission means that the forests comprising the Millewa Group are certainly younger than they were in 1750. They are virtually all new growth forests with stock grown since the 1870s.

While being younger and healthier, the forests are probably more heavily stocked than they were in 1750.

The timber industry with the forest managers has changed the character of the forest: the forest structure, the spatial arrangement of the trees and the age of the forest. The vast majority of the trees from eighty centimetres to a metre and a half at breast diameter would date from the latter years of the nineteenth century to about 1930.

A Discussion on these various historic extracts now follows. The Discussion starts with individual comments on each extract followed by a consolidated overview.

DISCUSSION

1. Did the floodplain river red gum forests exist only as scattered veteran trees prior to white settlement?

Take any group of people into the countryside or the bush and ask them to record what they have seen. It is an interesting experience for the narrative often includes the perceptions of what interests each individual the most. This effect is of course, similar to the different observation of individual eye witnesses in many a real court case and as depicted in any number of TV dramas or films. People, even the best of observers, tend to see and report what is important to them.

The early explorers by river and land, overlanders droving stock, and squatters were no different and their accounts of the locales they traversed and on which they squattered are coloured by their imperatives and interest. Often, their route took a 'path' of least resistance for horse and dray with convenience of feed and water. Despite forays from time to time from their preferred direction of travel they were limited in the area they could see, notwithstanding seeking high points and climbing trees to extend their vision. They did not enjoy and take for granted, the luxury of an extensive 'bird's-eye view' that is now "Googled" on an everyday basis.

Discussions on each author's narrative contained in the preceding extracts follows:

(1) **Mr Crump** and **Mr Joss** make the point that the Millewa, Gulpa Island and Moira forests *"were not there ... we are talking about something that occurred through the process of white settlement ...";* the present landscape is *"nothing like the landscape that is reported in the historical literature".*

These comments should also apply to the Barmah Forest, an integral part of the same floodplain and so needs to be included in any analysis..

*"The NRC claims many of the trees in the forests (*as distinct from box forests and RRG woodlands and scattered veterans*) pre-dated European settlement ...trees which pre-dated the great 1870 flood were routinely culled as part of a forest improvement program which began about 1890 ... almost all trees are less than 150 years old".*

Such changes, if effects of severe bushfires are included, would be true for many forests with the passage of nearly 200 years and particularly for these river red gum forests which have been continuously and heavily manipulated by "the hand of man" for thousands of years.

The cessation of aboriginal burning from about 1840, uncontrolled exploitation [more or less widespread clear felling] of timber resources from the early 1860s to the turn of the century and, most recently, radically changed flood regimes progressively from the 1930s coupled with periodic, prolonged El Nino drought events have wrought enormous changes to forest and wetland structures and ecosystems.

There should be no dispute that most trees in the present forests are less than 160± years old, that is, post white man's occupation and settlement. However, one needs to differentiate between forest [denser stands with high site occupancy] and woodland forest where the site is less than half occupied [crown cover] by trees and areas with scattered veteran trees.

There should also be no dispute that there were stands of younger dense forests in the region bounded by Tocumwal, Deniliquin and Echuca pre-1838 and earlier.

(2) **National Parks Association of NSW**, Submission No. 406.

"There have recently been a few highly inaccurate claims made about the red gum forests ... that the RRG forests were not present before European colonisation due to burning practices of the Traditional Owners ... this argument is not correct ... the oral history of the Traditional owners along with many massive tree stumps from the trees that were hundreds of years old when felled provide clear evidence that there were always RRG forests present in the area".

Here it is presumed the choice of the word forest is not by accident and it included well stocked stands as well as much more open stands of veteran trees.
In essence, the NSW NPA is refuting Mr Crump's and Mr Joss' assertions that the Murray Valley river red gum National Park is a *"fraud, built on a myth"*.
This is discussed under Implications for the Inquiry.

(3) **Bill Gammage** [2011.]
Gammage's description under: River Red Gum, Riverina and Murray River includes observations of early explorers and squatters that there were some dense RRG forest in the region.
Evidence of "vegetation thickening" since 1788 was also cited with changes extensive and obvious suggesting that they began when Aboriginal management burning ceased. Aboriginal burning is credited for defining the landscape. Certainly, regular burning would, in many years have eliminated fire sensitive river red gum seedlings. From time to time significant numbers of older trees, particularly with hollows that allowed entry of embers were burnt down.
Flooding and fire are the major factors in the dynamics of the Riverina/Central Murray floodplain river red gum forests. Frequency, season and duration of flooding control the timing and extent of deliberate fire and the influence of lightning-sourced fire. Prolonged drought produces an 8 – 10 month serious fire risk. Prolonged flooding results in only a 2-3 month window of opportunity for introducing fire in the landscape.
Flooding can kill young seedlings[37] and prolonged flooding over 12-18± months duration can kill mature trees although influenced by the distribution of their root systems and composition of the soil profile to depths of several metres.
Competition for soil moisture is also a significant factor in prohibiting the establishment of RRG seedlings. Trees quickly deplete moisture in the upper soil profile [Plates 1 and 2 refer] as evidenced by a zone of influence in which seedling establishment is generally excluded [Plates 3 and 4]. At higher stand densities competition for moisture usually precludes any seedling establishment.
Of these major factors, viz: fire, unfavourable flooding and competition for soil moisture, widespread fire is the dominant agency. However, river red gum is an aggressive coloniser under specified conditions[38]. It is highly likely that conditions would have been suitable, on a few occasions each century, for the establishment of seedlings in particular locales that were protected from fire.

(4) **Edward Curr – Recollections of Squatting in Victoria.** 1841 – 1851.
The Squatters' runs in the 1840s [Vic] and 1879 [NSW] are shown in Figures 2(a) and 2(b). Curr's Lower Moira Run [1848] is shown in Figure 3.
The location of Curr's Lower Moira run in the western section of the Barmah Forest, some 114 years on, is shown in Figure 5 [drawn in 1962]. The original map [Figure 3] identifies Parma [Barmah], Baala Creek [Broken Creek] flooded country [Barmah Island] and on the eastern part of the run: *"open forest of Box"*, *"forest of box"* and *"Box forest"*. It is suggested that some of the open box forest to the east of the Sandridge track [Figures 4 & 5] on higher ground in the vicinity of Buck's Sandhill could be "rough-barked" river red gum a feature sometimes displayed by the species. An alternative interpretation is that the observation applied to what is now farmland to the east of the present levied floodplain.

Curr reported that the Moira was under water for several months in winter and spring but abounded in summer in excellent sheep feed and was usually as green as emerald from November to March, thus defining opportunities for burning such areas. Also, there was quite high enough land about to ensure a retreat for sheep in case of sudden inundation. Its extensive reed beds were the great stronghold of the *"Bangerang Blacks"*. Interspersed with extensive reed beds intersected by the

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[37] Dexter, B.D. Regeneration of River Red Gum Eucalyptus Camaldulensis (Dehn). MSc Thesis The University of Melbourne August 1970 – Unpublished.
[38] Dexter, Bren.

Murray, which flowed here almost without banks, was open, grassy forest land which extended far [to the north] in the distance.
Significantly, when Curr returned to Baala Creek [Broken Creek] and examined the river frontage from a native canoe while travelling downstream to Pama [Barmah], Curr described birds perched on branches 150 feet [45m] overhead. The area [Barmah Island] was also identified as flooded country on the 1848 map of the runs. This area contained dense, well developed forest. From 1863 such areas were more of less clear-felled to meet the demands for railway sleepers, other highly sought after durable timber and fuel wood for steam driven engines.
As a matter of expediency for their travels, early explorers and squatters did not usually penetrate these dense stands of red gum typically occupying river bends and the lower lying areas above swampy country and the higher box country.
The purpose of including the 1962 map of the western portion of Barmah Forest is to show that the area Curr looked at in the distance still contained extensive swampy areas, plains and reed beds. With the passage of time, absence of fire and changed flood regime, former treeless areas were progressively being colonised by RRG. This process will continue if flooding frequency continues to decline.[39]
There is nothing in Curr's writings to support the contention that areas of dense, younger forests, as distinct from scattered veterans, did not exist on the floodplain pre-1840. To the contrary, he did make brief albeit oblique reference in his early impressions, but the forests were not his main interest; that was clearly pasture for sheep in summer and autumn when pasture on southern runs had dried off.
Well stocked stands of red gum did not magically appear between 1828 and 1848 to supply the massive demand for durable RRG timber from the early 1860s. They existed particularly on regularly flooded areas, less accessible to explorers and squatters, on the floodplain.

(5) **Gillian Hibbins (1978). A History of Nathalia Shire (Vic).**
A diligent historian, Hibbins' well referenced book provides details in the first six chapters covering: Confrontation [Edward Curr's experiences and comments on the structure of the landscape on his runs covered in the previous section]; Exploration; Arrival of the Squatters; The Eighteen - Fifties; The Eighteen – Sixties; and The Selectors.
Hibbins' quoting of Sturt's journey in 1838 from where he crossed from the north side of the Hume [Murray] at the junction of the Dalangen [Edward] River to the south side and travelled between 9th and 14th June to the junction of the Campaspe and Murray Rivers [Figure 4[40]] is revealing.

> *"The scene at a short distance from the camp (7th & 8th June 1838) ... broad expanse in foreground* [Picnic Point] *was covered with our cattle ... more distant flats looked like wheat fields ... the reeds being of a light yellow colour. A line of forest was in the background, and trees scattered here and there."*
>
> *"... at about 5 miles we (illegible) on a channel which at the time I thought merely a branch of the river (Budgee Creek?) ... from this point reeds again checked our progress and obliged us to alter our course still more to the eastward of south ... the country to our left was also subject to flood but was destitute of reeds ... to our right the ground fell, the nearer trees showing the marks of inundation four feet on their trunks ... beyond them reeds of great height stretched as far as the vision extended ... at 3 miles we again struck the river* [downstream of Moira and Bama lakes] *where it had assumed its usual appearance with steep banks ...".*

Sturt's route probably followed the line of the Sandridge track [Figure 5 refers] which more or less traverses the highest ground from the junction of the Broken Creek [Baala Creek] and the Murray

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39 Bren, L.J. (1992). Tree invasion of an intermittent wetland in relation to change in the flooding frequency of the River Murray, Australia. Journal of Ecology (1992) 17, pp 395-408.

40 Probable track of Charles Sturt and party enroute with cattle to Adelaide from Sydney – June 8th to 15th 1838. Extract from Hibbins, G.M. (1991) Barmah Chronicles ISBN 0 646 02766 2.

[Hume] northwards to the southern bank just upstream of the Edward [Dalangen] offtake in NSW. Sturt certainly recorded heavily timbered forest, as well as scattered trees here and there.

The squatters also recorded heavily timbered country particularly where the river inundated the land encouraging thick red gum growth.
The Eighteen-Sixties heralded the start of the timber industry with harvesting initially concentrated south of the Murray. Hibbins provides a snapshot of these developments. The early history of the timber industry is also well documented by Fahey [1988][41] and Donovan[42] and is discussed in the following paragraphs.

(6) **Peter Donovan (1997). A History of the Millewa Group of Red Gum Forests.**
One of Donovan's key objectives was to describe the distribution and condition of the Millewa group of forests in 1750 as accurately as possible and to list and describe the processes and events which have modified these forests and their distribution between 1750 and 1996.
Mr Joss is concerned about Donovan's choice of 1750 rather than a later date; a point with which I have some sympathy. However, Donovan was correct in his choice of date because under Nationally agreed criteria [JANIS] for the establishment of a comprehensive, adequate and representative reserve system [CAR system] for forests in Australia targets for conservation include;

* 15 percent of the pre-1750 distribution of each forest type;
* 60 percent of the existing distribution of each forest type if vulnerable.

Donovan in Chapter 3, Forest Management states, *"the suggestion is strong that the early forests were in appearance scattered woodland with scant under-storey apart from the taller native shrubs. The appearance would have followed centuries of firing of the undergrowth by Aboriginals".* This very generalised description is at significant variance with Chapter 1.4.1 History of Silvicultural Development - Forestry Commission of NSW 1985 Management Plan for the Murray Management Area, viz: *'Reports from early settlement days indicate that, except for low river bend shelves, the red gum forests were 'open' woodland forests of veteran trees".* This is the inescapable conclusion, albeit from brief references, from reports of the early explorers and squatters whose principal interest was grazing not forestry.
Donovan, in my opinion, fairly puts the proposition that *"... it is not possible to give a detailed description of the appearance of the forests* [as distinct from generalising on the landscape] *or to describe in detail the manner in which Aboriginal people modified the forests before European settlement in the area. However, it is certain that the regular firing of the undergrowth within the forests during the course of thousands of years would have had a significant impact".*
This was certainly Curr's observation and it is also fair to say that the impact was sometimes far from benign. "The hand of man" has manipulated the environment for human well-being and welfare for thousands of years.
Elsewhere, however, Donovan does refer to forests that were much more densely stocked than just scattered woodland; *... the dense forests and annual flooding of the forest floor, made the low lying regions of the pastoral runs unsuitable for farming...there were selectors who had made claims on the flats with a River Murray frontage precisely so they could exploit the timber resources".*
It should be borne in mind one of the earliest sawmills began in Deniliquin in 1859. The building of the railway from Melbourne to Echuca was completed in 1864 and northwards to Deniliquin, opened 16th June 1876. River trade flourished which required extensive de-snagging from the 1860s to clear the main channel. The timber industry was initially more concentrated on the Victorian side with the more readily accessible areas being virtually clear-felled.

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41 Fahey, C. (1988) A History of the Barmah Forest. Department of Conservation, Forests and Lands. ISBN 0 7306 1200 7

42 Donovan, P. (1997) A History of the Millewa Group of Red Gum Forests. Forestry Commission of NSW. ISBN 0 710 9131 0

The NSW Government introduced a system of licensing from January 1851 to regulate cutting timber, established Timber Reserve No. 524 in 1871; over 13,468 ha ultimately extended to 41,958 ha in August 1871 with the Gulpa Island Forest Reserve proclaimed on 5th February 1875. These reserves provided a bit more protection to timber resources than in Victoria where good timber was already becoming scarce. Nevertheless, it was estimated there were still between three and four million trees fit for cutting in the Millewa group of forests.

Significant timber milling commenced in the Barmah Forest in about 1863. Fahey (1988)[43] notes that there was no regular publication of official figures for timber production prior to 1890. However, in the late 1870s there were 14 red gum mills, two in NSW and 12 in Victoria [including Barmah and Gunbower]. The average annual consumption of Victorian milled red gum was said to total 16 million super feet [48,000m^3][44] of which 10 million super feet [30,000m^3] was sawn timber.

These significant volumes of timber would not have come exclusively from *"gnarled and spreading gum trees"* scattered veterans if you like. The timber was cut from well stocked stands in regularly flooded river bends along the whole river frontage to a depth of some 3 kms. Beyond this, access was often too difficult to permit work from the river. The existence of such stands is re-enforced in the words of Crown Land Bailiff, Henry Stephenson, to his superiors in 1869, warning of the need to protect remaining well stocked stands:

> *"I beg to call your attention to the desirability of having the portion of enclosed tracing, which is coloured red, proclaimed a timber reserve. It consists of a magnificent forest of red gum unequalled by any forest I have yet seen in Victoria. Some of the trees are like ship masts with 80 feet* [24m] *of barrel without a limb. The general description of this timber is very superior and so dense that the eye can penetrate only a little way into the forest"* (reported in Fahey, 1988).

A year later (May 1870) William Ferguson of the Botanical Gardens described parts of the Yielima Forest some 19 kms beyond Upper Moira station as equal to or better than the Barmah Forest, counting some 200-250 trees per hectare, upwards of 18 metres in height and 45-50 centimetres in diameter (stand basal area of $\approx$ 40m^2/ha); based on Forestry Commission NSW [1954] provisional yield table for even-aged river red gum stands [see Appendix 1], at these parameters the age of this stand/trees falls within the range 48-68 years old. This places their origin between 1802 and 1822. Obviously, these trees pre-dated widespread regeneration in the decade 1870 – 1880, and were certainly present pre-1838.

The difference, even at a relatively young age, between open-grown and densely grown trees is stark. The photographs [Plates 5 & 6] were taken in 1965.

The origin of the dense stand on Murray River frontage [and one of the best examples of Site Quality 1] most likely dates from 1863 when significant milling began in Barmah Forest. Such sites were known to be virtually clear-felled. The open-grown trees on higher ground [Site Quality 3] may also date from the 1860s but being much slower growing, may be older.

2. What are the implications for the Inquiry?

The fact that the landscapes and attendant vegetation on the actual/regularly flooded floodplain in the 19th Century are significantly different from their present day structure, supposedly an accidental result of white settlement, has no relevance to the claim that the Murray Valley river red gum National Park is a fraud, built on a myth. However, there are other writings from green activists which lend credence to such a claim.

As discussed above, one would expect a dynamic system to change in time and space especially with significant intervention to natural processes. The evidence is that once under reservation, dedicated

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43 Fahey, C. (1988) A History of the Barmah Forest. Department of Conservation Forests and Lands.

44 Based on the conversion: 1 super foot Hoppus Log Volume = 0.003m^3.

and progressively regulated management was directed at sustainable use, demonstrably good enough in international circles for recognition under the Ramsar Convention on Wetlands [Vic 1982, NSW 2003].

Adaptive management and wise use ensured the forests and wetlands future with one critical exception; their on-going conservation cannot be guaranteed unless water regimes are restored to meet the biological requirements of flood-dependent ecosystems. There is no reason why this cannot be done in an equitable way for all stakeholders.

In similar vein, misconceptions that are being perpetuated by some sectors of the community that only a land tenure of National Park status can guarantee the protection of conservation values is demonstrably wrong. The plea by the NSW NPA not to revisit previous public land decisions would be plausible if the assessment had been conducted without bias and based on scientific facts. It failed both these tests.

CONCLUSIONS

1. Did the floodplain river red gum forests exist only as scattered veteran trees prior to white settlement?

(1) The Millewa, Gulpa Island and Moira [and the Barmah and Yielima] forests certainly existed pre-white settlement, but the forest component of the floodplain vegetation was not described in great detail for that was not the primary interest of the first explorers and early squatters.

From the foregoing extracts of the writings of explorers, squatters and historians reviewing events in the 19th Century, the evidence is clear; there were dense stands of river red gum on regularly flooded areas, particularly river shelves and in bends.

It is not possible to specifically identify various age classes, which are sometimes confused by stem diameter. However, based on the inherent growth characteristics of RRG, there probably would have been several age classes spread over centuries notwithstanding Aboriginal burning.

(2) The forests are not an accidental result of white settlement. It should be expected that the present forest is vastly different in structure compared with the mid-19th Century as a result of dynamic ecosystems manipulated by "the hand of man" and affected by natural events such as periodic drought and lightning-sourced bushfires.

The present forest and attendant landscapes are products of:

* Cessation of Aboriginal burning from the mid-19th Century;
* Virtual clear-felling in the latter half of the 19th Century and early 20th Century;
  - Vast numbers of trees were cut down for sleepers, sawn timber and firewood for steam powered engines. Only trees unsuitable for these purposes were excluded from felling and, of these, many were subsequently ring-barked to reduce competition in developing regeneration [which was also extensively thinned].
* Radically changed flood regimes progressively from the mid-1930s;
* Favourable flood regimes 1870 – 1880, absence of Aboriginal burning, before rabbit plagues, seed supply from felled heads and remnant trees [many subsequently ring-barked] and suitable seed beds on harvested areas ensured widespread regeneration which now forms the bulk of today's maturing forest.

2. What are the implications for the Inquiry?

(1) Assertions that the Millewa, Gulpa Island and Moira [and the Bama (Barmah)] forests *were not there ... were not ancient* are not supported by writings of early explorers and squatters; nor were the forests of today *an accidental result of white settlement.*

Such assertions should have no bearing on the recommendations of the Inquiry.

(2) Pleas by the NSW NPA to *not revisit previous public land use decisions* on the grounds it would be a waste of public funds are specious. .

Decisions by the Parliament were based on flawed assumptions and incomplete data. The resultant changes in public land management under National Park land tenure have had huge adverse effects on local and regional communities and have cost local communities and the State, significant losses of revenue that could offset the now high, management costs.

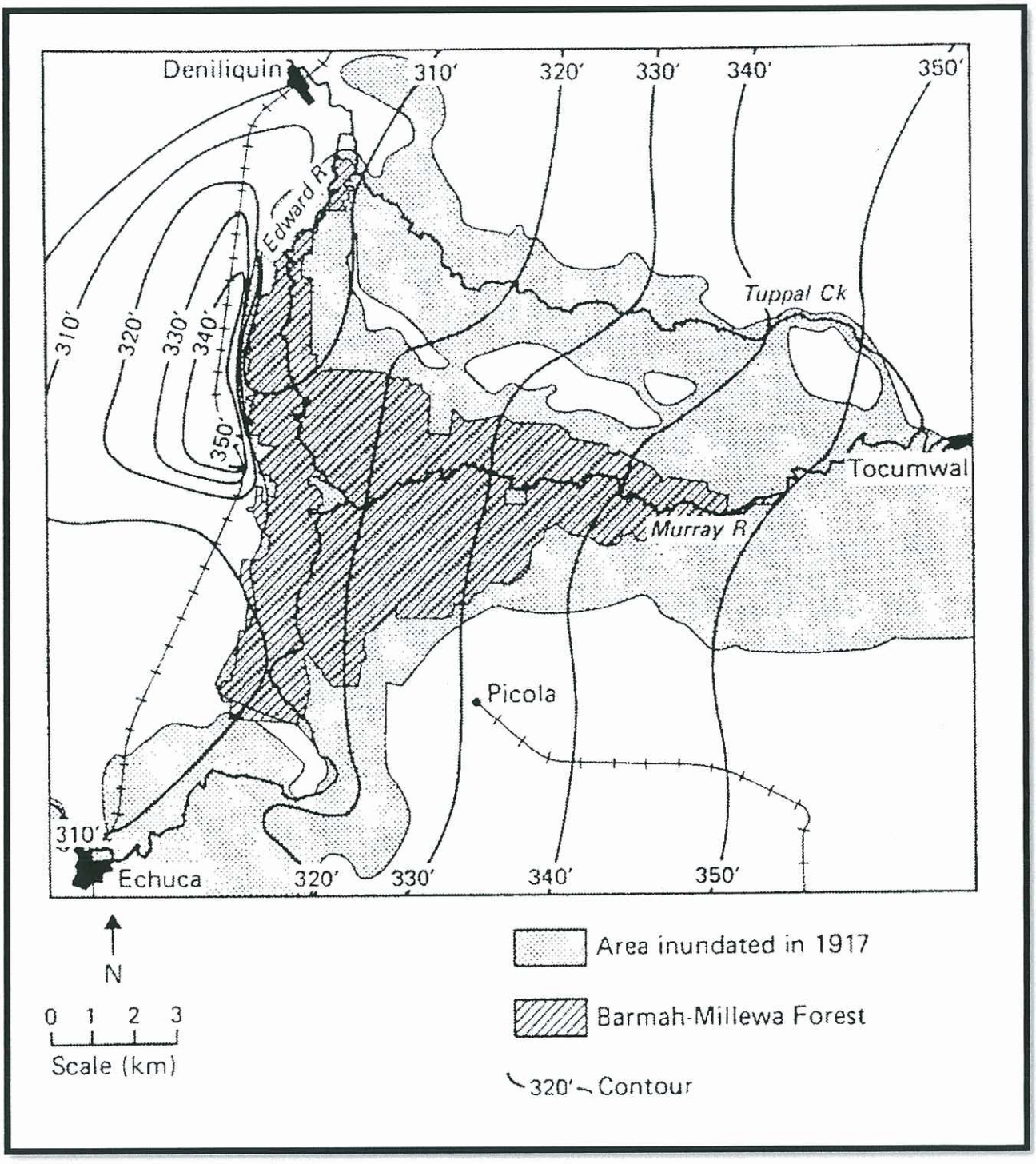
The Inquiry has the opportunity to recommend how to redress these problems.

(3) Forest and wetland landscapes have been manipulated by human intervention for thousands of years. These forests are possibly the most modified of any in Australia.

The Inquiry, while learning from the past, should not be constrained in recommending a management model that conserves social, economic, environmental and cultural uses and values under the wise-use principles of the Ramsar Convention on Wetlands and the requirements for sustainable use under the International Union for Conservation of Nature.

This can be achieved independently of the tenure of the land.

Figure 1. Barmah-Millewa Forest bounded by Echuca, Deniliquin and Tocumwal.



The boundaries of the 1917 flood provide a general indication of the extent of the floodplain in this region prior to European settlement. This flood breached existing protection works and the boundaries of inundation were carefully mapped at the time (Bren 1988).

Figure 2(a). Location map showing pastoral stations which included the forests in the Millewa Group in 1879 [source: Department of Lands and conservation.]

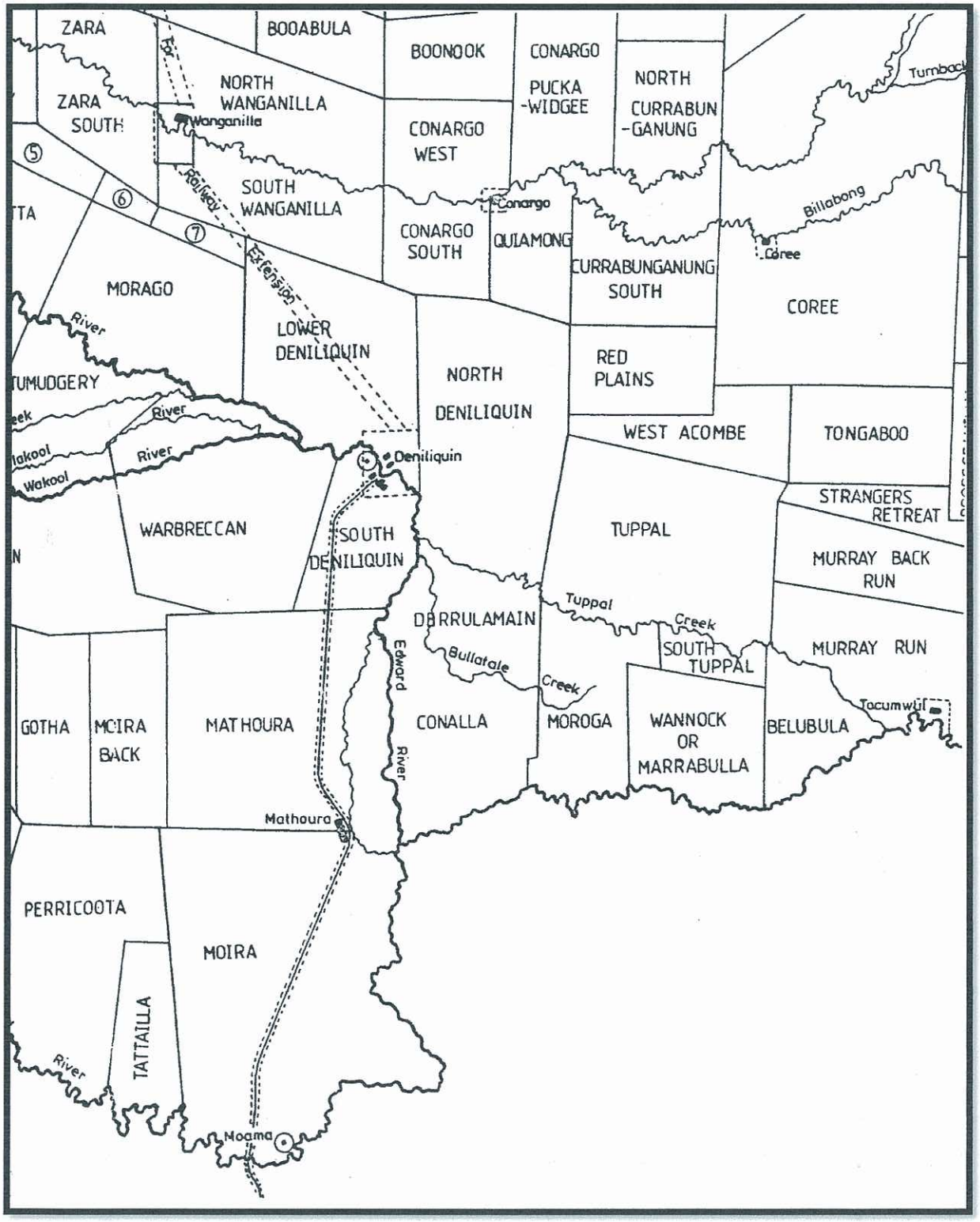
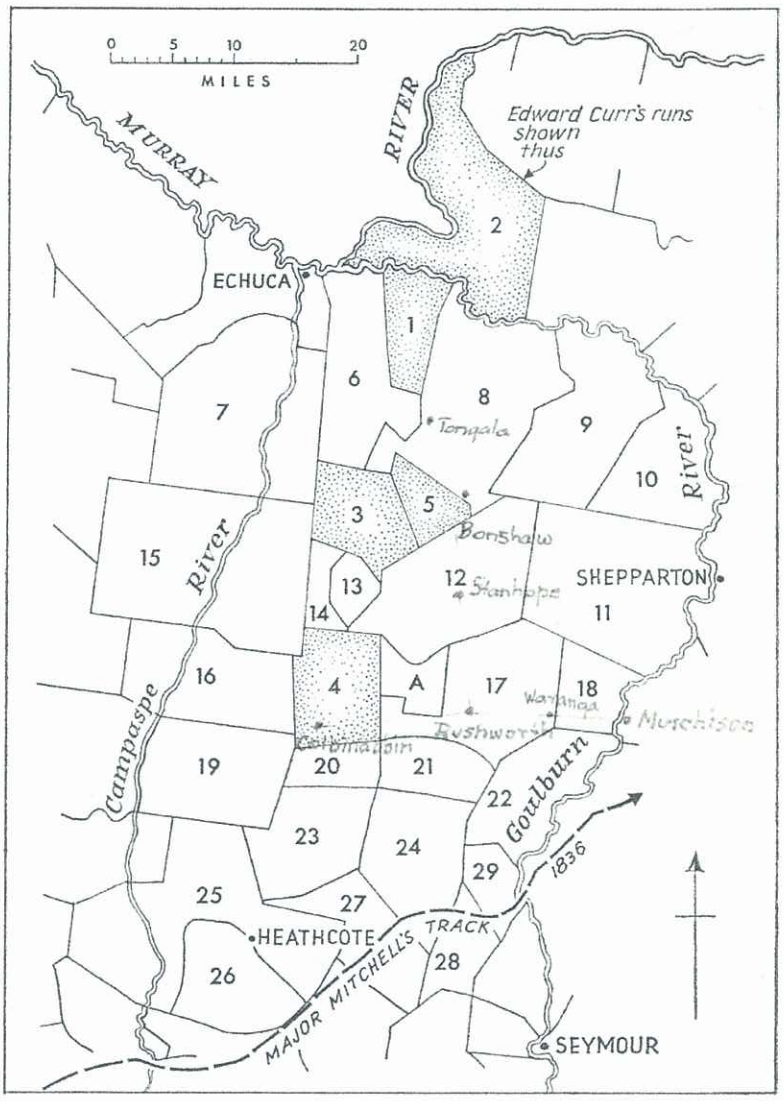


Figure 2 (b). Squatters' Runs in the 1840s [Victoria]. Reproduced from: Recollections of Squatting in Victoria. Edward M. Curr. Second Edition, reset 1965 MUP.



Squatters' Runs in the 1840s

1	Tongala	16	Campaspe River
2	Lower Moira	17	Waranga
3	Coragorag	18	Protectorate
4	Colbinabbin	19	Mount Pleasant
5	Corop	20	Colbinabbin Creek
6	Cornelia Creek	21	Cherrington
7	Restdown Plains	22	Baillieston
8	Wyuna	23	Mount Campbell
9	St Germains	24	Compton's Creek
10	Ardpatrick	25	Campaspe Plains
11	Toolamba	26	Wild Duck Creek
12	Wanalta	27	Major's Line
13	Stewart's Plains	28	Major Mitchell's Creek
14	Burramboot	29	Old Crossing Place
15	Burnewang		

(The run A identified by Kenyon as Gobareep is inaccurately located.)
After A. S. Kenyon, 1932 (Lands Dept, Vic.)

Figure 3. Map of the Runs of the Late Edward Curr, of St Heliers. Source: Recollections of Squatting in Victoria. Edward M. Curr. Second Edition, reset 1965 MUP.

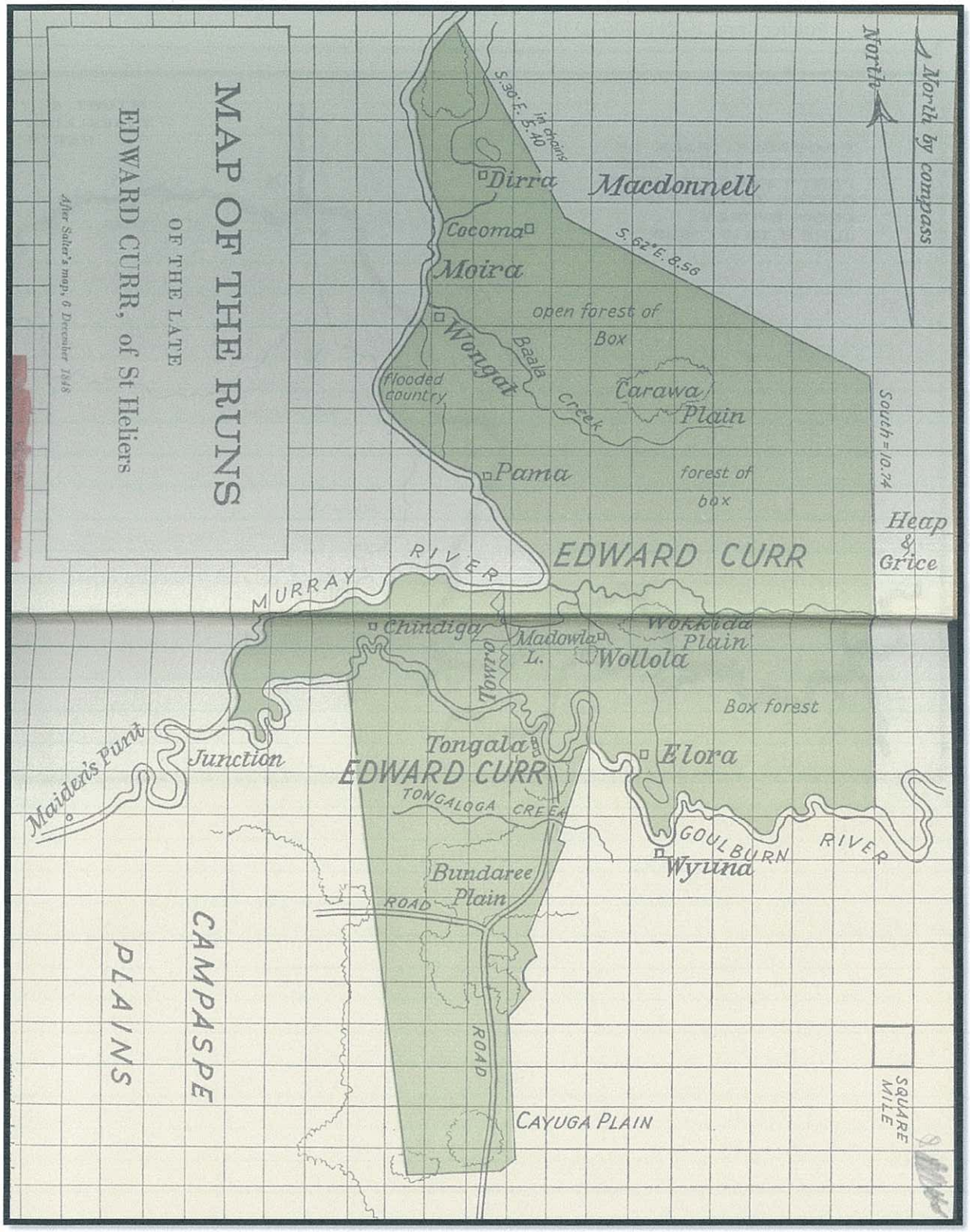


Figure 4. Probable track of Charles Sturt and party enroute with cattle to Adelaide from Sydney. June 8 to 15, 1838. Source: Hibbins, G. M. 1991 *Barmah Chronicles.* Lynedoch Publications. ISBN 0 646 02766 2.

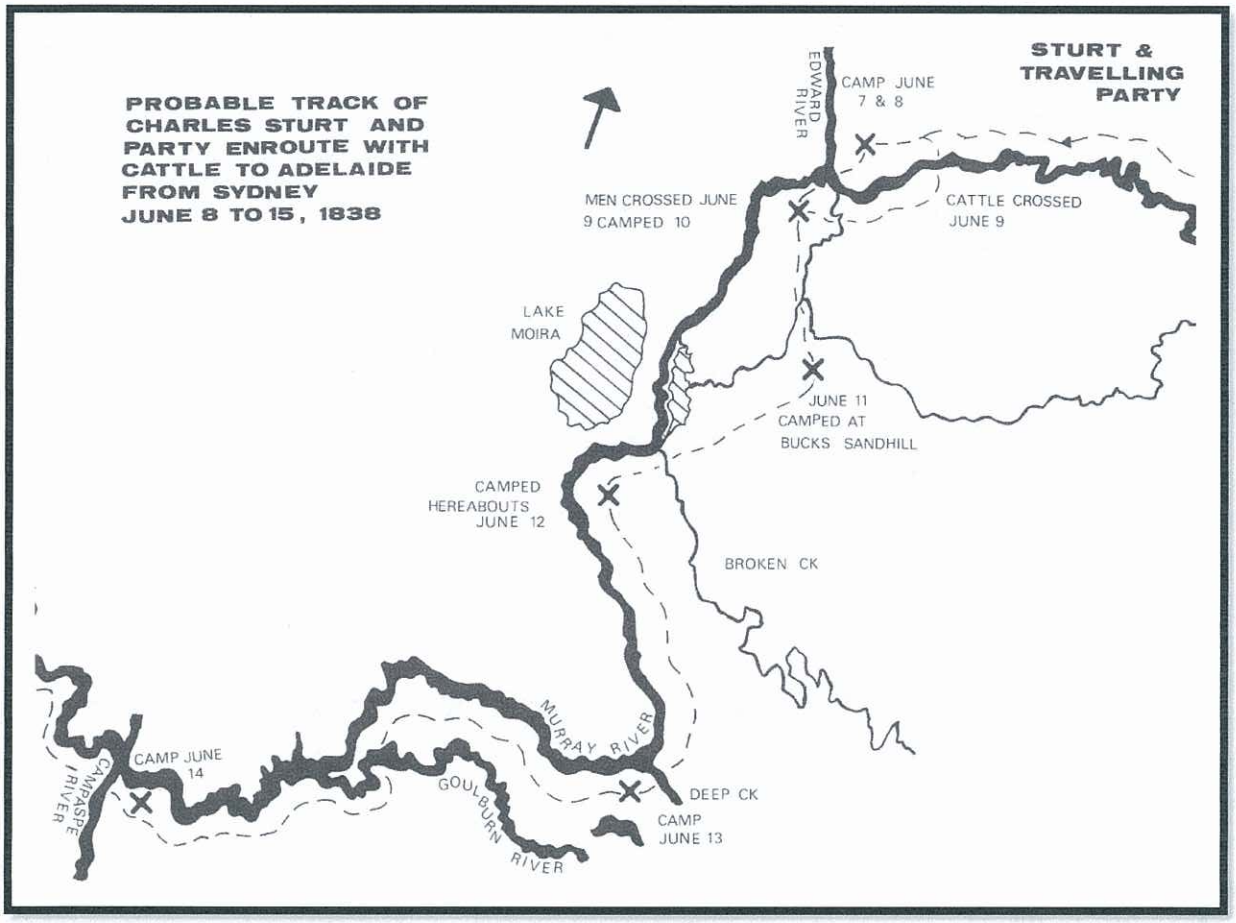
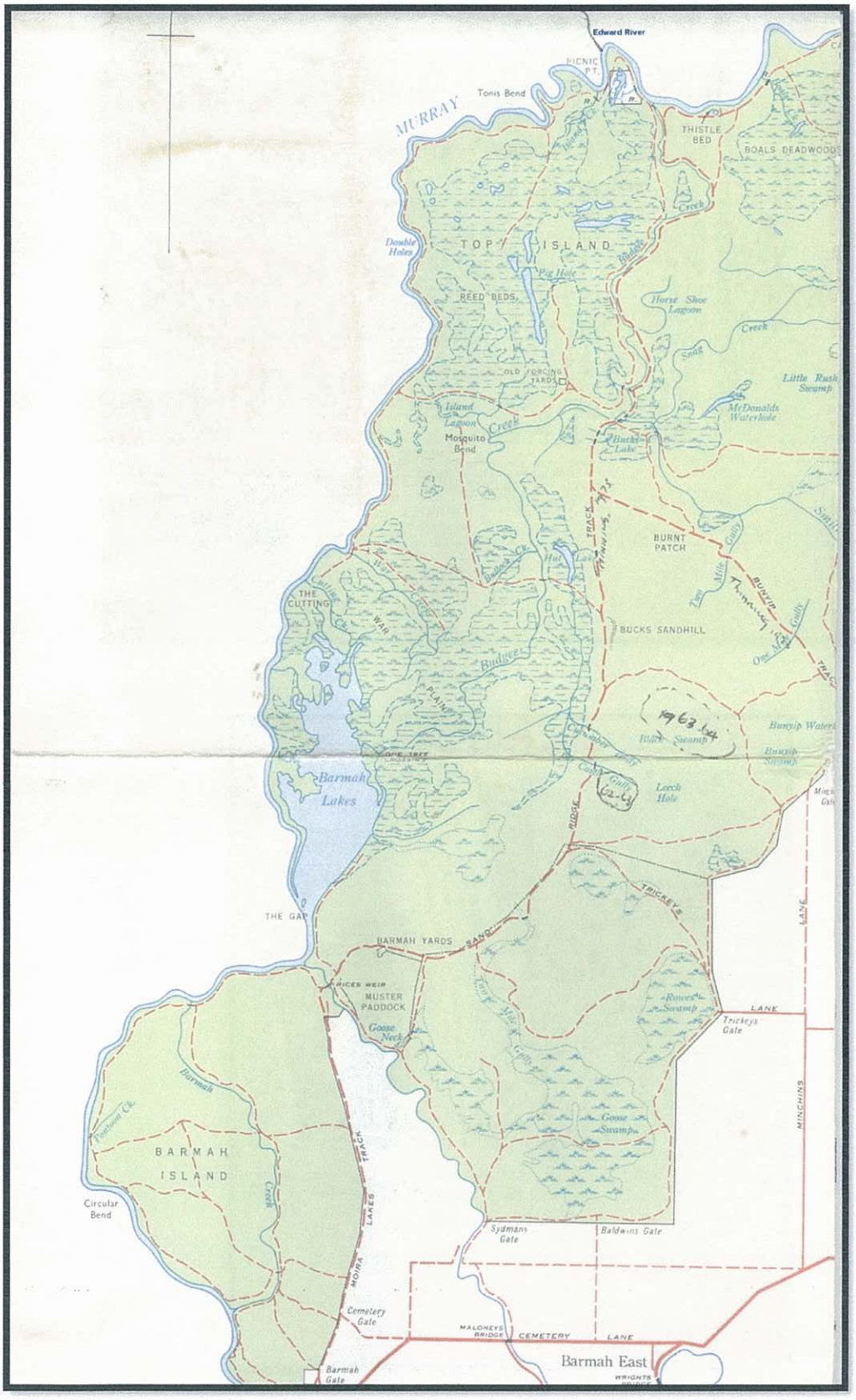


Figure 5. Western part of Barmah Forest: Forest Commission of Victoria, Drawn in the draughting section, Division of Forest Management. June 1962. Revised 1967.



Plates 1 & 2. Ground cover browning off within the zone of influence of mature trees. The zone is roughly circular and is more or less centred on the trees. Photograph taken in late October on an area flooded from June to mid-October 1963.

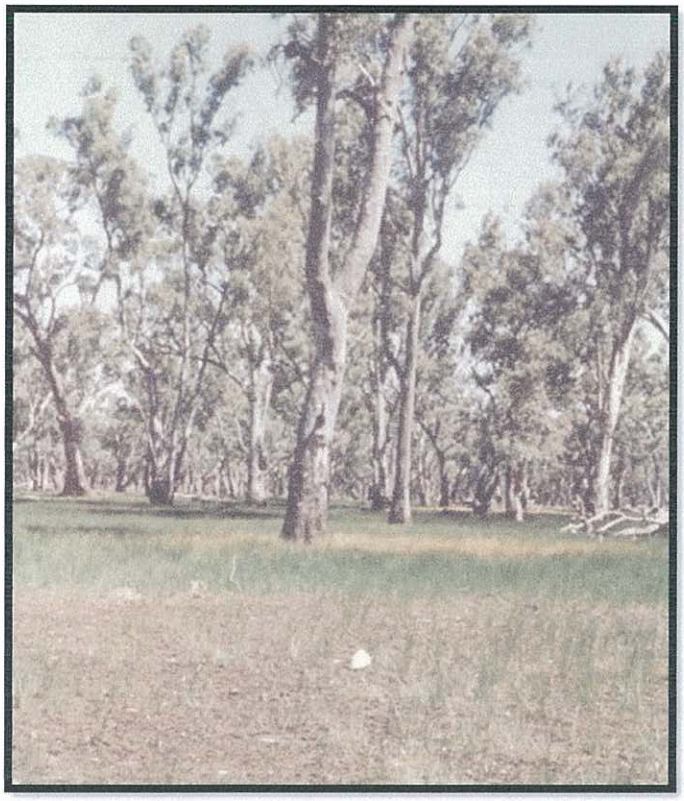


Plate 3. Zone of influence of older trees over-topping on a regularly flooded site. Photo: Buck's Lake, 1965. Age of regrowth – 7 years.

Plate 4. Seedling distribution on Buck's Lake 1965. The tongue of dense regrowth from the drainage line in the top centre of the photograph follows a slight depression several inches lower than the surrounding area. The "Lake" is now substantially colonised.

Plate 5. A relatively dense stand of mature River Red Gum exhibiting clear straight boles. Site Quality 1.

Photo: G. Self.

Plate 6. Short boled and heavily branched veterans of an open grown stand of River Red Gum. Site Quality 3.

Photo: G. Self.

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Report of a Public Forum [transcript uncorrected proof] at Deniliquin on Wednesday 1st August 2012. General Purposes Steering Committee No. 5. Inquiry into the Management of Public Land in New South Wales

Submissions to the Inquiry into the Management of Public Land in New South Wales. General Purposes Steering Committee No. 5.
023 and 023A – Mr David Joss;
204 – Mr Barrie Dexter;
259 - International Union for Conservation of Nature;
406 – National Parks Association of NSW.

APPENDIX

Provisional Yield Table – Even-aged Stands (from Forestry Commission of NSW, 1954)

Age In years	*DBH cm.*	*SQI Stands*			*SQII Stands*		
		Stocking Per ha.	*Total Volume m^3/ha*	Volume MAI m^3/ha/yr	*Stocking Per ha*	Total Volume m^3/ha	Volume MAI m^3/ha/yr
8	*5.3*	*3,600*	*17*	2.1	*3,000*	*13*	1.63
18	*12.1*	*1,050*	*44*	2.44	*900*	*36*	2.0
28	*19.4*	*730*	*84*	3.0	*480*	*68*	2.43
38	*26.7*	*370*	*135*	3.55	*320*	*105*	2.76
48	*34.0*	*275*	*190*	3.96	*235*	*140*	2.92
68	*50.0*	*165*	*300*	4.41	*140*	*220*	3.24
88	*65.0*	*120*	*410*	4.66	*95*	*280*	3.18
108	*78.8*	*90*	*520*	4.81	*70*	*310*	2.87

Although there is no difference in diameter growth between SQI and SQII sites, SQII stands produce less volume because of lower stocking and reduced height development. Mean annual volume increments rise to nearly 5 m^3/ha/yr for SQI sites at 110 years, but only to about 3.2 m^3 between 70 and 90 years for SQII. Unfortunately, this represents the growth in stands subject to natural flood regimes and far exceeds that seen under river regulation (Baur, 1983).

The value of Jacob's data is that it reflects forest productivity before large-scale water diversions deprived the forests of a traditional regular watering. Under natural conditions some 80% of the forest area was flooded 8 years in every 10. The average number of months the forest was flooded was approximately 3.7 months.

The natural growth characteristics described above are typical of river red gum including in Central Australia. Here, not surprisingly, the influence of an assured water supply on regeneration and growth is more starkly portrayed than in the central Murray floodplain forests. Hence they provide a salutary lesson that cumulative drought stress, allowed to continue unchecked will ultimately result in widespread mortality (Kube and Price, 1986).

River red gum is the dominant tree species associated with the major Central Australian water courses. It occurs in the stream beds, on the banks, or occasionally on floodplains up to 500 metres from the stream. The typically forms an open woodland that due to the inherently low and unreliable rainfall, is dependent on ground water. Under these conditions copious regeneration can occur but survival and growth is dependent on subsequent seasonal factors (Kube and Price, 1986).

Kube and Price (1986) studied even-aged red gum natural regeneration that was established in 1974 on some 300 hectares in the Mt. Benstead Creek area of the MacDonnell Ranges approximately 60 kms east of Alice Springs.

The average rainfall for Alice Springs is some 280mm per year, but 1974 was an exceptionally wet year (778mm) and many streams flowed continuously also extending over adjacent floodplains. Rainfall in the decade 1974 - 1984, with the exception of 1980, was also greater than average (434mm pa). Accordingly, the regeneration initiated in 1974 survived and developed to form dense even-aged stands with stockings between 500 and 8,000 stems per hectare on areas where open woodland had previously existed. The pattern and density of regeneration was determined by subtle changes in ground level with the highest density occurring in minor channels and low lying areas.

Stocking decreased with increasing elevation and distance from stream beds. Growth characteristics over the first ten years are shown in the table below.

Description of Eucalyptus camaldulensis regeneration at Mt Benstead Creek
(from Kube and Price, Australian Forestry, Vol. 49 No.4, p.238 (1986))

	Regeneration density class					
	High		Medium		Low	
Age (years)	5	10	5	10	5	10
Total stocking (stems/ha)	8190	7190	2282	2230	527	527
Stocking: dominant & co-dominant stems (stems/ha)	4000	2666	2205	1641	527	472
Total basal area (m^2/ha)	18.3	26.4	11.1	18.8	3.9	9.3
Basal area, dominant & co-dominant stems (m^2/ha)	16.9	22.2	11.0	17.4	3.9	9.2
Height, dominant & co-dominant stems (m)	8.4	11.2	9.3	11.9	7.5	12.1
Dbhob[(a)], dominant & co-dominant stems (cm)	7.3	9.4	8.4	11.4	10.4	14.3
Volume[(b)] (m^3/ha)	60.5	116.3	41.6	94.0	13.4	51.7
Mean annual increment (m^3/ha)	12.1	11.6	8.3	9.4	2.7	5.2

Notes:
[(a)] *dbhob is diameter at breast height (1.3 m) over bark*
[(b)] *Stem volume overbark. Volume = basal area x height x 0.4.*

Periodic inspection of these stands reveals a slow process of self-thinning (dead and dying co-dominant and suppressed trees) with significant tree deaths away from main channels and much reduced health of dominant trees under more usual rainfall patterns and progressively depleted ground water. Not surprisingly there is a similar situation on areas with much reduced natural flooding in the central Murray river red gum forests, particularly along the Murray River floodplain (NSW, Vic, SA) downstream of Gunbower State Forest to Mannum (Brett Lane and Associates, 2004).