

REPORT OF PROCEEDINGS BEFORE

GENERAL PURPOSE STANDING COMMITTEE NO. 5

INQUIRY INTO PUBLIC LAND MANAGEMENT

At Sydney on Thursday 26 July 2012

The Committee met at 2.00 p.m.

PRESENT

The Hon. R. L. Brown (Chair)

The Hon. R. H. Colless
The Hon. S. MacDonald
The Hon. Dr P. R. Phelps
The Hon. P. T. Primrose

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LEON BREN, Consultant, before the Committee:

CHAIR: I call the meeting to order. As part of the current process, which I think is quite useful, upper House standing committees are using input from expert advisers that does not necessarily form part of the process. The adviser's advice can be published by the Committee, with the permission of the person giving the advice. Dr Leon Bren is an independent authority, so there should be no question of any leaning one way or the other. What we are really here to hear today is a bit of background and a bit of what I will call baby science about how these forests grow, how they work, what they need, what is good for them and what is bad for them. We are going on some public tours of some of the forests, so I think it will be very helpful for the Committee to have some sort of understanding of the terminology, the technology, the nomenclature, and some of the science behind it. Dr Bren, you will have to forgive us if some of our questions are a bit amateurish, but none of us is a professional forester. We ask you to assume that we are a very undergraduate class.

The Hon. RICK COLLESS: Forestry 101.

Dr BREN: In point of fact, I have that as a heading.

CHAIR: It is over to you, Dr Bren.

Dr BREN: Thank you for that. We are talking about forest health, and it has caused a lot of thought. We have actually had a fair amount of discussion. There are nice big old red gums and younger red gums in the Barmah-Millewa Forest. One of the points we will be talking about is the question, when we are talking about forests, whether we actually mean the forest as in trees, or do we mean the whole shebang.

CHAIR: The whole shebang.

Dr BREN: That will come across. I will tell you a bit about me. I am a forester who was trained in the sixties as an academic at the University of Melbourne. First of all, forestry is falling apart in Australia. It is almost disappearing flat out, and I am now a consultant. In the eighties for some reason I did a lot of work on the hydrology of red gum forests, and at the time no-one was interested. People said to me, "Why don't you do something people are interested in?" Anyway, I did all this work and it has caught a wave and it is something that has kept me busy ever since. It is only a portion of my work.

Usually I have a foot in both the conservation work and forest production part of things—forestry, harvesting and research at some stage and all that—but I have done a lot of work on red gum and river Murray conservation issues at the same time. I have had a lot of discussion about this. If you know the history of it you will often find the name Barrie Dexter occurs. I have been talking a lot about Barrie Dexter and what he has had to say about this and that. We can go back as far as it goes. Neville Davies, if you have not heard of him, was a senior researcher of the Forestry Commission of New South Wales.

The Hon. RICK COLLESS: Yes.

Dr BREN: Neville has done this sort of research way back to the 1940s. Neville's son, Ivor, of Icehouse fame, is better known for *Great Southern Land*, if that makes sense.

The Hon. RICK COLLESS: True colours show now.

Dr BREN: I should also add that I am on the original committee set up to look at the transition of these forests to parks, and I am on a red gum thinning committee. This YouTube video turned up for me on Monday and I thought you might or might not have seen it.

[New South Wales National Parks and Wildlife Service three-minute video played, *Looking After Our River Red Gum Forests*]

Dr BREN: I do have some qualifications on that. I am not entirely happy with that. We will go into that; it is a little bit simplistic. In particular what comes across is that the foresters are saying that this is not a healthy forest and would never look anywhere as good as the riparian areas of the Murray, no matter what you did with it, because it always would have a water backdrop. So it is a little bit simplistic.

The Hon. RICK COLLESS: Do you know when that video clip was shot?

CHAIR: It would be recent.

Dr BREN: It only came out the other day. I think it has been on YouTube for about a month. It was probably last year.

The Hon. RICK COLLESS: But since the drought ended.

Dr BREN: Yes.

The Hon. RICK COLLESS: Those trees have all the characteristics of severely drought-stressed trees.

Dr BREN: Yes, that is true. But things having eased up a bit, but even-aged red gum forests—and red gum is nothing but even aged—are dying. It is going on all the time. You will always have trees dying. That is the nature of the beast.

CHAIR: The independent committee mentioned during the video, that is the one of which you are a member.

Dr BREN: I am a small pawn in the vast machine, if that makes sense.

CHAIR: Is it bi-State committee, or just a New South Wales-based committee?

Dr BREN: It is a bi-State committee, reputedly.

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Dr BREN: We have parks run by Parks Victoria, and the Department of Sustainability and Environment is meant to be slightly overarching.

CHAIR: Okay.

Dr BREN: Parks Victoria has set up its thinning committee and then the Department of Sustainability and Environment [DSE] set up its thinning committee in collaboration with the New South Wales people, reputedly as an attack on the Parks Victoria people. We have two competing committees, if that makes sense.

The Hon. RICK COLLESS: It does, yes.

Dr BREN: I am only a small pawn in the politics of these, but you do ponder. So there are these committees and this has got New South Wales and Victoria on it, and basically they are setting up this thinning trial. Do not get me wrong: I have no problems with ecological thinning, but it does cause certain amusement as to why we are going down this path, or at least what is intended. We will look at some of those reservations. We will go to the next slide.

When you talk about forest health, sooner or later you will talk about how you will manage the forests. In Australia, that is forest politics. The traditional world forest management paradigm, which still exists around the world, is that the forest is managed as a mosaic. You have individual areas of different priorities: you have trees for harvesting over there, superb parrots here and blue wrens over there, and the sale of the forest by-products pays for the management costs. Your forest health is the summation of the health of the individual areas. That is not always easy. The question of defining its health is not always easy. It has been rejected by the Australian political system almost across the board. We are starting with a new paradigm of how we are going to manage the forests. We will go to the next slide.

Right—red gum forests. Usually we mean a large ecosystem of which red gums are the major arboreal components. Red gums are the most common trees. Usually we would have river channels and a lagoon, and the video showed lots of shots of the river channel. We have reed beds that are not quite wet enough and not

permanently flooded, but are very close to permanently flooded. We have grasslands as the flooding thickness comes down, and a red gum with sedge understorey and red gums with no understorey and then you get onto box on some ridges. When we talk about red gum forests, we usually mean a whole collage of ecosystems, not just the one, but it can just mean the arboreal component. With the forests I have talked about, we usually just mean the tree component, not the grasslands.

CHAIR: What was the word you used—sedge?

Dr BREN: Sedge. It just means it is wet and stinky and all that. In the sense that that video would have talked about forest health, it probably actually means ecosystem health, and ecosystem health is a bit of a meaningless term because there is an ecosystem there, whether they are healthy or not. You can say that individual trees or aspects of it are healthy but individuals are not. It is much harder to talk about forest health. Notwithstanding that, people talk about healthy ecosystems, national parks have healthy forests and healthy people. All that sort of stuff is their motto. We will go to the next slide.

The next point I would like to make is that this is meant to be an interactive discussion, so feel free to chip in and tell me how wrong I am, or what have you. Forests are plastic. When you have a forest, you can make it whatever you want. You can have it as sedges, reed growth, old growth and big mature trees, or you can have small trees; you can have it dense or you can have its sparse or intermediate. You can have different species. So your forest is whatever you want it to be. But the transition from one, where it is at the moment, to where you want it to be will take time. You cannot hurry: *You Can't Hurry Love*, and I have been looking at my little three-year-old grandchildren and I have discovered that you cannot hurry three-year-olds. You really cannot hurry these forests to where you want them to be from where they are now. If you do, you will get all sorts of strange results.

I suppose you can have many different forests, but they are all equally healthy. If you said, "Well, which are healthier?", it is almost a meaningless question. They are all going to be equally healthy but they are all different. That is what you come across in much of this discussion.

The Hon. RICK COLLESS: It is very much a dynamic system.

Dr BREN: Yes. They are all living systems. They are a system composed of many living individuals, a little bit like a city. Because you have this vast assemblage of individuals, they have a life of their own. Trees and the grass will have big battles—and I think I refer later to the quiet cycle of ecological battles—and these things are going on. Perhaps fortunately we cannot hear the huge shriek from the mutilated trees or the shriek of mutilated grasses, but if you could, it would be a worldwide battlefield.

Red gum forests are big. The Barmah-Millewa Forest, which is a third of the red gums we are talking about are in a 60-kilometre a side triangle. You have many others. What it means is that you have a lot of space. You have a lot of diversity packed into that space, and that means that you have mosaics of species. You have zones of distances from waterways. If you are trying to manage parrots, it is a critical issue—how close the birds are to water? If you are talking about hollows, what would be a desirable flat for a bird? What rent would it pay, if it was paying rent?

Clearly closer to the water will give you a better rent, if that makes sense, or the bird would pay a higher rent if it were a cash economy, which it is not of course. Water is critical to the forest and if the forest gets flooded too frequently it cannot survive, it will die so it will go to weed beds or nothing. If it gets flooded not frequently enough it will lose its biomass and ultimately it would change species but it will take 500 years for a red gum forest to change to a box forest so it is not going to happen overnight. There are many other characteristics, and because they are big you can characterise your forest in many, many ways as to what is desirable.

I make the point that liking a red gum forest is an acquired taste, and we have discovered this again and again. They are actually a very addictive forest but they are slow acting. If you take an international visitor to a red gum forest they are not going to be very impressed. But if they go again and again they will like it more and more, so it is slow acting. We have found that casual visitors do not find the forests very attractive. The actual forests, as distinct from the ecosystems, are very uniform, quite dense, even aged and a little bit dull to look at. People like the riparian ecosystems where a river runs through or you have a wetland or a lagoon.

The Hon. RICK COLLESS: In the Riverina they are very even aged. Does that tell us they were germinated at the same time?

Dr BREN: Pretty much.

The Hon. RICK COLLESS: What was the event that activated that? What did it look like before that?

Dr BREN: That is a very good question. First of all they are even aged, by their nature they are even aged, and I will talk a little bit more about that. There was heavy logging in the 1870s. The red gum forests have produced a huge amount of wood. Marvellous Melbourne in the 1880s was built on red gum forests, so the tramways run on red gum blocks. You see these buildings with bluestone foundations. Typically they would cut 12 inch by 12 inch red gum, and they would put all these bluestone foundations on top of the 12 inch by 12 inch red gum. All of these mansions have a life span of about 130 years, which is about now I should add. I sometimes wonder about that. In the Victorian age they had these huge railway networks running through Victoria, South Australia, New South Wales all on red gum sleepers. All the fences were red gum. There was a huge wave of logging so that was the major one.

Other natural disasters, burning in particular, and cyclones and wind flattening them will cause it. Yes, they are very even aged. Blue gum forests without water are pretty dull. If you add water they just come alive with tortoises, turtles, fish, kangaroos and emus and they are just a great place. The water in that regime is critical to their health. If you define ecosystem health as having lots of tortoises, turtles, fish, kangaroos and emus it is terrific, but it is a bit of a RS definition of health. They grow in a 400-millimetre rainfall zone area and need about 1,000 millilitres of water a year to survive so typically they get that by flooding or by pulling up groundwater. We did all this work on groundwater but we could never quite work out how much they depended on groundwater but we came to the conclusion that they can get some but it is at a high-energy cost?

CHAIR: Do they have deep roots?

Dr BREN: They have sinkers which seem to go down a long way but not that many, and I think it is a high-energy cost so the trees can sustain themselves on what they are sucking up but they cannot thrive on it.

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CHAIR: Just maintain themselves?

Dr BREN: Yes, live today and hope it will rain tomorrow. That is what many of the forests have been doing in the drought. Forests are of tolerant and intolerant species. The video I showed really gave the impression that they had to view these forests as tolerant. It is fairly key to the health. Tolerant forests, you often find them in Europe in conifers. It means that you can have a big tree and a small tree, and then the big trees grow and the small trees grow and then when you cut down the big tree the small trees will come and fill the gaps. If you are standing here you would see a big tree, sapling, sapling, sapling, sapling, sapling, sapling, a big tree and then as a woodsman you would take your axe and fell the big tree and then the little trees would come up and you would have this lovely forest. That is the perception of forests. That is what people like. They say, "I wouldn't mind forestry if there was small selection but I hate clear-felling". That is a tolerant forest.

The other is an intolerant forest where basically the big trees will always gobble up the small trees. If you do end up with a big tree and a small tree, the big tree will suck the life out of the small trees, and will get bigger. Eucalypts are generally intolerant. So you can only grow them as even-aged stands. Usually the trees are often all the same age but the bigger ones are the ones that have got bigger, and the smaller ones are the ones that have not got big, if that makes sense. Red gum is not the most intolerant but it is towards the extreme of the big tolerances. It is very much an even aged species and you cannot really grow in a selection forest or a tolerant forest although people are always trying to.

Even-aged forests are usually generated by clear-felling. You make a big hole or a big gap with a big disturbance. Wind and fire would be the two major ones. My colleague, Ron Hateley, just published a book and the thesis of the book is that most severe forests are regenerated by big wind events that have blown them over just before the Europeans came along. He has got good evidence of that. Clear-felling makes a big gap and the seedlings will come up. If you try to make small gaps they will not. Fire will kill off even a red gum and the Victorian species, mountain ash, are very sensitive to fire. As soon as you burn them the trees die but you get millions of seedlings coming up.

In an even-aged forest you get big trees and small trees, and the big get bigger and the smaller die. Particularly in an even-aged forest they will often grow in extremely dense thickets. Red gum is an extreme of this and there is an intense and silent battle for superiority. The ones that have been shaded out do not die, they hang on so you have got this really dense thicket and if you do not thin it you will end up with many dead trees, these long thin dead trees—not much wood in the ones that have survived and are that much thinner. In Victoria we have the uneven-aged silviculture. Various people in governments have disliked clear-felling. I think the mountain ash, which is a current commercial species in Victoria, the Government said you have to do it with uneven aged. It spent a few million dollars trialling uneven-aged silviculture. It was basically a total failure. That has been repeated a few times, trying to treat eucalypts as an uneven-aged silviculture forest. It usually does not work.

CHAIR: Is there retained knowledge in Victoria of those experiments and their success or otherwise?

Dr BREN: It was well written up. It was called the SSP—Silviculture Systems Project—so it is all published. But having said that the people have been de-hired so all the individuals—

CHAIR: How long ago was that project?

Dr BREN: About 10 years ago was the SSP project from the early 1980s to the early 1990s but forest is almost dead in Victoria and so all the people have been de-hired.

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The age of red gum forests? They tend to grow in even-aged stands. One of the characteristics of this is the size differs widely in trees of the same age. The trees might all be 40 years of age but the big ones will be that diameter and the thin ones will be that diameter. You cannot look at a tree and say if it is fat it must be old. Height is a better guide than diameter because the height is less influenced by its stocking and trees almost grow, even the well endowed and the less endowed, at the same height. Height is always a better guide. The question of how old they grow is a great question. My life has been starred by my gullibility and people have always said "That tree is 2,000 years old. It is a big red gum". Occasionally somebody says, "How do you know?" They say it is because it takes that long for it to get that big. It is really hard to find out how old the trees are. Most eucalypts do not seem to get much past 300 years of years. A few times radiocarbon dating has shown they might be 260 or 300 years of age. The tree being 500 or 800 or a million years old, ask the people how do they know how old it is? They will say, "We can count the rings". It is almost impossible to count the rings on a eucalypts. They throw rings at the drop of a hat. Every time it rains they throw a ring.

CHAIR: One ring does not necessarily relate to one year?

Dr BREN: No, a red gum does not have rings anyway, or not that you can really discern except under a microscope, but it will throw a ring every time it gets a good rain event or a flood. There are a few theses on that. People are always chronically disappointed they are trying to fix global warming or whatever and they get totally frustrated by that lack of rings on the red gum. Concept of a national park? I probably do know something about this because I used to lecture in one subject on national park and catchment management and all of that. The concept of a national park came out of America in the 1850s roughly. I think Thoreau was one of the guys and he was a philosopher or something like that.

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The concept was that you take an area and you put it in and nature would look after it and it did not have human interference it would be preserved for all time. That is how nature would have been if humans had not been there.

The Hon. RICK COLLESS: What do you mean by that? Does that mean pre-European or pre-Aboriginal occupation?

Dr BREN: Well, that is part of the question. The concept was fine. Obviously Thoreau and all these other guys—he was only one of a number—were all very concerned about American "civilisation" spilling into

the wilderness areas. They said, "Let's preserve these. Let's free it from logging, settlement" et cetera. The idea would be that nature could do its work and that whatever happened, and then you have got a reference area. The concept of a national park does not sit quite so easily with red gum. First, it is driven by the flooding regime. You have got a very changed flooding regime along the entire Murray River. I think it really started changing about 1934 with Lake Hume being constructed as the first really major change but before that you had people who were always building levies. They had a 1901 interstate royal commission on levy building on the Murray because people were channelling it, irrigation development, and this and that, so there was change of flooding regimes. You got lots of roads for access, management, fire protection, tourism, meeting the needs of property owners. You guys will be dealing with the roads, if you have not already. There are different fire regimes. I left out grazing, you have got lots of feral animals and what have you. Even if you could get untrammelled nature, I am not sure it is what people would really want. So that is one of the things that does come into all of this.

Basically people are saying that is not what we want out of our national park; we want something different. Having red gum in national parks does not sit easily with the concept of national parks. The next slide is red gum management. A lot of it has to do with flowing conservation or trying to get floodwaters into the forests. That was not such an issue until perhaps the seventies or eighties. In 1934 there was Lake Hume, 1956 they doubled the size of it. In the late 60s there was Dartmouth Lake Buffalo and the Snowy Mountains Scheme in the early 50s to 70s and suddenly water became a much more valuable good and water has become pricey.

Back in the 60s no-one would cost the amount of water that is going in but these days this water is at a cost and that could be used for people for irrigation. It is time to get the water to the forests and there has been past history of micromanagement of water in the forests, effectively paddy field irrigation, trying to make the water go further. One of the other issues is—and I did a lot of work on this—you do not get the big hydraulic heads or big floods you used to get because it wipes out the vineyards and the golf courses get flooded. In the old days the water would come down and that was it. You cannot do it these days. "My vineyard on the flats is too valuable to be flooded". I spent a lot of time with feral animal and weed control and that is an interesting issue; you have horses and cattle and sheep sometimes, lots of invasive weeds and foxes.

Fire protection is a great question. Red gum is quite sensitive to fire, particularly if you have lots of trees with hollows, which are particularly sensitive to fire. Basically you have tractors that would go out and do it and you need dollars to pay the wages and the costs of petrol, diesel and whatever and traditionally you got that by selling the red gum or some sort of forest product. Charcoal is another good source of revenue but these days you have not got that so you become a mendicant, a beggar of the tax system. The poor old forest manager has to stand in line with the hospital people, the school people and everyone else who is saying, "Give me money, give me money".

The Hon. ROBERT BROWN: Police and ambulance?

Dr BREN: I do not know that mendicant is quite the right word but you certainly become a dependent on the government largesse whereas not so long ago you had a certain amount of revenue where you could say, "This is what we are financing." I turn to the next slide. Stuart asked me to talk about forest health and you start by talking about the health of individual organisms like, "How are you?" "I am good except I have a lesion on my skin" or something like that. Forest health is ultimately the summation of the organisms health. We have one million trees and 900,000-odd are healthy and 100,000 are not. Ecosystem health is one that is used but it is a buzzword because it seems you can somehow define what is a healthy ecosystem and you really cannot. I quote from Charles Darwin, "It is difficult to believe in the dreadful but quiet war of organic beings going on in the peaceful woods and smiling fields" so even in your forest there are always going to be winners and losers and those poor old losers are going to die, that is the long and short of it. That is biology 101.

I turn now to the next slide. Given that you have a forest and you have trees dying, a traditional technique in forest management was to remove the dead and dying. The idea was that a bigger tree per unit volume was worth more than a smaller tree. In other words, if you have a big tree you might get four times as much wood but you get eight times the dollar value because you get much better recovery when you saw it. A big tree is worth more than the equivalent volumes of small trees. You thin it out, make the big trees grow bigger faster, you maximise your dollar value and you get the best recovery. That is called timber stand improvement thinning. It is a traditional technique that goes back to when forests were first managed in the 15th or 10th century.

A more recent one has been the concept of ecology. People say, "These forests are all regrowth and what we would like are old growth but we cannot get it. We can get bigger trees that will simulate old growth."

The idea is that the big trees will develop hollows and it has been pointed out that you only get hollows in big trees arguing that more hollows mean more wildlife. The video showed parrots and lizards going into hollows and you have healthier ecosystems. If you had a hollow in your head you would say there was something wrong, that it is not really healthy to have a big hole in your head, but from an individual tree's point of view a hole is not really terrific and you can argue that a hollow formation is a failure of tree health; in other words a healthy tree does not have a hollow but as they get older they lose the ability to resist fungal infection and form hollows.

The Hon. RICK COLLESS: With the red gum, assuming you have the optimum spacing to grow, how quickly do they start to form those hollows?

Dr BREN: You would be waiting 50 to 100 years.

The Hon. RICK COLLESS: They would be old trees?

Dr BREN: You and I would be well and truly out of the system. That is the concept. There are some important issues there. Firstly, if you say there is a park and suddenly you have all these big heavy harvesting machines, 200 kilowatt diesel engines, well muffled and all of that, but they are still big machine. In the old days you would have a guy with an axe you cannot do that anymore. There are harvesting machines and big excavators with felling machines—snip, snip, snip—so even the most hardened person finds it a bit disturbing, saying "It is a national park; what are all these big forestry machines doing wandering around it?"

The retained trees will get certainly bigger and healthier, that is the nature of thinning, but if they are healthy they probably will not perform hollows quite as easily. If hollow formation is a failure of tree health, if you have made these trees growing hard, they are going to say, "bugger off" to any fungal agent that comes along. Remember that most hollows are formed by fungal attaching to the tree. It is going to take you a long time to get anywhere. Barrie Dexter and I were having a bit of a discussion about the cost per hectare—and this pilot will show up—and Barrie was saying it is \$500 a hectare and I said about \$1,000 a hectare. Anyway, it is going to cost money.

CHAIR: How big is the area in which the trial is taking place?

Dr BREN: About 30 hectares.

CHAIR: In Victoria or New South Wales?

Dr BREN: It is all to be revealed at the next meeting but I think it is half in Victoria and half in New South Wales; but 30 hectares in 150,000 hectares of forest is not much, is it?

CHAIR: I guess from your earlier description that in a forest that big of a forest 60 kilometres by 60 kilometres by 60 kilometres, a forest of 150,000 hectares, if you were not careful you could select 30 hectares that may be typical of one part of the forest but not another. How will you handle that problem?

Dr BREN: That is a classic scientific question. If it was a purely scientific one you would stratify the forest and you would have a random selection. You would say, "We can get in there and there" and the managers are probably very conscious that they would get political flak so they would probably be looking for a compromise with accessibility where they think people will not necessarily—

CHAIR: —not worry about it?

Dr BREN: On the one hand they want to get the kudos from doing it but on the other hand they do not want the flack so you will find it will be a judicious compromise. That is what I would be doing anyhow. The second one is the question of residual wood. The question of how much wood you should have, again I have been trying to form an opinion on this. Andrea Ballinger and various other people did all this work and for maximum ecology and they came to the conclusion that for maximum ecological health red gums should have an amount of wood so lizards live under that and they came up with 20 to 40 tonnes per hectare of wood. I think the Aboriginal population of the Barmah-Millewa forests was about 2,400 before Europeans came. If you go cooking something on a fire it is a very inefficient way of cooking in terms of the kilograms of food produced per kilogram of wood. There could not have been much understorey wood in Aboriginal times.

CHAIR: Because of the amount they would have used?

Dr BREN: Yes. Having said that, by the time the Europeans got there, remembering that the Aboriginal populations were very affected by smallpox and measles and they were very enfeebled by the time the Europeans got to the forest so the population had dramatically decreased.

CHAIR: Is there any assessment of what acreage there was of the forest at the time of these 2,400 indigenous people. I have heard a story from some of the visits I have had down there that it was not until we started altering the river regimes and river systems that the river red gums moved out from the riparian zones. Would they have been the same size, smaller or larger or does no-one know?

Dr BREN: Probably no-one knows. Again we have been having some discussion of that. The forest shrunk by settlement and in Victoria in 1882 the settlers came up with this huge plan to build this huge levee bank that would have taken half of the current Victorian side of the forest and put it into farming land. The government to its credit said no, that the forest was valuable and that set the boundaries. I think that Sturt when he went down the Murray hopped out of his boat at Barmah forest and all he could see was a sea of reeds. He never actually noticed red gum forests. He only saw reed beds. There are all these casual observations. I think Squatter Kerr, who is viewed as an unreliable correspondent these days, made the first observations of the red gum forest back in 1838, 1839 or 1840. He saw them from behind his cattle; in other words he was pushing cattle through these forests and they were as, "green as emerald", as his quote. Ron Hateley in his book published two years ago argues that many of the forests did not exist in 1830s or 1840s, that they are of relatively recent origin.

CHAIR: So the answer is unsettled.

The Hon. RICK COLLESS: There is quite extensive map prepared by Thomas Townsend in 1848 which clearly shows that there were very sparse populations of red gums in that area and that is only 10 years after Sturt was there?

Dr BREN: Yes, that is right and the argument goes that the forest was sort of patchy. There have been a few people who have made attempts, including myself, to gather information but most of us have not persisted. You end up spending hundreds of hours in libraries looking for things that probably do not exist.

The Hon. RICK COLLESS: It is pretty important information. If we go back and find out what that forest was like prior to white settlement?

Dr BREN: It is viewed as important now but when I was doing this work people would say, "Why are you working on red gum? Why don't you work on a more important species?"

The Hon. RICK COLLESS: The argument is: is this forest a naturally occurring forest or is it a forest that has appeared since European settlement? The same applies to the Pilliga forest.

Dr BREN: We have had a lot of discussion on this with Barrie Dexter too. There were always core forests but around the edges they disappeared. I did some work on the Moira grass plains. I am patting myself on the back a bit; it is a nice bit of work I did. When I started doing work on hydrology I hired an aircraft and a pilot and flew over the plains. There were large plains and one of the things that came out was that no-one went into these things because they were so hard to get to: you would get wet; if you tried to drive you would come to something you could not cross; and if you tried to boat your boat would run aground.

I did a study that noted the changes on the grass plains. After World War II they took aerial photographs of Australia because they had Dakotas (DC3's) that were not needed photographing the South Pacific so they sent them to photograph Australia. The grass plains were just bare grass plains. They have since thickened up with trees. Many of the plains areas have completely disappeared. Red gums are an aggressive invader. Red gums, given half a chance, will occupy any bare ground. I did a study for Parks Victoria at Hattah Lakes and they are concerned about conservation of red gum; except the red gums have invaded the lakes and they have thickets around the lake shores. They asked, "Can we flood them out or will they die?" We came to the conclusion it was a biological asset.

CHAIR: Coming back to the original concept: the estimation of how much timber was taken out by the indigenous people, on a guess of how much forest there was, leads you to this conclusion?

Dr BREN: It leads to us being confused. We are talking about relatively small amounts of wood that fall. MacNally and Ballinger talked of 20 to 40 tonnes. The Aborigines at that time would not have taken that much. When you start thinning these trees you are going to end up with hundreds of tonnes per hectare.

CHAIR: If you leave it there.

Dr BREN: If you leave it there. You chop out the trees and one of the characteristics of a eucalypt forest is the amazing volume that comes out once you start. You are churning wood out forever. If you leave it there it looks awful. You have piles of wood everywhere. It looks awful and you have a fire hazard. You can cart it to a dump or place it on sand hills but the sand hills are valuable ecosystems. You can find somewhere to dump it but you end up with a huge pile of wood in the bush. You can sell it for firewood and saw logs but you cannot do that in the national park. That is going to be an interesting issue for the thinning trial to deal with.

CHAIR: How long is the thinning trial due to run?

Dr BREN: It is going to start this summer—as soon as they can get into the forest following the flooding—and go until March.

The Hon. RICK COLLESS: Under the current policy settings you say you cannot sell wood from the national park?

Dr BREN: You will be asked, "Why is it national park if you are going to log it?"

The Hon. RICK COLLESS: Good question to ask. If it is going to lead to the improvement of the park ecologically it should be thinned as you are suggesting.

Dr BREN: A brave politician could put that point of view to the world.

The Hon. RICK COLLESS: It is a question environmentalists need to be asked.

Dr BREN: It is a key question that will be defined by this trial. You made the national park and now you are going through with heavy harvesting material and churning out a volume of wood that would not be taken out of the State forests. There is a point of view that to save the forests they must be designated a national park.

The Hon. RICK COLLESS: What are we saving?

Dr BREN: Yes. I never agreed with the concept they were saving the forest by putting it into a national park.

The Hon. Dr PETER PHELPS: What were the forestry practices in this area in the past? Was it selective timber extraction?

Dr BREN: Basically it was clear-felling for logs and a fair amount of thinning. The thinning would have produced a collection of smaller logs, firewood and wood chips—not for paper. The Victorian education department, as a case in point, mandated that there had to be shock absorbing material under children's slides and red gum wood chips were shock absorbing material. Red gum is not a good paper material; it is too red and coloured and very energy intensive. Red gum polishes beautifully and you have the fiddle-back and wavy grain you see in violins. People make boxes and you pay \$20 for a box for your trinkets and cufflinks and so forth. There was all of that. If you have areas with bigger trees it is hard to regenerate if you do not go to clear-felling. You are also a long way out the back of beyond.

CHAIR: The term ASG describes how the clear-felling is done?

Dr BREN: Australian group selection.

CHAIR: Where they calculate the amount of area that a mature tree needs to have for itself?

Dr BREN: That is because there has been a reaction against clear-felling. The answer was to make the coupe smaller but as you make it smaller and smaller you get an edge effect to the point you have lost all the concepts of clear-felling. The concept was a reaction to people saying, "I hate clear-felling." There are two forestry schools in Australia and they teach different approaches to silviculture. Victorians are influenced by Creswick and New South Wales is influenced by Canberra and there is a difference in approach between the two campuses.

CHAIR: Creswick being the forestry school—

Dr BREN: —in Melbourne university.

The Hon. Dr PETER PHELPS: How do the clear-fall coupes recuperate? Do they require intervention or do they self seed?

Dr BREN: Usually you would burn it because it reduces competing vegetation and it gives you a very fast strike of the seed. There is no great benefit, particularly if you get a good seed year. Red gum is like a clock; if the red gum is flowering it must be December. It is regular. You have little trouble getting regeneration. The problem is usually an excessive amount of regeneration; you get millions of seedlings per hectare and you get locked stands.

The Hon. Dr PETER PHELPS: Where there is no human intervention does the forest sort itself out?

Dr BREN: It does not. You get dense stands that continue being dense forever. If you wait long enough—

The Hon. Dr PETER PHELPS: —effectively they become stagnant forest?

Dr BREN: The term "stagnant" is a pejorative term. It is a human term but it is not a natural term. In a dense forest the crowns interlock and heavy birds can build nests in the crowns because there is more mechanical strength. It is an interesting environment under them. I can find you some pictures of them. It is a human concept that they are stagnating. In economic terms you are correct; you are not maximising your wood volume. But if you are running a national park you do not need to. You might have concerns about visitors and the hazard of falling limbs and what have you. People say, "Look at the dead trees"; but it is nature at work. That takes you back to the question of whether you are happy to accept nature at work. That is what I am getting at.

CHAIR: If you did thin and leave the timber you end up with hundreds of tonnes per hectare. Normally from a bush fire point of view they are not talking about thinnings such as logs and off-cuts, they are talking—

The Hon. RICK COLLESS: —six millimetres in diameter.

CHAIR: If you have 30 tonnes per hectare it is a disaster.

The Hon. RICK COLLESS: That is less than six millimetres in diameter.

Dr BREN: A lot of a material would not be flash material.

CHAIR: But there would be a hell of a lot of it.

Dr BREN: The other thing is once it is ignited it burns. Red gum fires are interesting because although the fuel load is usually not high compared to mountain forests it is still high enough and it is hard to put out. The root holes will burn for weeks or months.

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CHAIR: I use red gum and yellow box for our fire at home. It is interesting how long the red gum will burn.

Dr BREN: We used to burn red gum at home but you cannot get it now.

CHAIR: It is still around.

Dr BREN: Not in Ballarat. You realise what a terrific wood it is for fire. Can we go back one slide? What they do with this is going to be a fairly interesting issue for park management and the community. I think it is on the agenda for discussion at the next meeting. Next slide please. The third point is a hobby horse of mine. The thinning model is timber stand improvement. You end up with a forest that is evenly spaced and aged. If you take a plantation as being uniformly spaced it is not quite at plantation level.

CHAIR: But getting there?

Dr BREN: Yes, getting there. A colleague of mine—who unfortunately died—and I were playing with this. You could carve big sweeps into the forest or big holes. You could mimic other things. You might take this up with Barrie Dexter. You do not have to go to the timber stand model of thinning. You can do dramatic things. Forests are plastic environments and you can make them what you want to.

The Hon. RICK COLLESS: Forestry did some of that experimentation in Mathoura.

Dr BREN: A little bit. I lost track of it during the dying days. John Harris was the manager of the Grampians National Park and we tried this in some blocks of Crown land that had less restrictive tenure. We cut sweeps and it looked terrific. Because of the big openings you have a thinning effect around the edges—remembering that nature does not give you evenly aged trees. There is certain creativity here but any manager in a politically fraught environment would be a brave manager to introduce that practice.

The Hon. RICK COLLESS: Did the Aborigines patch-burn the red gum?

Dr BREN: We have been talking about the Aborigines. At the time no-one really thought to document their practices. I think the evidence is they were very thoughtful burners. Early settlers thought they were casual and careless with their fires but the people who look at it now think it was a much more deliberate and systematic pattern of burning and the European perception was not correct. There seem to have been two sorts of burning: burning to get grass, and that probably kept the forests a lot more open than they are now, and burning to keep the forests open because it made it much easier—

The Hon. RICK COLLESS: Which would have created that sort of model, would it not?

Dr BREN: That is correct. You would have got this sort of mosaic. Having said that, observers at the time really did not record much, remembering that it was of no interest in the 1860s and by the time we got documentary evidence it was really too late. I have been having lots of discussion with Barrie and I think you are going to meet Vic Eddy, who will have a lot to say about this too. Vic has spent a lot of time looking at what they did and did not do.

The Hon. Dr PETER PHELPS: Do the big open patches create a problem for fauna and their migration movements within those parks?

Dr BREN: People love the concept of corridors and animals moving along the corridors and being protected. Forestry experience is that animals will move along the roads because they like open space. You and I walk along the road rather than through the bush because it is a lot easier. I cannot speak for everybody—

The Hon. Dr PETER PHELPS: It is just that we had advice in an earlier committee inquiry that it would be difficult for some animals to traverse a single-lane path which had been carved through the forest.

Dr BREN: Yes, the little things like the phascogales might, but in their entire life they move only 10 metres or something like that from where they are born.

CHAIR: In the Natural Resources Commission assessment of forests there was some argument that even Australian group selection created clearings too big for the superb parrot to fly across, but some of the bird people said the superb parrot feeds in the grass so if it flies out of the forest to feed why would a 100-metre patch of grass—

Dr BREN: That is right. David Leslie did work on the superb parrot and showed that although they live in the forest in holes, and there were plenty of holes, what was limiting them was the food supply.

CHAIR: That is correct, which is grass seed.

Dr BREN: You always come back to the point that the superb parrot is only one of the birds you are dealing with. There are hundreds of things you are trying to optimise for, and that is a fairly key philosophic question. If you were hardhearted—I am not saying you should be—you would say the species will have to take their chances. We do not know enough about individual species and we are not God so we cannot favour one species at the expense of another species.

CHAIR: Historically small woodland bird species require a thick understorey to nest and protect them but if you now have an artificial understorey developed because of human intervention and there are a lot of other birds, if you let it go back to nature it will change over 100 years and those birds will not be there. In other words, you cannot have one of everything just because you want it.

Dr BREN: Yes, exactly. If you were following conservation you would. The Lake Pedder argument in Tasmania died because they realised that if they lowered the level of the big Lake Pedder 10,000 platypuss would die. You have created a new habitat and whatever you do will suit some species more than others.

CHAIR: Like the weirs at Toorale. Take them away now and people would scream.

Dr BREN: That is right—a naturalised habitat.

CHAIR: That is a good description—a naturalised habitat.

Dr BREN: Having said that, if you have an image of the perfect forest manager who is sensible, aware, socially sensible and financially responsible they are going to try to achieve the best balance they can through this maze of competing demands. The difficulty is that no-one is infinitely aware of everything to do. The next slide refers to other forest health issues: fire, fuel reduction burning, fuel loads, proclivity of habitat trees to burn. This is a picture of a fuel reduction burn in the Barmah forest. Trees with holes in them go up like candles. This is a fuel reduction burn that could have been done better. I have never liked fuel reduction burning notwithstanding it is mandated by the Government and that in Victoria after the 2003, 2006 and 2009 fires there were inquiries and honourable judges all recommended fuel be reduced to get the levels down. I know a retired anaesthetist who used to go through the fuel reduction burns afterwards and find koalas that had been burnt. She would either put them out of their misery or take them home and fix them up. There is always an animal ethics issue. I am surprised People for Ethical Treatment of Animals [PETA] has not got onto it.

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Dr BREN: In this case apparently there were always parrots whose young were burnt by the fuel reduction burns. There are some interesting issues. You might argue, as does my colleague Kevin Tolhurst, that the area is going to get burnt sooner or later, so which is the lesser of the two evils? There are some great issues there. I refer now to flooding. As a State Government you probably have some input into flooding and how the Murray-Darling is run but I imagine you are only one of many trying to control the flooding.

CHAIR: There is a bureaucracy that decides when the gates will be opened and when they will not. There is a lot of argument amongst many people as to whether that is good, bad or otherwise. It is not just New South Wales; there is also Victoria, which would have similar regimes.

Dr BREN: And South Australia.

CHAIR: As you say, South Australia.

Dr BREN: Before this really became political I used to be an observer of South Australia and Victoria and what came out was that in the Barmah-Millewa forest if you map the water you see it goes in big sweeps in and out of New South Wales and Victoria and the channel is irrelevant. Victoria and New South Wales used to have big arguments and it often came down to the question of parity. If New South Wales got a bigger diversion capacity Victoria had to have some.

CHAIR: If you try to pump too much water through the Barmah choke it goes everywhere.

Dr BREN: That has happened. Flooding is very political. With regard to grazing, Victoria ultimately got rid of its grazing animals such as cattle. People claimed that they could show health issues. I was never very convinced that they were doing damage. It comes back to the fact that it has been grazed since the first Europeans were there so whether you can show they were doing harm is another matter. Anyway, whatever the case people argued they should not be there. In relation to feral animals, in Victoria the Government has been very nervous about shooting horses although they are distinctly feral. There are also pigs, foxes and rabbits and a whole lot of other things. Carp is a great issue and it will probably arise again because we have had some wet years. It is a question of whether you call them a forest health issue; it is a bit moot. The carp will certainly breed in the forest ecosystem because they are a wetland animal but it raises the question of whether forest health includes animals in stream environments. You guys can sort that out.

CHAIR: Looking at it another way, the health of the trees, the red gums themselves, relies on water distribution.

Dr BREN: That is correct.

CHAIR: If water distribution equals carp distribution perhaps someone has to think about the carp as well as the water.

Dr BREN: That is correct.

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This next slide is of a Victorian forest. You can see it has been a long time between flooding and the red gums died out. I think it was a lignum plain and the lignum died out. There is one surviving red gum and all the rest are dead. I guess you would say that is an unhealthy forest. It is in a national park. Whether it is an unhealthy ecosystem is another matter because it has been replaced by something different. It is certainly no advertisement for forest management. In the next slide I have come up with a tool kit to maintain forest health: "ogy" knowledge—entomology, hydrology, pathology. You have to have good forest mapping and good forest records to go with whatever you are managing.

CHAIR: Would you say that, irrespective of jurisdiction, most States have good forest mapping and good forest records going back a long way, or is there a problem?

Dr BREN: The forest services did. I do not think the parks services ever put quite the same emphasis on it. I might be wrong.

CHAIR: Once the records exist, provided they are kept and archived, it does not matter who did them.

Dr BREN: I think that is an optimistic view of it.

CHAIR: That is a bit of a worry.

Dr BREN: I can tell you some stories about organisations that made bad decisions or someone pushed the wrong button and the records all disappeared. You have to have good forest access, which are roads. Roads will always create an issue. The United States Forest Service is the largest road owner in the world, can you believe?

CHAIR: I believe that.

Dr BREN: About 10 years ago they thought they would really reduce the length of their roads so they began an aggressive system of shutting down roads and all hell broke loose. Every road turned out to have a collection of champions, people who loved that road because it led to their favourite shooting spot or camping site.

CHAIR: Out here it is generally volunteer firefighters who champion all those roads.

Dr BREN: Whatever the case you have to have good forest access but once the roads have been built they are very hard to claw back. You have to have good fire knowledge and good fighting, fuel reduction and burning techniques. You have to have staff with excellent local knowledge. That really comes across. It takes a long time to get to know your way around the big forests with confidence. You have to have a collection of equipment—tractors, bulldozers, all those things that push and pull and dig. You have to have management that embraces the local community. In forests around the world there is a saying that if the local community does not support you your forest will disappear. If the local people are not positive about having a forest it will disappear in the long term. That reflects the fact there is often big pressure for land clearance in those places so that the locals can clear it and farm it. It is not quite the case here but you still have to have big support from the local community otherwise you will be in trouble. Management produces cash and jobs and material goods, and garners support. I think you will always have some issues on forest health, no matter what, and you are always going to have rough patches. I think you have to have political support to get you over the rough patches. Two years down the track it is all forgotten about. One cannot be too sensitive, but it is there.

The Hon. Dr PETER PHELPS: I am sorry, I am not clear on what you mean by rough patches.

Dr BREN: Things will go wrong. A tree will fall and you should not have dead over-wood in camping areas. The chronic one has been people who go into a forest and a tree falls on them, and then all hell breaks loose as to why you have cleared that branch away. You cannot clear every branch in the forest. There always will be people arguing that whatever you have done is wrong and they will garner a certain amount of support. If you build a road or if you shut a road down, either way you are in a rough patch.

CHAIR: Or hazard reduction has gone out of control, or the opposite.

Dr BREN: Particularly hazard reduction because one in 20 is going to burn a house down sooner or later. It is just a fact of life. These things are got over—there is no doubt about that—but ultimately you will have to have an organisation that will say, "Sorry about that. We will do better.", but not deter them. "Adequate revenue flow to sustain the above" refers to funds coming from the tax system or sold products. It is a big job to maintain the health of a forest, no matter how you define it. That is what I am getting at. The next slide says "Conclusions". I have been asked to make an interactive discussion, so it is not my job to conclude anything. However, I do have a couple of comments.

I think they are good meaty issues. Again, just talking to Barrie Dexter, Neville Davies and others, you virtually have about 120 years of European management of these forests. In 1880, government agencies suddenly said, "Look, these things are valuable. Let's manage them." So there is not much that is unknown about them, if you really get down to it. Going back some years, New South Wales had one of the most beautiful forests maps in Australia. It was made in 1947 of the Barmah-Millewa Forest—just beautiful. The modern values are very much different from the older ones. You could say that the older ones are very much concerned with material goods and the modern ones are much more concerned with intrinsic worth—not so much the value of the wood but the value of the animals in the forest.

CHAIR: Just before you go on, the science, if you like, or the actuality or the fact of the things that go to make a healthy forest remain whether or not the values change. I understand what you were saying before: you can only do all these things provided you have political and community support, et cetera. But apart from changes in techniques for doing the things, a healthy forest 120 years ago in terms of its ecological or its natural components is exactly the same as a healthy forest today. There is no difference, is there.

Dr BREN: That is correct, but there is one difference, and that has been that 120 years ago, things like superb parrots would not have been counted. No-one would have looked at the superb parrot's dying and said, "Oh, that's important." They would have said they are a pretty parrot, and the implicit assumption would have been that they have to take their chances with whatever happens.

CHAIR: So 120 years ago, you would look at a stand of magnificent trees such an even-aged forest and people saying, "That's what we want."

Dr BREN: That is right.

CHAIR: Now people are more likely to say, "Yes, but what about the kangaroos, what about the platypus, what about X and what about Y?"

Dr BREN: That is right.

CHAIR: When you try to make an argument for a particular regime of forest management in relation to the forest itself, and you talk to most Australians about what their version of a forest is, a forest is trees.

Dr BREN: That is right.

CHAIR: A forest is not trees plus grass plus a bit of scrub here or something there. It is trees.

Dr BREN: If we go back to 1900 through some remarkable cryogenic process, you would find the technology different and all that, but they would not find the basic principles of forestry very different. They would say, "Oh there's a dead tree. We should get rid of those because you have a source of infection." As soon as you have dead trees, you have possible sources of infection, and you get rid of those. When you fall the trees, slash the heads and lower the heads. You would probably burn off the heads to reduce the fuel load. You might have guys thinning or gathering wood if the fuel load was excessive. These days you have machines that will do it whereas they would have had people doing it.

CHAIR: In regard to the total mass of forestry knowledge, the "ogies", am I right in understanding that the management of a red gum forest is different from the management of a northern hardwood forest and is different from the management of a Brigalow forest?

Dr BREN: No, not very different. They are basically all forests, and there is a body of forest science.

CHAIR: Okay.

Dr BREN: In the old New South Wales Forestry Commission, the people would have come from Wauchope or somewhere like that down to manage the red gum and then go on to manage the plantations of Albury or Tumut.

CHAIR: So the one real difference then, probably, is the water regime, is it?

Dr BREN: Yes. Every forest—indeed, every area—is unique. A red gum forest has a different look and feel to an alpine ash forest at Tumut or a subtropical forest north of Coffs Harbour, but there are still some fundamental forestry principles. If you talk to the people, they would say, "Well, it doesn't take you very long to get the feel of the forest", and the issues are still the same—the people, machines, money and roads and what have you. The red gum does have its own very different look and feel, but it is completely analogous to people: whether you are in China, Australia or Antarctica, if you are a medical practitioner and people come in with illnesses, you are still going to fall back on the same tool kit of resources.

CHAIR: So there is not much point getting hung up on the fact that river red gums are highly specialised. A forest is a forest is a forest: it is just that there may be different aspects.

Dr BREN: That is correct.

The Hon. PETER PRIMROSE: The issue we have spoken about is general principles—for example, a live tree versus a dead tree, except that one could be alive and one could be dead. Throughout your presentation you indicated that you have had discussions with a range of colleagues and have been debating a whole range of issues. For example, you outlined the issue of a thinning exercise that is going on at the moment so that you can discover what would be the best approach to achieve certain outcomes. While there may be some principles, it sounds as though there are a whole lot of issues that are still up in the air that need research. Or is it established science that does not need any experimentation?

Dr BREN: It has taken academics years to say there are always things you could do better, but there has been a body of red gum thinning over the past 100 years. There has been a body of red gum thinning for the last 100 years, so from the point of view of wood growth, that is pretty much known. But these days, the point of thinning is to get bigger trees so that you can simulate an old-growth forest. Those bigger trees will then give you holes and hollows. I think that is almost completely unknown, so that is the new territory. The technique of cutting the trees down is known, but wood is not—

CHAIR: The driving factor.

Dr BREN: Wood is not the driving factor. The driving factor is these holes and, if you like, the ecological or economical value of the holes to the birds. Then you get back to this question: suppose you did produce a 100 per cent doubling of the superb parrot habitat, does that translate to a 100 per cent doubling of the actual superb parrots? You have created habitat and more living space. We always have a theory or thesis when you had lots of empty blocks of flats. There used to be a saying out in the bush that you have lots of holes or hollows, but you would need a more scientific basis than that. The short answer is, yes, there is a need for a lot more research and it will take a long time. The whole process or concept of ecological thinning, as I think I said, I first heard about 10 years ago. The oldest title I can think of would be about five years ago. We are talking about organisms that live for 200 or 300 years.

The Hon. RICK COLLESS: In Dick Eddy's paper submitted to us, he makes the comment that when the National Parks and Wildlife Services purchased Yanga, he asked them what they were looking to save. The response from the departmental people was that they did not buy it to save it. They bought because it was in good condition

Dr BREN: Yes, that is right, and they paid \$37 million for it or something.

The Hon. RICK COLLESS: The question is: Is it possible to have a forest that can perform both functions? Can it be an effective producer of wood, sawlogs, firewood and whatever, and still provide those environmental benefits that the National Parks people are looking for?

Dr BREN: I will go back to almost the first slide. That is the whole basis of forest management around the world. The argument is that you have a mosaic and you produce the wood, and some areas are managers' reserve and some are superb parrots. Some in South America are for armadillo.

The Hon. RICK COLLESS: Certainly the Canadians and the Americans are going down that path.

Dr BREN: Everywhere around the world, but it has been comprehensively rejected as a model by the Australian political system.

CHAIR: Over what period?

Dr BREN: Probably in the last 10 years. Tasmania is setting up to be the world's largest garden, is it not?

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Dr BREN: Victoria has still got some harvesting, but not much. We used to have 260 sawmills in Victoria but I think we are down to 10 or something at the moment.

CHAIR: Is there much interaction between forest ecologists and forest scientists in, say, Australia and internationally?

Dr BREN: Oh, yes.

CHAIR: Do our foresters generally speak to other people?

Dr BREN: Oh, yes. Australia leads the world in this. Yes. I am always going off to international conferences.

CHAIR: So we are not as Paul Keating described us—the "end of the world"—as far as our forestry ecology and science are concerned?

Dr BREN: No. Just in my own case, I go to America to follow up research each year and to study the growing of eucalypts in the southern states. We lead the world in publications and all this sort of stuff.

CHAIR: I have made the point with two different governments that with our rural firefighters, there is an active program of exchange.

Dr BREN: Yes.

CHAIR: We send firefighters over every time California goes up.

Dr BREN: That is right.

CHAIR: They have started to send Canadian and Californian firefighters over here beginning with the 2003 fires.

Dr BREN: Unfortunately, the Americans had very meaty experiences in 2003 and 2006, but not in 2009.

CHAIR: So in relation to one aspect of forestry management, which is fire management—and it is probably at the back end of forest management, not the front end—we have a pretty healthy interaction at an operating level with people actually getting experience. Do you believe that the same level of international exposure is made available to Australian foresters and forest scientists?

Dr BREN: Yes, it is there. The same issues occur, one way or another, in America, so that is a case in point. I am editing a special issue of an international journal on forestry research on planning forests. The mouth of the Mississippi has got some of the most beautiful forest, but you have got oil drilling issues and you have erosion issues. They are tackling them. Canada has had big issues of clear-felling in Clayoquot Sound and all those areas, and the political systems seem to accommodate them. Basically there has been some rejigging and rethinking and Canada is a case in point. As a case in point, I think I am actually editing a special issue of an *International Journal of Forestry Research* that is going to be on flooding forests.

The mouth of the Mississippi has an alternative course at Atchafalaya. It has got the most beautiful swamp cypress forest but they have got oil drilling issues, you have got road issues and they are tackling them. Canada has had this big issue. It is pretty appalling. You might have heard of Clayoquot Sound and all of those. The political system seemed to accommodate them. Basically there has been some rejigging and rethinking. I think in Vancouver, Canada, logging was financing the schools and the hospitals and if they got rid of it, in effect, they would have had to shut down their schools and hospitals. I was in Canada a year or two ago as my son was living there. I said, "What about the logging controversy?" He said, "No-one mentions it" whereas five years ago there were big signs they do not like clear-felling logging. Australia does not seem to have the capacity to resolve those issues but other countries have them but they are in the wake of their political system.

The Hon. RICK COLLESS: As an observer of the industry why is that? What has happened in Australia that we cannot have that attitude?

Dr BREN: I do not know, is the short answer. Clearly I do have some views on it and occasionally I get out the pen and write with varying degrees of success to various journals or newspapers. I think Australia has always had a more polemic political system with a sharper polarisation than other countries. I think that is part of it. I mean I am talking about politics to you guys who make your living from politics, so I am not really the right guy to talk. But we do seem to have become highly polarised. I think part of the other issue, of course, is that we have had so much wealth from coal and minerals that logging is only going to derive a relatively small amount of wealth compared to the big exports.

The Hon. RICK COLLESS: If you say that in Mathoura that it is only minor industry you would get run out of town very smartly.

Dr BREN: But that was the finding of the New South Wales Department of Primary Industries inquiry into forestry a few years ago, was it was not, when it came to the conclusion that it was not a very big industry, except of course that it has been cut down by successive governments. By the time of the Rees Government, I think it was, held the inquiry it was a relatively impoverished industry by then. In other words, so many slices had been cut off the cake that there was not much of the cake left anyway.

CHAIR: In relation to our scientific training capabilities, am I right in guessing, that because the forestry industry has declined that the forestry schools have declined or have they changed their focus?

Dr BREN: They are almost dead. Forestry schools, as I would know them, are almost dead.

CHAIR: How would you describe them these days?

Dr BREN: Melbourne university has a forestry school, teaching this sort of forestry. Basically the numbers declined and declined and the course would have been shut down except that Melbourne university went to a different model. The vocational is a masters so they now teach a master of forest ecosystem science—

CHAIR: On the basis of a basic ecology and various other things?

Dr BREN: That is right but it is all to do with animals, and animal ecology and what have you. It really has very little of the stuff that we once would have taught which is basically forestry management, growing trees and cutting them down. The Australian National University, one of the three schools, ultimately it got amalgamated into an environmental school. There are still some subjects there that they have effectively sheltered behind the environmental side. I think Southern Cross University has actually been the great survivor because it still does have some relatively, for want of a better word, harder nosed forest management subjects. But all forestry schools in Australia have been on hard times to the point that the industry is almost dead anyway.

CHAIR: We see now—probably funded by what is left of the forestry industry—Planet Ark promoting on the television wood products.

Dr BREN: That is right.

CHAIR: Because of the carbon target.

Dr BREN: That is right and some guy had an innovative wood house in Victoria. They asked him, "Are you going to import these to Australia?" He said, "No, you wouldn't do that because by the time you have imported it you have lost all your energy savings".

CHAIR: That is correct, on the footprints it has gone.

Dr BREN: You have got to produce these things yourself. The Wilderness Society says that one of the reasons that it opposes logging is that they found that opposition to logging and opposition to whaling have been the two best financial sources of getting money.

The Hon. Dr PETER PHELPS: Would that forestry management practice be used in Europe as well as in Germany and France? Do they have active commercial operations in their national forests?

Dr BREN: It is a great question because I have been watching the Tour de France. Twice they rode past whopping sawmills going through the Jura Forest between France and Switzerland, is it? There were whopping sawmills and the cyclists were whizzing along. Yes, here we are in a highly dense population and they have got these big sawmills. I would say that these are classic tolerant selection forests where you do not have as much clear cutting as you would in Victoria in those intolerant forests. From that point of view it is a little bit softer.

CHAIR: Are all eucalypts forests on the intolerant side of the scales?

Dr BREN: There is some variation, some around Central Victoria, that can be managed as a selection.

CHAIR: How would you describe cypress forests?

Dr BREN: I do not really know. I think cypress is pretty intolerant. I do not know as much about cypress as I should. I would use the analogy that trying to run an even-aged intolerant forest as a tolerant forest is a bit like trying to raise girls as boys, or vice versa. You can do it, and you will get a result, but the result is going to mixed and unresolved. It will not be quite what you expect, I guess.

CHAIR: We cannot necessarily just take lessons from Europe or the United States of America?

Dr BREN: No, you would have to add a filter to them, but the same issues have been successfully resolved in other societies.

CHAIR: We have resolved them over 150 years. Am I correct in saying that? From your academic background, and your knowledge of the way that we have managed our forests over 150 years, have we done such a bad job?

Dr BREN: No, you could always be critical and say, "I think they could have done a better job here or here" but I have really never heard of any issues, until about 2005, when suddenly red gum came on the political horizon. Before that no-one really thought about it.

The Hon. RICK COLLESS: Do you know what happened in New South Wales?

Dr BREN: No.

The Hon. RICK COLLESS: The environment moved had its way with the Pilliga Forest and got that closed down. I heard one of those guys say, "We got what we wanted in the Pilliga. We are now moving down to the red gum". It is all political.

Dr BREN: Yes, except you guys are at the cutting edge of politics, aren't you? I am just a poor little forester, a woodsman with my little axe.

CHAIR: Where do Australian foresters get most of their work these days?

Dr BREN: I make a miserable living as a consultant these days, so that is the short answer. Having said that if I actively went out and looked for work I would probably do better.

CHAIR: Are you and your colleagues involved very much in private native forestry?

Dr BREN: Yes. Let me answer your question. With the big shaking out, what has happened is that quite a number have, for want of a better word, taken jobs as national parks managers. Forestry has always had a commercial side and an ecology side. People like me have managed to have one foot in each camp. The commercial side, the pine plantations have burgeoned because there is so little wood coming out of native forests, but there is a good demand for pulp wood so the plantation side has burgeoned. The conservation side, people have got jobs there. There have been a lot of people like me who have retired. It is not just as much fun being in a forestry school as it used to be so we try elsewhere in the world. I have come to the conclusion there is probably quite a decent living to be made as a consultant in native forest issues, but I would have to lower my rates a bit to bring the work in. I should add because the forestry schools have been producing so few graduates, it is an ageing population, and people who usually advertise do not even bother, but advertise internationally and bring them from South Africa or New Zealand or America because there are so few graduates coming out that would meet their needs.

CHAIR: If I were to make an analogy with heavy manufacturing, I will use the obvious one, ship building, no matter what we might wish for, and there is a resurgence of manufacturing industry in Australia, using our own coal, iron ore and making our own steel to make our own ships, the argument is even if we tried, and started today, we would not find the expertise in Australia any more unless you were prepared to employ 80-year-olds.

Dr BREN: We are a bit better than that.

CHAIR: If I were to say that the goal is to start in New South Wales and then grab the rest of the country by the bootstraps and rebuild the forestry industry, have we lost too much expertise?

Dr BREN: No, it is still there but the expertise would be in the grey-haired people like me.

CHAIR: You cannot just import the young scientific minds because they may not be able to—

Dr BREN: You are getting into a broader question. If you took engineering skills they would say that, perhaps with the exception of medicine, young people do not want to do the science that we once would have learnt. They all want to become accountants and sociologists; they do not want to do the other and it goes into high schools with physics and chemistry and all of those types of subjects. There are some broader issues than forestry. Forestry is not dead but it is certainly going down the gurgler.

CHAIR: The keep the New South Wales hardwood forests industry going at the level it is going now the reality is that this Government would have to take roughly 1.8 million hectares out of reserve—not all at once but over a period of the next 10 years—in order to be able to satisfy the need for mainly hardwoods. I am not talking about sending woodchips overseas, but wood for use in the construction industry and things like that. That is a political decision; it could be done—there would be a hell of a political fight. It is not much use doing that though if, first of all, you do not have the people to manage the forests in the way that this new paradigm would require it to be managed.

Dr BREN: This is an old paradigm.

CHAIR: No, it was rejected and we have got a new one now. You would need foresters and managers and people like that, compliance people in forestry et cetera, who would be able to manage—

Dr BREN: The universities would snap to attention, let me assure you of that. If you could provide a flow of students the universities would snap to attention, and indeed, Glyn Davis, Vice-Chancellor, University of Melbourne, said that Melbourne university was not about shutting down forestry but if forestry was going to survive it had to survive by itself.

CHAIR: In other words, a demand has to be demonstrated?

Dr BREN: That is correct. It would be a reasonable view that they would try to help forestry to get where it wanted to be but if the population of the world was not supporting it you cannot expect the university—

CHAIR: It does not seem to be so much the population of the world, it seems to be the political population of this country.

Dr BREN: That is right and forestry is booming around the world, let me assure you of that, but just not in this country.

CHAIR: It is strange that it is booming on the back of the new environmental science that is wrapped up in carbon.

Dr BREN: When I was looking at that video I found on YouTube kids dancing and dressed up as trees and then a man came along with an axe and chopped them down—it was classic propaganda. All these little kids all getting these messages.

CHAIR: Time is moving on and I understand you have to be on a plane at 6.00 p.m.

The Hon. SCOT MacDONALD: What are your views on water? These natives forests are getting a water allocation.

The Hon. SCOT MacDONALD: What is your view of water because all these plantation forests are getting water allocation or water entitlement for their diversions of plantations?

Dr BREN: I have just written a long paper on exactly this question.

The Hon. Dr PETER PHELPS: You can send it to him.

Dr BREN: I can actually.

The Hon. SCOT MacDONALD: They say they cannot afford it?

Dr BREN: Every plant in the world uses water. There was a conference in America called "Eucalypts in the Southern States of the United States" and amongst going to this conference I gave a paper on water use of eucalypt plantations in Australia and prepared this with two other scientists; it is probably a state-of-the-art paper. What you can show is that eucalypt plantations is somewhere between pasture and native forest eucalypt. The same issues you have with native forest; they can be using much the same water use as your plantation, which is a point that people forget.

The Hon. SCOT MacDONALD: Over 30 years or 40 years, surely not the first 10 years?

Dr BREN: Most eucalypt plantations are only grown for about aged 10 to 15 anyway so if you left them to grow until 50 or 100 years, yes, they would be very similar to the native mature eucalypt forest but because you are only growing them for the first 10 or 15 years, their water use is age dependent, so they use very little in the first couple of years and then it ramps up, but usually they are chopped down at that point. If you going to parity, you would say that it is probably about the same water use as a field crop like corn or maize or something like that. I think I argued in one of the papers I wrote that if you are going to have a taxation regime, it should be the same taxation regime for all crops because all crops often use water; eucalypt plantations, particularly around 800 to 1,000 millimetres per annum and that will either come from the rainfall, groundwater or both.

CHAIR: Or irrigation?

Dr BREN: I do not know that anyone grows eucalypt plantations much with irrigation these days, although apparently it has been trialled, I know that. If you took something like a canola crop, it has probably not a dissimilar water use. I ran for years what is called a paired catchment project—it is still running—whereby you took eucalypt catchments. One was ultimately logged and converted to radiata pine and we measured the water use over the years and how much water has changed. It gives an interesting picture but the plantation never used as much as the native eucalypt forest; it was a pine plantation in this case. It never had the same water use as the native eucalypt forest it replaced. We came up with interesting figures, like it takes 800 cubic metres of water to make a cubic metre of log.

CHAIR: Hardwood?

Dr BREN: That was a pine log.

The Hon. RICK COLLESS: That is in a radiata plantation?

Dr BREN: Yes, in a radiata plantation. It was not a particularly efficient radiata plantation. It is a great question. What comes out is that it seems eucalypt plantations in particular tend to be grown for pulp wood; the fact that they are felled at age 12 or 15 means that they never really get into very heavy or high water usage because the trees are just moving into that phase. People get upset,

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You should say, "Look, if you're worried about the plantation using water, and you say the plantation owner should pay, surely the people who are running the national park down the road should pay too because their trees are using the same amount of water."

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CHAIR: The secretariat will supply you with some—

Dr BREN: Yes, I will send you the great paper. Another little rant that I am on about at the moment is what is happening is that eucalypts are almost the most planted species around the world but there is nothing in it for Australia. The technology has moved to Brazil and France.

CHAIR: Israel?

Dr BREN: Israel, and future generations of Australians will say, "What did these guys do?"

CHAIR: In 1980 I saw some trees that were called California blue gums and they said they were natives.

Dr BREN: I think future generations will not look back on us as very clever.

The Hon. Dr PETER PHELPS: This use of logging in red gum forests, let us just say 150 or 125—

Dr BREN: 1880 was the first advent of what you might see—

The Hon. Dr PETER PHELPS: Do you believe there is any material detriment to the health of the forests, taken in toto, by that period of logging?

Dr BREN: The short answer is no, but it would be nice if there were some older growth areas. I do think there is an excessive amount of regrowth compared to old growth. It would be nice to have something that vaguely corresponded to the full range of age classes, but I guess the fact that reflects the value of the wood that people are always hammering into them. When I was doing all this work I got the impression that from both the River Murray and the forest, society wanted more than these forests could reasonably produce out of both of them. That came from the River Murray too; that they wanted boating, they wanted irrigation and they wanted conservation of water. This poor little river, which is not a very big river, is being expected to provide all of these things. I thought the forest was being expected to provide too much. From that point of view I do not think it was anything definite but I think in hindsight it would have been nice if there had have been perhaps a bit better reservation of parks; the management was a bit single-minded towards the harvesting.

CHAIR: It strikes me, having had a look at that issue when it was being converted, that the level of forestry in the total of the Riverina gum forests say five years ago or three years ago was only a fraction of what it had been historically?

Dr BREN: That is correct.

CHAIR: The industry had already been regulated down, down, down, firstly on the Victorian side and then more recently in the last five to 10 years on the New South Wales side.

Dr BREN: And many of the sins were committed in the 1920s and 1930s. River red gums just get you in and there is so much other information that it would have been nice to produce. You must remember that when I was doing my research no-one really wanted to ever pay the money and so you did it on bugger all amounts of money.

CHAIR: Australia is a funny country. All our best science goes overseas, be it medical, forestry or whatever. Thank you very much for attending. If Committee members have any questions they will send them to you in writing and you might care to answer some of them?

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(The witness withdrew)

(The Committee adjourned at 3.52 p.m.)