

No Room for Complacency

by John Endersby, February 2015

A farmer and conservationist's perspective on the history of the grazing conditions and pasture quality for the Southern Hairy-nosed Wombats in the Murraylands Region and in particular the Moorunde/Twelve Mile Plain Wildlife Reserve.

"At first there was pride in the flourishing of the rabbits... farmers and vigneron on the Geelong road cursed them... sportsman were delighted and regarded farmers as universal spoilers of gentlemen's sport (1867)", Eric Rolls, They All Ran Wild.

There were many attempts to introduce rabbits to Australia and most of them failed. In 1864 the South Australian Government passed the Game Act to "... prevent the wanton destruction of certain wild and acclimatised animals". This Act put a closed season on rabbits between 1st August and 31st December, to protect them while breeding - to stop farmers from killing off the game that gentleman sportsmen wished to hunt. Farmers are not responsible for the rabbit problem in Australia it was the aristocracy or "would-be" aristocracy of the 19th century [Rolls].

Although attempts were made to establish rabbits along the western edge of the Murray River in the early 1840s, these failed. An examination of an 1879 map of the spread of rabbits in Australia [Rolls] shows that they had not reached the Murraylands region by this time - although they had become a pest plague species in many other districts by then. It would not be long before they reached the western edge of the river.

The 1879 map showing the distribution of plague rabbit numbers is particularly relevant because that was the year Portee Station was auctioned, following the death of the owner Eardley Heywood. At that time it and was recorded to be running 13,000 sheep plus lambs on its 28,500 hectares [Cockburn]. A portion of this land was destined to become the future Moorunde (and Twelve Mile Plain) Wildlife Reserve. At the time, Portee was running the equivalent of 0.7 Dry Sheep Equivalent (DSE) per hectare ("Stocking rate").

1 Dry Sheep Equivalent (DSE) corresponds to the grazing pressure of 4-5 adult wombats or 2 large kangaroos.

Some time after the sale in 1879 the plague of rabbits came!

The rabbits brought about a sudden decline in that "stocking rate". However there was nobody around (then) carrying out studies in "Environmental Science", and therefore we have no accurate records or details on the effects of this rabbit invasion - only anecdotal accounts from local settlers.

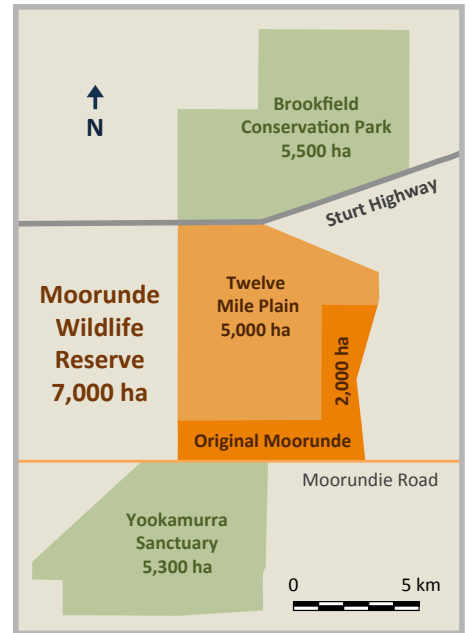
By 1879, Portee station had been operating successfully for 32 years, thus it is fair to say that the 13,000 sheep and lambs would have been having no serious impact on the grassland environment. In fact the "grasslands" would have benefited from this grazing! How can I make this claim?

From my observations in the district, practical research, and experience on my property at nearby Cambrai, a stocking rate of 0.7 DSE per hectare would have been well within the "comfort zone" in terms of the carrying capacity of the native grasses then growing. People who dispute this claim may perhaps base their opinion on "acquired anecdotal prejudice" from a time that post-dates rabbit invasions and not from an established knowledge base. I grow the same species of native Spear Grass and Wallaby Grass on my own property and have a comfortable carrying capacity of 1.5 DSE per hectare - twice that of Portee station in 1879. While rainfall at Portee is about 10% less than Cambrai, 0.7 DSE per hectare was clearly well within the carrying capacity of that station.

What other evidence do I have? In 1995 I erected an enclosure on Moorunde (south-west of the campsite) to demonstrate grazing pressure, or rather the *absence* of grazing pressure - the enclosure being kangaroo, rabbit and wombat proof. By the end of 1996 it contained a good stand of native grasses (see figure 1). The grasses continued to grow in the enclosure (with more plants germinating) through 1997, 1998 and 1999. Then, in 2000, despite that year being "picture perfect" and ideal for grasses to germinate and grow, they didn't! With a high rainfall early in the season, 2000 was the best year since the enclosure was erected, for germination and growing of native grasses. Despite this, grass growth in the enclosure was almost a complete failure! Why?

These native grasses will not thrive if there is a "heavy thatch" (or mulch) over the ground. In 2000, the soil surface inside the enclosure was covered with a dense thatch of dead grass stems and blades from the abundant growth of the previous few years. It took a further two years before this thatch had been broken down by the sun and weather and rotted into the soil. So the next good year for

¹ Coincidentally, the years 2001 and 2002 were not conducive to germination or growth, so grass would probably not have grown in this period anyway. I draw a distinction between "germination" and "growth", because these grasses are perennial. A year when timing of rainfall is such that seeds do not germinate can still be a good year if there is sufficient rain to allow existing plants to "follow through" to the next year, and even last for several years before dying off.



the germination and growth of grass wasn't until 2003 ¹.

In 2003 and 2004 there were good stands of grass in the enclosure and mature plants "carried over" into 2005. Then the "thatch" became too thick again, and despite the autumns of 2006 and 2007 being excellent years for germination, this did not occur. The grasses did not thrive again until three years later in 2010 and again in 2011 (in response to heavy summer and early autumn rains). These two years saw the grass at its highest and thickest ever.



Figure 1: A good stand of native grass in the trial enclosure near the Moorunde campsite, 1996.

In 2012, 2013 and 2014, despite these being the best years (in terms of rainfall events) since the enclosure was erected, germination and growth in the enclosure (germination in particular) has been quite dismal! This contrasts markedly with other trial enclosures (erected in 2011 and later), which have displayed quite remarkable germination and

growth in these three years. Even unenclosed areas of the Reserve have had unusually high numbers (but still far from an abundance) of individual native grass plants germinating in scattered locations. Other properties near the reserve, particularly to the west, have literally had “grass to burn” over these three years. So what is going on here, and what does it indicate?

In short, Spear Grass and Wallaby Grass NEEDS to be either eaten down or periodically burnt, to perform at its best! I am also beginning to suspect that the constant breaking down and rotting of the thatch is building up too much organic matter (and therefore fertility) in the soil for optimum growth of these grasses! Further observation will be required to confirm this.

Regarding another possible impact of sheep grazing, observations on my own property at Cambrai appear to indicate that “chipping” by the “cloven hooves” of sheep is not as devastating as is popularly thought by many (at least within this district, including Moorunde and Portee). Some degree of chipping by cloven hooves may in fact be advantageous - provided it is not too severe or intense. Moderation in everything you see! However I will have to continue with more work, research and observation to confirm this.

According to the renowned scientist and author Tim Flannery claimed in his book “The Future Eaters”, that the mega-fauna herbivores of Australia provided the necessary grazing and browsing pressure that most of the vegetation formations needed to remain healthy. After the extinction of various mega-fauna, Aboriginal people continued the practice of burning areas that were no longer being grazed or browsed down by these large animals. The general phenomena that Flannery describes can still be seen occurring in Africa where mega-fauna grazing and browsing species still survive.

“Browsing” is eating foliage of shrubs and trees. “Grazing” is eating grasses and other ground cover plants.

While in principal, Flannery is correct; I also think he takes the hypothesis a little bit too far in terms of extent, total area and locations of this grazing and browsing effect – an opinion shared by others [Benson & Redpath]. In any event, as the last glacial period receded, the First People would have taken up or extended the practice of burning – if they weren’t already doing so. During what is popularly referred to as the “Ice Age”, the landscape of Australia was predominantly grassland with the other vegetation communities (forests, scrub, etc.) present, but less dominant. As this glacial period receded around 10,000 to 12,000 years ago)

these less dominant vegetation communities began to spread out and take over areas of grasslands. This would have naturally reduced the population sizes of grassland herbivores such as kangaroos (and Hairy-nosed Wombats) and thus making them harder to hunt.

The First People responded to this and selectively burnt open areas to hold back the shrub and tree invasion of the grasslands [Gammage]. As the First People did not burn everywhere; deliberately and carefully choosing the sites, shape, timing, frequency and intensity of their fires, according to the location, vegetation communities and climate within the continent, a very remarkable (and almost inevitable) result occurred – Australia acquired the most diverse range of eco-systems within this island continent that it is probably possible to have!

It is extremely important for the ultimate survival of the Hairy-nosed Wombats that one appreciates this factor. The grasslands that these particular creatures depend on are virtually “living fossils of a previous age”, preserved by an ancient race of People that had evolved their culture and land management practices to accommodate significant changes in climate over thousands of years. These grasslands (to remain) *still* require active human intervention in some form of management, as they essentially cannot survive “naturally” under the present climate conditions. They are survivors of a long past era and only kept in existence by human intervention. The animals that depend on the grasslands will disappear too, if we allow these areas to be taken over entirely by scrubland – which is now in the process of happening!

Paradoxically (or perhaps obviously) these grassland areas, which were the most intensively managed (using fire) by the First People were also the most sought after, and first claimed, by the next group of human arrivals – European settlers. “Possession is nine tenths of the law” it is said, but ¾” calibre muskets, steel swords, small-pox (and other diseases) along with the law looking the other way, soon alters that balance. This invasion and settlement by another race with a radically different culture and food sourcing practices (including their own domesticated livestock) effectively turned the conditions for the grasslands (but clearly not for the First People) back to something akin to what Flannery describes for his mega-fauna hypothesis – at least initially, and at least in our area of concern, the Murraylands, and in particular Moorunde and the Twelve Mile Plain Wildlife Reserve.

At the time of European settlement, three quarters (at the very least) of the area of Portee Station was made up of native grassland, but the People who had kept it that way since the “Ice Age”, were now displaced and their numbers greatly reduced. Under the law of the new arrivals, they were unable to continue the traditional burning practices to maintain it. However, the sheep and cattle brought in to graze the grasslands effectively replaced and made redundant the need to regularly burn off the “thatch”, necessary to encourage and keep the pasture healthy. At least until the rabbits came and until the exotic weeds came! But at least the encroachment of shrubs and trees was held in check until now!

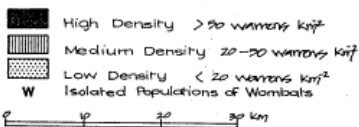
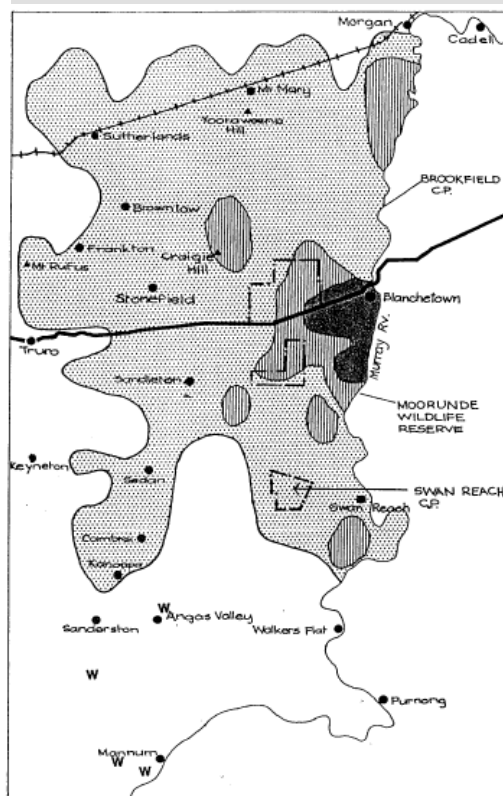
In this district, it was not “the farmers” per se, that damaged the country. Like the First People before them, they too controlled the numbers of kangaroos; if only to keep the grass for their livestock and to employ the station hands during slack work periods. In dry years, when grass was scarce, the stock turned to browsing the shrubs back (as had the mega-fauna) – something that kangaroos do not [Dawson et al].

The graziers in the Murraylands didn’t bring the rabbit plagues and they largely didn’t bring the weeds ². There failing was in the attempt to maintain their stocking rates along with the rabbit population after these pests were established. Yet even here, these stocking rates (until relatively recently) were fixed by Government regulations, pertaining to the Pastoral Acts that required a minimum number of stock to be kept on a property or the lease was forfeited [Williams]. Until mechanical burrow rippers, the myxoma virus and the pesticide 1080 (Sodium fluoroacetate) came into use in the 20th century, there was little that pastoralists and farmers could do to control rabbits and much of what they were forced to do by the Government only made the situation worse [Rolls]

By the middle of the 20th century these rabbit control techniques were available to suppress rabbit numbers. Yet, as with all communities in the world there are always exceptions, and some farmers were not making the most of, or best use of, the tools available – and not always from a lack of knowledge or attitude. By the 1960s the “carrying capacity” of Portee Station (part of which became the Moorunde/Twelve Mile Plain Wildlife Reserve) had dropped from 0.7 DSE to 0.25 DSE and conditions on the property were continuing to decline. The number of sheep had been reduced accordingly, kangaroo numbers were very low to rare (as noted in Natural History Journal reports of the time) and rabbit numbers were not mentioned. The

² Most of our weeds have come as seeds in the soil of potted plants and grape vine rootstock to establish orchards, gardens and vineyards for European settlers.

Wombat Density Distribution, 1989 "Plan of Management for the Hairy-nosed Wombat in South Australia". The black region once had the highest density but now has the lowest.



wombat population was probably around 5-7 per hectare [Taylor, 1972, unpublished data].

A review of the 1989 "Plan of Management for the Hairy-nosed Wombat in South Australia" [St John & Saunders] showed that at that time the "high-density population area" of wombats in the Murraylands (more than 50 warrens per square kilometre) ran south from Blanchetown for about 12-15 kilometres and west for approximately 10 kilometres, on the western side of the Murray River. Moorunde and Brookfield Conservation parks are located further west and are not in this area. They are mostly in what was described as the "medium-density population area" (20-50 warrens per square kilometre). The "low-density population area" (less than 20 warrens) surrounded these reserves to the north, west and south.

Today, the population density is essentially reversed, with the highest density (and healthiest) population located on surrounding privately owned land, medium density population on Moorunde and Brookfield, and the lowest density (to the point of being locally endangered) closer to the river, south of Blanchetown – where they were once the most populous!

The wombat populations on Moorunde and Brookfield can now arguably be classed as "vulnerable" (one step up from endangered) according to definitions by (Ride & Wilson 1982, I.U.C.N. 1982). Despite some opinions that the Moorunde and Brookfield wombat populations are safe, the 1989 "Plan of Management for the Hairy-nosed Wombat in South Australia" indicated that it was not – at least in so far as longer term genetic diversity requirements and longer term climate variations and other factors which were not necessarily in play in 1989, but alluded to in that Management Plan. Annual climate trends have radically changed over the past 26 years and "other factors" have come into play since 1989. In essence, the conditions stated in the 1989 Plan of Management that would lead to the wombat population being considered "vulnerable" have now materialised. It is also thought-provoking and somewhat alarming to note that the methods for "fixing" or estimating population densities has had to change to counting or estimating individual animals for a given area and can no longer reliably be done by counting or assessing warren numbers per square kilometre.

Going back to the mid 20th century, 1967 saw probably the worst single year drought in South Australia's recent history. Annual rainfall recorded at Sedon and Sandleton (near Moorunde) was the lowest ever on record in that year [Bureau of Meteorology] and this saw the wombats on Portee Station starving to death – along with those in the rest of the Murraylands. The population plunged into serious decline. This drought and the plight of the wombats ultimately resulted in the Natural History Society purchasing 2,000 hectares of Portee in 1968 and naming it the Moorunde Wildlife Reserve. In 1971, the Chicago Zoological Society purchased 5,500 hectares of the Glen Leslie Station immediately north and adjacent to the Sturt Highway, which they named Brookfield Conservation Park (ownership of Brookfield was passed to the South Australian State Government in 1978). This was also an effort to ensure the survival of Southern Hairy-nosed Wombats in the Murraylands.

In 1970, Glen Taylor, one of the early members of the Natural History Society, commenced a long-term study into the behaviour and population density of wombats on Moorunde Wildlife Reserve. Glen

produced a progress report of the study in 1977. Although trained as an engineer and not as a scientist, the study and progress report were remarkable achievements. While the wording of the report may indicate that Glen was not scientifically trained, the content of the study indicates work and due diligence worthy of someone so trained. Various scientists when conducting their own research on wombats have referenced the 1977 Wombat Population Study progress report, particularly as it was one of the first efforts of its kind to be undertaken. Unfortunately, despite the study continuing for many subsequent years, later research results have not been published. Since that time, other reports have been published: the 1989 "Plan of Management for the Hairy-nosed Wombat in South Australia" by St John & Saunders (referred to earlier) and a "Management Plan, Brookfield Conservation Park, 2005" by the Department for Environment and Heritage (DEH).

Notwithstanding the very useful historic information in the various reports, (Taylor 1977, St John & Saunders 1989 and DEH 2005), these documents are now rather "dated" for the present conditions of wombats in the Murraylands. The circumstances that the wombats now find themselves in have changed so radically since these reports and plans were published that any reader must consider any of the recommendations present with caution, and be aware of the new conditions facing the region. While these documents are very valuable, the reader who has a genuine interest in the survival of wombats in the region must view them in context and use them, together with current observations, as illustrations or guides to what has changed since they were written. So what has changed?

Despite the various criticisms expressed by some conservationists about various farming practices, there are quite a number of instances where they cannot lay claim to a better "track record" themselves³. In fact it is not hard to cite a number of cases where the land management performance of conservationists (no matter how well intentioned) has been worse than that of farmers; with some of these cases having had quite detrimental effects on either a particular habitat and/or a species of plant or animal.

Sheep were removed from what is now Moorunde Wildlife Reserve in 1968 and together with the breaking of the 1967

³ I feel personally qualified to make this claim, having been a conservationist for longer than I have been a farmer and having lived in both worlds. The two pursuits are definitely not mutually exclusive!

⁴ Ward's Weed (*Carrichtera annua*) is native to the Mediterranean region. Since its accidental introduction at Port Pirie in the early 1900s, it has spread widely into semi-arid rangelands of southern Australia [Cook, et al].

drought and a temporary return of native grasses around 1970 (both on Moorunde and the rest of Portee Station), depleted wombat numbers began to increase. However, the Natural History Society overlooked controlling rabbits on the Reserve until 1994. Unfortunately this was too late to save the native grasses and their “seed bank”. While active members of the society diligently and admirably went about eradicating most weeds on their area of responsibility, no attempt was made to control one particular weed that started to invade the Reserve in the 1970’s – Ward’s Weed⁴. This weed has now invaded all areas of “Grasslands” and “Tall Open Shrublands” across the region. Arguably, none of the weeds present on Moorunde except this one have had any real effect, positive or negative, on the population of any of the native plants or animals on the Reserve. It is just as well that Ward’s Weed could not be controlled because by the mid to late 1980s, this weed was just about all that was keeping the wombats (and kangaroos) alive on Moorunde!

From the 1980s, many surrounding stock grazing properties still had good stands of native grasses; but Brookfield, Moorunde and the remainder of Portee Station had almost none. Not all of the surrounding farms had native grasses – Portee was not on its own. But Portee was situated right between Moorunde and Brookfield and was consequently “noticed” by conservationists for its lower levels of available pasture, now in the form of Ward’s Weed. Portee’s “shrublands” and Myoporum trees were in serious decline from old age and no regeneration; but then... so too was Moorunde’s! Moorunde’s Ward’s Weed pasturage was superior and so it’s wombat population was “safer” which appears to have allowed a degree of complacency to creep in, that is not warranted (see figure 2 – north end of Moorunde 1995).



Figure 2: North end of Moorunde, 1995. Portee Station on the left, Moorunde on the right. The Ward’s Weed “pasture has been grazed down on Portee, but is present on Moorunde – leading to a degree of complacency regarding the food security of the wombats.

Extrapolations from Taylor’s wombat studies show a population growth of wombats on Moorunde from an estimated 290 individuals in 1970 to a peak of 500 individuals by 2005. Allowing for intervening yearly fluctuations, depending on seasonal rainfall, there had been a steady rise in numbers, brought about firstly by the drought breaking in 1968 and sheep being fenced out the same year. Then a further boost from 1994 with the rabbits being eradicated by a yearly baiting program. The summary of Taylor’s 1977 report does not of course consider the rabbit baiting aspect; and in fact includes some ominously optimistic statements: “The study confirms that the action taken by the Natural History Society to exclude sheep from the Reserve has allowed natural regeneration of the area, thus providing conditions favourable to the recovery of the wombat population.”

Certainly the population was healthier than the poor animals still struggling to maintain an existence on neighbouring Portee; but until 1994 there was no natural regeneration, just more Ward’s Weed! Ward’s Weed is an annual plant dependent on regular and reliable autumn, winter and spring rains for good growth, and it produces only dry feed over the summer. It also seeds down and dies off early if spring rain is not adequate – right at the time young wombats are weaned from their mothers and need ample green grazing. Over the past 26 years the yearly winter/spring rainfall trend has been declining, forcing the animals survival to become totally dependent on their own longevity. After 1994 the only natural regeneration was from the old and dying shrubs and Myoporum trees, which are now beginning to invade the open areas that were once grasslands. In fact, on Moorunde, almost all these areas are now covered in shrubs that are getting thicker and thicker – to the point where they will become so thick that even the Ward’s Weed will not be able to grow under them. Examples of this can be seen on the Reserve where the shrubs now smother out herbaceous plants and in the more open areas where new shrub growth is closing in. Figures 3 and 4 illustrate some changes that have occurred over 40 years. Myoporum trees are dead; the ground cover is no longer Spear Grass but Ward’s Weed, Thread Iris and Onion Weed. What was once open grassland with scattered Myoporum trees has become overgrown with dense tall shrubs.



Figure 3: Water-point 1 in 1974. Spear Grass growing in abundance. Photo by Glen Taylor.



Figure 4: Water-point 1 in 2014. The green ground cover is Ward’s Weed, Thread Iris and Onion Weed. The Spear Grass has gone, the Myoporum trees are dead and dense tall shrubs are invading.

Unpublished data by Taylor and Wells (referenced in the 1989 “Plan of Management for the Hairy-nosed Wombat in South Australia”) indicate that wombat populations of this eastern portion suffered a dramatic decline following the drought of 1981-82. Interestingly the Management Plan goes on to state “...a minimum of between 50 and 500 pairs of animals breeding at random each year is required to maintain the genetic diversity needed to cope with environmental change (Tyndale-Biscoe & Calaby 1975, Frankel & Soule 1981, Kinnear 1987).” The plan then goes on to say “...the possibility of an uneven sex ratio between breeding individuals imply that 50-500 breeding pairs translates to a minimum population size of between 1000 and 10,000 animals.” In other words even at this lower figure of 50 breeding pairs, 500 individual wombats on Moorunde is *not enough* to ensure genetic diversity and therefore this number *does not* guarantee long term survival on the reserve. The Management Plan continues with “The occurrence of preferred wombat habitat (grasslands) and drought refuge (chenopod shrublands) is limited and it is unlikely that Brookfield Conservation Park, as presently constituted, is capable of maintaining viable wombat populations.” And this was written when there was still grass and grasslands to be found on Brookfield!

If that is what the experts believe (St John & Saunders, et al) about Brookfield's 5,534 ha what does that mean for Moorunde?

The "Management Plan, Brookfield Conservation Park, 2005" includes the following statement "Evidence from transect counts indicates that kangaroo and rabbit populations have increased and may compete with wombats for food. The long-term effects of these interactions are presently unknown. Further research may suggest active manipulation of the vegetation and animal populations to maintain optimum wombat habitat as a priority."

The authors of the Brookfield Management Plan desisted from recommending specific methods to "manage" the overgrazing of kangaroos and rabbits – essentially, the need for kangaroos to be culled and rabbits baited. Perhaps like many governments publications, one cannot find anywhere within its pages what actually needs to be done and exactly how to manage reserves in the Murraylands. Unfortunately, the plan frequently drifts into a haze of vague suggestions with jargon such as "Objectives" and "Strategies" and there is an absence of specific instruction or direction for what one actually needs to do. For example, on rabbit control the plan says, "Control measures that involve warren destruction can conflict with wombat habitat conservation objectives as rabbits often share warrens with wombats". That is true – the wombat warrens cannot be ripped, but the plan then goes on, "... so alternative means of control must be utilised." This is where it abruptly stops on what to do about rabbits! What are alternative means of control are we to use?

The interesting part of the Brookfield Management Plan is part of the quote given earlier, that "Further research may suggest active manipulation of the vegetation and animal populations to maintain optimum wombat habitat as a priority." This! This is a recommendation for, and actual talk of, real conservation work; but once again the plan fails to actually say what this "manipulation of the vegetation" would actually entail. With this in mind, we can now proceed to discuss Moorunde.

Taylor's research shows two important aspects that we must consider in terms of the long-term survival of wombats on Moorunde and the Twelve Mile Plain Wildlife Reserve:

1. A total of approximately 500 individual animals (estimated to be living on Moorunde in 2005) is five hundred short of the *minimum* required to maintain genetic diversity in the long term future and to accommodate environmental change. My own records show that there is a trend over the past 26 years of lowering

winter/spring rainfall and increasing summer/autumn rainfall – a significant environmental change. Animal populations can adapt to changes such as this (if it continues and is a permanent trend). But not all individuals in the population will have the prerequisite abilities to do so; only those already adapted and only those carrying the genes that can accommodate the given change will adapt. A minimum of 1000 individuals may appear to be a large number of animals, but this number is required to not only accommodate environmental change but also to prevent the reoccurrence of weaknesses and what stockman and other animal breeders call "in-breeding". "In-breeding" within a small population can ultimately lead to extinction.

2. There was a dramatic decline in numbers after the 1982 drought – as previously quoted from the 1989 "Plan of Management for the Hairy-nosed Wombat in South Australia"

As conservationists, we need to keep these two points in mind for the long-term future because just working towards or thinking about the short- to medium-term is not going to "cut the mustard". It just won't look good if one day Moorunde (an area managed by conservationists) has no wombats on it while neighbouring farms still do!

2007 is an interesting year in our story for two reasons. Firstly, the dry period of years in the Eastern states had turned into a serious drought. Secondly it's the year the Natural History Society purchased additional land from Portee Station (the Twelve Mile Plain) that extended Moorunde Wildlife Reserve to 7,000 acres. This drought really started to bite into South Australia in 2008, but by 2009 it was over (in South Australia) and the seasons back to normal. It did not end in the eastern states until the middle of 2010. By then the Darling River had run completely dry; so too had many other tributaries of the Murray River. The Murray itself even stopped flowing and only had water in it because of the series of locks along it.

This drought started a migration of Red Kangaroos from the eastern states to South Australia in search of feed and coincidentally (in 2007) the control of kangaroo numbers, by the previous owner of the Twelve Mile Plain, abruptly stopped. The excessive kangaroo numbers spilled over into the original 2,000 hectares of Moorunde. Red kangaroos were once very rare on Portee Station and the surrounding district – now they are frequently observed and often seen as road-kill in the area including well south of Cambrai!

The fact that the sheep were removed from the Twelve Mile Plain in 2006 and the rabbits

virtually eliminated by 2008 by baiting made no difference to the overall grazing pressure there, and on the original Moorunde it suddenly increased! Kangaroo numbers have not been counted on the Twelve Mile Plain and they had never been counted on Moorunde in the past, so unfortunately we do not have any specific figures to numerically prove an increase. Some people may think that they don't see many, especially during the day, and of course they wouldn't as kangaroos "lie up" under shrubs for shade and shelter and are surprisingly hard to detect. On the other hand, it hardly matters how many kangaroos are seen or even how many there are, 300 or 3000 – it doesn't matter! It is the impact of their increased grazing pressure that really matters.

The number of Red Kangaroos and the two species of Grey Kangaroos in Australia is conservatively estimated (from regular counts that are then extrapolated) to be between 40 and 50 million; compared to wombat numbers, an error of 10 or 20 million either way probably doesn't really matter! The point is the Southern Hairy-nosed Wombats (almost exclusively confined to South Australia) can be counted in only their thousands or perhaps tens of thousands for those on the Nullarbor! Quoting from the 1989 Plan of Management, "Hairy-nosed Wombats are restricted to four main populations". One of these locations is the Murraylands, an area which has "highest drought frequency of any wombat population with a probability of drought in 7-8 years of every 10".

By 2008 wombats in the whole district were being seen to be suffering "some sort of disease or mange" (anecdotal reports). Autopsies indicated that the problem could be poisoning from eating Potato Weed (*Heliotropium europaeum*). During the rabbit-baiting program conducted in March/April 2009, numerous discoloured and emaciated animals were sighted on the Twelve Mile Plain. Later, in 2011, three sick animals with severe skin lesions were collected for autopsy for an officer from the Department of Environment Water and Natural Resources (DEWNR). The autopsies indicated significant liver disease possibly caused by eating Potato Weed and resulting in hair loss and discolouration and skin lesions; nobody was absolutely sure.

One day in May 2012, during a long walk on the Twelve Mile Plain, I sighted fourteen animals that were emaciated and near blind. Then, not long after, almost every second or third Warren on the Twelve Mile Plain became unapproachable due to the stench emanating from them. With blowflies busily coming in and out of burrows like bees at a hive, it was clear that we were losing many animals. In July 2012, I shot (euthanized) an emaciated animal that had collapsed in front



Figure 5: This emaciated animal collapsed in front of me in July 2012. It was euthanized and the stomach contents subsequently inspected. The green matter on the ground to the left is part of the contents – the stomach was full of toxic Thread Iris tops.

of me and subsequently cut open its stomach for inspection. It was full – but full of Thread Iris (*Moraea setifolia*) tops, which are known to be toxic. However this animal was not dying from the toxins but rather from starvation (see figure 5).

In September 2012, I euthanized another dying wombat (see figure 6). The body was taken to Roseworthy Agricultural College to be autopsied by the Veterinary Officer. While the final cause of death was obvious (a massive brain haemorrhage caused by the bullet), the real cause of the animal's demise was found to be starvation, despite a full stomach of Thread Iris tops. Then in April 2014 I came across the wombat carcass shown in figure 7, its body is untouched by scavengers (such as foxes and eagles) – unlike many other animals I had seen by then. There were so many dead wombats that not even the scavengers could keep up!

You won't find desperate animals like these now - they are all dead. And the survivors are currently managing without distress. While it may initially seem distressing to see the animals in the photos die like this we must keep in mind that it is the ultimate fate of all animals in the wild to die like this if they have no natural predator to kill them off before they reach old age. Even if the pastures on Moorunde and the Twelve Mile Plain made the Reserve "a land of milk and honey", that is, with grass in abundance, there would still be wombats and kangaroos expiring of old age, losing all resistance to parasites and disease, only to end up looking like the one in Figure 6. Then, when drought comes, more will inevitably starve, lose resistance to these afflictions too and die in absolute misery (unless somebody "puts them down"). It's a fact of life or the way of nature. All wild animals (even the sick Koalas that many well intentioned people try to save) ultimately die this way. Yes, if they have a disease when

they are young enough, wildlife rescuers can usually save the animal's life and return it to the wild. But then these possibly genetically weaker animals compete with the stronger ones for food resources, which creates another problem – one that is potentially worse. Meanwhile, animals like koalas and wombats (with no natural predators) ultimately all end up dying of old age or disease, and in the process die in the same manner as the wombat in Figure 6. So what am I "on about", if these wombats died in their hundreds on Moorunde and the Twelve Mile Plain during 2009-2012 and I am saying it doesn't matter?

I am trying to convince you that to save the population from becoming endangered and possibly (locally) extinct on Moorunde, over and above the individual, then the pasture quality has to be improved; and that the remaining shrub-free grassland areas be saved as grasslands and not allowed to be choked out by shrubs. So that sufficient numbers of wombats can survive to maintain a viable population on the reserve – which currently does not appear to be happening and the circumstances are deteriorating. Each year of delayed action brings us closer to the next serious drought where once again their numbers will plummet, then with "luck" may gradually recover. However, with native pasture quality already poor and in decline, and with our pasturage areas diminished and continuing to decrease in area, each drought brings us closer to the drought when the wombat population will collapse and crash beyond recovery. When that happens, the kangaroos can move on and find grazing land elsewhere, then later return to a reserve that has no wombats left on it. Except perhaps for a few wombats that may migrate in from neighbouring farm properties that still have native grass present – present because the farmers have controlled kangaroo numbers on their farms. However even these wombats will eventually be starved out by the returning kangaroos.

The authors of the 2005 Brookfield Conservation Park Management Plan were correct when they suggested "Further research may suggest active manipulation of the vegetation and animal populations to maintain optimum wombat habitat as a priority." This, as I have explained earlier, is what Aboriginal people did (at least in the Murraylands) and I also explained why they did it. I then pointed out that European settlers displaced these people from the land that they were managing. What should (or could) be done about that now is beyond the scope of this discussion. However, I believe that we have a moral obligation to, at the very least, try and restore and preserve some of the grasslands that the First People once managed for thousands of years, from the Ice Age to the present – if only to save the



Figure 6: This poor creature was euthanized in September 2012 and taken to Roseworthy Agricultural College for autopsy. It was suffering extreme starvation. Note the discoloured fur, large patches of fur loss and the strongly defined over-protruding spine.



Figure 7: In April 2014, I came across this "mummified" wombat carcass – untouched by scavengers. Too many dead wombats were seen on the surface and even more "observed" in their burrows by the presence of blowflies and odour.

wombats that depend on these ancient ecosystems.

There are about 300,000 hectares of Mallee Scrub, Open Shrubland and chenopod Scrubland in and around the region where Moorunde is located. Much of this "bushland" is safe and protected in one form or another; so why is there an apparent resistance by some to get behind an effort to save the endangered grasslands of the region? There are about 6,000 hectares of various forms of "bushland" on Moorunde and the Twelve Mile Plain Wildlife Reserve; what would it matter if a few hundred hectares of the remaining area be treated to repair the hard-panned soil and actively managed to retain the grassland areas and return the native grasses? So that eventually the reserve has the "carrying capacity" to support the necessary wombat population size to guarantee their survival on the reserve into the future.

Detailed explanations on the primary damage, secondary damage and tertiary damage caused from excessive grazing pressure, and proposals for how we can manage these effects and restore the grasslands have already been presented in several earlier articles: "Spear Grass Seeding Trials and Results at Moorunde" (John Endersby, 2014)

“Rescue Me: Grass Land Restoration on Moorunde Wildlife Reserve” (John Endersby, 2014), “Repairing Hard-Panned Soil in a Semi-Arid Environment” (a discussion with John Endersby by Al Smith, 2015), “Discussion Paper for the Management Plan of Moorunde and the Twelve Mile Plain Wildlife Reserve” (John Endersby, 2014).

The 1989 “Plan of Management for the Hairy-nosed Wombat in South Australia” includes definitions of “vulnerable” and “endangered”:
“A population is said to be vulnerable when its numbers are low and its known distribution is so localized that an environmental process not currently operating would endanger it (after Ride & Wilson 1982, I.U.C.N. 1982).” Given that this was written in 1989 and we do now have an environmental process currently operating that was not back then, then I think it is fair to

say that the isolated population in the Murraylands is now endangered! “An endangered population is defined as one in danger of extinction and whose survival is unlikely if the causal factors threatening it continue operating (Ride & Wilson 1989, I.U.C.N. 1982)”. For the wombat population on Moorunde and the Twelve Mile Plain we have ample evidence that the “causal factors threatening it” are continuing to operate! How much more evidence of this do we need?

After all of the practical research and I have conducted in establishing Spear Grass and Wallaby Grass I have failed to find anybody other than myself who has mechanically sown these grasses on a “broad acre” scale, managed to restore “hard-panned” soil to achieve germination in marginal and semi-arid country and who has over 20 years of intimate experience on Moorunde. I am 65

years old now, so there is little time left to train others to do it!

This has been the story, and a possible forecast for the future, of a 20,000-40,000 year old Ice Age habitat carried through into the 19th century by Australia’s First People. Then inadvertently retained by early European settlers and graziers until the beginning of the 21st century, only to now be placed under threat of extinction by inaction and neglect. Most of it has already gone and Moorunde and the Twelve Mile Plain have some of the last few hundred hectares of its ragged and impoverished remnants. Can or will we, as caretakers of Moorunde, truly be able to claim to be real conservationists? Will we have the foresight to see what will happen in the not too distant future if we continue to delay, and do we have the fortitude to do something now?

Bibliography

Benson, J.S. & Redpath, P.A. (1997) The nature of pre-European native vegetation in south-eastern Australia: a critique of Ryan, D.G., Ryan, J.R. and Starr, B.J. (1995) The Australian Landscape – Observations of Explorers and Early Settlers. *Cunninghamia*, 5, 285–328.

Bureau of Meteorology website, Australian Government, <http://www.bom.gov.au>

Cockburn, Rodney (1925) Pastoral Pioneers of South Australia, Publishers Limited.

Cook, Julia; Groves, R. H.; Ash, Julian (2011) The distribution of *Carrichtera annua* in Australia: introduction, spread and probable limits, *The Rangeland Journal*, 33(1) 23-35.

Dawson, Terence; McTavish, Kirsten J.; Ellis Bevery A. (2004) Diets and Foraging Behaviour of Red and Eastern Grey Kangaroos in Arid Shrub Land, *Australian Mammalogy*, 26(2).

Department for Environment and Heritage (2005) *Management Plan Brookfield Conservation Park*, Adelaide South Australia.

Flannery, Tim F. (1994) *The Future Eaters: an ecological history of the Australasian lands and people*, Reed Books.

Gammage, Bill (2011) *The Biggest Estate on Earth: How Aborigines made Australia*, Allen & Unwin.

Rolls, Eric C. (1969) *They All Ran Wild: the story of pests on the land in Australia*, Angus and Robertson.

St. John, Barbara J.; Saunders, Garry M. (1989) *Plan of Management for the Hairy-nosed Wombat in South Australia*, National Parks and Wildlife, South Australia.

Taylor, Glen K. (1977) *Moorunde Wildlife Reserve: Wombat Population Survey Progress Report*, G.K. Taylor.

Williams, Michael (1974) *The making of the South Australian landscape: a study in the historical geography of Australia*, Academic Press.