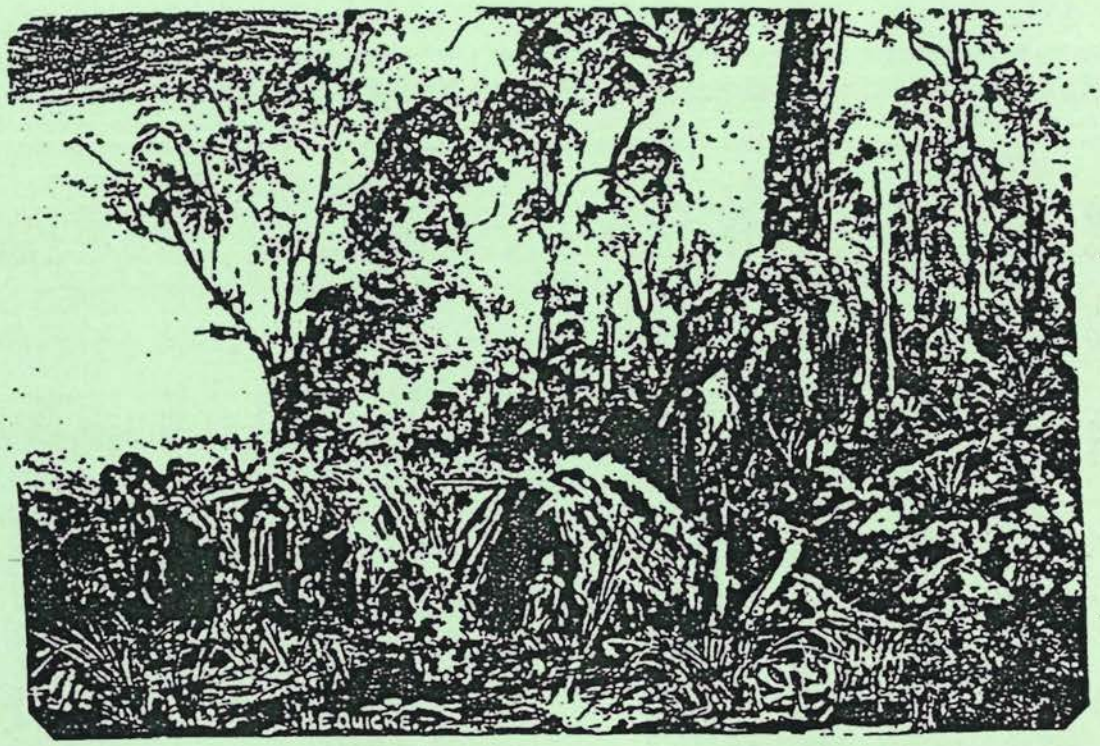
NYUNGAR FORESTS



THE SOUTH WEST ABORIGINE AND LAND MANAGEMENT

THE FIRESTICK FARMER

H.E. QUICKE

N Y U N G A R F O R E S T S
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The aim of this paper is to present and discuss evidence of Aboriginal land management techniques, mainly in the south west of W.A., and especially involving the use of fire as a management tool, and the effects of this upon the land and forests.

We are fortunate in that early seamen, explorers, and settlers, particularly the British, seemed to be possessed of a quite boundless urge to keep records. These being in the form of log books, formal records and files, reports and personal diaries etc. Many important diaries as yet remain under lock and key, while others are being prepared for printing. Probably most will eventually find their way into our archives.

The research that I have thus far carried out has been aimed more at the subtle pieces of information contained in personal letters and diaries, and as such is therefore incomplete. However, the more concrete evidence has been obtained from the writings of other researches and historians, and altogether I have used extracts from DR IZAAC SCOTT NIND (The Natives of King George Sound), THE REV WOLLASTON'S JOURNALS, LOUISE TILBROOK (Nyungar, Tradition) - JOSEPHINE FLOOD (Archaeology of a Dreamtime), MARY WITHNELL TAYLOR (Yeera-Muk-A-Doo), SYLVIA HALAM (Fire and Hearth), DAVID CARNEGIE (Spinifex and Sand),STANNAGE (New History of W.A.), NEVILLE GREEN (Broken Spears), NATHANIAL OGLE, (Introduction to New Settlers), NEVILLE GREEN (Nyungar, The People), GEORGE FLETCHER MOORE (Diary of 10 Years), MICHAEL C. HOWARD (Aboriginal Politics in S.W. of Australia), WILLIAM MCNAIR-HILLARY RUMLEY (Pioneer Aboriginal Mission) and the Journal of W.A. Royal Historic Society,(Early Days). Expeditions WA - 1829-1832 by J Cross - Kings Australia 188-22 by Lieut. Phillip Parker King.

My own interest in the subject has been kept alive by the persistence of some quite puzzling little "quotes from the past", together with some interesting bits and pieces picked up at lectures and seminars. These tend to become our arsenal of verbal ammunition when debating how things used to be, or how they should be.

The reader will no doubt have heard how the forest was once so open "one could gallop thru on horseback" - there was little or "no scrub or banksias" - the natives "control burned the bush" and how beneficial these and "lightning fires" were - we could learn some "forest management techniques" from the natives - "hot fires promoted forest growth" - "the natives lived in harmony with nature" - and "the natives did nothing with the land".

While there is some substance to some of these beliefs, in as much as they very likely have their origins in real situations somewhere, their application in today's situations are often incorrect, and I believe that this will become evident.

For instance, the bulk of the forest that early settlers galloped through is now farmland. The forest which remains, and indeed some of the forest which is now cleared was impassable on horseback and featured dense Banksias, scrub and debris of all sizes.

The Aborigines did burn their lands at regular intervals, and the forests they managed were open and often more like "plains of grass". These were quite eagerly snapped up by our forefathers. The remaining forests as we now see them were seldom occupied by the Aborigine, and were also of little interest to early settlers.

Neither Aboriginal nor European at these early stages was interested in forest management, and skills of pasture development and management were an obvious pre-requisite for survival. The timber industry through forest management was not.

It may be true that the Aborigine did live in a kind of pre-determined harmony with nature, if one can see nature as being that part of the eco-system which had survived some 40,000 years of his influence, for it is clear that that portion of the fauna and vegetation which greeted early Europeans were largely the survivors of Aboriginal man's techniques of management and exploitation, and I am convinced that the Aboriginal managed the land in such a way as to ensure himself, where possible, of the "good life" which seems to be the pre-occupation of most humans.

In fairness one must say that many of the Aboriginal and lightning fires would have benefited our "timber production" forests, but this is unlikely to have been by design.

The greatest fallacy of all perhaps, is the contention of many (and at one time possibly all) European settlers that the Aborigine did not make adequate use of his land to produce his needs. Indeed it was an ancient Saxon law by which white man justified taking the land, and this law said that any land which was not being put to good use could be taken and used.

It is unlikely that the Aborigine would have supported such a view even had he known of it in the first place.

This paper will demonstrate that the Aborigine did in fact use and manage his land and it can be adequately demonstrated that his land management techniques were superior to those of white man for the first three decades of settlement in the south west of W.A. at least.

Sylvia Halom - "Fire and Hearth" writes:-

> "There is plenty of evidence from the earliest voyagers round the western coasts of New Holland for bushfires, as well as campfires, initiated by Aborigines; and for the effects of such fires. In the first years of the seventeenth century the Dutch had sailed along this coast. Pelsart, for instance, observed "smokes" at a distance in July 1629 near Shark Bay (Flinders 1814:I,iii); Tasman in 1644 saw "fires and smoke... all along the coast" in the north west. The first detailed published account of the southern part of the west coast is that given by Captain Samuel Volkersen, of the Waeckende Boey which sailed from Batavia in January 1658 to search for the Vergulde Draeck, wrecked two years before. He described "a large island...in nearly thirty two degrees south latitude...about three miles from the continent, with "high mountains" and a good deal of brushwood and many thornbushes, so that it is hard to go over" (Volkersen 1658, in Major (ed) 1859:66; Collingridge 1895:284; Heeres 1899:79). The mainland was described as "downs covered with grass"
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> Vlamingh, with the Geelvink, the Nijptang, and the Weseltje, also explored Rottnest, first on 30 December 1696, then successively on the 31st, and on 1, 2 and 3 January 1697. On 1 January he saw "smoke arising" at different points on the mainland, on the 2nd "smoke arising" again, and on the 3rd after sunset "great numbers of fires burning the whole length of the coast on the mainland." On the 5th a visit to the mainland discovered a hut, a fire, fresh water and footsteps, but no men; a trip some "6 or 7 leagues" up the Swan on the 10th, 11th and 12th produced more campfires (eight in 1 place), more huts, more native water supplies, but the men themselves remained elusive (Vlamingh 1696-97, in Major (ed) 1859:90-4; less complete version in Collingridge 1895:292-3)."

It is interesting to note that at this early stage Europeans were already complaining that native mainland fires were polluting the atmosphere and causing discomfort even on Rottnest island (which was not burned).

Some early descriptions of forest areas and fire in the forest leave little doubt that our present forest area was not readily accessible and that fire was harmful in many cases.

Again Halom observes that:-

> "It is unlikely that the whole of the jarrah, and above all the karri, forests were burnt through frequently and consistently in the far south, as were the western and eastern margins of the south-west triangle of forest near the more densely inhabited coastal plain on the one hand and the more open mallee and sandheath country of the drier interior on the other (Gardner 1959). In the latitude of Perth, however, the east and west margins of the forest wedge approached each other and the whole width was penetrated by Aboriginal groups from either side (cf. Hammond 1933:23). Here early reporters (Dale 1833a-e; Henty 1830; Irwin 1835; Moore 1884a; Ogle 1839) spoke frequently of "fine open forest" (Erskine 1833:92) and only occasionally of "thick brushwood".
>
> Farther south the forest triangle was wider east to west, penetrated less by early European settlers and probably also by Aborigines. It is significant that for a good description of a transect across the forest 80 miles south of Perth, we must turn to a later date. In January 1839 a Mr Elliott set off westward from Williams, a remote pastoral outstation east of the jarrah forest, aiming to reach Leschenault on the coast in three or four days. This involved a journey across the Darling Range "never before crossed at this point" (Grey 1841:I,310). He became lost and Grey set out to search for him. From the "level plain" and "good feed" of the Bannister-Hotham area, he went south to Williams, then west towards the source of the Harvey into:
>
> > ... an elevated tableland of ironstone and granite (with) little or no herbage; the lower vegetation...a short prickly scrub, in some places completely destroyed by native fires, but the whole country was thickly clothed with mahogony (jarrah) trees, so that in many parts it might be called a dense forest. These mahogony trees ascended, without a bend or throwing off a branch...forty to fifty feet...and the ground was so encumbered by the fallen trunks of these forest trees, that it was sometimes difficult to pick a passage between them...I have never seen so great a want of animal life...we had in vain looked for natives. (Grey 1841:I,321-2)
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> Thus the centre of the jarrah forest belt, around the present milling centre of Hoffman Mill, must when first penetrated by Europeans have been relatively empty of both animal and human populations, burnt only in odd patches - and certainly not frequently - and thus difficult to traverse. It was only as Grey's party approached the point where the Harvey River emerged from the Darling Scarp that they found "...mahogony trees became less frequent...scrub higher...beautiful grass...on the banks of the Harvey...signs of natives" as they reached the coastal plain.
>
> The farther south, the damper and denser the forest. The land around Augusta was described as "so thickly wooded, as to render its clearing very expensive and discouraging to the settlers" (Irwin 1835:67).
>
> The karri forests behind the south coast were even thicker and less frequented. Bannister in 1831 passed through first jarrah and then karri on an ill-calculated route from the Swan to the

Sound. Setting off eastward from Perth in January 1831 he reported that "the trees are mahogony on the higher and rugged lands (the Darling Range)...many parts had been recently burnt, probably last year, and this year the herbage was quite green and fresh" (Bannister 1833:101-2). The party then took a southward course which brought them well west of their destination, King George Sound. For the last thirty or so miles to the south coast:

> ...the underwood was so thick...occasionally we were obliged to make a road with a hatchet. The trees were principally blue gum (karri)...in height before a branch 140 or 150 we thought at least...where the underwood was not remarkably thick grass and herbage grew luxuriantly.

They met no people. It took them nineteen days, subsisting on shellfish, to make their way east along the coast to the Sound. If the karri forests were burnt at all they were burnt only patchily, for example on their western margin, near the Blackwood River, but rarely in the inaccessibly interior. Aborigines used these forests only where they could move easily between forest and coast or forest and grass or heath.

The country north of King George Sound, at the inland margin of the jarrah belt, was burnt frequently. Collie (1833a), in a week's journey in late April and early May 1831, mentioned successively 'fires with which the natives seem repeatedly to have consumed the vegetable production'; the channel of the Kalgan River 'filled with tall shrubs, now burnt'; an area along the river north-east of the Porongorups with 'sandy or gravelly surface, bearing shrubs, in many parts burnt'; farther north along the Kalgan 'open forest country...grassy', and returning southward 'a belt of good soil...Fire had recently gone over its surface'. On another excursion, in February 1832, Collie could not see hills in the vicinity of the Sound from heights above the Kalgan valley, 'the atmosphere not only being very hazy, but thickened with the smoke of native fires' (Collie 1833b:171).

When Dale and a party had ascended the Stirlings a fortnight earlier, they had passed through 'patches of good land and grass...dense forest...open country' (Dale 1833f:162-3) to see from the top of Toolbrunup ' a panoramic view...towards the sea coast...native fires...materially obstructed our view'. The Panoramic View which Dale (1834) later published showed no fewer than five fires simultaneously, with many additional 'smokes' in the background. Dale summarised his impressions as follows:

> ...the country is not thickly inhabited and the forests are extensive...The fires, which are periodically spread over vast tracts of country for the purpose of driving objects of chase from their fastnesses, must be very destructive of bird life...The climate of King George's Sound is very fine: extreme heat...only...during a few days of the year...probably increased by the natives having at that season set fire to the country round for many miles...(Dale 1834:13-14).

Such descriptions make it clear that burning, though the work of a comparatively small population, was impressive in scale, frequency, and undoubtedly in vegetational effects.

After the foundation of the Swan River Settlement in 1829, settlers' observations on 'native' fires and their threat to crops and homes were legion. Mary nn Friend, for instance,

chronicles a voyage in her husband's ship taking emigrants to the Swan. On 10 February 1830, after sight-seeing around Perth she 'walked back in the bush...many parts were burnt by the Natives' (Friend 1931:7). At Fremantle, on 17 February, 'the natives had made a large fire to drive the kangaroos. It spread rapidly owing to the dry state of the grass and reached the encampment of Mr. Watson which was entirely burnt'. In November 1834 raging fires almost engulfed Thomas Peel's storehouse at Clarence, south of Fremantle (Hasluck 1965:157).

In August on 22 January 1833, Nancy Ann Elizabeth Turner recorded in her diary: "The natives burnt the bush at the back of the town. Mrs Brian's house was in great danger' (McDermott 1928:17).

Lieutenant Bunbury, who travelled from Perth to the Vasse in March 1837, wrote:

> This is the worst season in the year for travelling, being the last month of summer; the rivers and swamps are dry so that water is very scarce and the Natives have burnt with fire much of the country, and the sun burning the grass on the remainder there is no food for horses until the rains in May, when the vegetation springs again and the country assumes a different appearance. Now nothing can be more dismal, the country all black and bare of vegetation, while the blackened and charred trunks of trees look particularly horrid. Whole Districts appear in mourning at this season...(Bunbury 1930:179).

Banksias, which predominate in the coastal limestone and sand, form an important element in the understorey of the jarrah forests and extend into the sand heaths.

The predominance of fire resistant and pryophilous forms in the vegetation has been interpreted as indicating that fire, and fire more frequent than the few caused by lightning (Wallace 1966; Sparrow and Ney 1971), had affected the flora of Western Australia over a very long period - long enough to have eliminated any species unable to survive fire damage (Gardner 1957:167) and to have brought to dominance pyrophilous species in the sandplain, the jarrah forest, and east into the mallee.

The essential points which emerge are that infrequent burning may stimulate close forest growth; more frequent burning, or a combination of burning and fairly intensive grazing, would be required to prevent the secure establishment of new growth after fire, and so maintain wide-spaced forest. If so, contemporary descriptions should provide a clue to the regime, or regimes, of firing which had been maintained up to the advent of Europeans.

Frequent burning would keep the litter on the forest floor to a minimum; burning would thus be mild and present no threat to old established trees. Wallace (1966:34) described fires which as late as 1930 he had witnessed moving slowly during three summer months, through fifteen miles of such wide spaced forest of mature trees. It is his opinion that the forest would have to be burned every two to four years to maintain this condition. This accords well with Bunbury's estimate (1930:105) of Aboriginal burning every two or three years in the 1830's/ The practice was probably maintained right into this century by European settlers in parts of the South West who would casually set alight to a stretch of bush if they thought it was getting too thick.

The situation was very different after the start of European felling, which when unregulated would leave a residue behind on the forest floor twenty or thirty times as heavy as a year's natural fall of litter. The conflagration which would follow accidental ignition would be correspondingly severe, not merely clearing ground cover, but defoliating and severely damaging mature trees. Young second growth trees, scrub and weed trees which followed the opening of the canopy by a severe burn, would compound the fire problem in later years, and make recurrent severe fire more likely. We must dismiss such images when envisaging firing where there had been no felling and where Aboriginal burning had been frequent, as it must have been everywhere around the margins of the forest and across relatively narrow zones of forest (as between Perth and York), though not always across the centre of wider zones (as east of Harvey, where Grey in 1839 encountered considerable accumulations of litter).

Nor was the object of Aboriginal burning the same as that of the systematic European forest management which succeeded early unregulated felling. The European forester would wish to encourage timber at the expense of grazing; native groups had valued grazing, not timber. The forester would use fire to open up the canopy, and then encourage the dense growth of young shoots which developed from seeds falling from opened capsules on to a comparatively weedfree ash bed, by protecting them from further firing for their first few years (Hutching 1916:40). Conversely, refiring within a few years would prevent such dense growth, and under an unbroken canopy ligno-tubers would remain dormant until the collapse of an old tree opened up a light space to allow the development of a dynamic shoot into a young tree. By foresters' standards, the trees in "virgin" forest were too widely spaced and overmature, massive hundred-foot giants such as "T.W.H." had encountered near the Helena in 1833 (in Cross 1833:87-8). Aboriginal firing seems the major factor producing the wide-spaced pattern of trees first encountered, and in places ringbarked, by early settlers. Where these initial clearances have been abandoned, regrowth is many times as dense as the forest of old ringbarked trunks, for example at Darradup, on the Blackwood River, where early European settlers followed the Aborigines' occupation of fertile grazing land between spring-line and river.

In summary, jarrah forest is fire-climax vegetation, and witnesses a long adaptation to fires, frequent or infrequent. The particular patterns of growth varied locally with accessibility, and hence frequency and recentness of burning. The karri forest of the wetter south coast had been less exposed and liable to fire, though not unaffected on its coastal margin. The most open growth was on the eastern margin of the jarrah forest, and on the piedmont alluvial plain at the foot of the Darling Scarp; both were areas of relatively good soils and good grazing, where the forest might be most advantageously "worked" by Aborigines.

A number of lines of evidence make the presence of man and manmade fire in the south west of Australia for at least the last 10,000 years virtually certain, and for 15,000 to 30,000 or more years very likely.* Throughout that span the West Australian vegetation and landscape will have been exposed to the effects of increasingly frequent firing.

We turn now to the question of what more direct evidence there is of early humanly initiated firing in the south west.

Fire certainly has been a factor, and, one would expect, an increasingly important factor in the West Australian landscape over many thousands of years. The caves of the south west provide some hints of this, the swamps more certain evidence.

* Now confirmed by the work of Dortch and Merrilees (1973) in Devil's Lair.

For those of us who believe that they have a "feel" for "the bush" as they believe it to have been when unspoiled by man (European) or who wish to leave "nature" unimpended as it were to mould the land, may find that their fondly pre-conceived ideas of beauty and balance bear little resemblance to reality, and that the image thus conjured more closely resembles a land very much effected by the activities of man (Aboriginal).

In order to try to demonstrate this I will quote to you the descriptions of early settlers of parts of the forest which had not been "managed" or interfered with to any great extent by Aboriginal man.

The Rev. John Wollaston in 1830 writes of Bunbury-

"The appearance of the coast of Western Australia as you approach from the sea is most uninviting. It consists entirely of white sand, wherever rocks do not make their appearance. The sandhills, which rise gradually in the background, are very little varied in form and height and are for the most part covered with stunted trees and the scrub peculiar to the climate. These I am unable botanically to describe, but I will mention what I know whenever this, my humble attempt at a narrative, may seem to require it. Here I may mention that all the trees, although evergreens, want freshness; their foliage is of the most sombre uniform hue imaginable and the paucity of it causes their trunks and stems to bear a very undue proportion compared with the leaves. In short (speaking of timber trees only) nothing as a whole can be more at variance with English notions of the grouping of trees, producing variety of tints and beautiful outlines, than any view of a portion of an Australian forest which it has yet been my lot to behold. Here and there are very agreeable home prospects (and such a one is ours from our house and garden) but these are rare and always in the immediate vicinity of rivers or swamps. From a very high hill on Point Casuarina there is a view extending for many miles into the interior, bounded by Roe's range of mountains; but to me it is rather distressing than agreeable. Apparently an impervious mass everywhere presents itself of one uniform colour, a dark dirty green, over which on a hot day the hazy, African-looking atmosphere hangs like a pestilence. Where stems and trunks are visible, they are white, or red, or black, long and lanky, the two first being those of the White and Red Gum, the latter of trees burnt and scorched. Fire is most destructive here and well prepares the way for the wind, which continually levels the half burnt trees. For 50 miles through the forest a tree is hardly to be found which has not the mark of fire upon it. "The bush" presents a most striking and instructive picture of life and death. An immense timber tree is often seen with half of its trunk and branches, black, ragged and hollowed out by fire; while the other half is supported by a strip of bark, and sends forth more than the usual quantity of foliage, as if the destruction by fire of one half infused more life and vigour into the remainder. All the trees contain gum and are therefore very inflammable. In summer, when the dried-up grass and scrub are designedly, or accidently, fired by the natives, many catch the flame and burn for weeks together, until they are either levelled with the ground, or their trunks remain hollowed out like the

flue of a chimney. A large white Gum tree or Tuart tree which has died a natural death is a most frightful object - the stem and every branch being perfectly white.

In Van Diemen's Land, I am told, there are forests of these dead trees, presenting a most singular and even awful appearance. It may be readily imagined therefore that the general aspect of the country, on this side of Australia at least, is by no means inviting. Of some particular spots I shall be able to speak much more favourably, inasmuch as they have the advantage of greater variety of foliage. The Peppermint tree is very graceful and fragrant - not unlike our weeping willow in England; the Tea tree also, either single or in clumps, is ornamental and there are many varieties of smaller trees, and shrubs. The Tea tree is most remarkable for its bark, which is of a light fawn colour or dirty white; and peels off in strips, like sheets of paper and is frequently seen flapping in the wind, as if the stem had been enveloped in rags The shrubs and plants, when examined in detail, are, many of them, curious and beautiful; the flowers brilliant and characterised generally by great delicacy of texture. The Grass tree (or Black Boy) is most curious; the Zamia or Palm, beautiful and graceful. Yet, notwithstanding, I am very loath to believe there is any scenery to be found in the whole of this immense country at all equal to that in the picturesque parts of England. The leaves of many of the trees and shrubs grow in a vertical position to the stem - which is more curious than ornamental.

I had always entertained a wish to see a country in a state of primitive nature and now that that wish has been granted, but the impression on my mind has been very different to what I anticipated. Nothing can be more depressing than the loneliness of the bush away from any settlement. This feeling is greatly increased by the apparent absence of all animal life; sometimes not a bird or beast are to be seen for several miles and above all such an awful silence prevails, except when broken by the horrid screech of the great black, or white, cockatoo, that I have been almost tempted to shed tears at the desolateness of the scene.

95 indoors. It was much increased by the bush fires, extending many miles around, which filled the sky with smoke, causing a most dismal prospect.

Further I rode through an expiring bush fire of great extent which had a singular appearance at night and as you approached it from a distance, looked exactly like the lights of a town. I found it burning down to a water's edge. Some trees with their trunks ignited still retained their verdant tops.

During the whole journey, backwards and forwards, the only wild animals seen were two kangaroos and a native dog. The latter was about the size of an English lurcher and very like one, of a tawny colour. He crossed us at about 40 yards, on seeing us trotted slowly off and was soon lost in the bush.

At this time of the year all the swamps are dry, or nearly so and easily passed, as are also the mouths of rivers which disembogue into estuaries (the peculiar feature of the country) by taking the sand bar which for the most part is now above water, dry and firm.

> The scenery of West Australia is very peculiar, such as can hardly be described so as to give a just idea of it. It is very bold, I am told, to the southward. Major Irwin assures me that in taking a new line from King George's Sound across the country at the head of the Blackwood River, he and his companions met with grand and beautiful scenery, fresh and verdant, with no marks of fire upon the trees.
>
> In that which I have seen, generally speaking, the absence of animal life, the want of verdure and the terrible effects of fire render it melancholy and distressing. I did not experience that effect upon the mind which is caused by the magnificence and sublimity of nature.
>
> I went to Bunbury yesterday, through a raging fire almost all the way. Nothing could exceed the wretchedness of the appearance of the burnt country, presenting, with the volumes of smoke continually ascending, no very inviting aspect to our visitors. When a bushfire is approaching the premises it is a necessary precaution very frequently to fire the bush near the home to stop the spread of the devouring element. But this only makes more fires in another direction. It travels very rapidly and I passed yesterday trees flaming to their very summit. When it is considered the fires occur every summer and for the time, destroy hundreds of acres of vegetation, it will readily be imagined that a great extent of country is absolutely required for grazing, poor as it is at best.
>
> 10 o'clock: I had written thus far when John came to tell the fire of yesterday was creeping up to our palings, so I have been to help whip it out with boughs. This is easy when there is little else but leaves to feed it; when it gets among high grass, scrub, old decayed wood and grass trees it is impossible to stop it. The forest presented a singular scene at a distance; almost like a Vauxhall. A long line of fires was seen through the trees, lighting up all the branches, here and there a flaming stump, or tree hollowed out and burning like a chimney on fire. The embers of the prostrate trees ....."

It can be readily noted that the chance of Wolloston being a bit of an old "winger" is probably high, but it is obvious that the area he was unfortunate enough to have chosen was, although suffering to some extent the somewhat early impositions of Aboriginal man (ie. his fires) it was not used and managed by them to any extent, as for instance were the areas east of the ranges and along the Swan valley. These areas, although forested, were open and attractive and abounded with wildlife: I believe that Wallastons description of that area indicate that perhaps the first "phase" of Aboriginal Colonisation was in progress, this phase being quite destructive to the forest, and if continued over a long period - ie. 50-100 years, would have resulted in the development of an open forest grassland situation by and large, and thus an agreeable situation for human habitation (be it either Aboriginal or European) and an equally agreeable situation for a wide range of wildlife species.

Fire was used by the Aborigine to maintain an open grassland forest situation to facilitate access, and for the production of feed for the game he hunted. This situation was maintained by deliberate lighting, ie. to remove old grass and promote the new, for hunting purposes, and was often due to carelessness with camp or ceremonial fires. Whatever the origin of the fire the natives were careful to regulate it to their advantage whenever possible.

HUNTING FIRES

I Refer now to hunting fires - and once again Hallews research gives some reasonable indications of their application.

> At this season they procure the greatest abundance of game ... by setting fire to the underwood and grass which, being dry is rapidly burnt ... With a kind of torch made of the dry leaves of the grass tree they set fire to the sides of the cover by which the game is enclosed ... The hunters concealed stand in the paths most frequented by the animals and with facility spear them as they pass by. On these occasions vast numbers of animals are destroyed. The violence of the fire is frequently very great and extends over many miles of country; but this generally guarded against by their burning it in consecutive portions. (Nind 1831:28).

The careful regulation of this pattern of land use was preserved by a mechanism Nind interpreted as ownership: "The presence of the owner of the ground is considered necessary when they fire the country for game".
The notion of a close mesh of usage rights was reiterated by Eyre (1845:II,299) and Dale:

> The natives of the known parts are scattered over the country in their tribes, which differ from each other slightly in appearance and customs, though much in dialect. Each tribe occupies a large and determinate tract which is sub-divided into smaller portions as hunting-grounds for individuals, who jealously watch over and instantly retaliate encroachment upon their shores (Dale 1834:7).

Burning was not necessarily always on a large scale.

> The women also kindle fires, but only for the purpose of taking bandicoots, they sometimes, however, accompany the men at the larger firings for kangaroo and wallaby. As soon as the fire has passed over the ground they walk over the ashes in search of lizards and snakes, which are thus destroyed in great numbers...(Nind 1831:28).

The differentiation between the small scale firing carried out by the women, and the large scale firing carried out by men, or men and women together, was part of a general differentiation in roles, activities, equipment and the patter of each day's doings. Each morning:

> ...the men and the women go out in separate parties in companies of two or three together...the women to collect roots or crayfish, and the men with their spears to procure fish or game. The women carry a pointed stick, with which they dig up roots...a bag...made of a kangaroo's skin, in which they deposit the food they procure: they also carry a firestick.

The firestick was partly intended for starting their own cooking fires, but it might also be used for burning off, as part of the day's gathering:

> A portion of the roots, or whatever they may collect, they cook and eat, but reserve part for the children and men, to be eaten on their return to their huts. They also get lizards, snakes and bandicoots, and, in the burning season, set fire to the ground by themselves.

There was thus also a geographical differentiation between the areas likely to be burnt by women, and those whose firing was controlled by the men. During their diurnal movements, the womens' party 'generally go on the open, downy or swampy land'.

Their burning was likely therefore to be mainly of grassland. 'The men also go two or three together...They are move frequently found on the shores fishing, or in the woods seeking nests, opossums, bandicoots or kangaroos'. Their burns would therefore be woodland burns and would have to be more carefully regulated.

Besides deliberate firing, one suspects that domestic hearths (for cooking or comfort) and above all firesticks must have contributed something to the conflagration potential of the area:

> Every individual of the tribe when travelling or going to a distance from their encampment, carries a firestick for the purpose of kindling fires, and in winter they are scarcely ever without one under their cloaks, for the sake of heat. It is generally a cone of Banksia grandis which has the property of keeping ignited for a considerable time...

One must remember, however, that while the number of potential ignition points was high, frequent periodic burning would have kept the density of combustible material low, and dangerously intense fires, like that which Flinders's men lit on Mondrain Island, would be rare.

Nind's account of controlled 'burning-off' in the Albany area was confirmed and expanded by J.L. Stokes, describing a sally northward from Albany in November 1840, during the voyage of H.M.S. Beagle, to:

> ...a large clear piece of land called the Great Plain, about fifteen miles distant, and a little off the Swan River road. On our way we met a party of natives engaged in burning the bush, which they do in sections every year. The dexterity with which they manage so proverbially a dangerous agent as fire is indeed astonishing. Those to whom this duty is especially entrusted, and who guide or stop the running flame, are armed with large green boughs, with which if it moves in a wrong direction, they beat it out. Their only object in these periodical conflagrations seems to be the destruction of the various snakes, lizards and small kangaroos called wallaby which with shouts and yells they thus force from their cover, to be despatched by the spears or throwing sticks of the hunting division (Stokes 1846:II,228).

Their 'complete docility' or 'ungovernable fury' of the fires depended on their periodicity, as recent studies by the forestry division of CSIRO have shown. The regulated burning each year of different sections, which is now forestry policy (Gardner 1957, Wallace 1966, Symposium 1971), was just what the Aborigines had been doing.

The total picture given by these accounts is of country-wide burning 'by consecutive portions' as a deliberate, regulated activity, co-ordinated into the patterns of seasonal and diurnal movement and of mens and women's activities; it correlated with the scattering and amalgamation of groups, and the possibilities of contact between wider communities, for both economic and ceremonial purposes.

Firing was one very important component in a 'thorough...degree of resource utilisation' similar to that envisaged (by Vita-Finzi and Higgs 1970:26) for the Mt Carmel area. Our evidence for tightly organised mosaics of hunting, cropping and firing grounds by the Sound and throughout the South-west confirms the

suggestion that 'population pressure would have been felt prior to the development of agricultural techniques or more complex economies', with an 'obvious bearing on the issue of whether technological progress stems from, or promotes, demographic stress'.

Quantitative work, both ethnohistorical and archaeological, on the demography of the South-west is in progress (Hallam 1972a, 1973b;) to determine differential population densities between different areas at European contact, and also the ratios between those densities over time. Results for the Perth area suggest that firing may have been one of the factors affecting rates of population growth, population ceilings, and the time needed to reach those ceilings. Earlier densities were higher, and rates of increase levelled off more rapidly, in the drier interior; here perhaps the initial improvement of grazing would be most effective, and later climatic stress most crucial. Within the west coastal plain, the most seaward zones also had a relatively high early population; perhaps here firing, at a time when the zone was being constricted by encroaching sea levels, took vegetation beyond an optimal adjustment, and initiated devegetation and dune movement. On the other hand, on the coastal plain it was the sites on sandhills adjacent to swamps in the Bassendean Sands zone (McArthur and Bettenay 1960) which showed the greatest and longest continued increase in numbers, so that here there was no doubt still some possibility of intensifying resource usage right up to contact.

Does ethnographic evidence for organised, regular, usage-mosaics exist in the west as in the south? The evidence from the Swan complements that from the Sound.

Here the inference is that population densities and management techniques, i.e. burning, had resulted in site regression in some areas.

Halam also infers that European man was beginning to emulate aboriginal man in regulated burning techniques in the forest in the 1950s onwards. I prefer to maintain that there was a clear distinction between what the natives did on the plains and river valleys and what occurred in the area which is now State Forest.

This area was more likely to have been subjected to unregulated fires which had extended from the open grassland forests or managed areas of the plains and valleys. In any case - where the upland forest was deliberately burned it was more likely designed to reduce the forest population and promote grazing. Current forest management techniques, although of a regulated burning nature, are designed to achieve the reverse, i.e. promote the growth of trees.

I believe that Wallaston's, Bunbury's, Moore's etc descriptions of native fires entering the dense forest areas supports this view in as much as they were described as devastating - conflagrations etc with "awful" damage to trees.

In fact, Hallam goes on to support this view, but seems to have difficulty distinguishing between fires in "regulated" areas for promotion of grazing, and that portion of the burning which entered the upland and other dense forest areas and caused what European foresters would deem to be unacceptable damage. It is most likely that the Aborigine was constantly attempting to expand his grassland estate, and that uncontrolled and destructive "forest" fires were "phase one" of this operation.

With a kind of torch made of the dry leaves of the grass tree,

They set fire to the sides of the cover by which the game is enclosed and cannot escape. The hunters, concealed by the smoke, stand in the paths most frequented by the animals, and with facility spear them as they pass by. On these occasions vast numbers of animals are destroyed. The violence of the fire is frequently very great and extends over many miles of country; but this is generally guarded against by their burning it in consecutive portions. The women also kindle fires, but only for the purpose of taking bandicoots; they sometimes, however, accompany the men at the larger firings for kangaroos, or wallaby.

As soon as the fire has passed over the ground, they walk over the ashes in search of lizards and snakes, which are thus destroyed in great numbers, and those which have escaped in their holes are easily discovered.

Finally to diverge from the South west Aborigine (the nyungar) it is of interest to note that the "fire hunting" and "fire management" technique seems to have worked just as well in the deserts north of Coolgardie - David Carnegie in his book Spinifex and Sand:-

With my field glasses I could see the flames of the fiercely burning spinifex lapping the crest of a high sand-ridge.
Large tracts of burnt country had to be crossed from which clouds of dust and ashes were continually rising, blown up by "Willy Willies" (spiral winds). These were most deceptive, it being very hard to distinguish between them and hunting smokes. After 1 or 2 disappointments we were able to determine, from a distance, the nature of these clouds of black dust. On the 22nd we turned due East towards some smokes and what appeared to be a range of hills beyond them. The smokes, however, turned out to be dust-storms, and the range to be immense sandhills. Here we saw the first desert oak, standing solitary sentinel on the crest of a ridge. Around the burnt ground several old tracks were visible.
On October 11th we reluctantly left the "Diamond of the Desert" behind us, travelling in a NE by N direction over the interminable sand-ridges, crossing a greater extent of burnt country than we had yet seen, and finally camping on the top of a high ridge so as to catch any breeze that the night might favour us with.

The spinifex and other desert plants develop fresh edible shoots after burning and one wonders how many plants and animals had been unable to survive such constant firing.

FIRESTICK FARMING

"We shall be concerned with the role of fire in enabling the Aborigines of the south-west so to modify and exploit their terrain as to continue to extract sufficient resources for increasing populations. The process of modification is not usually considered sufficiently deliberate, laborious, or drastic to be called farming, though Rhys Jones (1969) uses the phrase "fire-stick farming".

Farming as Europeans know it - specialised cereal agriculture - we may see as one narrowly specialised mode among the wide gamut of forms of symbiosis and exploitation between human and other biological communities over a long timespan reaching back at least into the end of the Pleistocene (cf. Higgs and Jarman 1969; Harriss 1971). Original Australians adopted more generalised modes. However they did both exploit and husband their resources

systematically, and were careful to maintain continuing supplies. Fire had its part in these schemes of crop and stock management.

Irvine (1970) has discussed the way in which Aboriginal exploitation may verge on cultivation. Stanner (1961:240) sees the Murinbata interpretation of a myth in which the Rainbow Serpent sends his daughters to plant baobab trees as meaning that planting a garden was an old Aboriginal custom. Long (1970:329) cites an amusing example of Aborigines conserving breeding stock, taking dingo pups for the bounty paid on the scalps but leaving the adults to breed next season. A comparable plant example is the Tiwi custom of always leaving a portion of each cluster of edible yams in the hole from which they were dug. (Goodale 1970:360; cf. Lawrence 1968:205).

Gathering yams (dioscorea) was anything but a random process, whether in northern Australia or further south; it was certainly not a matter of digging out a root here and there, but of returning regularly to extensively used tracts. Grey, for instance, described in the Murchison-Hutt-Greenough coastal area (grey 1841:II, 12-38) define "warran grounds" as well as swamps producing Yun-jid (a species of Typha), served by well established paths and supporting abundant populations in clusters of well-built, clay-plastered and turf-roofed huts; "these superior huts, well marked roads, deeply sunk wells and extensive warran grounds, all spoke of a large and comparatively speaking resident population." Near the Greenough, "two groups of these close together ... would have contained at least a hundred and fifty natives". At one point Grey recounts:

> ... for three and a half consecutive miles we traversed a fertile piece of land, literally perforated with the holes the natives had made to dig this root; indeed we could with difficulty walk across it on that account, whilst this tract extended east and west as far as we could see.

Grey's summary was that this area was:

> ... the most thickly populated district of Australia that I had observed, and moreover one which must have been inhabited for a long series of years, for more had been done here to secure a provision from the ground by hard manual labour than I could have believed it in the power of uncivilised man to accomplish.

Grey allowed himself however to be persuaded by his own observations and not all later writers have been able to rid themselves of their preconceptions to the same extent. Certainly such intensive and laborious Aboriginal exploitation of plant products includes one of the notions implicit in our European use of the word "farming": the notion of hard work. It involves secondly territorial confinement; and thirdly conservation and husbanding, rather than depletion, of a product. If the effect of this were to extend the product outside its original distribution range, as well as redering it more abundant within that range, Aboriginal exploitation would have included also the fourth element implied by "farming" or "cultivation".

Yam grounds extended farther south than those described by Grey, and we shall find settlers in the Victorial Plains (north of Toodyay) and in the Bindoon-Gingin area north of Perth using them as indicators of fertile soils suitable for European agriculture. Mrs Robin Roe, of Beermullah, near Gingin, has examined "yam

grounds" in the valleys of two small brooks just south of Gingin, where mounds and holes up to five feet across, and said once to have been three or four feet deep, are reported by the present owners to have been "left by natives digging yams or Woorine. Early surveys, from the 1840's and 1850's, show such warran holes south of Gingin, yet others along the piedmont alluvium of the Swan - just south of the stretch where it flows west after emerging from the Darling Scarp - and again on the opposite side of the river after it turns south, just west of the point where it is joined by the Ellen Brook.

Another south-west Australian example of conservation verging on cultivation is described by Grey:

> The natives have a .... law that no plant bearing seeds is to be dug up after it has flowered; they can call them (for example) the mother of Bohn, the mother of Mudja, etc. ... I have never seen a native violate this rule. ... (Grey 1841:II,292).

The use of fire will have to be examined in this context of systematic near-cultivation and resource management. Grey interpreted the use of fire to improve root resources as "a sort of cultivation". Yun-tid, the root of a species of flag (typha) is pounded into a paste, made into cakes, and baked: "The natives must be admitted to bestow a sort of cultivation upon this root as they frequently burn the leaves of the plant in dry seasons, in order to improve it". These flags were abundant in the swamps of the coastal plain around Perth, as well as further north, and south, and indeed across the continent in South Australia, where also the leaves were burnt off before harvesting the roots (Eyre 1845:II,62).

Another crop which could be so improved was, of course, grass, and most of the rest of this paper will be concerned to establish that the Aborigines were agents of vegetational, and, it may be, geomorphic change (Jennings 1965) in their efforts to improve grazing by firing. George Seddon has drawn my attention to an assessment made by sir Thomas Mitchell:

> The extensive burning by the natives, a work of considerable labour, and performed in dry, warm weather, left tracts in the open forest which had become as green as an emerald with the young crop of grass. These plains were thickly imprinted with the feet of kangaroos, and the work is undertaken by the natives to attract these animals to such places. How natural must be the aversion of the natives to the intrusion of another race of men with cattle: people who recognise no right in the aborigines to either the grass they have thus worked from infancy, nor to the kangaroos they have hunted with their fathers (Mitchell 1848:306).

I shall cite later West Australian instances of a similarly acute appreciation by the early European settlers of the degree to which they were indebted to the work of their Aboriginal precursors.

We may thus dismiss as invalid Cleland's argument (1935) that 'deliberate burning to supply grass in the future would be an example of primitive agriculture, a stage which our natives do not seem to have attained'. They did indeed attain a high efficiency in the management of fauna and flora to the mutual well-being of human and other components in the ecological system. As in America, 'We no longer think of...plant collectors

as a ragged and scruffy band of nomands; instead they appear as a practised and ingenious team of lay botanists who know now how to wring the best out of a...bleak environment' (Flannery 1968).

The efficiency of Aborigines as animal as well as plant ecologists is attested by descriptions such as Landor's account of a kangaroo drive 60 miles south of York in Western Australia: 'I stood in the midst of a large plain which they had surrounded on three sides, multitudes of kangaroos - I believe I might say thousands, came rushing past me' (Landor 1847:262).

Eyre quotes a letter which summarises well the relationship of Aboriginal and European land usages and improvement:

> Every tribe has its own district...and within that district all the wild animals are considered as much the property of the tribe...ranging in its whole extent, as...flocks of sheep and herds of cattle...the native grass affording subsistence to the kangaroos of the natives, as well as to the wild cattle of the Europeans...burning off the grass...is done (partly) to provide a new crop of sweeter grass for the rising generation of the forest...(Eyre 1845:II,299).

Thus Aboriginal populations did change the vegetational and faunal balance. Fire was a major factor in this patter of regular exploitation and settlement. I shall examine these achievements in detail for the South-west of Australia, which is particularly fortunate in having abundant and intelligent records.

The first detailed descriptions of fired countryside in the south-west came at the end of the 18th century. Vancouver anchored in King George Sound in 1791, and Archibald Menzies describes in his journal the country the Captain and his Officers explored on foot and by boat:

> (29 September) ... a small hut ... the place had recently been burnt here and there ...
> (30 September) ... there were but few places I travelled over this day but what bore evident marks of having been set on fire ...
> 1st October ... rich pasture abundantly cropped with excellent grass ... 2nd ... country along the shore thickly covered with brushwood ... remains of where the natives had recently had a fire.
> 4th October ... a deserted village scattered about in the skirts of a small wood ... about six and twenty (huts) ... Many of the stems of the trees bore evident marks of fire, some were even hollowed out by it ...
> 7th October ... (from) Oyster Harbour ... a large rivulet winded back into a delightful country ... its banks were here and there bordered with extensive plains and meadows which seemed to afford easy access into the country ... a little way off from the rivulet a thick wood chiefly composed of the Eucalyptus obliqua a beautiful evergreen whose stems were naked and straight for some way up without any underwood to obstruct our progress ... We seldom met with these trees or the other gum plants anywhere about the Sound without observing their stems burnt or scorched with fire.
> (By) a small road not far from the shore found another village ... apparently later occupied. Several places about this village seemed to have been very recently burnt down and destroyed by fire, many of the larger trees had been scorched by it ... The further we penetrated inland the more favourable

> the country appeared, diversified with hills and dales, plains and meadows and woodlands capable of affording excellent range and good feeding to domestic animals of every description...
>
> The frequent marks of fire and general burnt state of the country everywhere round the Sound ... some attributed ... to a combustible quality in the earth ... others entirely to the busy capricious disposition of the natives who are fond of kindling frequent fires round their huts ... (Menzies 1791:43-74ff).

We can clearly envisage from these descriptions very general but mild and patchy burning, its effect varying with soil, topography and frequency, leaving in some areas (in coastal dunes) thick brushwood and elsewhere open grassland. The interior forests comprised tall, straight, mature trees, all frequently scorched but clear of undergrowth and easy to move through. The pastoral potential was obvious. Islands within swimming distance had shared the burning."

It must be pointed out and appreciated that the writer (Halem) has gathered information that will support a particular subject (ie. the aboriginal "farming" concept) and the unwary reader may not give sufficient regard to the other associated intricacies of Aboriginal lifestyle which also involved fire, and thus be overwhelmed by the evidence of "farming". Other writers either inadvertently or intentionally support Halems views and there is no doubt that early settlers to WA took possession of vast areas of grassland for their stock and that these grasslands had been cored for and developed, with constructed and attended water points, pathways and well known ownership.

What is not clear is to what extent exactly were the forested areas deliberately cleared by the use of fire in order to begin the development into pasture, and although much early information is available from records, letters and other writings, the accuracy of some of the detail must be sometimes questioned. Firstly there is the interpretation of what is written, there is the nature and disposition of the writer to consider, the interest of the writings, and the source of information.

Even information gained directly from Aborigines must be scrutinised as these people were masters of deception. For instance many early writers had pre-conceived views or purpose, or happened upon situations which they did not understand, and wrote accordingly. Dampiers descriptions surely reflect a near state of shock, while Ogle had some responsibility to "sell" the colony to prospective settlers and wrote more or less glowingly about everything. Wallaston - Smithies and others expected perhaps to convert and educate aboriginals and their views were often clouded by their own measure of success in this area.

George Fletcher Moore was more matter of fact and seemed to understand the Aborigine but was more concerned with the individuals than their overall habits. Halem refers to islands at King George Sound being also burned within swimming distance, and I think infers that this was one of Menzies observations (1791). Izaac Scot Nind observed (1827) that the natives at King George Sound could not swim at all. It is unlikely that, artful and deceptive as they were, the natives would have been able to deceive Nind for 2 years, while he remained at the Sound, into believing that they could not swim, when in fact they could. Other writers have commented also on some SW tribes being unable to swim.

Inability to swim raises fascinating questions as to the origin of some tribes, and as to the presence or absence of significant tracts of water inland during the last 40,000 years or so, and as to how long these tribes

had inhabited or visited the southern coastal areas. It raises the possibility that some tribes worked their way North - South around the coast, and retained their interest in swimming, while others came cross country North - South or Northeast - Southwest over a long period of time, and for Anthropological purposes may have been "newcomers" to water.

However to continue with Halems observations:-

> Burning is repeatedly authenticated for the block of land between Busselton and Augusta. An anonymous correspondent traversing the Margaret River district in mid March reported: "This district has been lately burnt." He passed through "superior (country) undulating with fine valleys covered with silky grass ... many excellent situations for farms well cleared of timber" (Anon 1833a:111). Approaching Cape Naturaliste, "the whole of the country ... has been burnt".
>
> John Bussell travelled northward from the Blackwood at Augusta along a route further from the coast, and observed by the estuary "the bush, where unburnt, luxuriant" (Bussell 1833a:184). Northward, he came into country which "for some miles abounded with valuable timber ... the trees were, many of them, large and fine, many much injured by fire". In yet another account of a journey from the Blackwood to the Vasse, he speaks once more of "good soil ... thickly wooded with mahogony (jarrah)" (Bussell 1833b:186), and an area "recently burnt .... "over a country clean burnt ... land good but rocky often and heavily timbered."
>
> So unremarkable is a burnt countryside that the absence of burning becomes remarkable. At one point Bussell described a flat which "bore numerous impressions of the feet of natives and kangaroos and where the ground ... was a vivid green ... unsullied with burnt sticks and blackened grass trees ... grass was plentiful". He was close to the Vasse, where he was later to settle (Shann 1926; Hasluck, A. 1955) and rhapsodised: "The country here was so clear that a farmer could hardly grudge the fine spreading trees of red and white gum and peppermint the small proportion of ground they occupied only to ornament" (Bussell 1833a:192). Still in the same general area he walked alongside an inlet through "fields of grass (where) native paths, which traversed these lawns in every direction, gave us easy walking".
>
> Wollaston refers to "the firestick generally carried in the bush to save the trouble and delay of obtaining fire by friction" (Wollaston 1841-44:27). The means of applying friction could be either a saw or a drill.
>
> Like Wollaston, Grey implies that it was more usual to carry fire than to light it by friction: "In general each woman carries a lighted firestick, or brand, under her cloak and in her hand" (Grey 1841:II,267).
>
> Moore pictures vividly the likely results of such love of warmth:
>
> > Djanni - the bark of Banksia and Hakea trees ... In cold weather, every native, male or female, may be seen carrying a piece of lighted bark, which burns like touchwood, under their cloaks ... In the valleys, even in summer, the air is chill before sunrise. The half-clad native starts with the lighted bark; as the day advances the warmth of the sun renders artificial heat unnecessary; the bark is discarded ... A breeze comes ... and the whole country is shortly in a blaze. (Moore 1884b:20-1).

Such accidental firing, especially at the wettest time of year, would be unlikely to result in really widespread fires, but would be one component in a system in which those areas most frequented were most often fired. Such frequent firing would be necessary if forest once cleared of undergrowth by firing were to be kept clear. Areas once fired but not frequently refired would have tended to produce thicker rather than thinner forest growth. Indeed European foresters have used fire to encourage thick growth of trees at the expense of timber. The very reverse - grazing at the expense of timber was the objective of Aboriginal land management.

It provided, however, land for the gentlemen who had first choice, including Stirling himself, to the chagrin of later arrivals. Wider extensions in the Serpentine and Harvey areas had to await improved communication for successful exploitation, though the widest lateral development of the zone, on the Murray around Pinjarra, and behind Geographe Bay, was appreciated early. This zone provides abundant evidence of Aboriginal occupation (in which the small isolated sandhills blown on to its western margin may be particularly significant) and usage, above all for hunting. Stirling's botanist, Fraser, described his view of it from the Swan as "an extensive Plain ... alluvial ... covered with luxuriant grass ... hilly promontories of fine red loam ... extensive interspersed with strips of good forest land" (Fraser, in Stirling 1827:581).

McArthur and Bettenay interpret remnants as indicating an original vegetation on the alluvial plains of jarrah forest, with some marri, undergrowth of banksia and blackboy, and a woody perennial ground cover. Parts at least had been so modified before contact as to offer good grazing for native herbivores and, for the first settlers, parklike grazing and relatively easy clearance for cultivation.

The actual foothills of the Darling Scarp, and particularly their sandy western margin (McArthur and Bettenay 1960:9) were important in providing sites for Aboriginal occupation in focal positions (eg. Bullsbrook, Mundijong) for exploiting the resources of several zones - upland, alluvial plain, and swamps beyond.

It becomes evident that due to a degree of what Europeans might call poor management, - or organisation, the areas cleared by fire were more or less haphazard even on the planes, and were interspersed by dense scrub and forest. Or was it by intention that the natives directed their efforts to the areas of better alluvial soil, leaving "shelter belts" on the poorer land.

It is quite probable that for the Aborigine, keeping his land cleared was an ongoing problem, with some areas of forest scrub and banksias persisting in spite of frequent firings, and these areas would likely "encroach" upon his grasslands from time to time.

How quickly this could occur is evidenced by the rapid "regression" of pasture to bush when white settlers took up the land and regular burning ceased.

What contemporary descriptions are there of the effect of Aboriginal firing practices on south western vegetation? What is explicit in Bunbury's account is implicit in many other descriptions from the second quarter of the nineteenth century, from King George Sound, Geographe Bay, the Swan River, inland in the Avon Valley, between York and the Sound, and northward onto

the Victoria Plains. The early settlers were alive to the variety of geology, from the limestones, sands and loams of the coastal plain to the inhospitable lateritic gravels capping the Darling Scarp and the deeply weathered soils of the Avon region; this diversity is clear in their descriptions. But they give also an overriding impression of openness, in areas which would not necessarily remain open when periodic and frequent burning ceased.

Some of Stirling's party in March 1827 'advanced along the Banks (of the Swan); its open forest-like character afforded no impediment to their march, indeed the lowlands resemble fields of grain, for the high grass had been turned yellow by the sun' (Letter to Governor Darling, April 1827; Stirling 1827:558). The botanist Fraser who accompanied Stirling, described the piedmont portions of the coastal plain and scarp they reconnoitered from the Swan as being 'covered with luxuriant grass...interspersed with strips of good forest land...the summit (of the) Mountains (the Darling hills) is covered with enormous trees...but with the exception of a few struggling Hakea there is no underwood'.

George Fletcher Moore described the Perth area in March 1831: 'the country has the appearance of being well-wooded, but I should not say it was thickly timbered. In some places there are open plains that resemble well-ordered parks' (Moore 1884a:32).

But openness is not universal. As one would expect, the variety of topography and soils and the varied degrees and patterns of Aboriginal exploitation on the coastal plain, are reflected in contemporary descriptions. The most detailed descriptions are given by E. W. Landor (1847) for the early 1840s.

Some of the coastal limestone was very poorly vegetated, while the interdunal valleys carried thick bush. On a shooting south from Fremantly, Landor remarked on:

> ...peppermint and wattle trees...gay with white and yellow blossoms; an infinite variety of flowering shrubs gave to the country the appearance of English grounds about a goodly mansion...The country presented very little appearance of grass, though abounding with green shrub; and frequently we passed over denuded hills of limestone-rock, from which we beheld the sea on one side, and on the other the vast forest of banksias and eucalypti, that overspreads the entire country (Landor 1847:54).

Making his way by sand-track towards Perth, 'It was scarcely possible to see more than fifty yards ahead of you, so thickly grew the banksia trees'. But on the high land above Melville water, 'The forest through which we passed resembled a wild English park'.

However, on the whole, 'with the exception of the rich flats of the Swan and Canning rivers, the vast extent of country between the coast and the Darling hills is a miserable region...except where occasional swamps appear like oases'.

The aeolian limestone and the coastal sandplain remain unattractive to agriculturalists. But the alluvial belt between these swamps and sandhills and the foot of the Darling Scarp, including land along the Middle Swan, the Canning, the Serpentine the Dandelup and the Murray, attracted settlers, including Stirling himself who took his own grant on the 'rich and extensive flats of Woodbridge' by the Swan, near the junction of

the Helena River at Guildford. 'The whole country of the middle and upper Swan resembles a vast English park'; only the steep slopes down to the river remained thickly 'wooded ravines'.

Among the waving corn of the settlers' fields 'rose up a number of scattered, lofty dead trees which had been purposely killed by ringing the bark'.

These showed the spacing and the size of the forest cover at contact. Even though Irwin's steward was able to build his house at Upper Swan of 'mahogany cut down on the estate' (Irwin 1835:57) we must not imagine that these original settlers on the alluvial plain faced clearance problems like those of the Augusta settlers.

South-east from Perth, Landor set off for the Canning, firstly across the sandplain:

> Passing over two well built wooden bridges connected by a Causeway, we crossed the river and took the road for the Canning. Thick woods of banksia, wattle and eucalypti closed in the view on every side ... lacustrine valleys ... broad swamps choked up with reeds ... (Landor 1847:153,157)

But when they reached the alluvial soils by the Canning River the picture changed:

> We now had a long canter which brought us to the neighbourhood of the Canning River. The country hereabouts resembles a wild English park. The trees are all of the eucalypti species, large and dispersed; the surface of the ground is level, affording a view of the Darling Hills, which appear to be close at hand. Crossing the river by a rustic bridge, we ascended the opposite bank ... a farmhouse close at hand ... a wide field of clover...

Continuing southward, "we rode down an extensive plain, covered plentifully with grass, and presenting numerous clumps of trees ... for several miles". Beyond this the hunting party continued among the rocks, hills and ravines of the Darling Range.

Another expedition on the coastal plain took Landor once more through "park-like scenery among which the Canning river pursued its lazy course". He went on through country where:

> A rough coarse scrub, interspersed with small quantities of grass, overspread the sandy soil ... open prairie ... thick wood ... swamp ... brushwood and thickets ... plains interspersed with swamps and thickets ... rambling over plains of coarse grass, penetrating into woods, struggling through swamps ...

The swamps and sands of the Bassendean Sands thus contrasted clearly with the fertile alluvial flats along the Canning and the Swan, with their tall dispersed timber and open greenery, as they awaited the settler's plough and stock.

The same open landscape is described by Bunbury in the alluvial zone farther south on the Murray. He settled on a grant near Pinjarra in 1836.

> Behind my hut grew a few large Mahogony trees (jarrah) and Red Gums, while beyond, if I had continued to clear, I should command a view through fine open country studded with groups

of large trees, under which grew a green covering to the ground... (Bunbury 1930:168).

Three miles downstream, where "the Dandelup joins the Murray ... there is on all sides an extensive tract of rich valuable grassy land richly timbered with magnificent trees". When he chose this grant he spoke of "the Murray river ... flowing close under the bank on which my house is to be built ... on each side of me is a rich grassy flat, which I can either cultivate or leave in grass, while behind me is an extensive plain with scattered clumps of very large straight Gum trees".

Intensive Aboriginal use of this area is well-attested by accounts of the European settlers' dependence on, and fear of, "the Murray men" and the punitive massacre at Pinjarra itself (Hasluck 1965:154-7). There were fords across both the Dandalup and the Murray above their junction. European settlers could use these rich soils without further clearance. That had already been done by the natives.

South around Geographe Bay the alluvial zone widens, Bunbury travelled from the Murray to the Vasse in 1836, and described "good rich country ... abundance of cattle food ... Clay plains from the Capel to beyond the Vasse ... no timber except for a few scattered Red Gums ... swarmed with Kangaroo". We have looked at descriptions of this same countryside in similar terms in conjunction with many reports of native burning. The settlers had no doubt of the causal connection.

To the north the moor river, where it flows southward on the coastal plain, also traverses country which was both open and well-frequented by Aborigines. Grey in December 1838 made an excursion northward from Perth, travelling via the interdunal swamps and lakes of the aeolian limestone belt, and on north over sandplain where "the whole of the country ... was sandy and bad, being thinly clothed with Banksia trees" (grey 1841:I,298), to the junction of the Gingin Brook and the Moore River, fifty miles north of Perth, where the much used alluvial flats along the river contrasted with the wooded limestone and sandhills around. "The scenery here was very picturesque: high wooded hills were upon each side of us, and the valley was open and rather thinly timbered; but the few trees it contained were of considerable size and beauty." No less than sixteen men, plus women and children, eventually gathered to greet Grey (who found himself regarded as one of their kin returned from the dead).

In May 1839, Roe, pushing north to look for the scattered remnants of Grey's shipwrecked party, came at Baramba, twenty miles further upstream, to "excellent water ... deep pools ... luxuriant pasturage". Further north the country becomes dry, sandy and inhospitable to European and Aborigine alike. Abandoned Aboriginal campsites of widely ranging dates scattered over the present "Baramba" property and those to the south.*

As on the coastal plain beyond the banksia scrub on limestone and sandplain the open landscape of the piedmont alluvial belt awaited the plough, so east of the Darling Scarp beyond the lateric gravels of the jarrah belt settlers found fine grazing country on the better soils of the Avon and kindred rivers.

It may be pertinent at this point to reinforce the analogy that much of our present State Forest (ie. the poorer soils of the Darling Ranges) - our "Heritage" - remain with us not so much by design as because of their unattractiveness to either black or white graziers.

It is quite possible that Aboriginal graziers did attempt to pasture the ranges and failed.

Likewise we do know that white settlers attempted to claim these ranges and there is still evidence of old leases and grants returned to forest, together with tiny outposts of settlement which also failed. An example of these is Willowdale, north east of Harvey where early in this century the Government of the day, in response to pressure from farmers, recognised certain flats and valleys among the ranges which could be brought into production, and established a scheme by which this land was cleared and worked on a part time basis by sustenance workers to produce articles for a growing export market. Many readers will find the history of Willowdale interesting and will no doubt recognise some familiar old forestry names (see Battey library - History of Willowdale ref:).

* Fieldwork Dec. 1971 to Jan 1972, following information from Mr W de Burgh of "Baramba", Mr F Edwards of "Millbank", and Mrs R Roe of Gingin.

Dale's first excursion to trace the Helena River, in October 1829, penetrated only briefly into forested hills. His second expedition in December of that year had pressed through the hill country without remark on fires or inhabitants for four days and sixty devious miles before his party saw "eastwards ... a range of mountains" (the far side of the Avon valley) with "the smoke of numerous fires made by the natives generally close to their base" (Dale 1833b). The journal of Lieutenant Erskine (1833) recorded another expedition eastward "over Darling's Range" in September 1830. They estimated they had travelled between 60 and 70 miles through "fine open forest" before they came on eight Aboriginal huts, and another fifteen miles through hills and thick brushwood before they had clear views to the east. The country continued thickly wooded until they came down to the river where Aborigines were fishing; they then moved through many miles of "fine rich pasture land" along it's valley where Aborigines were numerous. Swans and wild fowl were abundant. On their return, 40 miles of mainly "fine open forest" with some patches of thick brushwood were passed before they again met Aborigines at the western "base of the mountains".

James Henty, journeying across the Darling Range in October 1830, struggled eastward some 25 to 30 miles from the scarp: 'Iron stone pebble, quartz, and granite rocks were abundant...the former predominated...mahogany timber grew abundantly without a vestige of grass (until) a beautiful vale opened suddenly on us, thinly timbered' (Henty 1830).

As they continued eastward 'the soil visibly improved' until they emerged into country 'undulating and more or less grassy...altogether different from anything I had seen in the colony...' and eventually a plain 'covered with grass and about two miles wide'. Several times in describing different views Henty repeated the phrase 'thinly covered with grass and lightly timbered'.

The party encountered Aborigines first near the scarp, an hour's journey up the Helena, but none in the next three days and 40 miles of travelling. In the Avon valley they saw gum trees with patterns cut in their bark, shy Aborigines, and a fire to the southward. Returning westward, they saw no more trace of Aborigines until they reached the edge of the hills and viewed "the flat coast country between the range and the sea; Rottnest and Garden islands", the Swan below then and "further down the valley on the banks of the river several fires which ... we knew to be those of natives", probably Walyunga. The pattern of parallel sines - settlement on the coastal plain and into the foothills of the Darling Range, relatively empty lateritic uplands,

and settlement in the Avon valley-is reflected in description after description, and persists from the Aboriginal into the European land use picture.

Not only the river flats were grassy. The hills west of the Avon were described by Dale, probing inland in August 1831 as 'rich and verdant...clothed in grass to their summit...moderately wooded with gum trees' (Dale 1833c:57). His party moved eighteen miles along the west side of the river 'over country well clothed with grass...little underwood...lightly timbered with a species of gum tree'.

In October and November 1830 Dale continued his explorations south and north from Mount Bakewell (by the site of York) penetrating first 60 miles SSE through 'country of open forest character...lightly timbered with different varieties of eucalyptus (and) undulating grassy country' (Dale 1833e:157), then northward over 'good pasture country'. By 1831 Moore had heard of 'a vein of good soil...on the banks of...the Avon' and that Captain Bannister walking to King George Sound from Perth 'passed over...ninety miles of luxuriant pasture ground' (Moore 1884a:28) along the east margin of the jarrah forest. Accompanying Dale's party in September 1831, Moore found the Avon Valley soil to be 'a rich loam, producing patches of grass wherever a tree had been burnt', and the whole area 'open level and grassy country'. Captain Chidley Irwin described in the York area:

> ...extensive tracts of undulating surface covered with short sweet grass...ornamented with clumps of trees and shrubs...The situation is cheerful and open plain, resembling park scenery, and bearing fine pasture for sheep, slope down to the Avon...low hills...covered with good pasture...with evergreen shrubs and trees scattered over the surface...(Irwin 1835:64).

He quotes a letter describing a 30 mile tour around York: 'splendid country...with an abundance of grass and a very superior feed for sheep, or that may be ploughed almost without any clearing'. Exploitation quickly followed exploration.

Landor complained:

> The York and Northam districts afford a vast quantity of land suitable for all kinds of grain. The sheep and cattle runs are excellent, but they are now fully stocked and new settlers must direct their steps to the southward (Landor 1847:249).

Moore finally took up a grant south of York, and said (October 1835) that the pasture on the hills was excellent (1884a:287), while southward towards King George Sound (Albany) was more good country- 'an undulating country, the hills grassy'. Northward, Moore had reached the middle reaches of the river which took his name, reconnoitring from the Swan in April 1836. He reported "the grass fine, whenever it had not been burned (recently) ... the soil of the best brown loam" (Erickson 1971:2), and further upstream, approaching what must be now the New Norcia area:

> A hundred acres of ground in our view might be ploughed without clearing anything but a wattle here and there. several miles ... appeared to be of the same nature ... I think it fair to presume that a good grazing country continues on the east side of the Darling Range all the way from York to this district ... very little short of a hundred miles north ...

From the York area settlement was to push south towards Albany and north via Toodyay to what became the Victoria Plains. In May 1837 Moore reported in his journal: "Settlers are now going to the

interior, to the extensive grazing tracts" (Moore 1884a:309).

This initially pastoral zone lies roughly within the zone of "Younger Laterites" distinguished by Mulcahy (1967:216), swinging rather east of south from the Victoria Plains, through the Toodyay-York area, southward toward Williams and Kojonup, north of Albany. Here, "as we approach the inland margin the forest opens out and gives place to a narrow zone of savannah woodland in which York gum is associated with Acacia ... and the grass flora comparatively well developed" (Gardner 1959:279), a situation likely to result from, and to invite, human exploitation. The aborigines were already fully exploiting the resources of this area. In doing so they had opened up and improved the land for European exploitation: land abounding in kangaroos and grass could be made to abound in sheep and grain. Landor's account of pastoral establishments south of York illuminates landscape and inhabitants.

> Our sheep are generally kept on a squatting station on the Hotham some sixty or seventy miles south of York ... a broad valley abounding with grass and scattered gum trees ... We go wandering with our flocks from one patch of good grass to another ... an immense grassy plain, eight or nine miles wide, without a tree upon it ... (August) 18th .... It rained tremendously ... the natives happened to be hunting in a large party, driving the game before them; and as I stood in the midst of a large plain which they had surrounded on three sides, multitudes of kangaroos - I believe I might say thousands - of all sizes came rushing past me ... in the evening fifty (Aborigines) came about the hut. (Landor 1847:249-59)

Such abundance - of indigenous inhabitants, open land, good grazing and game - was not restricted to one small area.

> It is not until the granite range of the Darling hills is passed over that the principal agricultural districts are found. There are the farm settlements, the flocks and herds of the colony. From the Victoria Plains north of Toodyay, for hundreds of miles to the southward, comprising the fertile districts of Northam, York, Beverley, the Dale and the Hotham, is found a surface of stiff soil, covered over with straggling herbage, and many varieties of trees and shrubs.

The pattern of European settlement in Western Australia about 1840 would thus divide into three parallel north-south belts: a scatter of clusters (by the Swan, Canning, Murray, Leschenault, Vasse and Blackwood estuaries) along the western coastal plain; the relatively empty zone of jarrah forest east of the Darling Scarp; and farther east again a belt of intermittent settlement running from the Avon valley (the York-Northam-Toodyay area) down to King George Sound (cf. Hasluck 1942:25).

This third, pastoral, belt ran through the "savannah woodland" formation (Gardner 1942:xliv-xlviii and Plate X, p.ii) on the eastern margin of the jarrah forest where, as in Tasmania, anthropogenic factors might be expected to affect the balance between forest and open "parkland" and grassland.

East again are patches of sandheath. But the patchiness of the vegetation which is clear in early descriptions of areas east of a line from Albany to the Avon may be due as much to patchy firing as to soil differences. "T.W.H.", accompanying Dale eastward from the Avon in October 1830, described the first few miles as "country ... free from trees ... covered, where it is not burnt up, with a low scrub. This brought to my find an English common" (T.W.H. 1833:213).

Sandy shrub-heath country, reminding the explorers of English commons, may have had a similar genesis under a combination of firing and grazing pressures, "open common" alternating with "thick and almost impenetrable" bush (Dale 1833d:68). They continued to encounter

> ... considerable patches of land ... completely clear of timber ... There are hundreds and thousands of acres of land about this part entirely clear of wood, mostly sand ... open undulating country, very sandy ... a tract of better land with a fair quantity of wood ... two native huts ... the smoke of a native fire ... a view of the native fires .... the native grasses in this part are very good and grow very strong ...(T.W.H. 1833:214-18).

The extent to which "grassy forestland" may be the product of native burning is suggested by a later journey by Roe, who ranged well eastward into the mallee, but returned westward to the eastern margin of the forest north of Albany. Roe in 1848 travelled south-eastward from Perth towards Esperance. In November he passed over "tracts of country in which their fires were burning" (Roe 1852:15). He found early in December abreast of Esperance Bay that "tracks and fires of natives were numerous", and set up bivouac "amongst burnt sticks and scrub at a brackish pool". Returning westward he followed at one point "a beaten track of the natives behind the sea-coast hills". At the east side of the Stirling Range they encamped in "grassy forestland ... extensively fired by natives". On 18 January 1849, they travelled over "a grassy forest country" and next day found towards Bunbury, he crossed the Blackwood, where "whitegum became replaced by red ... better able to withstand periodic bushfires".

Irwin (1835:22) estimated the total Aboriginal population of the settled areas at no more than a thousand; other estimates were higher, Stirling attributing 750 to the Perth area alone (Ogle 1839:62). Moore (1884b:84) citied three thousand for the "located parts of the colony" in 1840.

Whichever the total, these few Aborigines had opened up a landscape in which it was possible for Europeans to move around, to pasture their flocks, to find good soils for agriculture, and water sources for themselves and their stock. The European communities inherited the possibilities of settlement and land-use from the Aboriginal communities. But in doing, they robbed these communities of the land which had mapped out the patterns of their existence. The dynamic design of the seasons with their appropriate and ineviatable economic, territorial, social and ceremonial round was disrupted. Yet each group remained tied to its land.

> Each tribe has its territory and landmarks. If but one is disturbed it experiences a difficulty in falling back, and retiring upon the tribes in its rear, who are similarly situated in their turn. They continue, therefore, to hover about their ancient grounds and depend for their subsistence upon them. (Irwin 1835:107).

The European community thus created the circumstances in which the skilled developers of the land appeared as indolent ne'er-do-wells, who needed encouragement to acquire the means of regular subsistence.

Deliberate or accidental, pasture improvement made possible European movement, and the expansion of European settlement, throughout and beyond the South-west.

It is remarkable that improvement by burning should apply not only to the drier country to the north and east, but also to parts of the dampest areas of the South-west.

> Even in the far south, burning made the land more attractive to European settlers. Grahame in 1861 found country west of Broke Inlet "covered with long coarse grass well adapted for cattle ... We cam across a party of natives who were burning the ground" (Stephens 1954:53). The timber country "consists chiefly of peppermint and tangin with some groves of blue gum (karri)."
>
> One can understand the conflict which ensued when on such "grasslands well adapted for cattle" the Aborigines came to complete an essential phase in their economic social and ceremonial year. Grahame' own homestead was near Kojonup. Here in 1862, "On 15 Dec my home and all it contained was destroyed by fire ... a native set my run on fire which spread to my house while I was absent". Such conflicts of interest were only ever resolved in one way.
>
> Eastward beyond the Avon valley into what is now the wheat belt, and east again towards the goldfields, the pattern persisted. For instance, the owners of the station at Jilakin Rock, 150 miles inland, obtained from an old sandalwooder the native legend of the isolated grove of jarrah trees there.

These trees remain at Jilikin Rock to this day.
As on continues to study the letters and reports of early settlers, explorers and 'agents' the evidence of Aboriginal exploitation continues to grow, and at the risk of labouring the point I will refer now to a document presented to the British at home by J Cross and titles "Expeditions W.A. - 1829-32. The document was designed to describe to prospective settlers (and others) the new land of Western Australia, and for this purpose summarises a number of expeditions by land carried out at the request of the administration of the new colony.

Cross himself in his introduction describes the land east of the ranges:

> It seems uniformly conceded by all exploring parties, that the great tract between Swan River and King George's Sound, bounded by the Darling Mountains on the west, and by unknown regions on the east, presents an undulating surface, averaging about 800 feet above sea level. The soil varies much in quality; in some places sandy, in others a rich loam, with rocky pasture, amidst regions of granite and limestone. Occasionally extensive forests of noble timber encumber the surface, and sometimes single trees, in all the luxuriance and pride of natural beauty, so decorate the scene, that the landscape resembles the spacious park of some wealthy proprietor, rather than a sylvan solitude in a newly discovered world.

Such writers, it must be realised, were very likely "expected" to avoid matters which might no appeal to investors or future settlers, and therefore the following expeditions are very likely for that reason carefully chosen. For my part I have extracted those portions which might support the purpose of this paper.

June 26, 1829 a party of officers and men from the "Challenger" landed at Cockburn Sound and explored the Canning River, and "..... travelled over about 12 miles of country, with generally an undulating grassy surface, thinly covered with trees of various dimensions ...."

Dr. J.B. Wilson - R.N. in a letter from King George Sound 15th Dec 1829 -

> About sunset we reached a valley, almost entirely destitute of trees. So much has been said of the scenery in New South Wales resembling noble English domains, that the comparison is rather trite. Imagine a

rich valley of considerable width, extending East and West as far as the eye can survey, bounded on the south and north by a succession of undulating and moderately elevated hills, thinly but sufficiently ornamented with trees of gigantic form, and you may have some conception of te beauty of the spot, where, near a pool of water, we bivouaced on Saturday evening. Mokare having shot a kangaroo of a large size, all the party were in high glee preparing the feast. We were now nearly seventy miles in a NW direction from the settlement.

Richard Dale, in describing his first excursion to trail the Helena in October 1829 indicates that the foothills of the Darling Ranges were grassy, and were very likely the "rolling down of grass" reported by the early Dutch as they passed along our coast...." at twenty minutes to 3 o'clock ascended the mountains, first passing over a hill about a hundred yards high, at the top of another conicala one, e found a rich soil and very good grass, which continued along the mountain for about a mile and a half ....."

In December 1829 Dale mounted a second expedition to trace the Helena, and 30 miles east of the Swan - (well into the Ranges - and having already passed "grass mixed with wild vetch of great luxuriance") walked "frequently over grassy country with good soil". Dale was in the "corridor" maintained by the Aborigines to communicate between the Eastern or Avon Valley areas and the Swan.

In October, 1830 Dale headed another expedition to the east of the Darling Range, and just SE of where York now stands ....." Arrived at extensive downs, of a breadth, at the part we crossed, of six miles "..... we calculated there might be from one to two thousand acres of very fair arable and pasture land in the vicinity ....." Passed over an extent of nearly 5 miles of beautifully fertile country, the grass on which was growing most luxuriously on rich soil, and was well adapted for agricultural and grazing purposes; infact, in the opinion of Mr Hardy, two acres of grass on this country were capable of supporting 3 sheep per annum.

In 1830 Roe explored the Dardanup and Collie River areas and named Mt Lennard "..... after one of my fellow travellers. It is well clothed with grass and timber, and may be about 18 hundred feet above the level of the sea.

"WELL CLOTHED WITH GRASS AND TIMBER!"
The reader may appreciate that for the most part the "grass lands" and "grassy forests" thus far referred to are probably now farmland. The very important "missing link" has been the open grassland type forest which has not been cleared and which can be clearly identified on the ground today, and which might yield some cluc as to the characteristics of such a site which might explain its tendency towards openess and grass.

Mt Lennard is now inside state forest, and apart from some very early felling, the absence of the Aborigine and his fires may be the most significant management change to which it has been subjected in say the last few hundred years.

In describing the Preston River area Roe refers to "... some level open plains, covered with grass, ... we could trace them as far as 5 or 6 miles across ...." We have read on numerous occasions where the country resembled "a fine English Park - or common, or the surrounds of a goodly mansion"

In J Cross's document he refers to an expedition along the SW coast, leader not named, and who, south of Port Leschenault, describes some country as ....." beautiful, much resembling a fine park in England, with

excellent timber, five or six to an acre." Here another piece falls into place, and helps develop a more accurate picture of what the settler or explorer might have been looking at when he described "..... open grassy forest etc."

Dale in 1831 explored N and S of mt Bakewell. His description of the grasslands there need not be repeated but it is interesting to note his comments of the Avon River. The water, in the course of the river being brackish, and in some places salt.

These comments apply to other parts of the Avon also and to other streams and rivers encountered by explorers. With present knowledge of the "flushing" effect of land clearing it may be possible to approximate the time and progress of "clearing" by Aborigines on that area. In any case it is evident once again that the style of management adopted by the Aborigine was causing similar prblems to later European "abuse" of the land.

In broader terms, Josephine Flood (archeology of the Dreamtime) describes use of fire by Aborigines.

> One of the Aborigines' most important artefacts was one that is largely invisible to the archaeologist: fire. Much of the vegetation encountered by early white settlers in Australia was not natural but artificial: an Aboriginal artefact created by thousands of years of burning the countryside. Even before the colonists started ring-barking the trees, humans had had a great impact on the Australian environment.
>
> There were many reasons for the extensive burning. it was used for signalling and also to make travel easier by clearing undergrowth along the route and killing snakes lurking in the bush. Aboriginal tracks were kept open by regular firing in the heavily timbered ranges of the Blue Mountains and in the dense tea-tree scrub of western Tasmania, and fire was also used to clear a path through the tropical grasslands of Arnhem land. Throughout the continent burning was used as an aid to hunting; animals could be speared or clubbed as they broke cover to escape the flames and creatures such as lizards could be later dug out of their holes, ready roasted.
>
> other uses of fire were for longer-term hunting strategies. After firing, the bush would regenerate, new grass would spring up and attract kangaroos and other herbivores, on which the hunters could prey. Likewise fire encouraged the regrowth of eucalypt trees and of edible plant foods, such as bracken roots, young leaves and shoots. The ashes acted like manure, and sweet, new green shoots would spring up after the first hard rain following the burn.
>
> Extensive and regular burning had the long-term effect of altering and actually extending man's habitat. Rhys Jones has convincingly demonstrated that the sedgeland of the west coast of Tasmania is a human artefact, the result of the long use of fire, which gradually changed the original rainforest, dominated by the fire-sensitive beech, Nothofagus, through a phase of mixed eucalypts and rainforest to scrub and finally heath and sedgeland. Now that Aborigines are no longer burning in Tasmania, in some places rainforest is re-invading its old habitat. Likewise in highland north Tasmania, explorer Henry Hellyer found open grasslands among the rainforest in 1827, and he named them the Surrey and Hampshire Hills after the rolling grassy downs of England. These grasslands provided perfect pastures for

sheep, but when Aborigines were no longer present to maintain them with a regular fire regime, sour grass and scrub took over, gradually obliterating the open land so that sheep-grazing stopped around 1845, with considerable loss to the non-fire-stick farmers.

The changes brought about in Tasmania by Aboriginal use of the fire-stick had the effect of increasing the amount and diversity of food available. Tasmanian rainforest is not rich in plant and animal food, whereas the mixed heath and wet scrub and grasslands that replaced it under the Aboriginal fire regime provided an abundance of game and plant food such as two of the carbohydrate staples of temperate Australia: bracken, a vigorous colonizer of newly burnt forest, and the grass-tree, of which the starchy pith of the trunk was eaten.

In different parts of the continent different fire regimes were used, adapted to local needs. In Arnhem Land the Anbara practice a fire-management programme that maintains the existing vegetation. They spare fire-sensitive areas, such as jungle thickets, which contain many edible plants that do not readily regenerate after burning. Here there are strong ritual prohibitions against burning: jungles are the home of spirits who, if disturbed by fire, would send smoke into the eyes of the fire-lighters and make them blind. Moreover, fire breaks are formed around such thickets: an area of about a kilometre broad is carefully burnt soon after the end of the wet season. Thus when the main burning is done between June and August in the dry season, the jungle-thickets are protected by a fire break of already-burnt grasslands. The reasons given by the Anbara for burning throw an interesting light on Aboriginal attitudes to fire. Fire was seen as necessary to clean up the country, and they regarded un-burnt grassland as neglected. Every part of the grasslands, savanna and eucalypt woodland of their own territory would be burnt regularly, at least once every three or four years.

Such regular, light burning was the pattern all over Australia at the time of first European contact. The fires were of low intensity, which meant that they consumed the litter of leaves and branches on the forest floors but did not burn down the trees. Without such regular burning, forest litter accumulates at a fast rate. This litter accumulation leads to disastrous wild fires, such as that of 7 February 1967, which threatened Hobart.

It is ironic that the Australian parklands and open woodlands so admired by the early settlers should have been created by the Aborigines they regarded as ignorant nomads. Yet when Aborigines were driven off their land and the regular, light burning ceased, the old grass turned sour, scrub invaded the parkland, and the settlers' fine houses, fences and sheep became victims of occasional uncontrollable bush fires. it has taken over a century for the European settler to learn from such mistakes, and now a system of controlled, regular burning has been instituted in many National Parks. In the recently declared Kakadu National Park in Arnhem Land, the burning is being done by local Aborigines.

Unlike modern conservationists, Aborigines never put out their fires. Camp fires were left burning, as were signal fires including those lit in a sequence to indicate the direction of travel of humans or game such as kangaroos. Hunting fires were likewise left to burn themselves out, and Richard Gould reports 23 square kilometres of country being burnt in the process of catching three feral cats. Indeed, Aborigines lit fires wich such apparent abandon that they have been called "peripatic pyromaniacs". Burning the country still continues in central and northern Australia, although instead of the fire-stick now lighted matches are tossed out of the back of trucks.

In the desert regions mosaic burning was usually carried out in winter, with parts, but not the whole, of an area being burnt. Much of the desert is clothed in clumps of prickly spinifex grass, which is of little economic value apart from the black, tarry gum it produces - a strong resinous adhesive used for fixing stone adzes to handles and other purposes. However, when large areas of spinifex are burnt, the burnt land is recolonized after rain by a variety of other desert plants more productive of food than spinifex. Gradually the country reverts to spinifex, but meanwhile there is likely to be an increased supply of edible plants such as the fruits of Solanum (wild tomatoes). These are the most important fruits of the desert people; they are up to the size of a nectarine, highly nutritious, full of Vitamin C, and hang on bushes for months with excellent storage quality. Another food plant which loves to crawl up burnt trees is the "wild banana", a vine with edible leaves, fruit and a yam-like root.

Aborigines in Arnhem Land have been observed to aim their fires in particular directions, and despite the apparent casual use of fire in the Western Desert, Gould "never encountered an occasion when a fire actually invaded an area that was already producing wild food crops." It seems that, as well as increasing their future food supply, they also protected their present food resources. Fire is the most versatile and important tool of hunter-gatherers. it is used for warmth; light, cooking, hunting, signalling, track making, and, whether intentionally or not, had the effect of improving the food supplies of prehistoric Australia.

The fire-stick was one of the few artefacts that was used all over prehistoric Australia at the time of contact with Europeans. The last thousand years had been a period of great regional diversity and complexity. There was no standard way of life but a series of remarkably different regional responses to varying environments, ranging from moth-hunting to sealing, from eel-trapping to cycad harvesting. There was not only diversity, but also intensification in the use of resources. The pace of change was quickening - who knows where this initiative and creativity might not have led Aboriginal society, had not hose ships of doom sailed into Sydney Harbour in 1788.

It is here that one might ponder either the credibility of some writers and historians, or the extent to which we have been able to <u>properly understand</u> the Aborigine and his use of fire.

He is variously described as using fire under hot, dry conditions in an indiscriminate manner, to carefully regulating his burns under mild conditions in the same general area.

Flood claims that "such regular light burning was the pattern all over Australia at the time of European contact - of low intensity - did not burn down the trees".

There is evidence that in the S.W. of Western Australia the "forest" areas were neglected by the Aborigines and that these "Firestick Farmers" from the flats and river valleys showed little interest in their fires that swept unrestrained into the hills. Trees were severely damaged and destroyed while other areas remained unburned for many years.

In European eyes this was seen as irresponsible. The complexity of the issue deepens when it is noted that although Flood may be correct in that due to lack of burning by Europeans, fuel build up occurred followed by disastrous fires, but the majority of white farmers suffered losses from fire during the traditional Aboriginal burns when these were carried out each year during the dry season, and that the fuel build up in these instances was the grass generated by previous Aboriginal burns.

I think that here again, the emphasis is upon the development, maintenance and extension of grasslands and access by the Aborigine. The question may well be raised as to why, after all this time, had not the upland forests succumbed to the firestick and "turned to grass".

To this I would suggest the answer that to a certain extent this did occur, and there would have been marginal areas of open forest as a result of uncontrolled native fires. The development of grass, however, and thus the maintainence of such an open forest situation, would be dependent upon soil type suitable to sustain grass, and for the bulk of the upland forest this did not occur.

It appears that the Aborigine did develop some access ways across the ranges, especially east of the Swan River settlement to the grasslands of the Avon valley, and early explorers, i.e. Ensign Dale 1830, report Aborigine contact during his way east over the ranges to the rich grassy country of this valley.

It is worthy of mention at this stage that the extensive grasslands of the Avon valley were matched by similar grassland all along the eastern side of the ranges, but were eclipsed by the vast stretches of grassland discovered by Gregory in the North, and Nancy Withnell Taylor writes...

> Supplies were dangerously low; the horses were knocked up so much they could scarcely walk and Gregory himself was ill. He had eaten some dwarf mesembryanthemum which he had observed being used as food by the natives on the Gascoyne. This caused him a violent headache and vomiting. He decided to return to the depot in Nichol Bay.
>
> On the return journey they crossed and named the Sherlock, George, Jones and Harding rivers and discovered fertile and well-grassed flats of some two hundred thousand acres, now the rich Tableland pastoral country.
>
> They discovered and named Yule, Strelley and Shaw Rivers. They followed a tributary of the Shaw River and named it the De Grey River. Leaving open grassy plains, further east they named the Oakover River where they entered extensive sand plains with ridges of red drift sand. The Oakover River was followed to its junction with the De Grey where, one each side, there were stretches of fine pasture.
>
> Passed over 3,000,000 acres of good grazing land and 200,000 acres of land suitable for agriculture.
> The flora was most brilliant, differing from that around Perth.
> Rivers named Ashburton, De Grey, Fortesque, Oakover, Sherlock, Harding, Maitland and others. All were fresh and abounded in fish, principally cobbler which weighed about five pounds and were found far inland.
>
> In his letters to his sister dated May 1863 Charles Nairn gives some idea of the country and his impressions:
>
> > ...the spinifex very quickly sprouts after being burnt and in that state is eaten by stock so in case of all the grass country becoming burnt we shall very likely find spinifex a good standby.. Grass is up to the horses backs - a new kind of tree "Walnut" which resembles the walnut tree in Europe in girth, leaves and fruit. The shell is very thick and hard and the kernel small, the taste and shape similar.
>
> Francis Gregory was a cousin of Emma Withnell's on her maternal side. Upon his return he had given her an autographed copy of his "Journal of Exploration" and as with Walter Padbury spoke most enthusiastically of the luscious pastures, good fertile plains, the beauty of the country, especially around the De Grey and Sherlock Rivers - he

urged them to consider taking up some of the free runs that were being offered by the Government.

Upon their return the report of the exploration part of the journey given by Inspector Panter, the leader, read:

> ... the country around Cape Villaret (Roebuck Bay) is splendid. About 40,000 acres is splendid pasture with abundant water ...

Dr. Martin, the Botanist, was even more emphatic and wrote:

> ... vegetation was luxuriant, animals, birds and fish were plentiful; the oyster abundant and millions of acres of good pastoral country was available. In the Glenelg district pouch bearing animals were very numerous, and emus, geese, ducks, bustards, dugongs, turtles, crabs and crayfish were innumerable...

The report was valuable to the colony.
A pamphlet was prepared by the Surveyor-General Capt. J Roe and distributed throughout Australia.

In June 1866 R.J. Sholl with another son Horace, who had only shortly arrived, and John Withnell, rode out to the Nichol Bay to look at a harbour said to exist there. It had been previously sounded and had a depth of water not exceeding two and a quarter fathoms at high tide. They found the course worthless but they were most impressed with the twenty thousand acres of grassy plain there, and some of the remaining Denison Plains men applied for leases in the area.

CONCLUSION

It is perhaps now evident that the Aborigines fire farming techniques were so extraordinarily successful that one can only express amazement that the European submission of Aborigines not using the land was ever lent credibility, let alone allowed to persist for so long to this day.

It is almost beyond belief that "modern man" could so eagerly occupy these ready made grasslands, pretend that they just happened somehow, and justify his actions of displacing the current owner, who, would you believe, just happened to "find" them also, by resurrecting an ancient Anglo Saxon law which infers that unmanaged land can be taken by anyone!!

I must now wind up this paper by pointing out that its purpose has not been to raise land rights issues or argue the Aboriginal case for restitution, but to put together information to support my view that the Aboriginal application of fire in and around our forest should not be seen as a model for forest management today. Fire should continue to be seen as potentially damaging and destructive to forests and regulated accordingly.

Hot fires have certainly occured over a long period of time, often with "awful" effects, and some of our forest trees are certainly fire tolerant to a degree. However, European foresters have added a dimension to forest management - timber production - and undiscriminate application of fire by Aborigines together with lightning strikes in forests behind the Darling Scarp was not necessarily conducive to the production of sawlogs.

Some fine open forests were produced in the better soils where grass would develop east and west of the present forest, and could have resembled a kind of agro-forestry. Although much of this land is now cleared, a duplication is probably possible in these areas by the planting of trees, grazing and application of fire in much the same way as carried out by the Aborigine. However any type of duplication of Aboriginal or lightning fires in the forests east of the scarp and southwards would at best reproduce a patchwork of dense thickets, severe damage and some clean open forest, but more likely, due to the added interference by logging, thinning and clearing, would bring about the destruction of some areas through potential burning of regeneration.

Aboriginal management was bringing about the gradual demise of these heavily timbered forests. European foresters aim to reverse this.

In preparing this, and other papers I have discovered an awesome mass of material relating to our early history and felt the urge to try to find some one to thank for the relatively short duration of our occupation of this land.

I believe that I have also discovered to my satisfaction for now at least, one or two of the very basic factors influencing the development or persistence of Aboriginal grasslands.

The first clue, I believe is the distribution of sites which lend themselves more readily to the growth of grass; and less readily to the growth of trees. This may appear fairly obvious of course, but European farming and forest management techniques now cloud the issue and these sites are no longer easily recognised on the ground.

The next clue might be to try to determine how these sites might be effected by natural factors of a consistent nature such as the seasons of the year, and as a result more easily recognised. For instance drought and water gaining may tip the balance in favour of grass.

Finally, what is it that the aboriginal could do that might further the balance in favour of grass. It is unlikely that he would have been able to irrigate or add water to any great extent, but he could assist in the "drought" areas by burning, and by burning at the right time.

Reflecting back to Roe's discovery of Mt Lennard and the grass and trees that he found there, and bearing in mind that Mt Lennard is easily identified, and only marginally disturbed by Europeans, it should be possible to recognise now, the natural factors which might be tipping the balance in favour of grass.

I have visited Mt Lennard and believe that the answer is there, and is applicable to many other areas which in turn I believe can now be recognised.

A large portion of Mt Lennard and the adjoining valley and adjacent slopes, consists of granitic loam with granite outcrops. Granite appears to be close to the surface on other places and although appearing to support vigorous growth of trees, shrubs etc. for periods, there is evidence that dry spells preclude or retard their development and in many places deaths occur at an early age. There are few large trees and little evidence of their presence in the past. Some 'marginal' areas have developed a young and apparently healthy forest.

It is not difficult to predict the effect that an Autumn or late summer fire would have on this area, and given the presence of the seed of native grass and the current grazing pressure from the surrounding forest, it is surely likely that we could become successful "Firestick Farmers".! Some restoration of ecological balance may take place also, and in this respect I suppose it would be unrealistic to expect Aborigines to embrace the idea of repossessing the mount!

On the serious side once again, it is possible, I believe to reliably recognise a duplication of the Mt Lennard situation along the scarp and mainly inside private property where more drought deaths occur each year. Some of these are possibly the "rolling downs of grass" of yesteryear, so often mentioned by the mariners that visited our coasts as far back as the 15th century.