THE NEED FOR PRESCRIBED BURNING IN DESERT CONSERVATION RESERVES

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INTRODUCTION

The Department of Conservation and Land Management is charged with the management of several million hectares of desert conservation reserves. At present these areas receive no real on-ground management; management is currently restricted to occasional visits by staff from Kalgoorlie and Perth.

Is management needed? Since the reserves are large and in a remote area that has not been disturbed by agriculture, pastoralism or mining some might argue that the land should be left alone so that natural processes can continue to shape the ecology of the land and its wildlife. Unfortunately this is not a viable option.

Research work carried out over the past decade and a half has shown that there has been a massive decline in the formerly species-rich mammal fauna (Burbidge et al. 1976, 1986, in press, McKenzie and Burbidge 19xx, Burbidge and Fuller 197x, Gibson 1986). Some once common bird species have also disappeared, notably the Mallee-fowl (Kimber 198x) and Night Parrot, but there is no evidence of any change in abundance of reptiles or other organisms.

Three main hypotheses have been put forward to account for the massive decline in arid zone mammals - changes in fire regimes, the effects of exotic predators and competition from exotic herbivores.

The first hypothesis suggests that major changes in fire regimes resulted from the depopulating of the deserts. Aborigines used fire for hunting, the regeneration of food plants and signalling, as well as for numerous other purposes (Gould 1971, Kimber 1983, Burbidge 1985). These uses are thought to have resulted in a mosaic of areas of differing age since fire, as well as promoting fires at different seasons, providing an environmental diversity that favoured the mammals and preventing the development of extensive wildfires in summer. As the Aborigines left their traditional lands for European settlements and missions a "natural" fire regime took over - one of infrequent but very extensive, hot summer wildfires, usually started by lightning. This change is thought to have had a profound

effect on the mammals, depriving them of the diversity of shelter and feeding areas that they required, destroying habitat over very large areas and leading to a rapid decline and local or total extinction.

The second hypothesis suggests that the indigenous mammals could not cope with exotic predators. Feral cats and foxes are now widespread and abundant in the deserts. It is not known when cats first became established, but they were present when European explorers entered the area in the latter half of the 19th century. Most Aborigines residing in the central deserts regard cats as always having been present and some indicate that they moved into central Australia from the west, so they may have established from 17th century shipwrecks on the west coast (Burbidge et al. in press). Foxes entered later, becoming established in parts of the centre by the 1930s (Finlayson 1961, Griffin & Friedel 1984, King & Smith 1985).

Rabbits entered from the south-east, first appearing in southern Northern Territory and arid Western Australia in the 1890s and becoming widespread shortly afterwards. Population size has fluctuated since then. Present rabbit distribution is mainly south of the Tropic of Capricorn with pockets in favourable country to the north (Griffin & Friedel 1984). The One-humped Camel became feral from escapes from pack animals first used in the latter half of the 19th century (Newman 1983). They are now very abundant throughout the deserts.

If the decline of the various species of mammal coincided with the time that the Aborigines left their country, as Burbidge et al. (in press) were told by Aborigines, then this would support the hypothesis that changes in fire regimes wee the primary factor leading to the decline of so many species from the central deserts. Their informants also told them that foxes did not become established in many areas until after the mammals had gone, and it is clear that in much of the northern half of the arid zone rabbits were never common except in particular habitats and none of the indigenous species were restricted to these.

If the decline of the mammals is to be halted and reversed it is clear that active management is needed to return the country to a fire regime similar to that prevailing under Aboriginal management and to control foxes and cats.

The Department of Conservation and Land Management is, therefore planning to develop the technology to burn desert conservation reserves, utilizing aircraft ignition. It is also working on methods to control foxes and cats over extensive areas following the successful application of control methods over relatively small areas in the south west of the State (Kinnear et al. in press).

ABORIGINAL BURNING

It is essential to develop a good understanding of Aboriginal burning practices before prescribing fires for desert reserves.

From 2 - 8 August, 1987, we talked to Pintupi people in the Kintore - Kiwirrkurra area about the traditional use of fire, especially bushfires. Many people in this area have only recently come in contact with European society and retain a profound knowledge of their previous nomadic lifestyle.

The interviews were conducted with the aid of a Pintupi linguist, John Heffernan, who lives at Papunya, N.T. John was employed on a consultant basis for eight days. We left Perth on July 29 and drove to Papunya via Kalgoorlie, Warburton, Giles and Walungurru (Kintore), arriving on 1 August. For the next week we talked with Pintupi Aborigines in settlement and outstations as far west as Kiwirrkurra.

Some difficulty was experienced obtaining interviews because of two local events. The first weekend we were in the area was a long weekend in the N.T. and a sports meeting was held at Yuendumu to which many local people went. However, some of the older people stayed at the settlements we were visiting and this was not a major problem. Of much greater significance was the iniation ceremony being conducted at Kiwirrkurra; many of the old people we knew from previous visits to the area were taking part. Some measure of the importance of this ceremony was that it involved men from Punmu as well as settlements closer by. When we arrived at Kiwirrkurra we were not allowed to move about the area freely. We had planned to take some informants away from the outstation to discuss fire in localities that had been burnt recently, but this was out of the question.

Additionally, because of the ceremony, many of the smaller outstations were devoid of people, meaning that the number of interviews we could conduct was limited. After one or two interviews have been carried out at one place it is almost impossible to talk to new informants without people from earlier interviews wandering up and prompting the people you are talking to, making independent corroboration of information difficult.

In all we conducted nine interviews, as well as talking about the local mammals to two other groups. As usual we took with us a box of puppet skins of some of the now locally (or totally) extinct species and this always proved both a drawcard and a means of initiating interviews. Sometimes it was difficult to make the jump from mammals to the more abstract question of fire, but in most cases this proved possible, even though some people would become bored and wander away part way through an interview.

RESULTS

We set out a series of questions for John Heffernan to ask and modified these as we went along. The following summary is from the answers we received.

Words for fire

waru is universally and commonly used for fire. It is also used to mean firewood. Walu is the walpiri equivalent

kunparatji is close relationship speech for waru.

kurrkalpa, malarra and kinparitji are words for cooking firewood.

tjangi is a firestick.

puyu is smoke.

kunarurru is a signalling fire in the distance (also a distant smoke haze?).

tili is flame.

tilirninpa is to make fire. Both men and women were able to ignite fire, although the implements used differed. Men used a mirru (spearthrower) on a piece of soft wood, often a kurtitji (a shield made from Erythrina vespertilio wood); the verb for this is patjipunginpa. Women used a fire drill. Both sexes commonly carried firesticks. (We did not not try to exhaustively research this facet of fire; the above information came up almost incidentally to our main discussion.)

Words for burning off the country

nyaru is most commonly used. Lunta and yarrpara are synonyms. Nyaruninpa is the verb: to burn off the country.

Uses of fire

Aborigines use fire for a variety of purposes (Jones 1969, Gould 1971, Latz and Griffin 1978). These include signalling, to clear the ground, hunting, regeneration of food plants and for fun. Jones (1969) suggests that one use was to extend man's habitat - to create more open country.

Pintupi people often refer to "cleaning up the country" with fire; we are not sure we fully understand what they meant by this but took it to be a combination of clearing ground for travel and regenerating food plants. Kimber (1983) describes "cleaning" fires thus: "it will 'make that bush tucker come up'; it allows very easy hunting of goannas as their tracks and fresh mounds at the entrance of their holes

stand out; it permits easy travel; and it gives a clear view when hunting larger game. In addition, cleaning of grass about an important native well or other site is viewed as a method of promoting fresh plant-growth for animals..." (p. 40).

Information about "cleaning up the country" fires and hunting fires

In our interviews with Pintupi people it was sometimes difficult to distinguish between information about fires lit for hunting and about those lit to "clean up" the country. Although it is clear that such a distinction exists, a single fire was commonly used for both purposes.

We were told that everyone can light fires to hunt or "clean up", even children. We were frequently given long lists of animal species that were driven by fire. So far as the larger mammals (bandicoots and wallabies upwards) are concerned it seems that all species except those that inhabited burrows were hunted in this way. Many reptiles were obtained by this method as well.

Hunting and regeneration fires travelled varying distances. While it is clear that some fires went out quickly it is also clear that some fires travelled relatively long distances. When we asked about the distance travelled we were usually told that it depended on the amount of fuel and the wind.

Some quotes from our interview reports are:

> How large did fires get in the old days?: "You could follow a fire for up to a few days. Some were big and some were small. Fires would often go out at night; sometimes they would go on for several days."
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> How large did fires get in the old days?: "You would follow a fire, camp overnight; maybe follow it again the next day."
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> How large did fires get in the old days?: "Sometimes they could get quite large; could go for five nights." One fire mentioned went from Kiwirrkurra to Jupiter Well (ca 130 km). An informant from near Tjukala said that in old days fires often went a short distance and they would often have to light them again. One recent fire went from Kiwirrkurra to Kintore (ca 180 km).
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> We were told of a fire that had been lit around Walungurru and travelled to Mt Liebig (ca 200 km). This was fairly recently and was considered a large fire.
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> What would people look for when deciding to light up?: "When spinifex gets dense, sometimes you would light up

small grass areas, often you would have to light these areas several times; it would depend on wind and rain."

People would come back to a burnt area after rains about a year later to gather food and track goannas.

"You burn to bring up the green shoots."

"Would burn areas and hunt while the fire was burning; then you would move on and return to those areas some time later to collect food from the plants that had regenerated and animals that had moved in to feed on those plants".

Which animals can you find in country some time after fire?: "You could burn up the country, go away, visit family and relatives, come back after rain when animals would be there."

"Kids would burn off the country to catch lizards."

"Fires would make it easier to track animals."

"The people would walk and keep up with the fire front so they could hit kuka (literally meat, in this context actually refers to mammals) on the head as they came out."

The people could tell whether an area needed burning by the amount of growth and if there was a lot of tracks. If, for example, they saw a lot of mala (Rufous Hare-wallaby) or goanna tracks they would burn so that they could follow the tracks and see the burrows.

Mala would move into sandhill areas to eat fresh plants after fire and rain. Mala were hunted with fire and chased two or three hundred metres.

On the use of fire today: "No need to go hunting with fire any more because there is no longer any kuka there".

How often were hunting fires lit? Every day? "Yuwa" (yes).

When it was suggested to one group that the mammals might have disappeared because the people were no longer out in the bush lighting fires we received the reply: "That would be right; no longer any green shoots".

Signalling fires

These were often lit and had two main purposes: for communication between members of one group, e.g. the women would light a fire to let the men know that they had

collected food, and for communication between different groups, e.g. a party entering another groups' land would light fires to let them know that they were coming.

> "Signal fire messages travel quick, little bit like the telephone."

Signalling fires were also used for hunting; we got the clear impression that if a signalling fire went well it was too good an opportunity to miss.

Regeneration of food plants

Pintupi people have a good understanding of the relationship between fire and the germination of many important food plants. We were frequently given long lists of plants that come up after fire and rain. Ukiri is generic for new growth and mirrka is a collective word for all the bush (non-kuka) foods. Some of the commonly mentioned species were:

kalpari - Dysphania kalpari
kampurarrpa = yakatjirri - Solanum centrale, desert gooseberry
kilkirti - ?.
pangkuna - ?Cassia
pintalpa - Solanums
pura - ?Solanum sp.
tjani - ?
tjulu - (specimen collected)
wakarti = wayarli - Portulacca aff. oleracea, inland pigweed
wangki - Solanum ellipticum, wild gooseberry
wangunu - Eragrostis eriopoda, naked woollybutt.
yalkara - ?

Lightning fires

We were told that lightning could start fires anytime during the hotter months. One informant described the start of the lightning season as the time when goanras come out of their burrows. Lightning fires were more common on hills but also occurred on the plains. Some people told us that lightning fires were not under their control so they could not have much to do with them. Others, however, said that lightning fires were used for hunting if suitable for this purpose; all were agreed that no good fire should be ignored if it was suitable for hunting.

Fire Animals

As previously reported (Burbidge et al. in press) Pintupi people (and other Western Desert Aborigines) regret the passing of the medium sized mammals and want them returned to their country. A quote from one interview:

The men asked us which mammals are still around in other places "where the government is looking after them". They said they were worried that all the animals had finished in their country. They would be pleased to see the animals back because they had been eating white-fellows' meat for so long they had become weak; they wanted to eat their own kuka (meat = mammals) again so they would be strong again.

FIRE FREQUENCY TODAY

Neil Burrows' data from QVSNR and GDNR

DISCUSSION

The short trip described above can not be substitute for careful long-term investigations by anthropologists and biologists working with Aboriginal people. However, these data supplement other work and helped us get some familiarity with Aboriginal burning so we could better interpret the literature on this subject. The difficulty is that there is some disagreement on the extent, frequency and effects of Aboriginal burning of the environment. Much of the debate has centred around the proposition that Aborigines purposely managed the land with fire; this is often termed "firestick farming".

It is clear that Aboriginal use of fire and the effects of that use varied considerably in different parts of Australia, so we will restrict our discussion here to the western deserts; areas that are dominated by Triodia and Plectrachne hummock grasslands, particularly Triodia basedowii and Plectrachne schinzii.

The firestick farming hypothesis suggests that Aboriginal fire usage resulted in (or was designed to cause) a change to the nature, season and frequency of fires in an area regularly visited for hunting and gathering (Jones 1969). Those that disagree believe that there is a natural potential fire regime that Aborigines observed and made use of. Horton (1982) suggested that in order to demonstrate the reality of firestick farming it would need to be shown:

(a) That the average frequency of fires was greater than the potential fire frequency determined by climate and vegetation type.

(b) That such burning occurred at a different time of year to the normal fire occurrence as determined by climate and vegetation type.

(c) That such increased frequency resulted in extensive and progressive shifts in the boundaries of vegetation types.

He stated that "these requirements have not been fulfilled by the evidence to date and it seems likely that they will not be fulfilled - they are not compatible with the distributions and adaptations of animals and plants in Australia" (p. 248).

There is little information on past fire frequency in the deserts. Information on past fire occurrence in spinifex deserts has been summarized from explorers journals and other sources by Kimber (1983), who concluded "that Aborigines made extensive use of fire, more often than not in a relatively controlled situation" (p. 40). Data presented here show that, in two desert nature reserves, fire is now infrequent and extensive. This is supported by our interviews with Pintupi people and by other work (refs).

With regard to Horton"s point (b) it is clear that Aborigines did burn at different times of the year to the normal fire occurrence. Our interviews show that fires were lit the year round, compared to a much shorter season of lightning-induced fires. The only other published information on fires lit by Pintupi people is from Kimber (1983), who also worked with other adjacent language groups, and Gould (1971) who reported on Aboriginal use of fire in similar areas to the south west, closer to the Gibson Desert Nature Reserve.

The information we collected in our brief visit to Pintupi lands is generally supported by Kimber's work. He describes fires being lit at all times of the year, although he suggests that fires were much more extensive in early summer before the rains. Gould also reports fires at all times of the year.

Horton's point (c) relates more to wetter, more complexly vegetated areas. However, one of his main arguments is that the idea mosaic burning by Aborigines is a myth. In the desert areas under discussion here mosaic fires have been discussed in the context of fire size: the hypothesis has been put forward that past fires were, on average, significantly smaller than those of today because the numerous Aboriginal fires created many low fuel areas, preventing the development of extensive conflagrations. Our interview information, and the information provided by Kimber, support this view. It seems that past fires did vary considerably in size depending on fuel and weather, but that most fires were relatively small; Kimber suggests that "small patch-burning", occurring generally in the March to August period, ranged from a few square metres to 5-10 square kilometeres and that more extensive burning, generally in the October to January period, occasionally resulted in very large fires, from 30 kilometres to 150 kilometres in traverse. Our data support these statements.

One area where Kimber's conclusions are not supported by our interviews is in relation to the protection of mulga stands. Kimber maintains that Aborigines "knew the susceptibility of

mulga to destruction by fire and preferred not to fire it." In contrast, when we asked if mulga country was burnt as well as spinifex country we were consistently told that it was. We have seen numerous areas of recently-burnt mulga near Aboriginal communities during visits to the western desert and have never heard any disquiet being expressed by Aborinal people; any comments we have heard were that the fires were "a good thing since they cleaned up the country".

Finally, Horton states that firestick farming is not compatable with the distributions and adaptations of plants and animals in Australia. In arguing for this proposition Horton accepts that firestick farming would have burned most county very often ("every two or three years" p. 243) and presents evidence that many species cannot tolerate fires of that frequency. Kimber's work shows clearly that, although fire was commonly and extensively used in the spinifex deserts, there were many areas that remained unburned for long periods. We suggest that Horton's arguments are based on a false premise.

CONCLUSIONS

Pintupi people used fire almost every day for hunting and, perhaps less frequently, for signalling and "cleaning up the country". While it seems clear that fires today are both much less frequent and, on the average, much larger, it also seems clear that past fires varied considerably in size. People tend to remember the unusual, so the very large (>100 km) fires we were told of were probably the exception rather than the rule. However, fires that ran for two or three days were apparently not uncommon. All vegetation types were burnt and we were frequently told that there was no attempt to protect mulga (*Acacia aneura*) communities from fire. The only areas protected from fires were certain sacred sites, although a fire would not be lit in dangerous situations, e.g. if it was likely that it would burn out someone's camp.

The people have a clear understanding of the relationship between fire and the regeneration of food plants that occurs after rain. There seemed to be a lesser understanding of the relationship between fire and the provision of mammal habitat.

As suggested by a number of authors, environmental heterogeneity would have been much greater under the fire regime maintained by desert Aborigines than it is today. The number of fires in the area now occupied by Pintupi people, especially around Kiwirrkurra, is clearly much greater than is the case, for example, in the Gibson Desert Nature Reserve. However, our observations suggest that the number of hunting fires in this area has decreased since our first visit in 1983. There is now little incentive to hunt with fire because of the local extinction of the critical weight range mammals and the availability of food in shops.

Obviously, we can not depend on Aboriginal communities to re-establish the old fire regimes, even close to settlements - if this is to be done it will have to be by those charged with the management of the land. The most effective method available for prescribed burning in the spinifex deserts is aerial prescribed burning.

From the information discussed above it seems clear that fire prescriptions for the Gibson Desert Nature Reserve can be reasonably flexible in terms of the size of fires and the type of vegetation burned. Fires were lit all year round; at present we propose to start prescribed burning in the cooler months when fires can be expected to go out during the night. We may not be able to prescribe fires in summer for some time; however this should be possible in a few years when a fire mosaic has been established.

AERIAL PRESCRIBED BURNING 1988 TO 1992

here we should describe our plans, including fire effects studies.

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