

CHAPTER SIX

OTHER ISSUES

1. Earlier parts of this report have dealt with the management of the major activities affecting the Park. This section presents a brief discussion of the management issues for other factors: viz the scientific resource, crocodiles, introduced species and fire.

THE SCIENTIFIC RESOURCE

2. The great diversity of the Park in species, habitat, climate, soil and geomorphology, requires informed and flexible management, scientific monitoring and research.¹ However, quite apart from the research needed for effective management, the Park also offers scientists a unique opportunity to contribute to the study of various fields. CSIRO, for example, contended that Kakadu was an important area for the investigation of tropical ecology and that studies conducted there could establish leadership in this field.²

3. The Park plan of management acknowledges that research is an essential element of Park management. In particular, research which provides information relevant to Park management is to be encouraged, with ANPWS providing funding where appropriate. Research would also be funded by other Government sources. Research programs are to be undertaken only after consultation with Aboriginal people and have to be conducted in such a way that there are no detrimental effects on the status of species, the enjoyment of the Park by other users, the lifestyle of Aboriginal people, or on Aboriginal sites and other areas.³ A

permit from the Director of ANPWS is required for research under regulation 7B of the National Parks and Wildlife Regulations.

4. Research and surveys in the region have covered subject matters such as fragile habitats, flora and fauna, mineralogy, fire, water (hydrology), urban studies and studies relating to Aboriginal languages and lifestyle as affected by uranium mining and tourism. A more detailed list of studies and surveys is included in the plan of management⁴.

5. A number of organisations have carried out research or survey work in the Park, including CSIRO, the Office of the Supervising Scientist, ANPWS, universities, mining and other private companies, the Northern Territory Museum of Arts and Sciences, the National Botanic Gardens and the Australian Institute of Aboriginal Studies. ANPWS conducts 'in-house' research programs using its own staff and also funds research programs conducted by personnel from organisations such as those listed above and the Queensland Conservation Council.⁵

6. The CSIRO Division of Wildlife and Rangelands Research, the principal research body active in Kakadu⁶, has carried out research at Kapalga, an area in the Park of about 670 square kilometres which was set aside for use by CSIRO for 15 years in 1976. In the same year it was also declared a wildlife protection area. Kapalga is held by CSIRO as a 'permissive tenancy'⁷. CSIRO has about 25 staff working at Kapalga and about 50 staff working in Darwin.⁸ Recent years have shown a marked increase in the number of scientists working at Kapalga and, according to CSIRO, this will assist greatly in the future documentation and understanding of ecosystems and their management in the wet-dry tropics of Australia.⁹ More than 35 CSIRO scientific publications on the subjects of work undertaken at Kapalga are now available¹⁰

7. Studies and surveys undertaken by CSIRO at Kapalga include:

- . Kakadu Fauna Survey;
- . weeds in KNP;
- . vegetation map of KNP;
- . woody plants at Kapalga;
- . joint research with ANPWS on feral buffalo at Kapalga;
- . land use potential of the Gimbat and Goodparla pastoral leases; and
- . survey of fish and crustaceans in the East Alligator estuary.

8. The determination of the physical, biological, and social carrying capacity of the Park is essential for effective management. CSIRO research has contributed substantially to these endeavours. Research into the effects of mining on vegetation and weeds, indigenous and feral animals, fire and pollution has made a valuable contribution in this area.¹¹ For example, one conclusion reached has been that fragile areas could be at risk if tourism is intensified. Erosion, weed intrusion, increased frequency of fire and disturbance of reptiles and frogs are some of the possible consequences.¹² CSIRO considers further research necessary to assist with effective management.¹³

9. The other major organisation carrying out research in the Park is the Office of the Supervising Scientist (OSS). The Supervising Scientist has a statutory research role in the protection of the environment, in the Alligator Rivers Region, from the effects of uranium mining operations. Specific issues for investigation include:

- . water management;
- . tailings management;
- . occupational hygiene;

- . environment monitoring; and
- . rehabilitation.

10. The Supervising Scientist reports to the Minister and through him to the Parliament on the work undertaken in the region.¹⁴ The scientific work of the Office is carried out by the Alligator Rivers Region Research Institute, which has laboratories in Jabiru.

11. The work of the Office of the Supervising Scientist, although primarily directed to the environmental impact of uranium mining operations in the region, has other benefits. For example, its research will assist with measures for the protection of the Park under article 5 of the Convention for the Protection of World Cultural and National Heritage in relation to:

- . knowledge of Australian tropical freshwater systems;
- . design of long-lived earth and rock-filled structures (geomorphology research); and
- . uranium mining elsewhere and mining of other materials.¹⁵

12. Rehabilitation is an essential part of a mining program in the region. Ranger is required each year to submit a national Plan of Rehabilitation to the Commonwealth Minister for Primary Industries and Energy. This provides a basis for estimating the cost of rehabilitation of the mine site, should mining operations cease¹⁶. Longer term plans for rehabilitation, especially those for the use of the mine pit for final disposal of tailings, remain under review.¹⁷ Rehabilitation and decommissioning proposals for Nabarlek are continuing to be developed by Queensland Mines Limited.¹⁸

13. Research results are clearly necessary for the day to day management of the Park and for developing baseline data against which the impact of any proposed changes in management practice can be assessed. The Committee believes in addition that environmental impact assessments should be necessary before any decision is taken about a major development in the Park.

14. Scientific research should play a major role in any such assessment, particularly where it relates to tourism and/or mining. Identification of rare and endangered species and work in the social field are also important. Scientific research has an important impact on the management of the Park and the management of mining in the region. For example, the Kakadu Fauna Survey Final Report prepared by CSIRO contained a number of recommendations relating to fauna, flora, fire and visitors to the Park. The report identified rare and endangered species, introduced species and urged elimination of the latter. It also advocated the supply of watering sites and the preservation of fragile habitats.¹⁹

CROCODILES

Introduction

15. Both the saltwater estuarine crocodile (Crocodylus porosus), and the freshwater crocodile (Crocodylus johnstoni), are present in the Park. The freshwater species lives in permanent bodies of freshwater and in the upper reaches of rivers which persist during the dry season as discontinuous chains of waterholes or billabongs. The estuarine crocodile lives in the tidal wetlands. The two species overlap where estuarine crocodiles occur in freshwater environments. To a lesser extent, the freshwater crocodile is recorded in saline tidal regions of rivers.²⁰

16. Crocodiles and their eggs are a traditional food source for Aborigines. Because of their aggressive nature, 'problem' crocodiles have been hunted and killed to prevent attack. Some flood plains tend to be avoided because of the crocodile danger to humans.

17. It has been suggested that crocodiles are threatened in the following ways:

- . crocodiles drown in fish nets in rivers and billabongs;
- . crocodiles may be killed for their hides as both species are commercially valuable; and
- . crocodile nests, eggs and habitats may be trampled, eaten or otherwise damaged by introduced species, e.g. water buffalo and feral pigs, and native species, e.g. goanna.²¹

So far there has been no suggestion that the crocodile population has been affected by pollution from mining. Dr H. Messel said that he had taken 'careful note of Magela Creek' as he considered it to be an area that might show early signs of pollution. From his studies he claimed there was 'no evidence whatever that they [the crocodiles] have been affected'.²²

Protection

18. Crocodiles are an important component of the region's ecosystems. As carnivores they regulate the abundance of other animals and so help to maintain the natural balance and conserve the character of the waters they inhabit. However, in the past crocodiles have been hunted for their skins. Initially the large, saltwater crocodile was most popular with hunters. However, as numbers declined, hunters took larger numbers of the freshwater crocodile. As it became clear that crocodile numbers were

becoming seriously depleted in Australia, protective legislation was enacted. Crocodile numbers are now increasing.²³ In relation to saltwater crocodiles CSIRO have stated that 'the Australian population is probably now the best in the world'.²⁴

19. At the 16th session of the General Assembly of the International Union for the Conservation of Nature and Natural Resources (IUCN) in Madrid in 1984, the crocodile specialist group expressed its support of the Australian proposal to the Convention in Trade of Endangered Species (CITES) to transfer the Australian population of saltwater crocodiles from Appendix I to Appendix II of CITES. This allows it to be used in commercial trade and farming activities.²⁵ This support was tempered with concern 'at the continuing commercial netting for barramundi fish (Lates calcifer) in the estuaries of Kakadu National Park, to the detriment of C. porosus which are an important part of the park ecosystems'.²⁶ The IUCN further requested the 'Australian Management Authority', in conjunction with the Northern Territory Government, to correct the situation as soon as possible. The IUCN also accepted certain assurances given by Australian Government representatives concerning other aspects of crocodile protection and management.

20. Professor Messel stated that the implication behind the support of the International Union for the Conservation of Nature and Natural Resources (IUCN) for the Australian Convention in Trade of Endangered Species proposal was the acceptance by the IUCN that the 'Australian Government has given an undertaking to phase out barramundi net fishing in the tidal waterways of Kakadu National Park'.²⁷ Professor Messel acknowledged that the resolution was not legally binding on the Australian Government. He claimed that the undertaking of the Australian Government in relation to this matter was given by 'Gough Letts, Harry Butler and the people representing the Conservation Commission of the Northern Territory (and) ... also ... by Derrick Ovington ... the official representative of the Australian Government'.²⁸ However,

failure by the Australian Government to implement the recommendations in the resolution would break faith with the IUCN, according to Professor Messel.

Crocodile numbers

21. Professor Messel surveyed the saltwater crocodile population in the Alligator Rivers region in 1977, 1978, 1979, with a final resurvey in 1984.²⁹ He claims that the inventories showed generally that both the crocodile and barramundi resources were depleting. In his view, one of the significant causes for the losses of the larger more valuable crocodiles was drowning in commercial fishermen's nets, both legally and illegally set.

22. Professor Messel estimated in 1978 that at least 100 saltwater crocodiles were drowned annually.³⁰ In his survey of the West Alligator River, in October 1978, he found 16 nets in tandem in 16 km of the river.³¹ This, he claims, would put great pressure on the crocodile population as, since the survey boat had difficulty navigating the river, the crocodiles would have little chance of doing so. In the 1978 and 1979 surveys, Professor Messel's survey team found nets strung illegally, that is, completely across rivers.

23. Professor Messel was very critical of barramundi poaching, which appeared to be unchecked, and wondered whether 'such individuals' (presumably fishers) could be trusted to manage the 'remaining remnants of the barramundi resource' and whether such individuals should be allowed 'to further reduce the highly endangered C. porosus population?'.³²

Current numbers

24. Changes in populations of saltwater crocodiles in the East and South Alligator Rivers and associated freshwater swamps are being monitored by ANPWS. Additionally, a pilot survey using

radio-telemetry has commenced to investigate the movements of crocodiles which have been relocated (because of their problem behaviour towards people). It is thought that crocodiles exhibit homing and territorial behaviour.

25. The 1986 plan of management states that 'the number of Estuarine Crocodiles is increasing even though some animals are drowned in commercial barramundi nets set in the mouths of rivers'.³³

26. The Northern Territory Fishing Industry Council (NTFIC) agrees that numbers are increasing and that numbers of larger crocodiles are increasing. In their submission the NTFIC claims that commercial fishers sometimes get to know the local crocodiles individually, that some crocodiles become 'tame', follow fishers from net to net and, in some cases, come to a 'call'. Commercial fishers protect crocodiles from 'weekend cowboys'. About one per cent of all crocodiles in a river may be killed by drowning after being caught in nets.³⁴ The new monofilament nets are much easier for a crocodile to break and escape.

27. Under current Northern Territory fishing regulations, no more than 50 per cent of a river can be blocked off by nets. Current surveys show that only small crocodiles, about 2 metres long, are caught in nets. The Northern Territory Fishing Industry Council claims that in 1985, 32 crocodiles were caught in the Kakadu area (160 in the whole of the Northern Territory).

28. Mr Kemp of the Council said he had figures which showed a 10.8 per cent per annum increase in the crocodile population generally, with a 22.5 per cent increase in the South Alligator River.

Impacts

(i) Environmental

29. As mentioned earlier, crocodiles are an important part of the ecosystem of the region. Destruction of the crocodile resource would result in considerable changes within the entire region. As crocodiles are now a protected species, this is unlikely to happen.

(ii) Aborigines

30. Crocodiles and their eggs are a food source for Aboriginal communities living in the Park. ANPWS estimate that Aborigines would take considerably fewer than 10 nests and 10 crocodiles annually.³⁵

(iii) Tourism

31. As aggressive, large, native animals, crocodiles have a certain attraction for tourists. Attacks by crocodiles on humans frequently generate world-wide media attention, in a sense providing free advertising for the region. ANPWS provide warnings of the dangers of crocodiles in strategic places. Information on the danger from crocodiles is printed on the Park visitor map and in a brochure about crocodiles. The Committee believes that no further warnings, e.g. in the form of fines, are necessary and that individuals should be responsible for their own safety in known crocodile inhabited waters.

32. Professor Messel suggested that saltwater crocodiles 'in large numbers could easily and quickly become one of the most outstanding and spectacular tourist attractions in the Park.'³⁶ Some tourist activities already emphasise the increasing

availability of crocodiles. The Committee agrees that the increasing numbers of crocodiles enhance the tourist interest of the Park.

INTRODUCED SPECIES

33. The Park has a number of introduced animals and plants. Some of these have caused, or have the potential to cause, considerable environmental damage. The two most important feral animals are water buffalo and pig. The feral cat is widely spread, but in smaller numbers and the cane toad, which is prevalent in other parts of northern Australia, has not yet appeared in the Park. Around 70 species of exotic plants have been identified, mainly near settlement sites, but only a few of these are causing concern. The most important of these is Mimosa pigra.

Water Buffalo

34. Asian water buffalo first became feral in northern Australia in the late 1820s, after having been introduced as a source of fresh meat and as draught animals for early settlements. They spread rapidly and had established themselves throughout the Alligator Rivers Region between the visits of Leichardt (1847) and Carrington (1885-86).³⁷ Beginning in the 1880s a buffalo harvesting industry developed and until World War II the main basis of the pastoral industry in the region was the hunting of buffaloes for their hides. When the price for hides fell, attention was given to the production of meat, first for pet food, later for human consumption. At first mobile abattoirs were used but in 1973 hygiene and inspection requirements led to the establishment of an export standard abattoir at Mudginberri.³⁸

35. In June 1978, pursuant to the recommendation of the Ranger Uranium Environment Inquiry, the Commonwealth Government acquired the Mudginberri and Munmalary pastoral leases from Northern Pastoral Services Ltd, which continued its operations under an arrangement with the Commonwealth Government. The main activity of the company was the processing of buffalo meat for overseas markets and the Company augmented buffalo available from its former lease by tendering for removal of feral buffalo from other land in the area.³⁹ In June 1982 an agreement was signed between the Commonwealth and Buffalo United Farmers Pty Ltd to conduct the abattoir and associated activities in the pastoral leases of Mudginberri and Munmarlary.⁴⁰ This is the basis on which the abattoir continues to operate.

36. In 1979 it was estimated that buffalo numbers ranged from between 150 000 to 200 000 throughout the Northern Territory.⁴¹ Some indication of the numbers that have existed in the Park region is given by the fact that 'in the eight years prior to proclamation (of the Park) some 24000 buffalo were removed from Woolwonga by contract operations and several thousand despatched by staff'.⁴² In its 1986-87 Annual Report, ANPWS estimated that 35 000 buffalo had been removed from the Park since its declaration in 1979. In 1985-86 it was estimated that there were 2 700 buffalo in Stage 1 of the Park, 12 100 in Stage 2 and 14 300 in the Stage 3 region.⁴³

37. The presence of large numbers of buffalo foraging on the vegetation in a manner different from that of native animals has had a significant environmental impact. This has been studied by the CSIRO research station at Kapalga, in Stage 2 of the Park, by establishing controlled zones free of buffalo. The effects are many: channelling and gullying of entrenched buffalo trails and the development of wallows has breached the levees of tidal rivers and creeks, resulting in salt water incursions that have destroyed native vegetation; wallowing and feeding activities of buffalo in billabongs breaks down the banks and maintains fine

mud in suspension, inhibiting the growth of aquatic vegetation; pastures are denuded when buffalo congregate and this disturbance creates habitat suitable for exotic weeds, which are themselves spread by the buffalo.⁴⁴ Moreover, as discussed in Chapter 3 of this report, buffalo have the potential to damage mine tailings dams by trampling up and down the sides of the impoundments.⁴⁵

38. There is no doubt that the buffalo have caused considerable environmental damage, but, fortunately, the control and eradication of buffalo can lead to significant environmental improvement.⁴⁶ The ANPWS 1986-87 Annual Report refers to many areas that were barren in 1979 being now green with vegetation as buffalo numbers have been reduced, and the research at Kapalga shows marked improvements in the buffalo free zones. The flood plain vegetation is in better condition and more profuse, and the number of magpie geese has also increased where the buffalo have been removed.⁴⁷

39. The environmental damage caused by buffalo is a sufficient reason in itself to remove buffalo from the Park, but there is an additional reason for control. This is that feral buffalo can serve as a reservoir of exotic bovine diseases and that these could be transmitted to cattle. The national Bovine Tuberculosis and Brucellosis Eradication and Control (BTEC) program requires the reduction and control of buffalo numbers, including eradication of all signs of these cattle diseases, from Australia by 1996. Failure to achieve this objective will seriously affect the beef export industry. ANPWS has received formal notice under the Northern Territory Stock Diseases Act that Stages 1 and 2 of the Park have to be destocked of all cattle and buffalo by 31 December 1988. The Stage 3 region has to be cleared by 31 December 1989.

40. Under the Park plan of management tenders based on a royalty system have been let to catchers to work in the Park. These people catch the animals or shoot them for human

consumption or pet meat. A study of the costs of buffalo eradication has shown that about 90 percent of the population can be removed at no net cost because of the returns from the commercial buffalo catchers. However, it becomes very expensive to remove the last one to two percent.⁴⁸ The use of commercial buffalo catchers and the need for the eradication campaign has provided a justification for the continuation of the Mudginberri abattoir operation within the Park. However, with the removal of the buffalo and the increasing need to bring animals from areas such as Arnhem Land into the Park to maintain the operation, the presence of an abattoir within a World Heritage listed area became an increasing anomaly. During the course of its inquiry the Committee developed the view that the operation of the abattoir should be phased out gradually as the need for a local abattoir decreased. The Committee notes that this has happened, with the abattoir being officially closed on 10 September 1988 because the reduced supply of buffalo meant that it was no longer financially viable.

41. While a commercial tender process provides a means of controlling buffalo populations when these are at a high density or in relatively accessible areas, it is not a complete solution. As populations are reduced or confined to less accessible areas other methods become necessary, and buffalo are shot to waste, from the ground or from helicopters, by Park staff.

42. The Committee recognises the need for the removal of buffalo from the Park to meet BTEC objectives and supports the approach adopted by ANPWS. However, it also recognises that the complete removal of buffalo would disadvantage some groups, particularly the traditional Aboriginal owners. The Gagudju people voluntarily approved and assisted in the removal of most

of the original buffalo to achieve environmental rehabilitation objectives. They did this without seeking any financial compensation. However, the animals now being exterminated from Stages 1 and 2 of the Park 'have a dispersed distribution' and do not 'place an unacceptable impact on the Kakadu environment'. The Gagudju Association told the Committee that:

total eradication of cattle and buffalo from Stage I and II of the Park will not only place an economic burden on the local aboriginal population but will deprive them of a now traditional fresh food source. Buffalo meat to many Gagudju people is not only a cheap readily available beef, but a sought after fresh food preferred by many to cattle beef.⁴⁹

43. In addition to the wish of the Aboriginal people to maintain a source of fresh killed meat, the buffalo also appeal to tourists. The Big Buffalo tourist Centre on the outskirts of Darwin, the buffalo symbol used by a variety of Government Departments, the buffalo head used by the Automobile Association of the Northern Territory and various other uses of the buffalo symbol testify to the degree to which the buffalo has become integrated into the Northern Territory psyche.

44. One means of maintaining a supply of buffalo for Aboriginal land owners and catering to the tourist interest in buffalo would be to maintain a disease free herd within the Park. The Kakadu Fauna Survey, for example, recommended that a:

dedicated zone of high water buffalo density of wetland-margin-monsoon forest-woodland-open forest be defined and fenced. This would not only cater to tourists but contribute to enhanced habitat diversity of the Park as a whole.⁵⁰

45. The Committee also understands that a proposal is being prepared for a buffalo park involving tourist accommodation to be developed on the edge of Stage 3 of the Park. The Committee

believes that either or both of these proposals could be supported to meet the needs of both the Aboriginal land owners and the tourist industry.

Recommendation

The Committee recommends:

- (i) that, as a matter of urgency, ANPWS work with the Gagudju Association to consider the feasibility of establishing a disease free herd of buffalo in a controlled area within the Park to meet Aboriginal needs for field killed meat. This recommendation should be read in conjunction with (ii). Should the proposal contained in (ii) proceed, it may be possible to put into place arrangements that will accommodate the matters referred to above; and
- (ii) that the proposal for a buffalo park adjacent to the boundaries of Stage 3 of Kakadu National Park be investigated and, subject to necessary environmental safeguards, that it be supported.

Pigs

46. Pigs are found near waterholes which provide year round access to water. Although they can cause considerable environmental damage, pigs are much harder to control than buffalo. The pig population is restricted to fairly small areas, but, in suitable conditions, pigs have a rapid breeding rate. Moreover, they are known to carry certain diseases such as tuberculosis and potentially foot and mouth.

47. Although pigs are omniverous, most of their food gathering is through rooting. The environmental damage caused by this behaviour is unsightly, disturbs the soil and increases the chances of the human population catching a pig-carried soil-related disease. Rooting disturbs root structures and damages plants, fruits, shoots, tubers and regrowth in rainforests. Pigs may also spread weeds.

48. In the first Park plan of management, the theory was advanced that the pig population might increase as the buffalo population decreased. Although no specific pig eradication program has been introduced, pigs have been shot by staff during vehicle patrols or during buffalo control work by helicopter. Additionally, they are eliminated from areas suffering a high level of pig damage when staff resources permit. It is agreed that further research into pigs in the Park would be useful. ANPWS have advised that as buffalo numbers decline, greater emphasis will be given to pig control.⁵¹

49. Although the Conservation Commission of the Northern Territory advocates commercial use being made of feral animals, no specific proposals concerning feral pigs were put to the Committee.⁵² In its submission, the Department of Arts, Heritage and the Environment stated that the de-stocking of Gimbat and Goodparla pastoral leases and the imposing of Park management in them would enable improved control of feral pigs.⁵³

50. The Committee believes that because of the threat of foot and mouth disease being introduced to northern Australia through pigs, greater efforts be applied to reducing feral pig numbers as soon as possible.

Other Animals

51. A number of other introduced species e.g. horses and cattle, are also found in the Park, but they appear to cause less concern largely because their numbers are low.

Hunting

52. The Hunters Union of the Northern Territory (HUNT), submitted to the Committee that recreational hunting of wildlife was very popular in Australia and should be permitted in the Park. The Union pointed out that between May 1980 and May 1985, 20 593 shooters licenses were issued in the Northern Territory, and that a high proportion of the population was involved in recreational shooting.⁵⁴ HUNT suggested that allowing recreational hunting of buffalo, pigs and waterfowl would:

- . increase the tourist potential of the Park for Australia and overseas tourists;
- . assist in Park management in terms of control of feral animals especially in low density areas;
- . create revenue from the issue of permits or trophy fees; and
- . return to local residents traditional hunting areas and therefore improve relations between ANPWS and Territory residents.⁵⁵

53. The Hunters Union suggested that controls as applicable to deer hunting in Tasmania could be applied in the Park and emphasised that recreational hunting, a legitimate and local recreational activity, would help considerably with feral animal control. Dr Landsberg of CSIRO similarly said that:

[a]s a purely personal opinion and recognising the risks associated with this sort of thing in parks, I would have thought that there would be quite a lot of possibilities for

allowing shooters into the Park under licence with possibly some sort of supervision by rangers to shoot for example pigs ... The answer is to let in competent people who behave themselves.⁵⁶

The Committee is aware that illegal shooting does occur and that there are serious problems with feral animals, particularly in Stage 3. The Committee believes however, that hunting is at odds with the idea of a national park, and supports the current prohibition of recreational shooting in the Park (which does not apply to leased shooting range areas near Jabiru for pistol, rifle, gun and archery activities). Feral animal control should not be treated as a recreational activity.

Recommendation

The Committee recommends that, with the exception of fishing, recreational hunting within the Park continue to be banned.

Plants

54. ANPWS has identified about 70 species of exotic plants, most of which grow near sites of settlement. Certain weeds are causing concern with Mimosa pigra emerging as a major problem within and outside the Park. A number of other species are also causing concern. Weeds are inevitably spread by visitors, residents and miners.

55. The Park administration is applying various direct control measures, ranging from biological (weevil) control, buffalo control, and the washing down of vehicles, to hand pulling of weeds.⁵⁷ It is obviously difficult to control weeds and this will be an ongoing task for Park staff. The Committee urges all persons travelling through the Park to be aware of the threat of weeds to the environment and to undertake such procedures as would reduce their spread.

FIRE

56. The management of fire within the Park can have considerable impact on, or is affected by tourism, mining, flora and fauna management, and general Park management. A description of traditional and proposed fire management practices is provided in the current plan of management.⁵⁸

57. Apart from fires which are 'planned' under a management plan, much of the Park is affected frequently by fires lit by careless individual Park users and, more rarely, lightning strikes. Aborigines who live in the Park are also involved in the setting of fires around outstations and in areas used extensively for hunting and gathering.

58. There have been, of course, major alterations to the environment through deliberate burning procedures by traditional owners. The early dry and early wet season burns which result in low intensity fires, were adopted by the Aborigines to maximise their food gathering possibilities. This maximised the production of fruit, flowers and other resources, important to both the Aborigines and a variety of animals.

59. Park management observes normal fire bans as imposed by the Northern Territory Bushfire Council during period of high winds and/or high fuel load in the dry season. In addition, ANPWS regulations provide for conditions under which fires may be lit and penalties are imposed for improper use of fire.

60. ANPWS and CSIRO differ in their approach to fire management, although both agree that more research is needed. CSIRO recommends the deliberate implementation of a variety of fire programs, noting specifically that 'parts of the Park should be maintained under early, mid and late fire season, biennial, triennial, perennial and no fire regime'. Further, CSIRO

recommends that the 'scorched earth' policy along the roads be discontinued and that a 'substantial public education program' is necessary.⁵⁹ However, these are to be regarded as interim measures until the necessary research has devised 'specific biotic objectives'.

61. Although ANPWS see some virtue in having a diversity of burning practices in the Park, they are attempting to re-establish traditional Aboriginal patterns of burning, in accord with vegetation type and status.⁶⁰ ANPWS and CSIRO are working together on different fire programs to determine the most appropriate for the Park.⁶¹

1. Evidence p. 1905
2. Transcript of informal discussions between CSIRO and the Committee dated 2 October 1986 p. 27
3. Australian National Parks and Wildlife Service (ANPWS) 1986 Kakadu National Park Plan of Management ANPWS p. 84
4. ibid p. 107 and 109
5. ibid p. 107 and 109
6. Evidence p. 1909
7. Evidence p. 1910
8. Transcript of informal discussions op cit p. 18
9. Evidence p. 1910
10. Evidence p. 1910
11. Evidence p. 1929
12. Evidence pp. 1930-1931
13. Evidence p. 1906
14. Supervising Scientist for the Alligator Rivers Region, Annual Report 1986-1987 AGPS p. 10
15. Evidence p. 650
16. Supervising Scientist for the Alligator Rivers Region op cit p. 49
17. ibid p. 50
18. ibid p. 61
19. Division of Wildlife and Rangelands Research, CSIRO. Kakadu Fauna Survey. Final Report
20. ANPWS op cit p. 128
21. ibid p. 129
22. Evidence p. 632
23. ANPWS pamphlet Crocodiles in Kakadu National Park NT
24. Evidence p. 1918
25. Evidence p. 621
26. Evidence p. 615
27. Evidence p. 627
28. Evidence p. 628
29. Evidence p. 617
30. Evidence p. 609
31. Evidence p. 606
32. Evidence p. 611
33. ANPWS op cit p. 26
34. Evidence p. 2286
35. ANPWS op cit p. 26
36. Evidence p. 613
37. Division of Wildlife and Rangelands Research, CSIRO. Kakadu Fauna Survey Final Report Vol.3., Ch. 14 p. 601
38. Ranger Uranium Environment Inquiry p. 181
39. ANPWS 1980 Kakadu National Park Plan of Management p. 200
40. ibid p. 64
41. ibid p. 147
42. Evidence p. 2492
43. Evidence p. 1775
44. ANPWS 1980 op cit pp. 148-150
45. Evidence p. 1500
46. Evidence p. 1912
47. Evidence p. 1912
48. Evidence p. 1981
49. Gagudju Association 1988. Letter of 9 February
50. Division of Wildlife and Rangelands Research, CSIRO Kakadu Fauna Survey Final Report Vol 4, p. 880

51. Letter from Professor J D Ovington, Director ANPWS to Ms E Mountain, Senate National Resources Committee, dated 5 December 1986 p. 6
52. Evidence p. 1268
53. Evidence p. 1712
54. Evidence p. 720
55. Evidence p. 714
56. Evidence p. 1981
57. Letter from Professor J D Ovington op cit p. 2
58. ANPWS 1980 op cit p. 37
59. Evidence p. 1960
60. Evidence p. 2210
61. Evidence p. 2210