

Wetland management — Kakadu National Park

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Abstract

The wetlands of Kakadu National Park have received national and international recognition. Their significance lies in their large size, the great diversity and high biomass of plants and animals which they support, and the level of protection and management afforded them. The management of these wetlands is influenced by many factors including a uranium mine, a range of alien plants and animals, increasing tourism, an environment subject to change, and Aboriginal ownership of part of the land. Maintaining wetland conservation values appropriate to a major national park and a World Heritage area requires considerable research and management and a continued high level of funding.

Introduction

Kakadu National Park contains some of the most important wetlands of northern Australia. Stage I of the Park was proclaimed in April 1979 with a second stage following in February 1984. In June 1980 areas of the Park were included on the United Nations List of Wetlands of International Importance especially as Waterfowl Habitat and in the following year Stage I was accepted as the first Australian World Heritage Area.

Kakadu Wetlands

The wetlands of Kakadu comprise some 2,700km² of lowlands which are either seasonally or permanently inundated. They can be divided into three broad landscape types: coastal swamps, tidal flats and floodplains (Ovington, 1985, pp. 15-17).

The coastal swamps, which fringe the seaward boundary of the Park and extend into the mouth of the five major rivers in the area, are dominated by mangroves. Immediately landward of the mangroves are tidal flats characterised by occasional tidal inundation. These areas are generally bare of vegetation since few plants can withstand the high salinity and alternate drought and flood, but occasionally areas of low vegetation such as samphire *Arthrocnemum leiosachyum* occur. The floodplains comprise the vast area of lowlands over which rivers and creeks flood during the wet season and are more complex. Large areas are dominated by the sedges *Eleocharis* spp. and *Fimbristylis* spp., grasslands, (*Pseudoraphis* spp. and *Hymenachne* spp.), paperbark woodlands and forests (*Melaleuca* spp.) and deeper water areas including billabongs with emergent vegetation such as water lilies (*Nymphaea* spp., and *Nymphoides* spp.) are all common (Finlayson, Bailey, Freeland and Fleming, in prep.).

The significance of these wetlands lies in their sheer size, the great diversity and biomass of plant and animal species which they support and, lately, the fact that a high level of protection and management is afforded them. Twenty one of the 29 mangrove species in Australia occur in Kakadu (ANPWS 1986, p. 7). Over 40 species of fish have been recorded in the Park compared with about 20 species in the Murray Darling System. In one small pool alone 22 species have been counted (Walden, pers. comm., 1986). Thirty five species of waders have been recorded on the wetlands, many being migrants for which the Park is the first Australian contact (ANPWS 1986). The South Alligator River floodplain has been clearly identified as a dry season refuge for magpie geese *Anseranus semipalmata*, once common throughout Australian wetlands but now confined to the north of the continent. More than 2,000,000 magpie geese were estimated to occur in Kakadu in the dry seasons of 1983 and 1984 (Bayliss, 1985).

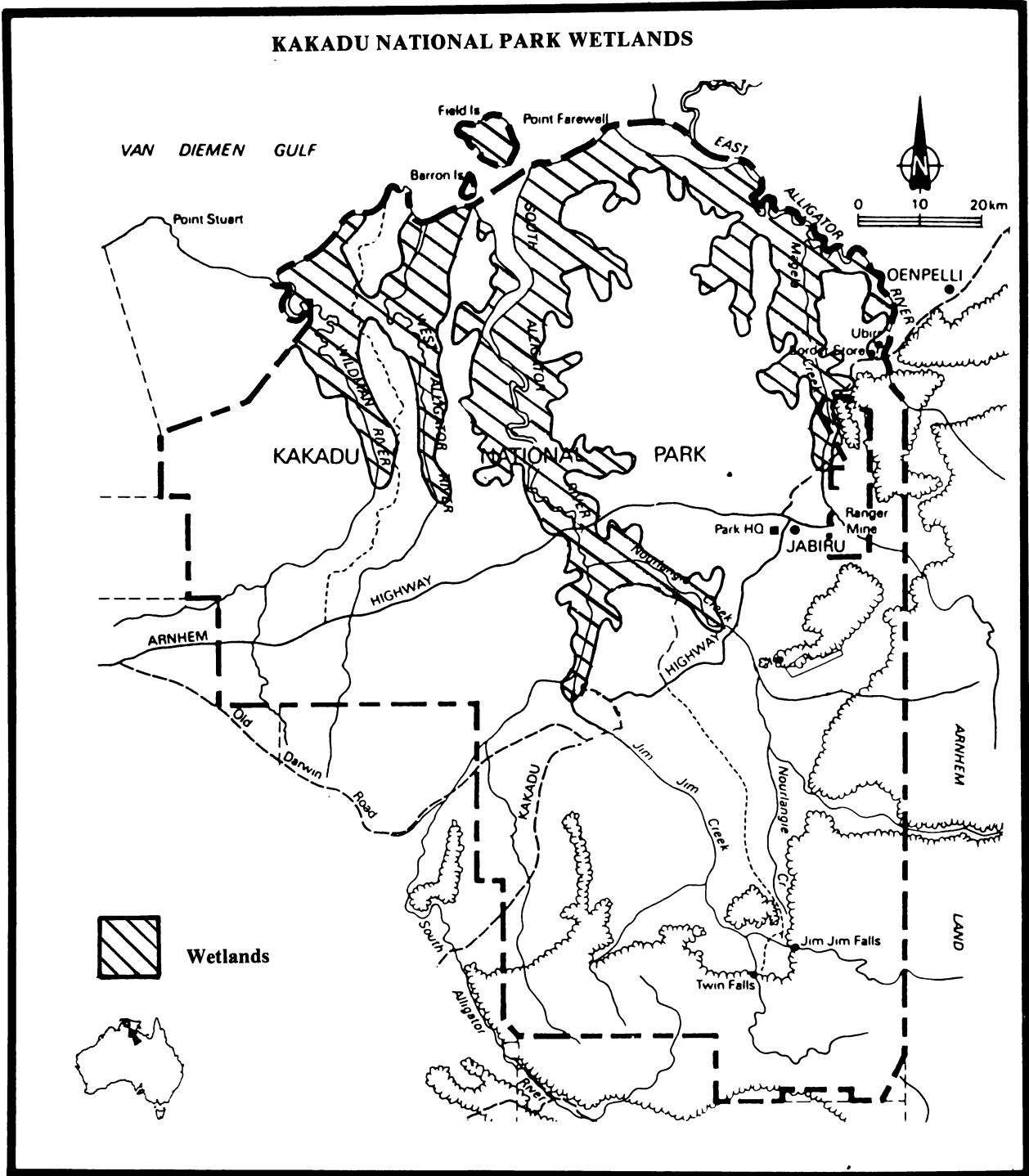
Management complexity

Management of wetlands in Kakadu is influenced by many factors. These include a major uranium mine situated in the catchment of the East Alligator River, a range of alien plant and animal species, visitation by a large and increasing number of tourists, and an environment subject to rapid natural change. A major management consideration is that a large portion of the Park is owned by Aboriginal people who have strong spiritual, economic and physical bonds with the land.

Mining

In 1969 the orebodies which now comprise the Ranger Uranium Mine were discovered near the Magela Creek which runs into the East Alligator River. In the light of widespread public concern, the Ranger Uranium Environmental Inquiry was instituted and in May 1977 the second report of the Inquiry (known as the Fox Report) recommended, amongst other things, that mining should occur with stringent environmental controls and that Kakadu National Park should be established.

The mine is a potential threat to the integrity of the wetlands of Magela Creek and the East Alligator River. Stored within the mine lease area are approximately eight million cubic metres of water, much of which is heavily contaminated with radionuclides, heavy metal residues from ore and other chemicals including sulphates, manganese and ammonia. Should a catastrophic failure of the Tailings Dam occur the result would be disastrous. Such a failure is, however, extremely unlikely and of more immediate concern is a need for the mine to dispose of slightly contaminated water to keep its water system in balance. Currently this excess water is being removed by spray irrigation onto land within the lease area and consideration is being given to releases of water direct to the Magela Creek. While receiving water standards have been set which supervising authorities believe will allow water to be



released without causing unacceptable change, concern remains over the long term effect of both direct release and spray irrigation.

On the positive side much effort is expended on minimising environmental problems associated with the mine. The Supervising Scientist for the Alligator Rivers Region has 75 staff employed to co-ordinate the protection of the environment from the effects of uranium mining in the Region. Forty five in-house research projects were underway in 1984/85 and 19 external projects were funded (Supervising Scientist for the Alligator Rivers Region, 1985). The mining company and Northern Territory authorities also conduct research and monitoring and all interested parties including the Australian National Parks and Wildlife Service are represented on a Co-ordinating Committee which considers and reviews environmental protection measures.

Alien Species

More than 70 plant species (Cowie, Finlayson and Bailey, in prep.) and 1 species of vertebrate animals have been introduced to the Park since European settlement. The most damaging has been the feral buffalo *Bubalus bubalis* which was brought to Northern Australia on several occasions in the early and mid 1800s and quickly built up in numbers to reach a maximum in the 1950s and 1960s of perhaps 300-400,000 across the Top End. Buffalo caused destruction of vegetation by trampling and grazing, movement of weeds and nutrients and the breakdown of natural levee banks allowing inflow of saltwater, and reduced retention of freshwater at the end of the wet season. The results were obvious: floodplains and waterbodies bare of vegetation, death of large stands of paperbarks and extensive soil erosion.

The Park Service has responded by removing more than 30,000 buffalo since declaration of Stage I of the

Park. Annual aerial surveys conducted to assess the efficacy of control show about 2,500 animals remain on Stage I and 12,000 on Stage II. Control has resulted in a dramatic recovery of the wetlands with dense sedges growing on once bare floodplains and the rapid re-emergence of water lilies and other aquatic plant species. Levee banks built to control saltwater intrusion have also been successful.

Currently the most serious threat to the wetlands is the thorny shrub *Mimosa pigra*. This South American species was introduced to the Northern Territory around the turn of this century and since the 1960s has spread rapidly to nine of the major river systems of the Top End. It forms dense impenetrable stands on floodplains which exclude many plant and animal species, for example magpie geese which require open sedgeland to breed and feed. *M. pigra* currently occurs on approximately 35,000ha. of the Adelaide River floodplain to the west of the Park and a further 10-15,000ha. on the other river systems (Miller and Ionsdale pers. comm.). Thirty one small infestations over about 10ha. have been identified in Kakadu wetlands all of which are under control. Four persons are employed full time to control known infestations, search floodplain areas for new outbreaks and wash down vehicles and equipment considered likely to import seed into the Park. More than \$100,000 was spent on *M. pigra* control in 1985/86.

Tourism

Kakadu National Park and its wetlands are a major tourist destination in the Northern Territory, receiving national and international publicity. Conservative estimates of the number of visitors to the Park are 45,800 in 1982, 57,900 in 1983, 75,200 in 1984 and approximately 100,000 in 1985 (ANPWS, 1986, p. 23). Meeting the needs and aspirations of this large and increasing number of visitors without impairing the natural or cultural attributes of the Park is a considerable challenge. There are many potential conflicts. Amateur fishing can be surprisingly intense — a survey of amateur fishermen in the Northern Territory suggested that, in one year, between 80 and 85 tonnes of barramundi were removed from five Top End rivers, including the East and South Alligator rivers (Griffin, 1982). Tourists require accommodation, and in the past unregulated camping around waterbodies has led to degradation of surrounding vegetation and water quality, and soil erosion. Unrestricted access to wetland areas even for simple wildlife appreciation can lead to damaging disturbance of wildlife.

Management responses have included the construction of three major serviced campgrounds and four others with basic facilities which provide visitors with ready access to major points of interest while limiting their impact on fragile areas. Similarly three wetlands nature trails have been provided and a drive along a wetland margin is under construction. As necessary, restrictions have been placed on potentially damaging activities. Recreational vehicles are not permitted to drive off formed roads, access to two major bird rookeries has been controlled and it is proposed that some waterbodies be closed to fishing.

Natural changes

Wetlands in Kakadu are managed against a background of past longterm changes associated with climatic trends, a potential for rapid change with changing landuse and an annual cycle of change with

pronounced wet and dry seasons. Sea level stabilised in the region a mere 6,000 years B.P. At that stage mangroves on the South Alligator River may have covered up to 80,000ha. or 28 times the present area (Davie, 1985). Herbaceous floodplain communities are dominated by annuals (64-80%) and it appears that significant year to year variation in botanical composition can occur in response to natural events such as timing and duration of the wet season (Taylor and Dunlop, 1985). The implication is that managers must proceed with caution and cannot assume that changes such as saltwater intrusion or loss of a sedge species from an area are 'unnatural' and deleterious.

Aboriginal ownership

Aboriginal people have lived in Kakadu for at least 25,000 years and probably much longer. A large portion of Kakadu National Park is owned by Aboriginal people who have leased the area to the Director of the Australian National Parks and Wildlife Service for the purpose of a national park. For many of these people traditional customs and beliefs are still important in their everyday lives. Close consultation occurs between Park staff and Aboriginal owners and their concern and values influence Park management at all levels. Education and interpretation programs for visitors focus on the interaction between the natural environment and Aboriginal people. Environmental protection measures such as the control of buffalo and *M. pigra* have been strongly supported by owners who have been amongst the first to recognise the adverse effects of these species on wetlands.

Conclusion

Many factors affect wetland management in Kakadu National Park. Large areas are involved, the systems are complex and diverse and rapid natural changes occur. In addition there are a number of threats to the wetlands, principally alien species of plants and animals, heavy visitor pressure and mining. Maintaining wetland conservation values appropriate to a major national park and a World Heritage Area requires considerable research and management and a continued high level of funding.

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