World Heritage Sites

Protected Areas and World Heritage

KAKADU NATIONAL PARK
NORTHERN TERRITORY, AUSTRALIA

Kakadu is a unique archaeological and ethnological reserve covering almost the entire catchment of a major tropical monsoonal river system. It is a unique example of a complex of ecosystems, including tidal flats, floodplains, lowlands and plateaux, and provides a habitat for a wide range of rare and endemic species of plants and animals. In addition it has been inhabited continuously for 50,000 years and there is an immense range of cave paintings, rock carvings and archaeological sites. These record the skills and way of life of the region's inhabitants, from the hunter-gatherers of prehistoric times to the present Aboriginal inhabitants and provide an outstanding record of human interaction with the environment over tens of thousands of years.

Threats to the site: Invasion by exotic plants, now coming under control, immanent invasion by cane toads, and pollution by a uranium mining company of local streams which has been inadequately controlled in the past.

COUNTRY Australia - Northern Territory

NAME Kakadu National Park

MIXED NATURAL AND CULTURAL WORLD HERITAGE SITE
1981 (Stage I); 1987 (Stage II); 1992 (Stage III). Inscribed on the World Heritage List by stages under Natural Criteria vii, ix and x + Cultural Criteria i & vi.

INTERNATIONAL DESIGNATION
1980: Stage I & parts of Stage III designated Wetlands of International Importance under the Ramsar Convention;
1989: Stage II designated a Wetland of International Importance under the same (total, 692,940 ha).

IUCN MANAGEMENT CATEGORY
II (National Park)

BIOGEOGRAPHICAL PROVINCE
Northern Savanna (6.11.10)

GEOGRAPHICAL LOCATION
Situated between the Wildman and East Alligator rivers, 200km east of Darwin, Northern Territory at approximately 12° 04'S to 14° 00'S, 132° 00'E to 133° 10'E.

DATES AND HISTORY OF ESTABLISHMENT
1964: Woolwonga Aboriginal Reserve (50,500 ha) established;

1972: Alligator Rivers Wildlife Sanctuary and Protected Areas established (ca.200,000 ha);

1970s: Three mining leases granted within the area of the present Park;

1975: The National Parks and Wildlife Conservation Act passed: the principal legal basis for the park;

1979: Kakadu National Park, Stage I proclaimed, incorporating the above reserves;

1980 The Alligator Rivers region entered on the Register of the National Estate; also entered were: Koolpin gorge (1986) and the southern third of the Park (1989);

1980: Stage I and parts of stage III declared Ramsar Wetland sites;

1984-5: Stage II proclaimed and incorporated into the National Park; 1989: designated a Ramsar site;

1987: Stage III proclaimed, incorporating a conservation zone.

LAND TENURE

The Kakadu Aboriginal Land Trust and Jabiluka Aboriginal Land Trustown about one third of the land, but lease it to the Director of National Parks and Wildlife in whom the remaining area is vested. The Jawoyn people have lodged a land claim under the Aboriginal Land Rights (Northern Territory) Act of 1976 over Stage III. But this will not affect the National Park status of Stage III, and joint management like that in other Aboriginal land in the Park will be established. Administered by the Australian National Parks & Wildlife Service (ANPWS) now Parks Australia), under the Department of the Environment, Sports and Territories (DASETT, 1991). All designations exclude an enclave containing the Ranger and Jabiluka mining lease areas.

AREA

1,980,400 ha (180 x 110 km).

ALTITUDE

Sea-level to 520m

PHYSICAL FEATURES

The Park extends from coastal and riverine floodplains to lowland hills and basins some 160 km south, and from the dissected Arnhem Land plateau and sandstone escarpment in the east to the wooded Koolpinyah Surface savanna 120 km west. It includes the entire watershed of the South Alligator River, and parts of the West Alligator, Wildman and East Alligator Rivers. The western rim of the Arnhem Land plateau, with sheer and spectacular escarpments, waterfalls, overhangs and caves, is within the Park. The escarpment ranges in height from about 30m to 330m over some 500 km. It is formed by the relatively resistant quartz sandstone of the Middle Proterozoic Kombolgie Formation unconformably overlying less resistant rocks. Where these underlying rocks are weakened by erosion, the sandstone is undermined and eventually collapses. This has produced a landscape of intricate relief with numerous micro-habitats hosting a diverse biota and a large number of overhangs and caverns that house much of the Aboriginal rock art of the region.

Relative tectonic stability means that within Kakadu National Park there are very old rocks as well as modern land forms and because of its great age of over 2,000 million years, much of the area has deeply weathered landforms and soils that are leached and infertile. On the plateau the stripping away of most of the late Cretaceous rocks has produced a rugged landscape of resistant, flat-bedded quartzose sandstones, criss-crossed by weaker areas that have been deeply eroded into a maze of narrow valleys and gorges. The surface is mostly bare pavements and sandstone outcrops with a strongly leached sandy soil which is skeletal where present, seldom more than 150cm deep, but there are pockets of deeper soil in gorges in the plateau which support rain forest communities with relict species. Commercially viable deposits of uranium, gold, copper and tin are found on the site and small-scale mining occurred in the South Alligator River Valley in the past. Leases for working three sites were granted in the 1970s.

The south of the Park is mostly hills and basins, the hills forming a modern erosional surface of rocky strike ridges flanked by narrow talus slopes or pediments, separated from each other by alluvial flats of varying widths. The Koolpinyah Surface is a series of gently undulating lowland plains from Darwin to the Arnhem land escarpment. These lowland and coastal riverine plains surround the tidal reaches of all the major river systems in the Park with a mosaic of floodplains, lagoons and seasonal creeks. Some 147,000 ha may be flooded during the wet season. The plains are recent and still actively forming, with acidic easily eroded soils and are often flooded for four months of the year. Natural but easily broached levees protect the plains below from saltwater inundation. In addition to the four major landforms, Kakadu National Park contains approximately 473 sq. km of coastal, intertidal and estuarine areas and two islands (ANPWS, 1998).

CLIMATE

The tropical monsoonal climate, with marked wet and dry seasons, is the major factor determining the surface water hydrology, vegetation and, over time, the land forms of the region. Temperatures are high all year, with monthly average maxima varying from 33°C in July to 42°C in October. More than 90% of

annual rainfall occurs in the wet season, between November and April, which is characterised by localised thunderstorms, monsoonal depressions that cause heavy rains, and tropical cyclones. Rainfall intensities in the region are among the highest in Australia. Humidity is highest from January to March, averaging 85%. May to September is a period of annual drought when relative humidity drops to an average of 57%. In general, the mean annual rainfall decreases from the coast towards the interior, from 1,565 mm to about 1,100-1,200mm in the south. In the wet season, the Park's rivers carry large amounts of water, and wide lowland areas are flooded. By the late dry season, flow ceases in the upper reaches, leaving a series of shallow billabongs in dry river beds (ANPWS,1998; Braithwaite & Werner, 1987).

VEGETATION

The Alligator Rivers region which surrounds the Park is the most floristically diverse part of monsoonal northern Australia with around 1,600 recorded plant species, reflecting the variety of land forms and the associated plant habitats of the region. Over half the region is forest or open woodland but it includes savannas, plateau spinifex and outliers, riverine fringing forest, wetlands, floodplain sedgelands, monsoon forests, tidal, coastal, aquatic and marine habitats as well as the southern hills and basins. As a consequence of the area's intricate relief, there are also numerous micro-habitats, and the biota of the plateau is ecologically very diverse, containing a distinctive assemblage of species, many of restricted range. Of particular note is the flora of the sandstone formations of the western Arnhem Land escarpment, where some species are relict and many are endemic. Some 60 plant species in the Park are considered rare or threatened. One notable species is *Cycas conferta* (VU). A list of these is given in DASETT (1991).

The vegetation can be classified into 13 broad categories, seven of which are dominated by a distinct species of eucalyptus. Other categories comprise: mangrove; samphire; lowland rain forest; paperbark swamp; seasonal flood plain and sandstone rain forest. These categories are described in detail in DASET (1991). The seven eucalyptus-dominated open-forest and woodland categories, typically with a one to two meter grassy understorey, are the dominant vegetation. 21 of Australia's 29 mangrove species grow along the tidal reaches of the major coastal river systems. Samphire, a sparse low chenopod shrubland, occurs on tidal salt flats, typically of fine clay, between mangroves and the supratidal fringe. Lowland rain forests occur as small habitat pockets with rare tropical flora in *Eucalyptus, Barringtonia* or paperbark *Melaleuca* -dominated vegetation of two types: rain forest associated with springs and seepages; and rain forest on freely draining land. Paperbark swamp, dominated by one or more tall *Melaleuca* species, covers wide areas of the seasonal freshwater flood plains. The vegetation of these plains changes more or less continuously throughout the wet-dry cycle, from permanent open water communities, invaded by the waterweed *Salvinia molesta,* which, with the giant sensitive plant *Mimosa pigra,* is rampant, and to ephemeral communities of herbs, grasses and sedges associated with seasonally flooded, cracking clay soils that dry out completely in the dry season when the southern hills become a refuge for the Park's fauna (ANPWS, 1998).

FAUNA

The scientific and conservation value of the fauna of the Park is of national and international significance. It is diverse, representative of a large area of northern Australia, and includes regional endemics. The 64 native mammal species known from the park comprise slightly more than a quarter of the total number of known terrestrial mammal species in Australia, and include 26 of the 65 species of Australian bats. Mammals globally threatened include dugong *Dugong dugon* (VU), ghost bat *Macroderma gigas* (VU), orange leafnosed bat *Rhinonicteris aurantia* (VU), false water rat *Xeromys myoides* (VU) and goldenbacked tree rat *Mesembriomys macrurus* (VU). Two other threatened mammals are the narbalek *Petrogale concinna* and the rock ringtail possum *Pseudocheirus dahli.* Northern quolls *Dasyurus hallucatus* have also recently been locally threatened by extinction by a cane toad invasion.

Reptile species total 128, comprising two crocodile species, three species of sea turtle, 77 lizard species (15 species of gecko, four legless lizards, 10 dragons, 11 monitors and 37 species of skink) and 39 species of snake. Those globally threatened include loggerhead turtle *Caretta caretta* (EN), green turtle *Chelonia mydas* (EN), hawksbill turtle *Eretmochelys imbricata* (EN), olive Ridley turtle *Lepidochelys olivacea* (EN) and pignosed turtle *Carettochelys insculpta* (VU). The flatback turtle *Natator depressus* is also found. There are two species of crocodile, estuarine *Crocodylus porosus* and freshwater *C. johnstoni*. 55 species of freshwater fish make the Park Australia's richest in these fish. Aquatic escarpment habitats are important dry season refuges for freshwater fish, including several species with restricted distributions. The extremely rich avifauna of 274 species includes 33% of those

found in Australia, and in the autumn up to one million waterbirds of 60 species gather. Red goshawk *Erythrotriorchis radiatus* (EN) and Gouldian finch *Chloebia gouldiae* (EN), also the threatened hooded parrot *Psephotus dissimilis* occur within the region (DASETT, 1991).

The 1986 Plan of Management identified 3% of mammal species, 10% of birds, 9% of reptiles and 4% of amphibians occurring in the Park as having a small range, high habitat specificity and low population density, and should generally be considered rare. A further 21 notable species have since been identified on the basis of the species' rarity, restricted range, taxonomic interest, uncertain or declining range or substantial range extension. A list of species of particular conservation importance is given in ANPWS, (1998). The poisonous and invasive cane toad *Bufo marinus* began to encroach from further east in 2001 and is beginning to threaten local wildlife (Kemp, 2003).

CULTURAL HERITAGE

Aboriginal people have occupied this landscape as travelling hunter-gatherers for 50,000 years, endowing it with sacred attributes which are still respected. Excavated sites have revealed evidence of the earliest human settlement in Australia, the world's oldest evidence of edge-ground axes and pieces of ochre used for painting 25,000 years old. The Park contains many sacred sites of religious significance, some 1,000 archaeological sites of Aboriginal culture and an estimated 15,000 rock art sites in a number of styles in richly decorated caves concentrated along the Arnhem Land escarpment, some dating back 18,000 years which record animal species no longer present (ANPWS, 1998; Gillespie, 1983). The overhung rock of Ubirr is a well known site of this art, to which men continued to add even in the 20th century. European discovery was by the Dutch in 1623 and 1644. British exploration reached the area in 1818 and 1824, and in 1880 there was a local gold rush (Pyers, 2002). Persecution and forced assimilation of the Aboriginal people followed until the constitutional referendum of 1967.

LOCAL HUMAN POPULATION

The Park's Plan of Management refers to Australians of European origin by two terms from the main local languages: *Balanda or Mam,* and the Aboriginals, mainly of the Gundjeihmi/Mayali, Jawoyn and Kunwinjku tribes, as *Bininj* or *Mungguy*. The latter, approximately 500 people of about 16 clans, live in about ten locations in the park. These also include the Mirrar traditional owners and other Aboriginals with recognised social and traditional attachments to the area who may stay, and where necessary, establish new living areas and exercise their rights to traditional uses. This recognition of Aboriginal title to land dates back to a 1973 commission of enquiry into their land rights in the Northern Territory in relation to the lease on the Ranger uranium mine. The land is leased by the Aboriginal's Gagadju Association to the government.

In the 1970s, the Northern Land Council, on behalf of the region's aboriginal population, approved government mining leases at three sites with the potential for large export earnings plus earning royalties to aboriginal people. These sites were at Ranger and Jabiluka, 20 km north, in the northeast, and at Koongarra in the southern headwaters of the South Alligator River. The small industrial town of Jabiru within the Park was built by Energy Resources of Australia (ERA), now owned by the Rio Tinto Corporation, as a closed town to service the uranium mines. It has a population of about 1,480 and was to be limited, but the added incentive of tourism has created pressure to expand it (ANPWS, 1998). The local traditional owners of the land, the Mirrar, resent the mines' potential to pollute their land.

VISITORS AND VISITOR FACILITIES

Tourism in Kakadu is important to the region's economy and is a major management issue. There are as many foreign visitors as Australians, at least half of all visitors coming on organised tours. Numbers, estimated at 47,000 in 1982 and 169,517 in 2001, were said to be 250,000 in 2002 (Pyers,2002). Since 1988 all commercial tours operating within the Park have been required to obtain the approval of the Park Director (DASET,1991). There are two visitor centres. Many people are attracted by the Aboriginal culture and art on which talks are regularly given. A range of accommodation is available within the Park and there are a number of camp sites and picnic areas. A number of airstrips suitable for light planes are available both inside and outside the Park. (ANPWS, 1998).

SCIENTIFIC RESEARCH AND FACILITIES

Research, surveys, monitoring and rehabilitation programs in the Park have focused on both the natural and cultural heritages: on wildlife, vegetation, water quality, fire, problem weeds and feral animals; rock art and archaeological sites, Aboriginal knowledge, oral history, use of plants and satisfaction as residents; visitor use and impacts; and Park information systems. The establishment of a 'Keeping

Place' for Aboriginal artefacts returned from museums, some of ritual importance, is being researched. Monitoring is still discovering new species, and mapping of the plant communities most vulnerable to fire is also important. Research in the Park is carried out by ANPWS and the Commonwealth Scientific & Industrial Research Organisation (CSIRO) though this no longer runs the 67,000 ha Kapalga Research Station, a major centre for studying the wet/dry tropics of Northern Australia. The Office of the Supervising Scientist also operates a research station in the Park, monitoring especially pollution. Research projects funded by ANPWS are listed in the Plan of Management (ANPWS, 1998).

CONSERVATION VALUE

The Park is listed on the World Heritage List for both natural and cultural values. It covers almost the entire catchment of a major tropical monsoonal river system. With its large size, wide range of ecosystems, its habitats with rare and threatened biota, its beauty and ancient but living culture, it is recognised as Australia's most significant National Park. The numerous cave paintings, rock carvings and archaeological sites which record the skills and way of life of the region's inhabitants, are a unique artistic achievement, which provide an outstanding record of Aboriginal interaction with the environment over 50,000 years (ANPWS, 1998). The Park lies within a WWF Global 200 Eco-region, a WWF/IUCN Centre of Plant Diversity and in one of the world's Endemic Bird Areas. It also contains an extensive Ramsar wetland site.

CONSERVATION MANAGEMENT

In 1993 the Native Title Act recognised that native title could coexist with other rights on the same land. In 2000 the Environmental Protection and Biodiversity Conservation Act recognised the role of Aboriginal sustainable practices. The result in Kakadu has been the acceptance of the local people as participants in the governing process through five associations and their representatives

The National Parks and Wildlife Service is well aware that Kakadu's unusual status as a cultural as well as a natural heritage site rests on its ancient Aboriginal culture which is therefore respected within the Park. The management of the Park is overseen by the Director of National Parks and Wildlife and the Kakadu Board of Management, established in 1989, and carried out by staff of the Parks and Wildlife Service with officers seconded from the Conservation Commission of the Northern Territory and the Northern Land Council (NLS). Ten of the fourteen members of the Kakadu Board of Management are Aboriginal people nominated by the traditional owners of Park lands, to ensure that the Service is aware of Aboriginal perspectives on park planning and management, and expects them to participate in them. The native communities' interest in having their land managed with and by the Park Service is to preserve it in the face of outside and competing pressures. This regime of joint management is an admired model both at home and abroad, though publicly challenged for its limits on tourism by the Northern Territory government (ANPWS,1998).

The Park's fourth five year Plan of Management started in 1997, continuing the consolidation of the Park management, with increased programs for monitoring its resources (DASETT, 1993). The Park is divided into four zones of increasing sensitivity with appropriate policies for each. Site-specific plans for a number of visitor destinations in the Park provide for their responsible management. Active management ensures that minimal damage is caused by weeds, feral animals, fire, tourism and other human uses such as mining, especially in the southeast, and over 500 roadside gravel extraction pits which are being rehabilitated. Weed control continues with a successful *Mimosa pigra* control program. The Commonwealth Government also supports a program outside the Park to prevent invasion from nearby infestations. Management of *Salvinia molesta* is high priority. There has been a program to eradicate introduced feral, water buffalo as part of the national brucellosis and tuberculosis eradication programme. The remaining animals are tracked using 'Judas cows' carrying transmitter collars (DASETT, 1993). The effects of mining are monitored, but not regulated, by the Office of the Supervising Scientist.

MANAGEMENT CONSTRAINTS

The main past cause of natural environmental degradation has been the water buffalo, which damaged the native vegetation and caused erosion. However, these have been reduced from 20,000 in 1988 to less than 250 and this population is being controlled. Feral pigs, horses and donkeys are also targeted. Combating infestation by the poisonous cane toad has recently become necessary (Pyers, 2002). Their effect on the local wildlife is so severe that the Park authorities may translocate quolls to an offshore island to save them (UNESCO, 2005). Since their successful protection, the saltwater crocodiles have multiplied to some 5,000 in number and become very bold, attacking boats and swimmers. Park officials have had to begun protecting tourists from them. The two weeds, giant sensitive plant *Mimosa pigra*

and the waterweed *Salvinia molesta*, are currently of great concern because they can easily come to dominate wetland areas (DASET, 1991). Much effort have been made to eradicate *Mimosa pigra* since it first appeared in the Park in 1984, by a full-time team of six staff, using manual and herbicidal techniques (Braithwaite *et al.*,1989). As a consequence, Kakadu, with no untreated occurrences of adult plants known in the Park, is one of the few estuarine river systems in the Northern Territory that is effectively free of the weed, but there is a constant threat of re-infestation. *Salvinia molesta* infestation has been so severe that biological control, using the Salvinia weevil *Cyrtobagous salvinae* and mechanical harvesting, have been attempted, and in 1989 the Magela Creek system in the north-east of the Park was quarantined. A number of other weeds also cause concern and are subject to control programmes.

Fire, although a major threat in the dry season, is an integral part of Australian ecosystems. Since 1979, a return to the traditional Aboriginal fire regime has been an objective of fire management. This creates a mosaic of burnt and unburnt patches which protects the area from the destructive hot fires used by European pastoralists. This is important in the traditional floodplain hunting areas of the natives who have tended to be excluded from consultation in the past. Research and monitoring of the effects of fire in the Park has been a continuing priority, especially to prevent it spreading outside the Park. Rock art is most seriously damaged by water flowing over the rock and by feral animals. These sites are also damaged by vegetation, termites, wasp nests, and vandalism by visitors, although the last is rare (ANPWS, 1998).

Leases for working three uranium mines within the area of the Park were granted in the 1970s, before the National Park was proclaimed. These have proved especially contentious. The Ranger mine in an enclave within the Park, has been worked open-cut since 1981, the land having been ceded to the company by the Northern Land Council acting on behalf of the local tribes in 1982, and the mining rights were transferred to the company in 1991. However, the mine had a long record of toxic spills into its surroundings. In 1997, as work on the Ranger mine diminished, Energy Resources of Australia (ERA) started construction in a second enclave of an underground uranium mine with a surface mill at the Jabiluka uranium lease, to start operating in 2001. A resulting movement by UNESCO and NGOs to designate Kakadu an endangered site (Wilderness Society,1998) prompted a 1999 government campaign, supported by UK and US opinion, to oppose this designation since the native rights had been legally ceded (Environment Australia, 1999; Brown, 2003). The Office of the Supervising Scientist stated in 2000 that the mine would pose negligible effects on the area's health and ecology.

Concerns were then voiced over the effects of the mine on Aboriginal cultural sites: a proposed haul road would cross an Aboriginal sacred site and over 200 similar sites exist within the lease area, including burial sites, creation sites, living areas and art (UNESCO, 1998). Work on Jabiluka was postponed to allow for an investigation of the effects on the culture (UNESCO, 2000). In 2002 a cultural heritage management workshop on this issue was held by ICOMOS Australia with the Gundjemi Aboriginal Corporation and Environment Australia (UNESCO, 2002). In 2003 IUCN and UNESCO called for more effective management of the mines, with monitoring and oversight by an independent scientist, with continued involvement of the traditional landowners affected. In addition clearer definition of responsibilities, better communication between all parties and above all, active support from the State Party, were considered necessary to avoid the site being listed as endangered

The local Aborigines, particularly the Mirrar, have for years been strongly critical of both mines, fearing the destruction of their ancestral landscape, and have constantly opposed the government's support for them. Their main concerns were for the effects on the area's water, ecology and people of radioactive pollution from mine tailings incorrectly stored at the Ranger mine, from uranium ore stockpiled in the open at Jabiluka and from continued leaks of contaminated water into local streams. There were serious concerns about the standard of management by the Ranger mine operator and the lack of reporting and information about breaches; also about the lack of baseline data on the effects of the mines on rare or endangered species. In early 2002 there were four breaches by ERA, which led to heavy contamination by uranium waste, not immediately reported, of a creek used by local people.

In 2003 the Federal government proposed amended guidelines to permit development within World Heritage sites. But even before this, pressured by international attention concerning aboriginal rights and reduced world prices for uranium, ERA had decided to backfill and clean up the uranium stockpile. In 2003 the company made a commitment to the Gundjehmi Aboriginal Corporation not to mine Jabiluka without the agreement of the Mirrar and put the mine into long-term care and maintenance. Three releases of contaminated water in 2004 from the Ranger mine again alerted conservationist pressure –

between 1982 and 2004 over 120 incidents had been recorded (Murdoch, 2004) and it was temporarily closed. In March a uranium mine spillage led the Northern Territory government to charge ERA for negligence. In late 2004 the aboriginal owners gained the right to veto the future development of uranium mining in the Park. The Northern Land Council acting on their behalf, voted unanimously to ratify this agreement with Rio Tinto/ERA, subject to review every four years (ERA, 2004).

STAFF

Approximately 70 staff are employed, including scientists, plus 41 Aboriginal rangers, seasonal rangers, and support staff. Two staff are employed full-time to plan and supervise research and management of the cultural resources (Environment Australia, 2003; DASETT, 1991).

BUDGET

The Australian government made an annual allocation for Park operations and capital works. In 1990-1 about A$6.7 million (US$ 5.1 million) was allocated to the Office monitoring the effects of mining operations. For years, CSIRO spent over A$1 million on research in Kakadu each year (DASETT, 1991) In 2001-2002 about A$5.8 million (US$3 million) was allocated by the Commonwealth government for Park operations. Lease payments are generated from park use fees to the Northern Land Council: royalties of about A$5million a year are paid by the government to the Gagadju Association (Pyers, 2002; Environment Australia, 2003).

LOCAL ADDRESSES

The Director, Australian National Parks and Wildlife Service, Department of the Environment, Sports and Territories, GPO Box 787, Canberra, ACT 2601. Australia
The Director, Australian Nature Conservation Agency, GPO Box 636, Canberra, ACT 2601, Australia
The Director, Conservation Commission of the Northern Territory, POB 496, Palmerston, N.T., Australia

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