World Heritage Sites

Protected Areas and World Heritage

PURNULULU NATIONAL PARK
WESTERN AUSTRALIA

Brief description: *The Bungle-Bungle Range is a spectacular karst landscape of high cones of quartz-sandstone. It has been deeply dissected into round-topped towers of orange rock banded with dark grey cyanobacterial crusts which change color after rain. With their deep intervening palm lined gorges the landscape is geologically unrivalled and of unusual beauty. The region is between desert and savannah with wildlife and flora of both, and several endemic species. Within it lived one of the few ancient hunter-gatherer aboriginal societies which has retained its vitality. They expressed their ties to the land in the well-known paintings of the Turkey Creek artists.*

COUNTRY Australia - Western Australia

NAME Purnululu National Park

NATURAL WORLD HERITAGE SITE
2003: Inscribed on the World Heritage List under Natural Criteria vii and viii.

IUCN MANAGEMENT CATEGORY
II (National Park)

BIOGEOGRAPHICAL PROVINCE
Northern Savanna (6.11.10)

GEOGRAPHICAL LOCATION
Purnululu National Park is in the East Kimberley region of the state of Western Australia, in the far north-west of the continent. It is 450 km directly south south-west of Darwin and approximately 300 km by road south of the town of Kununurra. The nominated site is bounded by the Ord River to the south and east. Its
geographical co-ordinates are 17º15' to 17º46'S by 128º15' to 128º55' E.

DATES AND HISTORY OF ESTABLISHMENT

1967: The Ord River Regeneration Reserve was designated in order to restore grasslands degraded by overgrazing. This included the sand plain and grasslands along the River Ord and surrounding the Bungle Bungle Range;

1987: Purnululu National Park created by the National Parks and Nature Conservation Authority of Western Australia, now the Conservation Commission (CALM) under the Conservation and Land Management Act of 1984;

1988: Upgraded to a class "A" Reserve, including the nominated area and the surrounding buffer zone, the Purnululu Conservation Reserve.

LAND TENURE
The Government of Western Australia. Administered by the State Department of Conservation and Land Management (CALM). Its enabling Act is being amended to vest the National Park and Conservation Reserve buffer zone, within a Prescribed Body Corporate. This could then hold native title on behalf of Traditional Owners (the local aboriginal tribes in the area), allowing the Park to convert to

conditional freehold. A perpetual or termed lease will probably be established to enable management of the property for the Purnululu Park Council, which unites representatives of the Traditional Owners and CALM.

AREA

Purnululu National Park World Heritage site is 239,723 ha. Purnululu Conservation Reserve, a narrow buffer zone along the northwest sides of the Park, is 79,602 ha.

ALTITUDE

From 350m to 600m within the National Park, and to 720m in the adjacent Conservation Reserve.

PHYSICAL FEATURES

Purnululu National Park with the Purnululu Conservation Reserve contains four major ecosystems: the Bungle Bungle Range of some 45,000 ha in area, a deeply dissected plateau of cone-karst that dominates the centre of the Park; wide sand plains surrounding the Bungle Bungles; the grassy Ord River valley in the east and south of the Park; and limestone ridges and ranges to the west and north of the Park.

The Bungle Bungle Mountains are an unusual and very dramatic plateau of Devonian quartz sandstone, approximately 360 million years old. They were created through a complex process of sedimentation, compaction, uplift caused by the collision of Gondwanaland and Laurasia approximately 300 million years ago, and the convergence of the Indo-Australian and Pacific Plates 20 million years ago, and long ensuing periods of erosion. The Bungle Bungle landscape comprises a mass of beehive-shaped towers striped with regularly alternating dark grey bands of cynobacterial crust (single cell photosynthetic organisms). The towers rise very steeply with an abrupt break of slope around the domed summit. Their surface is fragile but stabilised by the crusts of iron oxide and bacteria. The plateau is dissected by a labyrinth of 100-200m deep, sheer-sided gullies. They provide an outstanding example of dissolutional weathering of sandstone, with removal of sand grains by wind, rain and sheet wash on slopes.

The range is one of the most extensive and impressive occurrences of sandstone tower karst in the world (Wray 1997). Comparative areas include the *tepuis* of the Canaima World Heritage Area in Venezuela, the Wulingyuan Scenic & Historic Interest World Heritage Area of China, the Chimanimanie Highlands on the Zimbabwe-Mozambique border, and the Vila Velha region of south Brazil, but all these have a different geomorphological evolution and are within different bioclimatic zones. Within Australia, there are several examples of tower karst landscapes in quartzites, such as the ruiniform relief of the Arnhemland Plateau, the Watarrka and Keep River National Parks in the Northern Territories, and Monolith Valley in New South Wales. In all these cases, the tower karst is smaller in scale and differs in geological composition and landform evolution from that in Purnululu.

The grassy Ord River valley in the east and south of the Park drains two creeks from the south, Bellburn Creek and Piccaninny Creek, and three creeks from the north of the mountains, Red Rock Creek, Osmand Creek and Buchanan Creek. It is deeply incised as a result of crustal uplifting during relatively recent geological times. The wide sand plains between the uplands and the river are composed of infertile black soil covered with grassland and scattered trees. The limestone ridges to the west and Osmand Range to the north are better wooded, especially the forested Osmand Creek valley. These rocks are believed to be of Cambrian age (550-500 million years old). There are stromatolites (very ancient fossil cyano-bacterial growths) in the Osmand range.

CLIMATE

The region has a dry monsoonal climate, with two contrasting seasons. The hot wet summer season between November and March has an average maximum temperature in October of 38.3ºC, and receives all of the annual rainfall of between 600mm, often in heavy falls during thunderstorms. The long winter dry season from April to October has an average minimum July temperature of 29.1ºC and occasional night frosts. Evaporation exceeds 2000mm and run-off is rapid. There is little permanent water or dry season flow except for pools in well-sheltered gorges.

VEGETATION

The Park's vegetation reveals its transitional location between the northern tropical savannah (Torresian) and inland arid desert (Eyrean) biogeographical regions. Some 17 vegetation communities can be classified according to moisture availability, ranging from closed forests in the gorges and valleys, through open forests in riparian areas and open woodlands in drier areas, to stunted shrublands and grasses in the driest uplands and surrounding plains. The dominant vegetation in the Park is open woodland and spinifex *Triodia* spp. (spiny hummock-grass) grassland, with many eucalypts, acacias and grevilleas; notably silverleaf bloodwood *Eucalyptus collina* and roughleaf range gum *E. aspera*, The regionally endemic sandstone grevillea *Grevillea miniata*, and rock grevillea *G. psilantha*, are found only in the Park. Its transitional location has made the Park a centre of endemism for spinifex resulting in the highest density of *Triodia* species in Australia, including *T. bunglensis*, which is endemic to the Park.

The southernmost penetration of monsoonal savanna species brings palms, *Livistona* spp., orchids and ferns into the micrenvironments of the deeper valleys. The transitional climate may also explain the presence of the five species of bacteria, very ancient single-cell photosynthesising organisms, which form a striking grey crust on alternate layers of sandstone over a wide area of the mountains. In all, 653 plant species are recorded from the Purnululu area, including 628 higher plants (of which 597 are native), 17 ferns and fern allies and 8 species of lower plants. 13 plant species are considered to be relict species.

FAUNA

The diversity of the animals in the Park also reflects the mixing of tropical and desert habitats. The recorded fauna comprises 298 vertebrate species: 41 mammals, 149 birds, 81 reptiles, 12 frogs and 15 fish (Woinarski *et al.*1992). It is composed of animals from both desert and savanna ecosystems and includes species such as short-eared wallaby *Petrogale brachyotis*, monitor lizard *Varanus dumerilii*, and many varieties of skinks Scincidiae. These are all arid land animals found on the upland plateau, while in the sheltered valleys below is a variety of frogs, the pale field rat *Rattus tunneyi* and large-footed mouse-eared bat *Myotis adversus* which are damp environment species. The nocturnal burrowing skink *Proablepharus reginae* is also a relict species. Birds pass through on migration from the north in the wet season and from the south in the dry season. One rare grassland species is the grey falcon *Falco hypoleucas* (VU) of which only about 1,000 are said to remain.

CULTURAL HERITAGE

Aboriginal Australians have lived in the Ord River region for at least 40,000 years. This is attested by over 200 sites of rock art and burial within the Park. It was and still vestigially remains a hunter-gatherer culture, with people moving from the desert to the uplands in the wet season, to foothill pools after the rains and along the river in the dry season, when this becomes a vital resource and refuge. Fire was historically used to manage the environment to create a mosaic of vegetation with differing uses. Two main tribal groups and their economic networks, one based on the desert and the other on the savanna, meet in the area, each having two languages. Historically these groups were river people who used the Ord River Valley, Red Rock and Osmand creeks in particular. Aboriginal religious observance is based on their countryside, which guides the culture. Their Law, like the 'Dreaming' elsewhere, is called *Ngarrangkarni*. It sees the landscape as an embodiment of spiritual and cultural values: as a record of the creation, past history, past ancestors, their laws and ceremonies and traditional food production and networks of exchange.

This belief enabled the Aborigines in this area to survive the impact of colonisation by pastoralists. These started to arrive in the area after 1884, taking up 50,000-300,000 ha leases on the native lands. By 1902 there were nearly 50,000 head of livestock on the Ord River grasslands. Then in 1885 there was a gold rush at Hall's Creek, 100 km to the south, bringing an influx of miners. The Aboriginals suffered from introduced diseases, murder, erosive destruction of waterholes and riverbanks by overgrazing and received only food in payment for work. To stop livestock raiding, the government provided some refuges and food but did not stop the dispossession until the 1970s. In Western Australia where 40 per cent of mining rights could fall subject to native title claims, the government legislated to extinguish native titles as late as the 1990s, offering "rights to traditional usage" of land instead.

LOCAL HUMAN POPULATION

By 1967, the area had been used for pastoralism for 80 years. But by this time, erosion caused by overgrazing had begun silting up the new Lake Argyle downstream which led the state government to create the Ord River Regeneration Reserve to control erosion by limiting numbers of stock and carrying out revegetation of the bare land. The state government also decreed that the aboriginals should be paid for their work. They were, however, forbidden from living on the local sheep stations and were banished to refuges, settling at Turkey Creek to the north and Hall's Creek to the south.

In the 1970s senior aboriginals petitioned for return to their country and expressed their discontents in public ceremonies and through paintings, made as records of their country and past history, which are now widely appreciated as works of art by collectors. They regard proper maintenance of their land as essential to their cultural survival. After the National Park was mooted, livestock numbers were at last reduced and in 1995 the Purnululu Aboriginal Council was set up. This is an incorporation giving legal identity to indigenous communities and eligibility to receive government funds. In 2002 1,000 hectares of Living Area leases within the Park were signed for some traditional aboriginal owners. The Park authorities intend to establish more such leases in future.

VISITORS AND VISITOR FACILITIES

The Park has only been widely known since media promotion in 1983 of the Bungle Bungle Mountains. In 1986 there were 2,350 visitors by land. By 1996 there were 14,500 visitors by land and some 40,000 by aerial tours. There are now about 20,000 overland visitors a year. Development of visitor facilities is mostly concentrated on the west side of the Park. There is a visitors centre, helipad, and new airfield at Bellburn, two commercial and two public campsites, 50 km of internal vehicle tracks and 7 walking trails ranging from 30 minutes long to a 30 km overnight trip. There are no accommodations nor is there access to the Park during the wet season (November to March) except to the commercially run camp from the air, because of seasonal flooding along the access track. This is kept suitable for 4-wheel-drive cars only, in order to control tourist numbers and encourage them to take aerial or guided safaris. To improve access to the site will require improved infrastructure, facilities and staff. Meeting the growing interest in indigenous cultures should increase the economic benefits to local people from direct employment, crafts and art.

SCIENTIFIC RESEARCH AND FACILITIES

The first geological map of the area was made in 1884. In the 1930s three studies of aboriginal occupations and social organisation were made (Kaberry 1937, 1938 and 1939). In the 1980s there was a botanical survey of the mountains and the Osmand Range (Forbes & Keneally, 1986), investigation of the geomorphology and structure of the sandstone (Young 1986, 1987, 1988) and in 1988 a three month survey of archaeological sites on the north and west margins. In 1992, Woinarski surveyed the vegetation and wildlife of the Park and surroundings. In 1997, Hoatson and others from the Australian Geological Survey brought together all the existing data on the area. In 1997 Wray, and in 2001, Tyler, published studies of the geology and in 2001, Kirkby & Williams described the cultural values of the native people.

CONSERVATION VALUE

The Bungle Bungle Range is a spectacular and extensive karst landscape of sandstone towers vividly banded with grey cyanobacteria. The surrounding plains and riverine grasslands are a region between desert and savanna, with wildlife and flora from both, and several endemic species. The Park lies within a WWF Global 200 Freshwater Eco-region. Within it lives one of the few surviving 40,000-year-old hunter-gatherer societies, which has retained its vitality despite more than a hundred years of hostile colonisation. The relationship of these people to the land and their past, expressed in their Law or *Ngarrangkarni*, is revealed in the famous paintings of the Turkey Creek group of artists.

CONSERVATION MANAGEMENT

The uplands are in good condition, but erosion of the sand plains following intensive and continuous overgrazing has caused destructive silting downstream. In response to this the Ord River Regeneration Reserve was established to limit stock numbers and revegetate bare land. In 1985-6 the proposed designation of the National Park led to the removal of 25,000 cattle, 4,000 donkeys and several camels.

Programs were also started for feral cat control, and for protective patch burning, as practised by traditional owners, to create vegetation mosaics which would decrease the destructiveness of the wild-fires to which the now recovered grasslands are vulnerable.

The National Park is managed under the Conservation and Land Management Act of 1984. For years after adoption of the original Management Plan which spoke of joint management, there was no recognition of traditional ownership, and no Aboriginal majority on a Board of Management. The Western Australian Department of Conservation and Land Management is arranging for future joint management of the Park with the traditional owners within the Purnululu Park Council. These owners who are aboriginal claimants registered under the Commonwealth Native Title Act of 1993, were barred from living in the Park. However, their knowledge of the ecology and how to manage the land is now being drawn on. For them, this is to manage their own cultural survival as well as providing employment, training and funding. They are given the opportunity to return and live seasonally in Living Area leases inside the Park. With World Heritage status, the Park will be protected under the Commonwealth Environmental Protection and Biodiversity Conservation Act of 1999, and key indicators and monitoring of the state of conservation will be developed by the Park's Council and the Advisory Committee.

The Purnululu National Park Management Plan for 1995-2005 was complied in 1995 and is currently under review by the Conservation Commission. It aims are to:

- Conserve and protect landforms, ecosystems and areas of scientific and cultural importance;
- Permit aboriginal traditional owners to live on the land following their customary lifestyle;
- Provide for public recreation;
- Promote appreciation of natural processes and interpretation of the native culture
- Protect the safety of residents, neighbours and residents;
- Institute research and monitoring of all aspects of the Park to improve its management
- Control any commercial and industrial impacts.

Preparation of a new management plan for incorporating indigenous heritage values, has been given high priority by the Federal Department of Environment and Heritage. In addition, funding has been allocated to support the engagement of a new executive officer for the World Heritage area, the establishment of World Heritage management committees and a cultural heritage management study to support the planning process and the proposed re-nomination of cultural heritage values for the area. It is also hoped that the Purnululu Conservation Reserve will eventually be incorporated into the Park.

MANAGEMENT CONSTRAINTS

The past pressures of accelerated soil erosion due to overgrazing, the destruction of native animals by exotic wildlife (especially cats) and invasion by alien species have all come under control but continue to need monitoring. Other pressures on the site are not yet serious, but growing visitor numbers will increase the erosion of fragile sandstones and the need for risk-management of floods and rockfalls. There is a need for safer vehicle tracks and a fire protection management program, against events such as the fire that swept over 30% of the Park in early 2005. Adequate management of the present high level of wear on the main access track and on certain tracks and trails within the Park will need more staff and funding.

STAFF

The present staff employed at the Park include one Ranger in Charge, one assistant ranger, one (seasonal) visitor centre manager and volunteer campground hosts. At least two additional rangers, two maintenance workers and two aboriginal heritage officers are planned with the granting of World Heritage status. The Department of Conservation and Land Management (CALM) can draw on regional and state expertise, and the aboriginals can draw on their traditional knowledge of ways to manage the land.

BUDGET

The 2000-2001, annual funding for Park management was AUS$324,620, a third coming from the regional management of CALM, and two thirds from Park entrance fees. To upgrade the Park as a

World Heritage site will need facilities, staff and living areas for the traditional owners at a cost estimated at AUD$3.3 million (US$1.95,m) per year for three years plus an average of AUD$400,000 (US$2.6m) annual operational costs.

LOCAL ADDRESSES

Ranger in Charge, Purnululu National Park, c/o Department of Conservation & Land Management, P.O.Box 242, Kununurra WA 6743, Australia.
Purnululu Aboriginal Corporation, P.O.Box 440, Kununurra WA 6743, Australia.

REFERENCES

The principal source for the above information was the original nomination for World Heritage status.

Anon. (1987). Sandstone landforms of the tropical East Kimberley region, *Northwestern Australia. J. Geology* 95:205-18.

Anon. (1988). Quartz etching and sandstone karst: examples from the east Kinberleys, Northwestern Australia. Z. *Geomorphologie N.F.* 32(4): 409-23.

Behn, G.*et al.* (1997). Watching the grass grow. *CALM Landscape* 13(2):23-27. Western Australia.

Eldridge, D, *et al*. (2001). Soil biota in banded landscapes. In Tongway, D.,*et al*. (eds). *Banded Vegetation Patterning in Arid and Semiarid Environments: Ecological Processes and Consequences for Management,* In Ecological Studies, Vol.149. Springer, New York.

Environment Australia, (2002). *Nomination of Purnululu National Park by the Government of Australia for Inscription on the World Heritage List*. 67pp. [Includes a list of 41 references]

Fisher, A. & Woinarski, J. (2002). *Assessment of the Vertabrate Fauna of the Bradshaw (Juliki) Field Training Area, Northern Territory.* Northern Territory Parks and Wildlife Commission. 86pp.

Forbes, S. & Kenneally, K. (1986). A botanical survey of Bungle Bungle and Osmand Range, south-eastern Kimberley, Western Australia. In *Western Australian Naturalist*, 16: 93-169.

Hoatson, D. *et al.* (1997). *Bungle Bungle Range - Purnululu National Park, East Kimberley, Western Australia: a Guide to the Rocks, Landforms, Plants, Animals and Human Impact*. Australian Government Publishing Service, Canberra.

Kirkby, I. & Williams, N. (2001). *Purnululu National Park World Heritage Cultural Values.* Unpublished report for Environment Australia.

Purnululu National Park Website: http://calm.wa.gov.au.

Scarlett, N. (1985). A *Preliminary Account of the Ethnobotany of the Kija people of Bungle Bungle Outcamp*. (East Kimberley working paper, no. 6). Centre for Resource and Environmental Studies, Australian National University.

Thomas, R., *et al.* (1994). *Roads Cross. The Paintings of RoverThomas.* National Gallery of Australia, Canberra.

Tyler, I. (2000). Geology and landforms of the Kimberley. *CALM 2000*. 72pp.

Western Australian Department of Conservation & Land Management (1995). *Purnululu National Park Management Plan, 1995-2005*, for the National Parks & Nature Conservation Authority, Canberra.

Woinarski, J. (1992). *A Survey of the Wildlife and Vegetation of Purnululu (Bungle Bungle) National Park and Adjacent Area*. CALM Research Bulletin No.6, W. A.

Wray, R. (1997). A global review of solutional weathering forms on quartzite sandstones. *Earth Science Reviews* 42:137-160.

Young, R. (1986). Tower karst in sandstone: Bungle Bungle massif, northwestern Australia. Z.*Geomorphologie N.F.* 30(2):189-202.

---------- (1987). Sandstone landforms of the tropical East Kimberley Region, northwestern Australia. *Journal of Geology* Vol. 95, pp. 205-218.

---------- (1988). Quartz etching and sandstone kars: examples from the east Kimberleys, Northwestern Australia. Z.*Geomorphologie N.F.* 32 (4): 409-23.

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