



CUTTA CUTTA CAVES NATURE PARK

PLAN OF MANAGEMENT November 2000



Summary

The Parks and Wildlife Commission of the Northern Territory is responsible for the management of Cutta Cutta Caves Nature Park. Located 30 kilometres south-east of Katherine, the 1499 hectare park includes the Cutta Cutta Cave, a significant regional tourist destination.

The Park was first created in 1967 under the management of Northern Territory Reserve Board to protect and manage its conservation and tourism values. These include the Cutta Cutta and Tindal Caves and the surrounding karst landscape. Rare and scientifically interesting flora and fauna inhabit the caves formations, which also represent important opportunities for study into tropical cave ecology and karst processes.

Since 1967 a section of Cutta Cutta Cave has been used for ranger-guided underground tours, offering visitors a unique cave experience and excellent interpretation of karst and cave formations. Since 1991 guided tours and kiosk sales have been conducted under a concession operation.

Past management activity has focused on supporting concession operations, furthering knowledge of the Park's caves and cave fauna, control of weeds, maintenance of boundary fencing and reducing the impact of wildfire on vegetation.

This is the second Plan of Management for this Park. It identifies the key management issues and presents guidelines by which the Park will be managed. The Plan proposes no drastic change to the way the Park has been managed to date. It focuses chiefly on continuing management for the protection of the Park's natural values, encouragement of further research and monitoring and enhancing visitor service through the concession operation. For the period of this Plan significant management directions are:

- Improvement in the knowledge and understanding of the Park's karst and caves, the fauna utilising this habitat and the processes acting on these environments.
- Increasing cooperation with neighbouring landholders to facilitate effective management of fire, weeds, feral animals and human activities, which may impact on cave systems in the Park.
- Continuing a close working relationship with the concessionaire to enhance visitor experience and satisfaction.
- Continued regulation of access to the caves through guided tours or permits only.

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1.0 INTRODUCTION

1.1 Purpose of this Plan

This plan states the intent of the Parks and Wildlife Commission with regard to the management of Cutta Cutta Caves Nature Park. It sets management objectives, identifies and addresses current issues, and presents actions and guidelines aimed at ensuring the effective management and appropriate development of the Park with regard to its values and resources.

This plan is prepared pursuant to sections 18 and 19 of the *Territory Parks and Wildlife Conservation Act*. It is the second Plan of Management prepared for Cutta Cutta Caves Nature Park. The first plan was completed in 1992 and was in operation for a period of five years. This plan will remain in operation for a minimum of 5 years and a maximum of ten years unless revoked by a new plan or amended in accordance with the Act.

1.2 Park Location, Background and Description

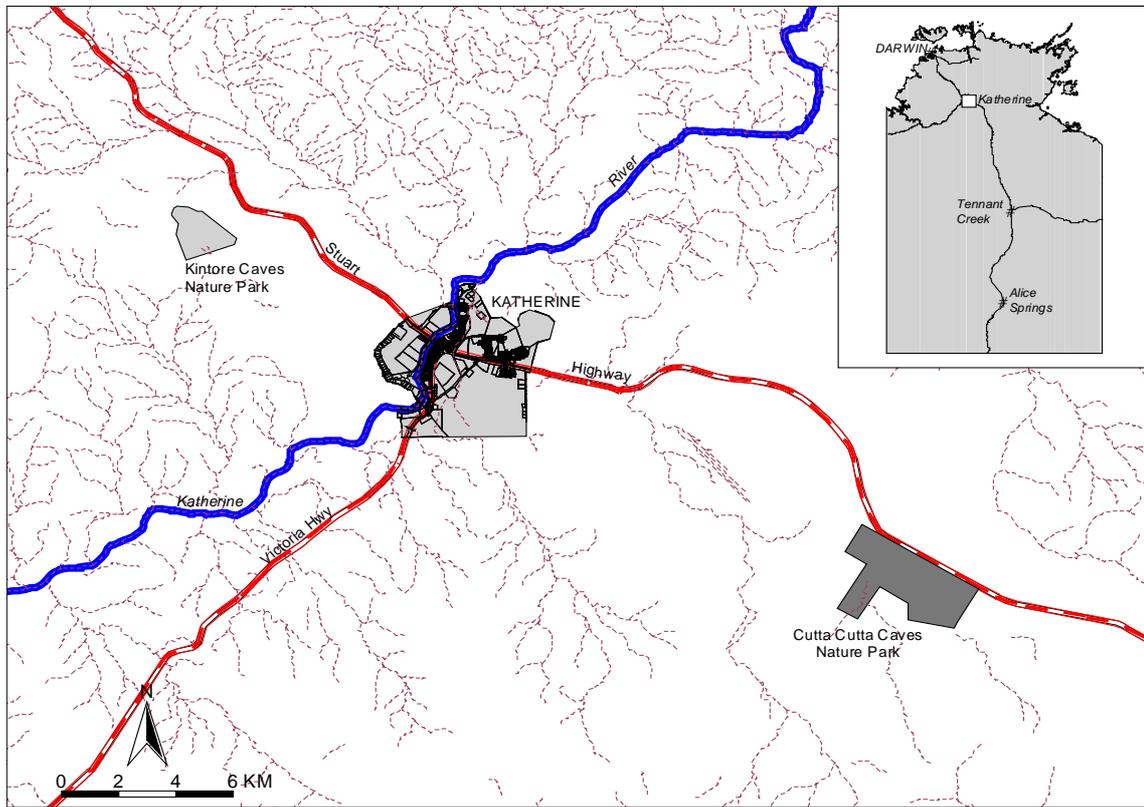
Cutta Cutta Caves Nature Park is located 30 kilometres south-east of Katherine (see Map 1). The Park's total area is 1499 hectares, comprising NT Portions 1797 and 786. Adjoining the Park's boundaries are the Stuart Highway to the north, the Tindal RAAF Air Base to the west and land zoned for rural use to the south and east (see Map 2).

The Park's main feature, the Cutta Cutta Cave is presently the only cave in the Northern Territory that is open for public tours. This and other caves in the Park have been known and visited since the early 1900s, but it was not until 1967 that an area of 259 hectares was reserved as Sixteen Mile Caves Reserve, under the control of the Northern Territory Reserves Board. The name of the reserve was changed to Cutta Cutta Caves Nature Park in 1979 and in 1984 the area of the Park was increased to include NT Portion 1797.

The initial impression of the Park's landscape is typical of much of northern Australia. Vegetation consists mainly of Eucalyptus open woodland with minor shrub cover over a *Sorghum* and *Themeda* tall-grass understorey. The Park is located on a broadly rolling plain with local relief of only 25 metres. Surface drainage in the area is indistinct, consisting of two small watercourses flowing into the southwest portion of the Park.

The visual character of the Park is defined by its limestone geology. The weathering and erosion of this limestone has produced a visually striking terrain known as *karst*, which is apparent over a large area of the Park. The limestone pavements, low rocky hills and ridges display a range of interesting surface features unique to karst. Of most interest however, is the extensive system of underground caves and subterranean features.

Two of these caves have been developed for visitor use. The cave from which the Park's name is derived, Cutta Cutta Cave, has been the subject of guided tours since 1967. Cutta Cutta and one other cave, Tindal Cave, have been developed, with constructed walkways and lighting for visitor safety and amenity.



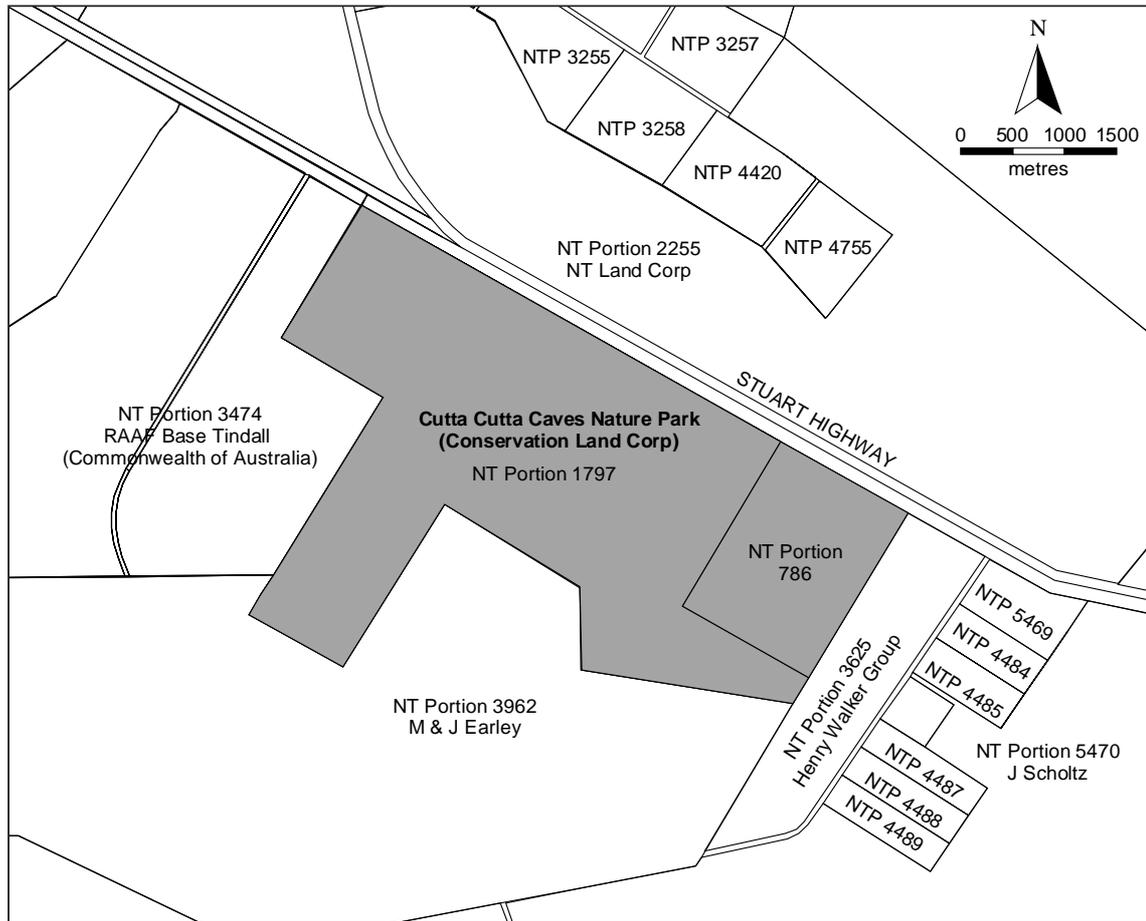
Map1. Park Location.

A concession operator conducts guided tours of Cutta Cutta Cave daily. Visitor facilities on the Park include bitumen road access, car-parking and picnic facilities, a visitor centre / kiosk, and short interpretive walks. Over 18,500 people visited the Park and participated in guided underground tours in 1999 (PWCNT Database).

The Park lies within the traditional lands of the Jawoyn Aboriginal people for which this place has some significance. The Park contains evidence of a long history of human occupation, including campsites, stone artefacts and at least one cave wall that exhibits incised grooves of marked significance. The Park is not subject to any current land claim.

1.3 Background

There is relatively little information on the early European history of the area. For a period around 1900 the main cave was known as "Smith's Cave" named after a white stockman said to have discovered it. The caves are recorded as being a picnic destination for Katherine residents during the period 1920 - 1960. During the Second World War the Caves became known as the Sixteen Mile Caves and were regularly visited by servicemen based in the area. The south-eastern section of the Park was used by pastoralists as a cattle holding area with evidence of past camping including materials left in some caves and rock overhangs. The main cave attracted some fame in 1962 when used for a "cave-sitting" record attempt. The area was eventually declared a reserve in 1967 and it has since become one of the Katherine Region's major tourist attractions.



Map 2. Neighbouring Land Tenure.

Cave tours were conducted by a number of concession operators until 1975 when the Reserves Board staffed a ranger on the Park permanently and assumed full management of the Park including cave tours. The name of the reserve was changed from Sixteen Mile Caves Reserve to Cutta Cutta Caves Nature Park in 1979. Unfortunately the origin of the name “Cutta Cutta” is unknown. In 1991 Tindal Cave became the second cave developed for guided tours, and a concession operation was granted for public cave tours. The Park continues to be a tourist attraction of regional significance.

1.4 The Values of the Park

The Park has considerable **scientific and conservation value**, which is recognised through its listing on the Register of the National Estate. The Park’s karst features, in particular the extensive underground caves represent an excellent opportunity for continued study into tropical caves, their ecology and karst processes.

The caves are inhabited by bat species of particular conservation significance as well as interesting invertebrate fauna about which little is known, including a rare blind shrimp. Remnant monsoon vineforest fringing the limestone outcrops of the Park are also of marked conservation interest.

The opportunity for visitors to see spectacular underground caves with interesting formations and associated fauna, as well as distinctive surface landforms, gives the Park significant tourism and recreation value. The Park is one of the most visited tourist destinations in the Katherine Region. They are also well known and visited by speleological groups for research purposes.

The Park represents an excellent opportunity for visitors to gain an understanding of the dynamic processes of tropical karst development and the relationship between caves and flora and fauna of the area. In this respect the Park has important **interpretation and education values**.

The Park's **cultural values** stem from the long association of the Jawoyn people with the area and archaeological evidence of past Aboriginal activity.



Figure 1. Rugged limestone such as this outcrop is found over much of the Park.

1.5 The Purpose of the Park

In respect of its primary values, the purpose of the Park is to provide for continued conservation of its biodiversity and scientific study of its relatively rare karst processes and features. The Park will continue to represent a key tourism and interpretive resource within the Katherine Region and opportunities for high quality cave visit experiences for the general public will continue to be fostered. Management of the Park will also recognise the value of the Park's cultural resources.

The Park will be managed in accordance with the following guiding principles:

- Management of the Park will focus on conservation of the Park's biodiversity, its natural features and processes for present and future generations.

- The Park's caves and other karst features and processes are of considerable recreational and interpretive value and management of the Park to facilitate visitor enjoyment and appreciation is very important.
 - Effective management is enhanced by knowledge of the Park's biodiversity, natural processes and other resources. It is important therefore that appropriate research, survey and monitoring is encouraged.
 - The area is culturally significant to the Jawoyn people. Sites and resources in relation to their traditional association with the Park will be protected. The Park may contain resources of European historical importance which will be conserved appropriately.
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2.0 PARK ZONING SCHEME

The purpose of the zoning scheme is to define appropriate activities and development within designated areas of the Park to ensure that human use does not conflict with the need to conserve the primary natural and cultural values of the Park. Public access within any part of the Park may be restricted if it is shown to be having a deleterious effect on Park values. Any development on the Park will be carried out with a minimum of environmental disturbance and according to the requirements of the *Environmental Assessment Act*.

Four zones are defined, shown in Map 3. The purpose for each is outlined below:

- **INTENSIVE USE ZONE**

This zone provides for unrestricted public access to the car park, toilet facilities, picnic area and visitor centre, where Park orientation, introductory interpretation, cave tour ticket sales and food and souvenir sales are available. This zone includes the Tropical Woodland Nature Walk.

- **RESTRICTED ACCESS ZONE**

This zone includes the two show caves, Cutta Cutta Cave and Tindal Cave, and associated surface walking and vehicle tracks. Public access within this zone will be with a permit or in the company of a tour guide or ranger. Facilities provided will include access to these caves, on-site interpretation and directional signage and, within the caves, walkways and lighting for visitor safety and amenity.

- **MINIMAL USE ZONE**

Management within this zone will concentrate on protection of the Park's natural and cultural resources and retaining its natural character. Development will be kept to a minimum and access will be by permit only. Caves are often fragile and potentially dangerous environments. They can be damaged and represent a public risk if visited by persons uneducated in minimal impact and

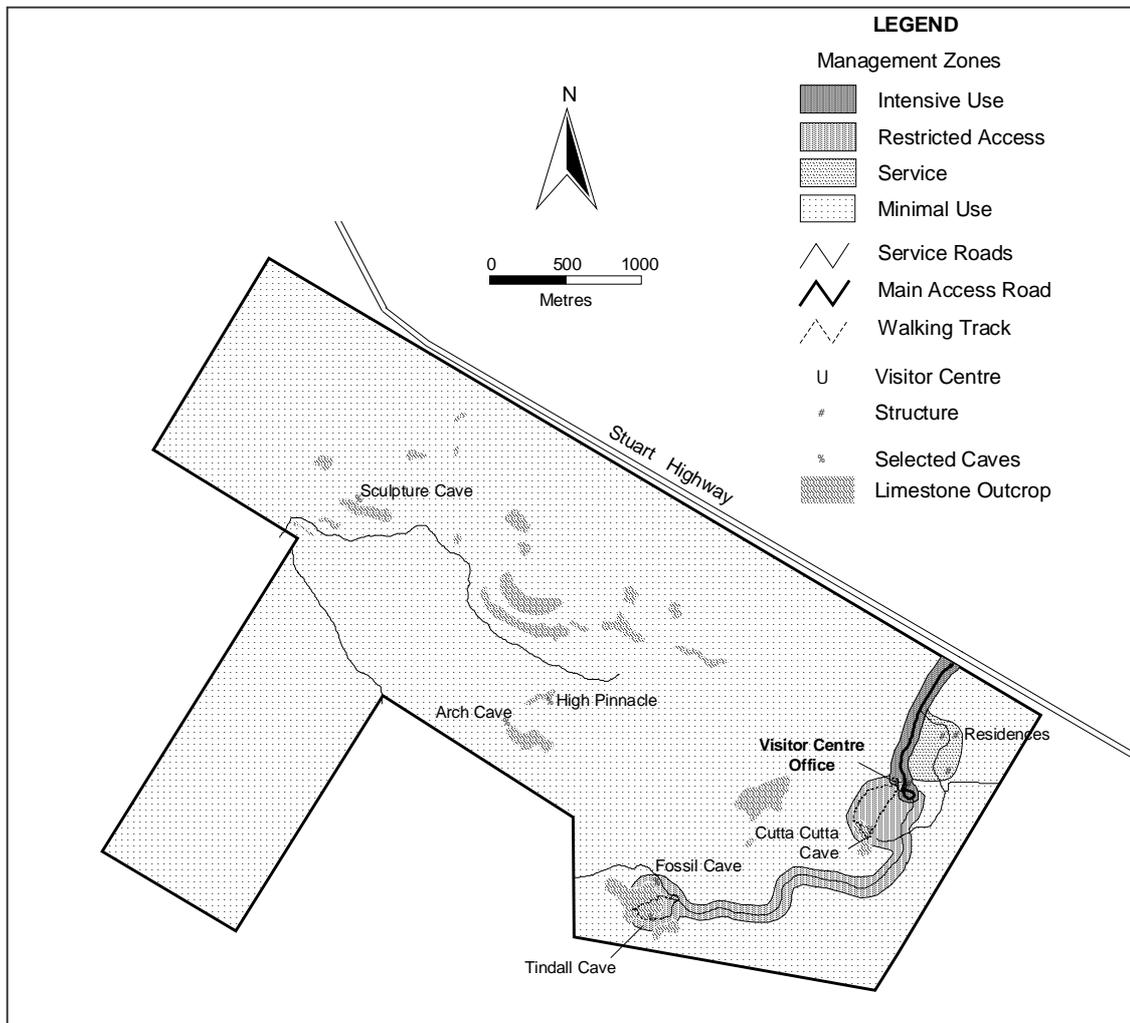
safe caving techniques. A permit system will accommodate caving activities only by skilled cavers who can add to scientific knowledge of the caves.

- **SERVICE ZONE**

This zone provides for staff accommodation and service facilities necessary for the efficient management of the Park. Public access to this zone will be restricted to people requiring emergency assistance.

Zone	Purpose	Access	Activities	Facilities
Intensive Use	To provide unrestricted access to the car park, toilet facilities, picnic area and visitor centre.	Sealed road for conventional vehicle and coach access.	Park orientation and introductory interpretation, cave tour ticket sales, short walks, picnics.	Visitor Centre with public toilets, interpretation, food and souvenir sales. Parking and shaded picnic shelters.
Restricted Access	To provide for access to the two show caves with a permit or in the company of a tour guide or ranger.	Marked walking tracks to the caves, walkways within the caves.	On-site interpretation, guided cave tours.	Walking tracks, interpretive signs, cave safety and amenity developments.
Minimal Use	To protect the Park's cultural and natural resources.	By permit only.	Management activities, karst and cave survey and research.	Service roads and boundary access
Service	To provide for staff accommodation and management facilities.	Visitors requiring emergency assistance only. Maintenance and accommodation	Management activities only.	Residences, storage and workshop areas.

Figure 2. Summary of Zoning Scheme.



Map 3. Park Facilities, Limestone Outcrops and Zoning Scheme.

3.0 MANAGEMENT OF THE PARK'S NATURAL RESOURCES

3.1 Karst, Caves and Hydrology

Objectives

- To protect the Park's caves and karst formations from damage.
- To minimise negative impacts on hydrological processes operating within the Park and surrounding catchment areas.

Information Summary

The Park overlies a geological sequence known as Tindal Limestone, a member of the Daly River Group formed on the eastern rim of the Daly Basin (Twidale, 1984). This sequence, developed in the middle Cambrian period more than 500 million years ago, consists mainly of porous and permeable grey limestone. From the Park's geology, along with the tropical climate and the passage of time, an ancient tropical karst landscape has developed – a terrain with distinctive landforms and hydrology due to the limestone's high solubility and porosity (Lauritzen and Karp, DPLE, 1993). Tropical karst and cave systems such as those represented in Cutta Cutta Caves Nature Park are of limited extent in Australia and are, therefore, of considerable scientific interest. This Park, and the Kintore Caves Nature Park

northwest of Katherine conserve the most significant limestone and karst of the Katherine area. See Map 4.

Karst formations and caves develop from the chemical weathering / dissolution of limestone. Carbonic acid formed from the absorption of atmospheric carbon dioxide into rainwater slowly dissolves limestone. The Park's landscape exhibits a range of surface weathering features unique to karst including pinnacles and towers, ground collapse structures (dolines) and limestone pavement dissected with deep crevices (grikes) that have developed from chemical weathering along rock joints.

Caves are a measure of the intensity and persistence of karst processes. Acidised rainwater moves slowly through cracks and joints in the limestone, producing the soluble compound calcium bicarbonate which is carried away, leaving a cavity. If the process continues a cave is formed. Solutional activity is highest at, or just below the water table where water movement is slow and acidity highest. Most caves on the Park are believed to have been formed in this way.

Both Cutta Cutta and Tindal Caves have been subject to scientific study by the Department of Lands, Planning and Environment as a means to understanding the geological history and hydrology of the Tindal Limestone Formation in the Katherine area. Both caves exhibit convection cupolas, large smooth hemi-spherical scallops in the cave walls and ceilings that indicate times in the past when the caves carried fast flowing heated water, that is, the caves were thermal springs.

There are at least three major cave systems on the Park that have underground passages that exceed 500 metres. Another twelve or so caves contain passages of 100 metres or more and perhaps another fifty smaller caves have passage lengths greater than fifty metres. The Top End Speleological Society has been actively exploring, mapping and documenting the Park's caves for many years and have made a significant contribution to the cave knowledge base. About 50 cave entrances have been numbered and tagged, many of which are linked to the same cave system. The Cutta Cutta and Tindal Caves have been comprehensively mapped and about ten other caves have been partially mapped. Every major limestone outcrop on the Park has been surveyed to some extent but the potential exists for many more cave entrances and probably cave systems to be found (pers. comm B. Swain, Top End Speleological Society).

The cave systems are mainly horizontal although a few caves have vertical entrances that cannot be accessed without special equipment. Many parts of the cave system display interesting calcite formations, or *speleothems*, including stalactites, stalacmites, helictites, shawls, flowstones and rim-pools. See Figure 3. Such features, while visually fascinating and of high interpretive value, are often delicate and easily damaged. Tindal Limestone also contains tubeworms and similar fossils, which can be seen in some parts of the Park.

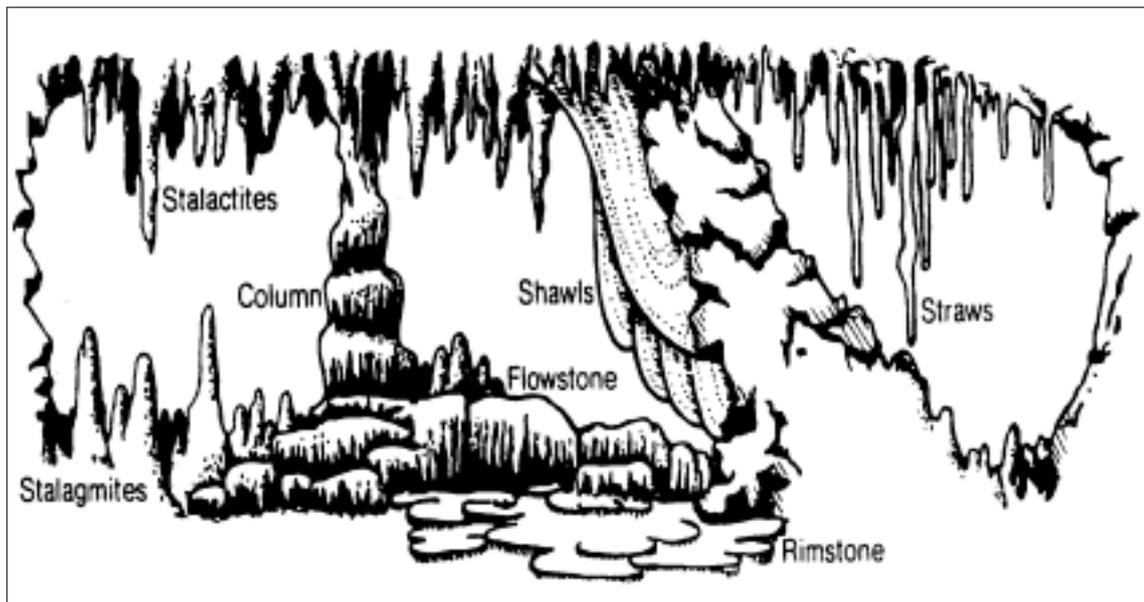


Figure 3. Cave Calcite Formations that are found in Cutta Cutta Caves.

Both surface and underground processes influence caves, and in this regard they are unusual ecosystems. The relative rarity of cave habitats correlates to the fauna that uses them. Cave fauna is often sensitive to change in environmental factors such as humidity and groundwater chemistry. They often exhibit morphological adaptations and life strategies to suit their unusual environment and are therefore generally of high scientific interest and conservation value (see section 3.3).

Caves are highly sensitive to surface disturbance, in particular, any change in the surface hydrology or water flow may alter underground hydrology, increasing or reducing natural flooding and sedimentation patterns. The hydrology of the Park is part of the larger Katherine karst aquifer, the true extent and water flow patterns of which are not fully known.

In 1991 the Parks and Wildlife Commission entered into a twenty year agreement with the landholders adjoining the southern boundary of the Park (NT Portion 3962), with regard to minimising erosion within and around water courses draining into one of the Park's cave systems.

Some parts of some caves on the Park are subject to regular wet season flooding. Many of the Park's caves were subjected to extreme flooding during record rains in January 1998, with high levels of sedimentation in some areas resulting.

The two show caves have been developed to provide a safe and comfortable cave experience for visitors whilst protecting the caves' environment. The Cutta Cutta Cave has a passage length of 750 metres with the first 240 metres developed for public access. The passages of Tindal Cave have a total length of 1700 metres with just 200 metres developed for public access. Access to either cave requires the company of a guide or a permit issued by the Parks and Wildlife Commission.

A number of Aboriginal occupation sites have been identified in association with small shelter caves on the Park. No art sites have been recorded although one shelter exhibits incised grooves of Aboriginal origin. Walsh (1964), reported mysterious incised lines he found on rock faces more than 200 metres beyond daylight in Cutta Cutta Cave. Whether these markings are of human, animal or geological origin is still subject to some debate.

The prospect of economic minerals occurring on the Park is poor and the whole of the Park is *Reserved from Occupation* under Section 178 of the *Mining Act* (RO 1122, gazetted 6 June, 1985 and RO 1163, gazetted 5 February, 1986.).

Issues

- While there exists considerable knowledge of the Park's karst features and caves, ongoing survey, mapping, documentation and database development is very important for management to continually improve. Speleological groups represent an important resource to progress the knowledge base.
- The relationship between surface and underground hydrology requires that any surface disturbance that could interfere with the natural hydrology of the Park must be minimised. Park management activities such as grading of firebreaks and tracks can impact on local drainage patterns and hydrology.
- Cave systems can suffer deleterious impacts due to erosion and sedimentation caused by altered water flow associated with land use activities on neighbouring properties within the local catchment.
- Any development of a cave and visit by a person has an impact on that environment. Caves should not be modified in any way without critical assessment into the potential impacts of actions on the cave environment. When unnatural light is introduced to a cave, moss and lichens grow on cave surfaces. Visitors introduce dirt, lint and other contaminants into caves that may deposit on cave formations, causing discolouration. Over time such deposits can become calcified into place. Unregulated access to caves can disturb wildlife, particularly sensitive bat colonies and can potentially affect cave water quality and sensitive invertebrates using this habitat.
- The sensitive and potentially dangerous nature of caves on the Park requires that visitor access be carefully regulated. Persons visiting caves unescorted by a qualified guide or ranger should be educated in minimal impact and safe caving techniques.

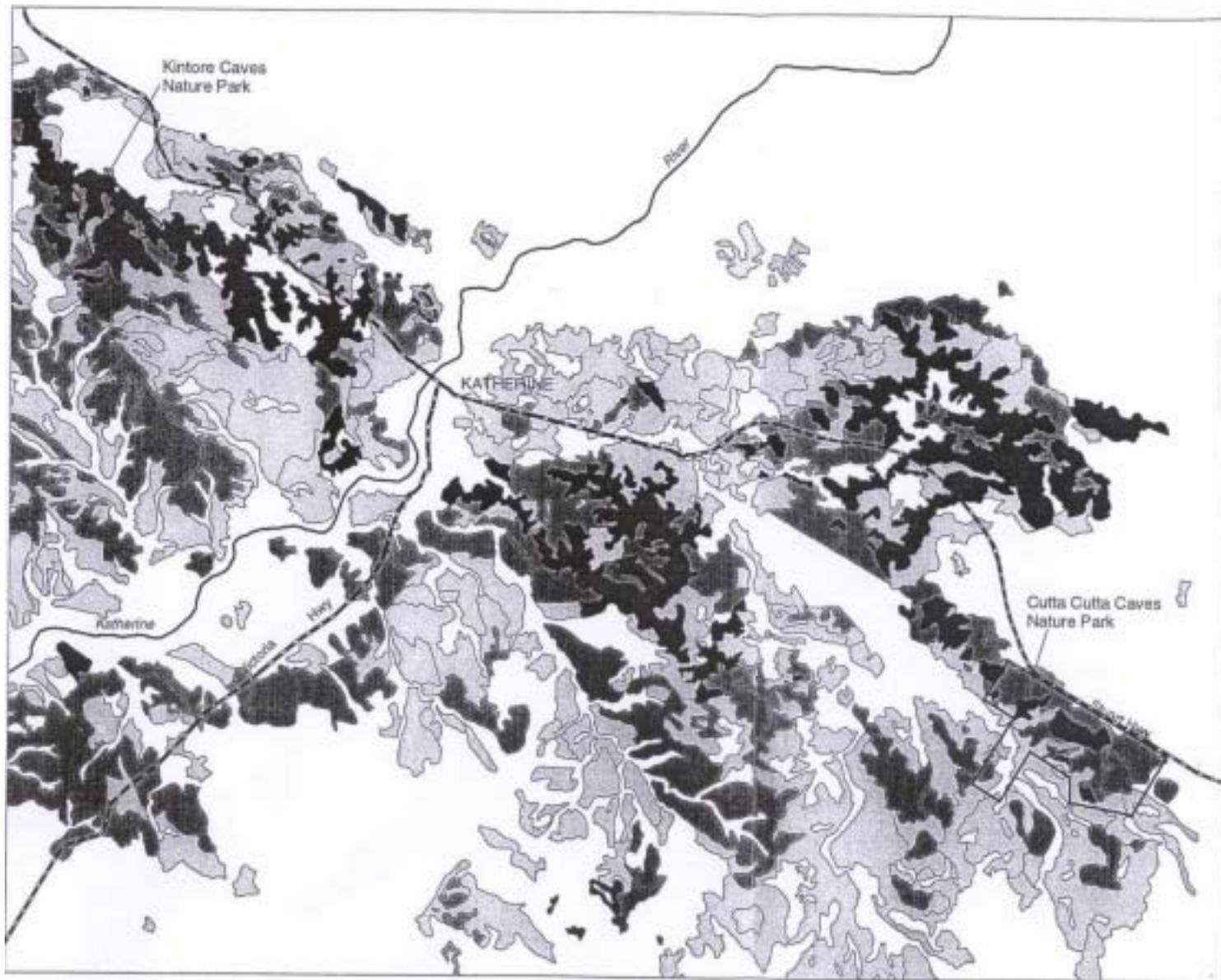
Actions

1. *Further study to improve understanding of the hydrological dynamics of the cave systems and the catchments which influence them, will be actively encouraged.*
2. *Any management activity with the potential to alter surface water flow and cave hydrology or silting will not take place without prior consultation with the Soil Conservation officers of the Department of Infrastructure, Planning and Environment or their agent.*
3. *Study and mapping of the karst and cave features and hydrological processes will be ongoing. The assistance of speleological groups will be sought in this*

regard. A karst and caves database will be developed that is compatible with the Parks and Wildlife Commission's Geographic Information System (GIS).

Information to be acquired and recorded in the GIS database will include:

- Spatial information on cave openings and passages.*
 - Locations and description of significant speleothems.*
 - Data on fauna including bats and invertebrates.*
 - Location and description of Aboriginal archaeological sites and unexplained markings in caves and on rock faces.*
- 4. Consultation and negotiation will be carried out with neighbouring landholders within the surface or subsurface catchment with regard to land management practices that will help safeguard the cave systems on the Park from pollution and sedimentation. The results of further study of the karst aquifer will assist the direction of such liaison.*
 - 5. No cave on the Park will be developed or modified without a thorough assessment of possible deleterious impacts on a cave's resources and ecological processes and will be subject to requirements of the Environmental Assessment Act.*
 - 6. National best practice standards in cave monitoring, maintenance and cleaning of the show caves will be actively pursued and implemented. Expert advice with regard to removal of unnatural mosses and lichens and human imported contaminants, will be sought from respected speleological authorities such as the Australian Speleological Federation.*
 - 7. Public access to the Park and its caves will be controlled. Access to Cutta Cutta and Tindal Caves will continue to be subject to a permit or the company of a qualified cave guide or ranger. Access to other caves on the Park will be by permit only, granted subject to criteria given in Section 5 of this Plan.*



LIMESTONE KEY

Land Units

- 2d
Substantial limestone outcrop with massive ridges and tower karst formations
- 3a, 3b
Rocky with abundant limestone pavement.
- 3c, 3d, 4a1
Scattered limestone outcrop or pavement

N

0 2 4 6 8 10
Kilometres

Resolution of Land Unit boundaries is valid only to 1:50,000.
Enlargement beyond this scale will not result in improved accuracy.

Bibliographic Reference:
J.M. Aldrick and C.S. Robinson,
"Report on the Land Units of the Katherine - Douglas Area,
Department of Lands, Planning and Environment."

Map produced in Review by Mac Moyes, Strategic Planning Unit,
Parks and Wildlife Commission of the NT, December, 1998.

Projection: UTM Grid: AMG Zone 53.

**CUTTA CUTTA CAVES NATURE PARK
PLAN OF MANAGEMENT**

**LIMESTONE OUTCROP IN THE
KATHERINE AREA**

Map 4.

Map 4. Limestone Outcrops in the Katherine Area.

3.2 Flora

Objectives

- To conserve the Park's floral diversity.
- To enhance knowledge and understanding of the Park's flora

Information Summary

The vegetation of the Park consists of plant communities that are relatively common across the Tindal Plain. Most of the Park is open-woodland dominated by *Eucalyptus foelscheana*, *E. tectifera* and *E. confertiflora* above a tall grass understorey chiefly of *Themeda triandra*, *Sehima nervosum* and *Sorghum* species. A small area adjacent the Stuart Highway comprises open forest with similar grasses with trees mainly of *E. tetradonta*, *E. miniata* and *E. bleeseri*. The better defined creeklines are fringed with woodland of *Terminalia* and *Lophostemon* species. Associated with the poorer freely draining soils of the limestone outcrops are communities of non-eucalypt deciduous woodlands of *Lysiphyllum cunninghamii*, *Cochlospermum fraseri* and *Ficus virens*.

The limestone outcrops on the Park support a number of monsoon vineforest communities that contain a variety of broad-leaved species, many of which produce a fleshy fruit. Two species of fig, *Ficus virens* and *Ficus platypoda* are common, in addition to *Celtis philippensis*, *Grewia brevifolia*, *Diospyros humilus* and *Canarium australianum* and a number of climbers (Price, 1998).

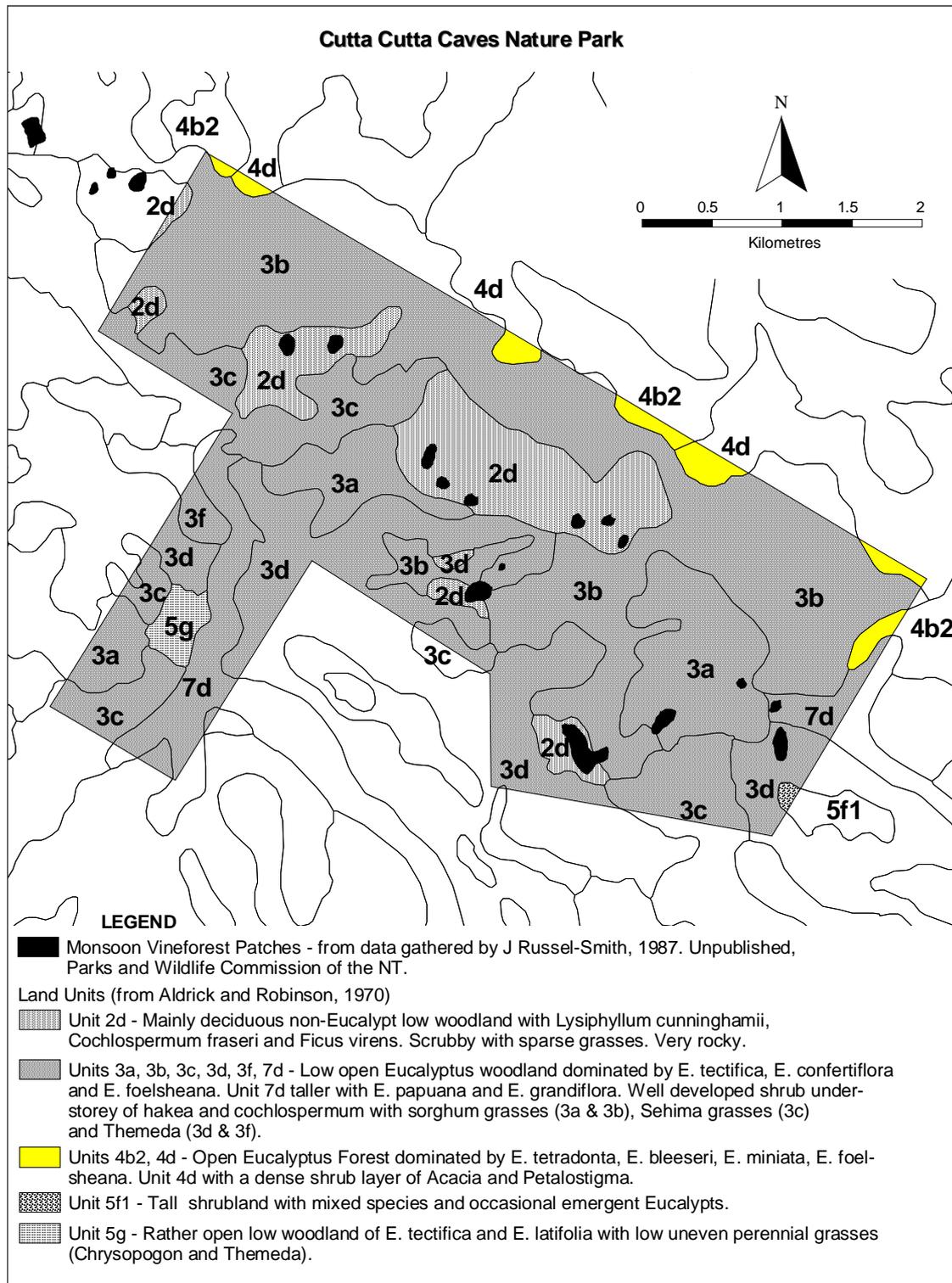
The vine *Cissus repens* and the shrub *Murraya paniculata* var. *ovatifoliolata*, which are normally found in semi-deciduous coastal vine thickets, are associated with these communities. Also found in these patches is the relatively uncommon hairy-fruited banyan fig, *Ficus virens* var. *dasycarpa*, known from only one other site in the Northern Territory.

The monsoon vineforest patches are ecologically important. A strong interdependence exists between these communities and mobile fauna such as fruit and blossom feeding bats and birds such as Common Koels, Figbirds and Bowerbirds (Price et al, 1998). Although not uncommon across northern Australia, vineforest patches are generally small in area and contain a distinctive assemblage of plants, which warrant conservation measures. These communities were probably more common in the past but have declined due to the impacts of fire and changing climate. Vineforest species are also often associated with cave entrances and limestone depressions on the Park.

Noteworthy weed species occurring on the Park include Rubber Bush *Calotropis procera*, Hyptis *Hyptis suaveolens*, Caltrop *Tribulus terrestris* and Khaki Weed, *Alternanthera pungens*. All of these species are noxious weeds declared under the *Noxious Weeds Act*, requiring that their spread is contained. Rubber Bush and Hyptis are of primary management concern, as each are able to form dense thickets which exclude native species. Rubber Bush is very adaptable to different habitats, and while it is most concentrated around limestone ridges, it is able to grow equally well on the flats. Hyptis is common along boundary tracks and firebreaks and can be controlled by early dry season burning which kills the seed crop. Caltrop and Khaki Weed are essentially nuisance burrs of amenity areas, spread by people and vehicles. Target control of these is

focused on intensive use areas such as the access road, the picnic area and walking tracks, including the entrance to Cutta Cutta Cave.

Map 5 shows vegetation communities of the Park based on land units mapped at a scale of 1:50,000 (Aldrick and Robinson, 1972) and monsoon vineforests patches. A list of plant species recorded for the Park is presented in Appendix 1.



Map 5. Vegetation Types and Monsoon Vineforest Patches.

Issues

- The conservation of the hairy-fruited banyan fig, *Ficus virens var. dasycarpa* is a priority.
- The monsoon vineforest communities are of conservation value. These communities are sensitive to fire which warrants close attention in the Park's fire management program.
- Effective resource management requires good resource knowledge. More comprehensive data on the Park's vegetation resources than is currently available would be of benefit to management.
- Weeds generally invade disturbed habitat. Stock entering the Park from neighbouring properties may introduce weeds directly or create opportunities for weeds to establish. Weeds are also more likely to colonise areas of active soil erosion, graded firebreaks and tracks.
- Introduced species planted for landscaping purposes at residences and the intensive use area have the potential to spread and become pest weeds.
- Vegetation plays an important role in the regulation of cave environments. Openings to most caves are semi-concealed or covered in vegetation, influencing air flow into and out of cave systems, cave temperature and humidity.
- The relationships between different vegetation types and karst areas are quite apparent, representing good opportunities for interpretation.

Actions

8. *The distribution of the hairy-fruited banyan fig, Ficus virens var. dasycarpa on the Park will be mapped and requirements for its conservation will be determined. Appropriate action will be taken to ensure the protection of the species on the Park.*
9. *Fire protection measures for the monsoon vineforest communities will be detailed in the Park's fire management strategy.*
10. *A comprehensive survey of the Park's vegetation and production of an updated vegetation map will be strongly encouraged.*
11. *The Park's weed control strategy will be the basis of annually prepared weed action plans and will include the following key elements to ensure effective ongoing control of weeds and protection of vegetation communities:*
 - *Criteria for prioritising weed threats and control actions including potential environmental threats and availability of resources.*
 - *Weed survey schedules.*
 - *Control options, which impose the least environmental impact.*
 - *Control methods recommended for different species and conditions, including burning, slashing, physical removal and chemical methods.*

- *Requirements for follow up monitoring after control efforts.*
 - *Reporting standards so that the effectiveness of control efforts are recorded.*
 - *Training needs of staff in terms of control methods and safety.*
12. *Only local native plant species will be used for landscaping in the intensive use zone. Non-native plantings around residences will be confined to species approved by the Parks and Wildlife Commission Weed Control Officer.*
13. *Significant cave entrances protected by vegetation will be mapped and this vegetation protected as far as practicable from fire.*
14. *Karst - vegetation relationships will be a theme of the Park's interpretation program.*

3.3 Fauna

Objectives

- To conserve the Park's faunal diversity.
- To enhance knowledge and understanding of the Park's fauna.

Information Summary

The vertebrate fauna recorded for the Park to date includes 78 bird, 18 mammal, 29 reptile and 11 frog species. Appendix 2 presents fauna lists for the Park. The terrestrial fauna of the Park is typical of the tropical open woodland habitat. The Agile Wallaby *Macropus agilis* is common in the Park and the Euro *Macropus robustus* and Antilopine Wallaroo *Macropus antilopinus*, are also seen frequently.

Mammals seen using the entrance zones of caves include the Northern Quoll, *Dayurus hallucatus*, the Echidna, *Tachyglossus aculeatus* and the Short-Eared Rock-Wallaby *Petrogale brachyotis*. The frogs *Cyclorana australis* and *Limnodynastes ornatus* are occasional cave visitors and the Brown Tree-Snake *Boiga irregularis* is frequently seen during tours of the main cave.

In northern Australia there are eight cave-dwelling species of bats. Six species are recorded from Cutta Cutta Caves Nature Park:

- Little cave Eptesicus
- Common Sheath-tail Bat
- Ghost Bat
- Dusky Leaf-nosed-bat
- Common bent-wing Bat
- Orange Leaf-nosed-bat

Two bat species are of conservation interest. The Ghost Bat *Macroderma gigas* is the largest member of the sub-order of microbats, Microchiroptera and one of a relative few species of Australian carnivorous bats. The Ghost Bat has a widespread and patchy distribution over northern Australia and is listed in the new Bat Action Plan (Duncan, 1999) at the lowest level of threat (Category Lower Risk). The species is however sensitive to environmental disturbance (Strahan, 1995).



Figure 4. The Ghost Bat, *Macroderma gigas*.

Populations of the Orange Horseshoe Bat, *Rhinonicteris aurantius* are sparsely distributed but no longer considered rare or threatened. The species prefers the deepest passages of extensive caves of very high humidity and is found beyond the tour section deep in Cutta Cutta Cave. Orange Horseshoe bats are known to be highly sensitive to human interference and, if subject to continual disturbance will abandon roosts completely.

The Park's aquatic and non-aquatic invertebrate cave fauna are of high scientific interest. Some species are troglobites, animals that have evolved within dark cavernous environments and lack pigment and, in some species, eyes. Examples include blind shrimp and other tiny crustaceans inhabiting cave waters on the Park. The Katherine aquifer of which the Park's cave system is a part, contains one of the greatest diversities of fauna from a karst aquifer in Australia (Bannink, 1999). It is possible that freshwater crabs present in this aquifer could also reside in the Park's caves.

Of non-aquatic cave invertebrates, all major orders commonly encountered in karst areas of northern Australia are represented, including spiders, pseudoscorpions, snails, segmented worms, millipedes, centipedes, cockroaches, beetles, predatory bugs, cave crickets, moths and slaters. For some species the cave environment is their natural habitat while other species can be classed "accidental visitors".

Three species of cave beetle are commonly associated with deposits of bat guano on which their larvae feed. One of these, *Brisis katherinae* is so far recorded only from Cutta Cutta Caves and Kintore Caves Nature Parks.

There is the potential for an extremely rich diversity of invertebrates to be recorded. More intensive surveys than have been done to date are likely to discover new species of invertebrates restricted to cavernous environments and possibly individual caves (Bannink, 1998).

Feral animals occur infrequently on the Park. A stock proof fence encloses the entire Park and is effective in excluding stock from neighbouring properties. Feral cats, which are usually solitary, highly mobile animals are occasionally seen. Feral pigs occasionally enter the Park as they are not stopped by stock proof fencing. Pets entering the Park with

visitors are an occasional management problem. Pet prohibition messages promoted through pre-visit media and signs near the Park entrance are generally effective in this regard.

The Cane Toad, *Bufo marinus* is predicted to establish in the Park at any time from 2000. They are expected to have a noticeable impact on native animals through competition, predation and poisoning of predators, particularly goannas. At this time there is no known means to control this species. The ecological impacts of Cane Toads will be monitored at Nitmiluk and Elsey National Parks.

Issues

- Effective resource management is dependent upon good resource knowledge. More comprehensive data on the Park's fauna than is currently available would be an aid to improved conservation management.
- Invertebrates are usually the most poorly known of fauna. The probability of new species being discovered in the Park's caves is high.
- The current status of Ghost Bats and Orange Horseshoe Bats on the Park is unknown. Their presence in the Park warrants attention in the Park's monitoring program.
- The uniqueness of the cave environment means cave-dwelling invertebrates are of high scientific interest. Cave ecosystems are relatively simple and delicate with the only energy inputs often being only those organisms, which feed outside such as bats. The simplicity and vulnerability of these systems poses special problems for their conservation. Protection of the habitat from disturbance is vital to conservation of the species that rely upon it for survival.
- Cattle and other stock may enter the Park from neighbouring properties through poorly maintained fences. If they are not quickly removed, native vegetation is impacted and the risk of soil erosion and weed invasion increases.
- Feral cats are likely to inhabit caves, making these sites the most suitable for trapping. Feral cats cannot be permanently eradicated from the Park, but their maintenance in low numbers is highly desirable. Pigs occasionally enter the Park from neighbouring properties. Locating their origins and working cooperatively with neighbouring landholders assists their control.
- Although pets are generally prohibited from the Park, they may enter from neighbouring properties and Park residential areas.

Actions

15. *The Parks and Wildlife Commission will continue surveying and monitoring the Park's fauna. Priority will be given to survey of habitats that are the least known and investigation of cave fauna, especially the little known but scientifically interesting invertebrate fauna*

16. *A monitoring program for the key bat population, the Orange Horseshoe and Ghost Bat, will be instigated. This will involve assessment of caves inhabited, and monitoring resident population sizes and maternity sites. Scientific staff of the Parks and Wildlife Commission will be consulted with regard to survey methods.*
17. *Cattle will be excluded from the Park by maintaining boundary fencing and will be removed immediately if entry is gained.*
18. *The presence of feral cats on the Park will be monitored and immediate steps will be taken remove them.*
19. *Pets will not be permitted on the Park in accordance with the Pets in Parks Policy (1991) and by-law 22 of the Territory Parks and Wildlife Conservation By-laws. Messages to this effect will continue to be promoted through signs on the Park and pre-visit publications.*

3.4 Fire

Objectives

- To ensure the protection of people, personal property and Park assets from fire.
- To protect the Park's biodiversity with the judicious management of fire.
- To improve scientific understanding of the role of fire in the landscape of the Park and to use this knowledge to improve fire management practice on the Park.

Information Summary

The savannah woodlands covering most of Cutta Cutta Caves Nature Park is typical of that found over vast areas of tropical Australia. It is a landscape that has evolved over thousands of years with frequent fire an integral part of the system. Much evidence supports the notion that in the past, Aboriginal people fired the land frequently. Since settlement, fire has remained a force that continues to shape the landscape.

Annual grasses, mainly *Sorghum* species, grow quickly during the wet season producing fuel loads capable of supporting annual fires. Most species in the woodland communities are fire tolerant and will persist with reasonably frequent fire. This tolerance to fire however, diminishes in respect of increasing fire intensity and frequency. In general terms, a mixed fire regime involving variable fire seasonality, frequency and intensity will maintain biodiversity in the environment while a fire regime marked by frequent, intense fires will in time, reduce biodiversity.

Management of fire on Parks and reserves is critical for the management of biodiversity. The relatively small area of this park necessitates careful fire management planning.

Monsoon vineforest communities possess some resilience to fire. Fire is usually started at the margins of monsoon vineforest communities such as those represented on the Park. However, the small areas of these communities make them vulnerable to intense fires. Continued exposure to fire opens the canopy, permitting the entry of weeds and grasses which further increases the risk of fire, particularly late dry season fires.

Fire-sensitive vineforest species such as *Ficus platypoda* and *F. virens* commonly form small thickets near cave entrances where they have an important influence on cave air flow, and hence temperature and humidity. They are an important link therefore to the environment of sensitive cave fauna, including bats.

Current management of the Park focuses on the exclusion of wildfire, the maintenance of established fire-breaks, both along boundaries and within the Park, and prescribed burning of sections of the Park on a rotational basis.

Issues

- Management of the Park's biodiversity can be enhanced with careful use of fire, using prescribed burns to create a fire regime marked by fires of varied seasonality, intensity and frequency.
- Extensive intense late dry season fires should be prevented as far as possible.
- Effective fire-breaks around the Park are essential to reduce the potential for wildfires entering from neighbouring land as well as preventing fires originating on the Park from spreading to neighbouring properties. Firebreaks within the Park reduce the potential for extensive fire damage of large areas of the Park.
- Graded firebreaks may lead to erosion and cave sedimentation, and may create opportunities for weeds to establish.
- Large unbroken areas of high, dry fuel load pose the greatest risk for hot destructive wildfires, especially late in the dry season.
- The dry monsoon vineforest on the Park should be protected from fire as much as possible, in particular from fires of high intensity.
- The vegetation around major cave entrances, often also vineforest species, should be protected from fire as far as possible.
- Wildfire suppression on the Park is difficult given its rocky terrain, and hot wildfires are most likely to be stopped only at managed firebreaks.
- Fire may be used in an ecologically sensitive way to manage some weed species.
- The Parks and Wildlife Commission have a duty of care to ensure that fires originating on the Park do not enter neighbouring properties.

Actions

20. *Fire management actions on the Park will continue to be guided by annually prepared fire action plans. Fire action plans will comply with a Fire Management Strategy as the basis for consistent and effective fire management*

actions for three to five years. The strategy will have as objectives those stated above, will be subject to review during that period and will give specific attention to the following.

- Specific means by which protection to people, personal property and park assets will be achieved.*
 - The maintenance of diverse habitats on the Park through prescription for varied fire seasonality, frequency and intensity.*
 - The identification and mapping of fire-sensitive habitats or areas of high conservation value to be protected from intense and/or frequent fire and strategies for achieving this objective.*
 - Minimising the potential for late dry season fires of high intensity.*
 - Strategic fuel reduction / fragmentation burns within the Park in the wet and early dry seasons and on boundary areas to reduce the incidence, extent and impact of late dry season wildfires.*
 - The maintenance of boundary firebreaks through cooperative arrangements with neighbouring landholders. Slashed and / or burned firebreaks will be preferred to graded breaks that may present weed and cave siltation risks.*
 - Wildfire response plans.*
 - Minimising the risk of fire damage to monsoon vineforest communities.*
 - The identification and protection from fire, of fire sensitive vegetation screening major cave entrances.*
 - Staff competency and training needs.*
 - Fire mapping, recording and reporting standards will be implemented so that fire history information and improved understanding of the effects of past fires can guide future fire management decisions. Fire history data will be recorded in the Park's Geographic Information System.*
 - Monitoring the implementation of the fire management strategy.*
-

4.0 CULTURAL RESOURCES AND ABORIGINAL INTERESTS

4.1 Objectives

- To record and conserve sites and resources of historical, cultural and archaeological value.
- To advance knowledge of the cultural heritage of the Park by actively encouraging scientific and archaeological research.
- To involve Aboriginal interests in cultural resource management issues whenever those interests can be identified.

Information Summary

Detailed information on the cultural resources of the Park is scant. Aboriginal campsites and stone artefacts are known from some locations on the Park. There are two sites of significance recorded on the Aboriginal Areas Protection Authority

database. These are the Cutta Cutta Cave and an unnamed cave with an entrance rock wall that exhibits incised grooves.

The Park is located within the traditional lands of the Jawoyn Aboriginal people. The Jawoyn name for Cutta Cutta Cave is *Barrac Barrac*, meaning Diver Duck Dreaming. The traditional mythology of the caves relates to this story, which is associated with a place called *Barrac Barrac* within Nitmiluk National Park. The story makes no distinction between different caves but relates to the entire area. The Aboriginal Areas Protection Authority record for the Cutta Cutta Cave has the name *Galkdirn* but there appears to be no living custodian who can relate to this name (pers. comm. Jawoyn Association). The origin of the name "Cutta Cutta" is uncertain. The words are not part of the Jawoyn language.

Issues

- Continued survey and documentation of the Park's cultural resources and Aboriginal mythology is important in order to manage these values effectively.

Actions

21. *Actions to further knowledge of the cultural heritage of the Park will be actively pursued. This will include ongoing survey and documentation of the Park's Aboriginal and European sites.*
22. *All cultural sites and artefacts found on the Park will be documented and recorded on the Park's Geographic Information System (GIS). Expert assistance will be sought with regard to the significance of sites and conservation requirements will be implemented if required.*
23. *Jawoyn Aboriginal custodians for the area will be consulted in regard to the mythology, significance, protection and interpretation of sites and artefacts found on the Park.*
24. *Aspects of the Aboriginal heritage of the area will be communicated through the Park's interpretation program.*

5.0 MANAGEMENT FOR VISITORS

The Park is a significant regional tourist destination, averaging around 25,000 visitors per year during the 1990s. The attraction of the Park is, of course, the caves. Caves are environments with which few people are familiar and, because many of the features to be seen within them are of considerable beauty and interest, caves have broad appeal and possess a wide range of aesthetic, educational and recreational values.

Being within a cave involves a close association with natural processes at work in the landscape and provides a new perspective for understanding aspects of geology, ecology and relationships with systems operating on the surface, such as hydrology.

Most people are also intrigued by rarely seen cave fauna such as bats, whose habitat differs so greatly from terrestrial fauna with which they are more familiar.

A concession for the operation of a kiosk and public tours of Cutta Cutta and Tindal Caves has been in effect since 1991.

5.1 Objectives

- To promote and provide for appropriate use, appreciation and enjoyment of the Park's values and resources.
- To provide information and interpretation about the Park to enhance visitors' experience and promote visitor awareness of, and positive attitudes toward the Park's values.
- To manage the recreational use of the Park to minimise impact on Park resources and to take remedial action where necessary.
- To ensure that visitor facilities and services are well maintained and presented.
- To monitor visitor numbers, profiles and satisfaction levels to assist management decision-making.
- To provide for visitor safety.

5.2 Visitor Services and Facilities

Information Summary

A sealed road from the Stuart Highway leads to a car park adjacent the visitor centre with public toilets and picnic facilities located nearby. There is a short nature walk with signs interpreting common trees of the tropical woodland in a loop from the visitor centre. The visitor centre provides orientation and introductory interpretation and cave tour ticket, light snack and souvenir sales. From the visitor centre, visitors walk either a 250 metre or 500 metre route along a formed walking track to the Cutta Cutta Cave. Here, guided underground tours of about one hour duration are conducted for a fee. Electrical lighting, concrete and steel walkways through the cave provide for a safe and relatively comfortable cave tour. Park visitor facilities are shown in Map 3.

In 1991 the Tindal Cave became the second cave developed for public tours with walkways constructed and lighting installed in the first 200 metres of the cave. A 600 metre karst surface walk encircles the cave and limestone outcrop. The surface walk includes bridges and viewing platforms overlooking cave entrances, and provides excellent opportunities for interpretation of surface and sub-surface karst processes and landforms and relationships between geology and vegetation. An unsealed access road links this site with the main car park.

Issues

- Karst systems are highly vulnerable to damage arising from surface or underground development or uncontrolled visitor activity. Facilities, services and activities must therefore be carefully designed and managed to ensure protection of the karst resource and to enhance visitor appreciation.
- Well presented and maintained facilities are a major management objective. Day to day cleaning and maintenance of facilities is undertaken by the concession operator. The Commission is responsible for major repairs and maintenance and has a program that provides for annual maintenance inspections of all visitor facilities.

Actions

25. *All proposed developments on the Park will be subject to requirements of the Environmental Assessment Act, and possible impacts to the Park's caves and karst environment will be carefully considered.*
26. *Maintenance standards, and the appropriateness and demand for new or extended facilities on the Park will be assessed against data derived from the Park's Visitor Monitoring program. See section 5.5.*
27. *Parks and Wildlife Commission staff responsible for the Park will regularly assess standards of presentation and maintenance of facilities and work closely with the concession operator to ensure high standards in compliance with the concession permit and operational agreement.*
28. *The Parks and Wildlife Commission will continue with regular facility inspections. Minor works will be carried out by Parks and Wildlife Commission staff responsible for the Park. More major works will be carried out under the annual repairs and maintenance program.*

5.3 Guided Tour Operations

Information Summary

In 1991 a private concession operation took over the running of all cave tours that previously were conducted by rangers. Tours of both Cutta Cutta and Tindal Caves were offered for the first time and the number of tours offered daily was increased. This largely alleviated problems relating to very large tour groups and extended visitor waiting times.

The current permit for the conduct of cave tours issued under By-law 13 of the *Territory Parks and Wildlife Conservation Act*, expires in September 2004. The Operational Agreement as part of the permit between the concessionaire and the Commission requires that guides escort visitors from the visitor centre to the caves and back. This is on foot to Cutta Cutta Cave and by minibus to Tindal Cave. Tours are to be one hour in duration and are to be conducted in a format as specified by



the Commission. The Commission is free to evaluate the quality of the operation as they see fit. Neat and tidy dress is required by all guides and uniforms are to be of a standard approved by the Commission. Guides are also required to be qualified in first aid.

The Parks and Wildlife Commission has produced a manual for conducting cave tours to a high standard and has conducted training sessions for guiding staff working on the Park.

Park visitor patterns are highly seasonal with approximately 70 percent of total annual visitation occurring from June to August. On a daily basis, visitation is concentrated between 10:00 a.m. and 1:00 p.m. Tour group size varies considerably. Visitor numbers are highest during the middle of the day and the peak-season months of the year (June-August).

In some years natural flooding of the two show caves has prevented tours from running continuously through the wet season. Tindal Cave tends to drain more quickly and has been used as an alternative to Cutta Cutta Cave at these times.

Tours of Cutta Cutta Cave have been commercially successful. Despite marketing efforts, tours of Tindal Cave, have sold poorly and the cave and associated surface walk have not been well used.

Issues

- A visit to an underground cave is a unique experience for most visitors. Visitor experience of the Park is strongly influenced by the standard of guiding and personal interpretative service. A professional standard of service and perceived good value for money is very important in the overall management of the Park.
- There are practical and environmental limits to tour frequency, party size and hours of operation. Larger groups are more difficult to guide. With larger groups effective communication between the guide and the group is more difficult, reduced air quality can pose a safety risk and potential impacts on the cave environment are increased. Coach groups of up to 50 persons seek cave tours.
- Staffing levels on the Park may vary at different times but must be commensurate with the level of visitor activity.
- There is considerable investment in the visitor infrastructure at Tindal Cave. The low level of use of these facilities at this site is of some management concern.

Actions

29. *The Parks and Wildlife Commission will support the development of a Northern Territory wide tour operator / guide accreditation scheme expected to be introduced during the life of this Plan. The Parks and Wildlife Commission will continue to support the concessionaire with guide training and encourage the highest standards possible in tour content, interpretive technique and service delivery.*
30. *The Parks and Wildlife Commission will work closely with the concessionaire to promote the highest standards possible in visitor service, interpretation, safety and environmental protection. At revision and renewal of the concession permit and operational agreement, attention will be given to provide for modification of the terms of the operation on the basis of feedback from safety, visitor and environmental monitoring programs.*
31. *In the interests of cave tour quality, visitor safety and environmental values, tour group size will be generally limited to 35 persons for Cutta Cutta Cave and 20 persons for Tindal Cave, tour times will be restricted to between 8:30 am and 4:30 pm, and there will be a maximum of nine tours per day for each cave. To accommodate large coach groups only, a maximum of 50 persons will be permitted in Cutta Cutta Cave. Additional visitors will need to be booked on a different tour. The concessionaire will be encouraged to use a booking system for tour groups.*
32. *Staffing levels of the guided tours must be commensurate with visitor activity to enhance visitor safety and service quality. See action 42.*
33. *Opportunities for increasing levels of use of the Tindal Cave will be investigated. The Commission will work with the concessionaire in this respect and in accordance with the requirements of the By-law 13 permit and Operational Agreement.*

5.4 Access

Since the Park's inception the restriction on cave access to visitors with a special permit or the company of a guide has been justified by public safety and cave protection concerns. The Park is officially closed between the hours of 4:30 pm and 8:30 am. A gate at the Stuart Highway entrance is closed at these times.

There are occasional requests for unguided access to caves for the purpose of adventure recreation. The demand for adventure caving, however is low and can often be met by caves located off the Park. Speleological groups, from time to time, request unescorted access to the Parks undeveloped caves or undeveloped sections of the show caves.

Issues

- The sensitive and potentially dangerous nature of the caves on the Park requires that visitor access be carefully regulated. Persons visiting caves unescorted by a qualified guide or ranger should be educated in minimal impact and safe caving techniques.

- Speleological groups often possess scientific knowledge, skills and expertise in cave survey and mapping. They are a resource that can benefit management by adding to the bank of knowledge on the cave systems of the Park.

Actions

34. The Park will continue to be closed overnight between the hours of 4:30 p.m. and 8:30 a.m. In the interests of public safety and the protection of cave environments, public access to the caves and associated walking tracks will be managed in accordance with the Zoning Scheme described in Section 2. A permit will be required to access Cutta Cutta Cave and Tindal Cave without the company of a ranger or concession operator guide. Access to any other caves on the Park will require the company of a ranger or a permit issued under By-law 52 of the Territory Parks and Wildlife Conservation By-laws. Recreational caving will not be permitted. A permit will be granted subject to:

- *The purpose being cave survey and mapping or the furthering of scientific or archaeological knowledge of the Park's caves.*
- *Permit applicants demonstrating significant caving experience and an appreciation of the Australian Speleological Federation's Code of Ethics and Minimal Impact Caving Code.*
- *Permit applicants providing a report of their visit and any data acquired, to the Parks and Wildlife Commission.*

5.5 Visitor Monitoring

Information Summary

Visitor Monitoring is an essential Park management activity. Data gathered on visitor numbers and demographics, their behaviour and satisfaction levels can be used to guide all aspects of visitor management. Planning and design of facilities and interpretation programs rely largely on data from visitor monitoring programs.

Quantitative data on visitors is recorded by the concession operator as the number of paying cave tour participants. Figures are submitted monthly to the Parks and Wildlife Commission and entered on the Commission's Visitor Monitoring Database.

A traffic counter installed on the main access road provides data on how many people are entering the Park. Visitor figures are entered into the Commission's Visitor Monitoring Database.

A survey to acquire visitor profile and satisfaction data was conducted in 1998. The Strategic Research Unit of the Northern Territory Tourist Commission assists with the formulation of survey questionnaires and data analysis. Noteworthy findings from this survey were that 96% of travel parties were from interstate or overseas and the average age of visitors tends toward older people with 50 % of respondents over the age of 45.

Issues

- Systematic monitoring of visitor numbers, demographics and satisfaction is essential for achieving both conservation and tourism goals. The data acquired provides a basis for management planning with regard to visitor control and facility, service and interpretation development.

Actions

35. *A visitor monitoring strategy will be produced for the Park compliant with the Commission's Visitor Monitoring Program. This strategy will provide the basis for effective visitor monitoring actions for a three to five year period incorporating the following key elements:*

- *Continuous counting of Park visits.*
- *Regular maintenance and calibration of counting devices.*
- *The acquisition and effective management of data from counters, surveys, concession operation and ranger observation.*
- *A program of quantitative and qualitative surveys compliant with the Commission's Visitor Monitoring System.*
- *Acquisition of visitor satisfaction data specifically in relation to the concession operating on the Park.*
- *Measurement of the effectiveness of interpretive media in communicating key messages to visitors.*

5.6 Visitor Safety

Information Summary

Visitor safety concerns both the prevention and management of harm or injury to visitors. All visitor activity on the Park carries some risk of injury. The main visitor health and safety issues are related to the hot climate of the area and air temperature, humidity and quality during cave tours.

Although the karst environment of the Park presents unusual safety risks to Park visitors, these risks are minimal provided visitors comply with access requirements. Caves are attractive places for adventurous people but present dangers in relation to steep, sharp, rocky and often wet and slippery surfaces in poor, or no light. Persons inexperienced in caving can easily become disorientated and get lost underground.

Wet season water flows have been known to open up vertical sided sinkholes in unexpected places at ground level.

Issues

- Management must have a proactive approach to visitor safety. This includes assessment and management of both natural and artificial hazards and preparedness to deal with emergencies on the Park.
- The commercial operator has a major responsibility to uphold high standards of safety regarding every aspect of the operation.

Actions

36. *Safety messages in relation to the hot climate, cave air quality and conditions of Park access will be accommodated in the Interpretation Strategy and stated in all promotional and orientation information both on and off the Park.*
37. *The Park's Emergency Response Plan will be reviewed annually in collaboration with Park concessionaire and Police, Fire and Emergency Services. The plan will provide for the following:*
 - *Procedures to be followed in the event of emergencies on the Park.*
 - *Minimum first-aid resources and other equipment and their maintenance.*
 - *Communications resources and procedures.*
 - *A training exercise schedule.*
 - *Support agencies and personnel and how they may be contacted.*
38. *Visitor safety audits will be carried out on the Park once a year by a qualified agent.*
39. *Tour guides employed by the concession operator will be required to give verbal safety briefs to visitors prior to commencing tours, must possess current senior first aid certificates and be familiar with, and trained in response actions prescribed in the Park's Emergency Response Plan.*

5.7 Communication and Interpretation

Information Summary

Information and interpretation facilities and services in relation to the Park include:

- Pre-visit literature distributed by the Parks and Wildlife Commission, tourism agencies and the concession operator.
- Highway signage providing direction to the Park installed by the Dept of Transport and Works and the concession operator.
- Orientation and regulatory signs upon entering the Park.
- Orientation and interpretive signs at the visitor centre.
- Free of charge, take-away literature about the Park available from the visitor centre.
- Interpretive signs along the tropical woodland nature walk and the Cutta Cutta Cave karst walk.
- The personal interpretive tours of the caves provided by the concessionaire.

Issues

- High quality information and interpretation facilities and services are essential to manage visitors effectively and facilitate safe and enjoyable visitor experiences. It is very important that information distributed by any agency in any form is accurate and appropriate.

Actions

40. A Park Interpretation Strategy will be developed to ensure that services and facilities are in place so that visitors have adequate orientation to the Park and full opportunity to appreciate the Park's values. The plan will have regard to existing Parks and Wildlife Commission standards and will identify:

- *Key orientation and safety information.*
- *Key messages regarding management objectives for the Park.*
- *Interpretive messages and themes to foster enjoyment of, and appreciation for, the Park's aesthetic, natural and cultural values.*
- *The audience for the communication.*
- *Appropriate media by which to communicate different messages and orientation information.*
- *Stakeholders such as Aboriginal custodians and caving associations.*
- *Sites for interpreting key messages and themes.*
- *Training program resources and requirements for tour guides working on the Park.*
- *Evaluation techniques to determine visitor satisfaction with interpretation services and facilities.*

6.0 PARK ADMINISTRATION

6.1 Objectives

- To ensure sufficient resources are provided and appropriate administrative arrangements are in place to enable the effective management of the Park and implementation of this Plan.
- To ensure that effective communication and constructive relationships with the Park's stakeholders are maintained.
- To improve the basis for future management decision through ongoing research and monitoring programs.
- To ensure the effective implementation of the management actions presented in this Plan, which are fundamental to achieving the Plan's objectives.

Information Summary

The Parks and Wildlife Commission have overall responsibility for management of the Park including facility development and maintenance, visitor monitoring, safety and interpretation, resource research survey and monitoring, fire, weed and feral animal management, administration and supervision of cave tour and kiosk operations.

A permit for a concession operation to conduct cave tours and kiosk sales was issued under By-law 13 of the *Territory Parks and Wildlife By-laws* in 1991. This operation is

bound by the terms and conditions of the permit, an Operational Agreement and the current Plan of Management. Royalties of 15 per cent from cave tours and 5 per cent of kiosk sales are paid to the Commission monthly. The current permit expires in September 2004.

Management facilities on the Park include an office associated with the visitor centre occupied by the concession operator. Within the service zone are two residences and a workshop and storage compound.

The Park is currently managed as part of the Katherine River/ Roper River District administrative unit which includes the Kintore Caves Nature Park, Flora River Nature Park and Elsey National Park. Current staffing includes a Chief District Ranger, a Senior Ranger level T4, two Senior Rangers level T3 and two Rangers level T2.

Key stakeholders in the Park include:

- The Concession Operator
- Adjoining landholders
- Speleological groups
- Private Tour Operators
- Tourism industry authorities
- Aboriginal custodians

The development of the Park has been based very much around knowledge derived from a range of research, survey and monitoring programs both within this Park and others by both the Parks and Wildlife Commission and external agencies such as speleological groups. The importance of improving the knowledge base to future development and management of the Park is well recognised.

Issues

- Adequate staffing levels and sound management systems are fundamental to the effective management of the Park and implementation of this Plan.
- Well managed concession operations that meet park objectives reduces the input required of the Commission and is an aid to visitor management. The content and conduct of tours has a marked influence on the visitor's experience and impression of the Park. Poorly operated commercial enterprises on Parks not only compromise the experience of visitors but can reflect badly on the park management agency. Concession staffing levels must also be commensurate with visitor numbers to ensure safe and effective visitor management. It is also vital that commercial facilities and services are not introduced that are inconsistent with visitor needs, park objectives or the Park's character.
- The maintenance of constructive relationships with all stakeholder groups is regarded as very important in achieving management objectives and the Commission will involve interest groups as much as possible. A close and congenial working relationship between the Commission and the Concession Operator is critical to the overall successful operation of the Park.

- Ongoing survey and monitoring tasks have been identified throughout this plan and are summarised in Section 6. Priority should be assigned to those tasks, which provide important feedback into the management decision-making process. These include continued survey of cave systems and associated rare fauna, monitoring of cave impacts relating to cave development and visitor use, and monitoring of visitor numbers, profiles, satisfaction levels and demand for activities and services.
- Research programs whether conducted by the Parks and Wildlife Commission or external agencies, must be appropriate, well-considered and coordinated to ensure maximum return to the Park and community at large.
- In recognition of the increasing tendency towards accountability in the planning and management of parks and reserves, the Parks and Wildlife Commission realises the need for performance accounting mechanisms to be established.

Actions

- 41. The Park's management resources will be reviewed from time to time to ensure that they are adequate to meet the objectives outlined in this plan*
- 44. The Parks and Wildlife Commission will work closely with the Concession Operator to ensure the highest standards in visitor service and safety are upheld. Both parties will monitor compliance with the terms and conditions of the permit, the Operational Agreement and this Plan of Management. The Commission will encourage and support appropriate concession staffing levels and training standards.*
- 45. Effective communication with and involvement of all interest groups and stakeholders in the Park's management will be sought in relation to Park management programs as far as practicable.*
- 46. The Parks and Wildlife Commission will encourage research, survey and monitoring that:*
- *will enhance understanding of the Park's visitors and its natural and cultural values,*
 - *will lead to more effective management of the Park,*
 - *will benefit conservation and the broader community in generally.*
- 47. Operational Plans, guided by this plan of management, will be prepared annually, clearly stating priorities, objectives, schedules and actions for key programs, so that management of the Park is efficient and orderly, and the effectiveness of management can be measured against objectives.*
- 48. Towards the end of this Plan's term of operation the Parks and Wildlife Commission will report on the implementation of this Plan with the following objectives:*
- *To establish whether or not, and to what extent the prescribed actions of this Plan were carried out.*

- *To assess the effectiveness of actions against the objectives they are intended to achieve.*
- *To determine the reasons that actions were not carried out or fail to achieve their intended results.*
- *To recommend changes to the objectives and prescribed actions that should be considered in preparing the next Plan of Management.*

7.0 SUMMARY OF MANAGEMENT PROGRAMS

The key actions required to achieve the objectives outlined in this plan are summarised below and will be addressed in annually prepared operational plans. Priorities are assigned to tasks as follows:

- Ongoing:** Established activities that need to be continued.
High: Essential to achieve the Plan's stated objectives.
Medium: Very important to achieve the Plan's stated objectives, but may be subject to the availability of resources.
Low: May be undertaken only if other guidelines are met and the necessary resources are available.
Denotes a research opportunity for which external grants could be applied.

Selected Actions	Reference	Priority
• Pursue and implement current best practice in cave monitoring, maintenance and cleaning.	3.1	High
• Map distribution and determine conservation needs of Hairy-fruited Banyan Fig.	3.2	High
• Implement Visitor Monitoring Strategy.	5.5	High
• Review Emergency Response Plan annually.	5.6	High
• Develop and implement Park Interpretation Strategy.	5.7	High
• Develop and implement Fire Management Strategy.	3.4	High-Ongoing
• Initiate a monitoring program for Ghost Bat and Orange-Horse-Shoe Bat populations.	3.3	Medium/ High
• Continue survey of cave systems and develop GIS-based karst and caves Park database.	3.1	Medium
• Encourage and support a hydrological study to achieve an understanding of surface and subsurface catchments.	3.1	Medium #
• Continue surveying and monitoring of the Park's fauna.	3.3	Medium
• Conduct comprehensive survey of the Park recording art, artefacts and other cultural resources and develop conservation plans.	4.0	Medium #
• Document and record all cultural sites and artefacts on the Park's Geographic Information System (GIS).	4.0	Medium
• Consult with adjoining landholders toward land management practices that protect cave values.	3.1	Ongoing
• Continue implementing Weed Control Strategy.	3.2	Ongoing
• Continue Feral Animal Management Program.	3.3	Ongoing
• Maintain boundary fences to ensure neighbouring stock do not enter the Park.	3.3	Ongoing

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Plant Species Recorded from Cutta Cutta Caves Nature Park

<i>Abrus precatorius</i>	<i>Digitaria gibbosa</i>	<i>Melhania oblongifolia</i>
<i>Abutilon indicum</i>	<i>Dioscorea bulbifera</i>	<i>Melochia corchorifolia</i>
<i>Acacia hemignosta</i>	<i>Diospyros cordifolia</i>	<i>Micromelum minutum</i>
<i>Acacia pachyphloia</i>	<i>Diospyros humilis</i>	<i>Miliusa traceyi</i>
<i>Acacia platycarpa</i>	<i>Dolichandrone filiformis</i>	<i>Mitrasacme micrantha</i>
<i>Acacia valida</i>	<i>Ehretia saligna</i>	<i>Mitrasacme nudicaulis</i>
<i>Alloteropsis semialata</i>	<i>Enneapogon pallidus</i>	<i>Mnesithea formosa</i>
<i>Alysicarpus ovalifolius</i>	<i>Enneapogon purpurascens</i>	<i>Murdannia graminea</i>
<i>Alysicarpus schomburgkii</i>	<i>Eragrostis cumingii</i>	<i>Murraya paniculata</i>
<i>Ampelocissus acetosa</i>	<i>Eragrostis tenellula</i>	<i>Owenia vernicosa</i>
<i>Ampelocissus frutescens</i>	<i>Eriachne obtusa</i>	<i>Panicum mindanaense</i>
<i>Amyema sanguinea</i>	<i>Erythrina vespertilio</i>	<i>Passiflora foetida</i>
<i>Aristida hygrometrica</i>	<i>Erythrophleum chlorostachys</i>	<i>Pennisetum pedicellatum</i>
<i>Aristida pruinosa</i>	<i>Erythroxyllum ellipticum</i>	<i>Perotis rara</i>
<i>Boerhavia dominii</i>	<i>Eucalyptus patellaris</i>	<i>Phyllanthus minutiflorus</i>
<i>Bonamia pannosa</i>	<i>Eucalyptus tectifera</i>	<i>Phyllanthus reticulatus</i>
<i>Bothriochloa pertusa</i>	<i>Eucalyptus tetradonta</i>	<i>Planchonia careya</i>
<i>Brachyachne convergens</i>	<i>Eulalia aurea</i>	<i>Plectranthus scutellarioides</i>
<i>Brachychiton diversifolius</i>	<i>Euphorbia coghlanii</i>	<i>Plumbago zeylanica</i>
<i>Brachychiton megaphyllus</i>	<i>Euphorbia schultzei</i>	<i>Polycarpaea staminodina</i>
<i>Breynia cernua</i>	<i>Evolvulus alsinoides</i>	<i>Pouteria sericea</i>
<i>Briedelia tomentosa</i>	<i>Exocarpos latifolius</i>	<i>Premna acuminata</i>
<i>Buchanania obovata</i>	<i>Ficus opposita</i>	<i>Pseudoraphis spinescens</i>
<i>Buchnera linearis</i>	<i>Ficus platypoda</i>	<i>Pterocaulon serrulatum</i>
<i>Cajanus acutifolius</i>	<i>Ficus virens</i>	<i>Rhynchosia minima</i>
<i>Cajanus marmoratus</i>	<i>Fimbristylis macrantha</i>	<i>Secamone elliptica</i>
<i>Cajanus scarabaeoides</i>	<i>Flueggea virosa</i>	<i>Sehima nervosum</i>
<i>Calotropis procera</i>	<i>Galactia tenuiflora</i>	<i>Setaria apiculata</i>
<i>Canarium australianum</i>	<i>Gardenia resinosa</i>	<i>Sida rohlenae</i>
<i>Capparis sepiaria</i>	<i>Gomphrena affinis</i>	<i>Sorghum plumosum</i>
<i>Cayratia trifolia</i>	<i>Goodenia odonnellii</i>	<i>Sorghum stipoideum</i>
<i>Celtis philippensis</i>	<i>Goodenia purpurascens</i>	<i>Spermaceoce brachystema</i>
<i>Chamaecrista nomame</i>	<i>Grevillea dimidiata</i>	<i>Strychnos lucida</i>
<i>Christia australasica</i>	<i>Grewia breviflora</i>	<i>Stylosanthes hamata</i>
<i>Chrysopogon fallax</i>	<i>Grewia retusifolia</i>	<i>Tacca leontopetaloides</i>
<i>Chrysopogon latifolius</i>	<i>Gyrocarpus americanus</i>	<i>Tephrosia A26376 gyropodus</i>
<i>Cissus adnata</i>	<i>Hakea arborescens</i>	<i>Tephrosia remotiflora</i>
<i>Cleome tetrandra</i>	<i>Helicteres elongata</i>	<i>Terminalia ferdinandiana</i>
<i>Cleome viscosa</i>	<i>Heliotropium bracteatum</i>	<i>Terminalia grandiflora</i>
<i>Commelina ensifolia</i>	<i>Heliotropium tenuifolium</i>	<i>Themeda triandra</i>
<i>Corymbia confertiflora</i>	<i>Heteropogon contortus</i>	<i>Trianthema rhynchocalyptra</i>
<i>Corymbia foelscheana</i>	<i>Heteropogon triticeus</i>	<i>Tribulopsis pentandra</i>
<i>Corymbia grandifolia</i>	<i>Hybanthus enneaspermus</i>	<i>Trichosanthes holtzei</i>
<i>Corymbia latifolia</i>	<i>Indigofera colutea</i>	<i>Uraria lagopodioides</i>
<i>Crosslandia setifolia</i>	<i>Indigofera hirsuta</i>	<i>Urochloa holosericea</i>
<i>Crotalaria brevis</i>	<i>Indigofera linifolia</i>	<i>Ventilago viminalis</i>
<i>Crotalaria medicaginea</i>	<i>Indigofera trita</i>	<i>Vigna lanceolata var. filiformis</i>
<i>Crotalaria montana</i>	<i>Ipomoea eriocarpa</i>	<i>Vigna lanceolata var. lanceolata</i>
<i>Croton arnhemicus</i>	<i>Ipomoea macrantha</i>	<i>Vigna radiata</i>
<i>Croton tomentellus</i>	<i>Ipomoea nil</i>	<i>Vigna vexillata</i>
<i>Cucumis melo</i>	<i>Jasminum molle</i>	<i>Vitex glabrata</i>
<i>Cymbidium canaliculatum</i>	<i>Litsea glutinosa</i>	<i>Waltheria indica</i>
<i>Cynanchum pedunculatum</i>	<i>Lysiphyllum cunninghamii</i>	<i>Wedelia cunninghamii</i>

Denhamia obscura
Desmodium glareosum
Desmodium pycnotrichum
Digitaria ctenantha

Marsdenia angustata
Marsdenia viridiflora
Melaleuca viridiflora

Whiteochloa semitonsa
Xenostegia tridentata
Yakirra pauciflora

Source: Parks and Wildlife Commission Herbarium.

Appendix 2

Fauna Species Recorded from Cutta Cutta Caves Nature Park

Birds

Turnicidae

Little Button-quail

Areidae

White-faced Heron

Pacific Heron

Glareolidae

Australian Pratincole

Accipitridae

Brown Goshawk

Whistling Kite

Black Kite

Black-breasted Buzzard

Falconidae

Grey Falcon

Brown Falcon

Columbidae

Peaceful Dove

Diamond Dove

Bar-shouldered Dove

Common Bronzewing

Crested Pigeon

Cacatuidae

Red Tailed Black-cockatoo

Galah

Loriinae

Red-collared Lorikeet

Varied Lorikeet

Polytelitinae

Red-winged Parrot

Playtcercinae

Cockatiel

Northern Rosella

Cuculidae

Pallid Cuckoo

Brush Cuckoo

Common Koel

Pheasant Coucal

Strigidae

Southern Boobook

Podargidae

Tawny Frogmouth

Alcedinidae

Blue-winged Kookaburra

Red-backed Kingfisher

Meropidae

Rainbow Bee-eater

Coraciidae

Dollarbird

Neosittidae

Varied Sittella

Climacteridae

Black-tailed Treecreeper

Maluridae

Red-backed Fairy-wren

Pardalotidae

White-throated Gerygone

Striated Pardalote

Weebill

Meliphagidae

White-throated Honeyeater

Black-chinned Honeyeater

Banded Honeyeater

Bar-breasted Honeyeater

Brown Honeyeater

Rufous-throated Honeyeater

White-lined Honeyeater

White-gaped Honeyeater

Blue-faced Honeyeater

Little Friarbird

Silver-crowned Friarbird

Pomatostomidae

Grey-crowned Babbler

Petroicidae

Jacky Winter

Hooded Robin

Lemon-bellied Flycatcher

Pachycephalidae

Rufous Whistler

Grey Shrike-thrush

Dicruridae

Northern Fantail

Leaden Flycatcher

Restless Flycatcher

Australian Magpie-lark

Oriolidae

Figbird

Olive-backed Oriole

Ptilonorhynchidae

Great Bowerbird

Campephagidae

Black-faced Cuckoo-shrike

White-bellied Cuckoo-

shrike

White-winged Triller

Varied Triller

Artamidae

Pied Butcherbird

Australian Magpie

White-breasted

Woodswallow

Black-faced Woodswallow

Little Woodswallow

Corvidae

Torresian Crow

Corcoracidae

Apostlebird

Ploceidae

Zebra Finch

Long-tailed Finch

Masked FinchDicaeidae

Mistletoe Bird

Mammals

Echidna	<i>Tachyglossus aculeatus</i>	Common Rock-rat	<i>Zyomys argurus</i>
Common Planigale	<i>Planigale maculata</i>	Forrest's Mouse	<i>Leggadina forresti</i>
Euro	<i>Macropus robustus</i>	Feral Donkey	<i>Equus asinus</i>
Northern Quoll	<i>Dasyurus hallucatus</i>	Northern Cave Eptesicus	<i>Eptesicus caurinus</i>
Antilopine Wallaroo	<i>Macropus antilopinus</i>	Little Cave Eptesicus	<i>Eptesicus finlaysonii</i>
Little Red Flying-fox <i>brachyotis</i>	<i>Pteropus scapulatus</i>	Short-eared rock wallaby	<i>Petrogale</i>
Ghost Bat	<i>Macroderma gigas</i>		
Dusky Horseshoe-bat	<i>Hipposideros ater</i>		
Orange Horseshoe-bat	<i>Rhinonicteris aurantius</i>		
Common Sheath-tail Bat	<i>Taphozous georgianus</i>		
Common Bent-wing Bat	<i>Miniopterus schreibersii</i>		
Little Broad-nosed Bat	<i>Nycticeius greyii</i>		

Reptiles

Spiny-tailed Gecko	<i>Diplodactylus ciliaris</i>
Northern Dtella	<i>Gehyra australis</i>
	<i>Gehyra nana</i>
Bynoe's Gecko	<i>Heteronotia binoei</i>
Marbled Velvet Gecko	<i>Oedura marmorata</i>
Hooded Scaly Foot	<i>Pygopus nigriceps</i>
Chameleon Dragon	<i>Chelosania brunnea</i>
Friiled Lizard	<i>Chlamydosaurus kingii</i>
	<i>Diporiphora albilabris</i>
Two-Lined Dragon	<i>Diporiphora bilineata</i>
	<i>Diporiphora magna</i>
Long-Tailed Rock Monitor	<i>Varanus glebopalma</i>
Mitchell's Water Monitor	<i>Varanus mitchelli</i>
	<i>Varanus tristis</i>
	<i>Carlia amax</i>
	<i>Carlia munda</i>
	<i>Carlia triacantha</i>
	<i>Cryptoblepharus plagiocephalus</i>
	<i>Ctenotus saxatilis</i>
	<i>Ctenotus spaldingi</i>
	<i>Lerista orientalis</i>
	<i>Menetia greyii</i>
	<i>Menetia maini</i>
	<i>Glaphyromorphus isolepis</i>
	<i>Ramphotyphlops unguirostris</i>
Brown Tree Snake	<i>Boiga irregularis</i>
	<i>Rhinoplocephalus punctata</i>
Mulga or King Brown Snake	<i>Pseudechis australis</i>
Northern Bandy-Bandy	<i>Vermicella multifasciata</i>

Frogs

Giant Frog	<i>Cyclorana australis</i>
Marbled Frog	<i>Limnodynastes</i>
Ornate Burrowing Frog	<i>convexusculus</i>
Green Tree Frog	<i>Limnodynastes ornatus</i>
Copland's Rock Frog	<i>Litoria caerulea</i>
Peter's Frog	<i>Litoria coplandi</i>
Red Tree Frog	<i>Litoria inermis</i>
Magnificent Tree Frog	<i>Litoria rubella</i>
Wotjulum Frog	<i>Litoria splendida</i>
Northern Spadefoot Toad	<i>Litoria wotjulumensis</i>
Stonemason Toadlet	<i>Notaden melanoscaphus</i>
	<i>Uperoleia lithomoda</i>

Data Source: NT Fauna Atlas