

This paper was presented to a conference "Better management for Protected Areas" on Jeju Island, Korea in October last year. The recent ASF conference in Mount Gambier raised issues of management of cave areas and a workshop will address this at the upcoming ACKMA conference in Buchan. Some sections of this have been reported in this journal previously, but for the sake of continuity, it is presented here in its entirety as presented in Jeju.

A tour group in the Bat Observation Centre, Naracoorte Caves.  
The innovation in using infra red cameras to view bats was a world first.



## **MANAGEMENT OF UNDERGROUND PROTECTED AREAS: A Case Study of Naracoorte Caves World Heritage Area**

- Steve Bourne

### **ABSTRACT**

Management of caves requires an understanding of the whole karst landscape in which they fit and the contributing factors; life, energy, water, soils, gases and bedrock. Karst landscapes are three dimensional, with strong links between the surface and underground cavities. Boundaries are often difficult to delineate and protected areas are often only a small part of the overall landscape, requiring cooperation of adjoining landowners to achieve conservation objectives.

There are many threats to caves, especially low energy systems which are extremely fragile and may be irreversibly changed through a single careless act. Caves are susceptible to pollution, as they are often used as convenient waste disposal sites. Pollution may not be intentional, but caused through a lack of understanding of hydrological systems. Developments that fail to consider the subterranean environment pose a

serious risk to caves and many have been totally destroyed in the name of progress.

Caves have long been appreciated for their natural values and aesthetic beauty, while others have a strong cultural significance. Some caves have scientific value, for speleothems provide evidence of past climate and preserve remains of long extinct animals and civilisations. There may also be an economic worth, most often in the form of tourism. Effective management then becomes a balance, achieved first through a planning process that identifies values and objectives and then through careful implementation and monitoring.

Naracoorte Caves National Park was inscribed on the World Heritage list in 1994. This recognises the value of extensive Pleistocene fossil deposits found within the caves, the most complete fossil record of the past 500,000 years of Earth history. Major contributions have been made to the

knowledge of Australian megafauna and research now seeks to understand the effects of climate change and the arrival of humans on faunal populations. The research provides the basis for the park's interpretive program, and has made it the most popular visitor attraction in the region.

Innovative presentation of the underground is achieved at Naracoorte, using infra red cameras to bring the normally inaccessible world of bats to visitors. Strong conservation messages and research outcomes contribute to the interpretation, making it a powerful educational tool.

The World Heritage Area is compact, just 307 hectares, but makes a positive contribution to whole of landscape management with the support of the local community.

This paper describes the management of Naracoorte Caves World Heritage Area, in balancing research objectives with conservation and tourism, and significant achievements beyond the park boundary.



A view in the Ossuaries. Rich Pleistocene deposits such as The Ossuaries are the reason for Naracoorte Caves World Heritage listing

## INTRODUCTION

Naracoorte Caves National Park covers 600 hectares in the southeast of South Australia, Australia in a region called the Gambier Karst Province. In recognition of the region's marine origin, tourism and business bodies have adopted the name Limestone Coast. A 307 hectare section of the park is recognised by UNESCO as a World Heritage Area. The park was listed under two natural criteria:

- as outstanding examples representing major stages of the earth's evolutionary history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiogeographic features; or
- as outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, freshwater, coastal and marine ecosystems and communities of plants and animals.

The World Heritage listing recognises the value of the Pleistocene fossil deposits found in the caves, which cover a period of time marked by severe

climate changes and the arrival of human populations to Australia (Ayliffe *et al* 1998). The fossil record is the most complete of this period and is possibly the only place on the planet with a continuous record of the past 500,000 years. Hence the park holds a strong interest to scientists as well as the regular visitors to a cave system who come for recreational, educational or sightseeing experiences. Balancing the needs of each of these groups is a key component of park management, which is guided by a comprehensive management planning process involving all stakeholders. Implementation of the management plan includes permits and guidelines for research, monitoring of each cave using a variety of methods depending on the cave's use and reviews to ensure park objectives are being met.

The park is unusual for a show cave system in the number of experiences available to visitors. In addition to regular show and adventure cave tours, presentations involving fossils and bats are offered. In each case, interpretation is strongly linked to research. Presentations are kept vibrant and up to date and innovative technology is used to enhance the visitor experience. The Wonambi Fossil Centre houses a diorama recreating a time when extinct animals, termed megafauna, roamed the land at Naracoorte. Science and art have combined to bring these creatures to life, so that visitors may take a "walk in the past". Bats are a difficult animal to observe in their natural habitat. This has been overcome through the use of infra red technology with cameras placed inside a bat maternity cave on the park. The interpretive program is educational, aiming to generate and interest and understanding in park visitors so that they leave the park with a positive attitude towards the conservation of caves, their contents and inhabitants.

The park has a relationship with the local community extending back to 1845 when European settlers discovered the first caves. Prior to this, Indigenous people used the larger open caves for shelter although little direct physical evidence remains and knowledge is restricted to a small number of oral Dreamtime stories. The park retains strong links with the local community, through a structure that allows involvement and encourages participation. This contributes to greater conservation benefits well beyond the park boundary, both above and below ground.

Just as all elements in a karst landscape are linked, so are the research, interpretation, conservation and tourism at Naracoorte Caves. This case study describes how this is achieved.

## MANAGEMENT PLANNING

### Balancing the management and managing the balance

Effective planning for karst regions demands a full appreciation of all their economic, scientific and human values, within the local cultural and political context (Watson *et al* 1996). Naracoorte Caves National Park(NP) is one of 330 parks and reserves across South Australia managed by the Department for Environment and Heritage (DEH).



Thylacoleo carnifex skull, in situ



Each is required to have a management plan under the *National Parks and Wildlife Act 1972*. The management plan provides the framework for management of the park by stating the philosophy on which management should be based and by setting out objectives and actions for management (DEH 2001). Comments are invited from key agencies, groups and individuals as a matter of policy before the draft management plans are formally released for comment from the general public. This internal review stage aims to gain a measure of understanding amongst various stakeholders, with a view to retaining support before the subsequent public exhibition period.

Once a draft management plan has been prepared, it is released for public comment for at least three months to allow further stakeholder input before the plan is finalised and adopted. Once a plan is adopted, no activities may be undertaken that conflict with the objectives and actions set out in the management plan.

It is this structured process that allowed for all stakeholders to provide input into the Naracoorte Caves National Park Management Plan 2001. These included;

- Researchers with an interest in the scientific values of the park.
- Caving groups with recreational interests.
- Conservation groups interested in the conservation of flora and fauna and well as geological features.
- Tourism groups seeking to increase visitation to the region.
- Heritage groups with interests in the park's history.
- Local community and landholders with social interests.

### **The Naracoorte Caves National Park Management Plan**

The management plan sets out a series of objectives;

- to protect and preserve the natural World Heritage values for which the Park was listed, and also other values including cultural;
- to conserve areas of natural vegetation and to manage other vegetated areas for their natural or historic conservation values;

- to provide and maintain appropriate access for vehicles and pedestrians;
- to provide appropriate facilities for visitor use and enjoyment;
- to provide opportunities for visitors to experience, understand and appreciate the significant natural and cultural values of the Park, in particular the caves and their contents;
- to ensure that the Park maintains its key role as a significant element in regional tourism;
- to ensure that protection practices are consistent with the maintenance of all the Park's values;
- to encourage, foster and facilitate appropriate research, inventory and monitoring of the natural and cultural features of the Park;
- to liaise with neighbouring landholders and instrumentalities to ensure that development and activities do not adversely affect Park values;
- to ensure through a program of monitoring and research using measurable objectives that impacts from uses and management actions and practices do not adversely affect the values of the Park.
- to utilise and build on the Park's World Heritage status to boost community support and understanding.

The caves in the Park are its most significant resource and providing for their protection was the sole purpose for Government acquisition and management of the area. They provide the community with educational and recreational opportunities, while preserving a broad range of geological, historical and palaeontological values for scientific research and aesthetic appreciation. Palaeontology is an extractive science and as the fossil resources are finite, research needs to be carefully managed to ensure long-term viability of the park as a research site. Studies into the effect of human visitation on caves have demonstrated that the tolerance of caves to visitation without discernible change is minimal. The impact of human visitation on caves is therefore a primary issue for management and protection of cave values.

### **Cave Classifications**

Caves vary greatly in their size and morphology and with regard to their specific values. The vertebrate fossils in the cave sediments at Naracoorte Caves have led to the World Heritage listing and other significant values at Naracoorte include biospeleological, archaeological and aesthetic.

The system used to classify the caves at Naracoorte is based on that of Davey *et al* (1982) and Rosengren *et al* (1987). Caves are classified into five different categories, according to values and their use.

- Wild Caves are managed to provide opportunities for responsible cave recreation, exploration and research subject to guidelines set out by the Australian Speleological Federation.

- Adventure Caves are managed to provide guided tours with a balance between interest in the features of the cave and the challenge in its exploration along pre-determined routes that avoid exposure of features vulnerable to damage. Access will be only under direct supervision of guiding staff or with written approval for recreational caving or research;
- Show Caves are managed to provide guided tours with a balance between education and aesthetic appreciation of cultural, geological and palaeontological values of the caves, and access is only under direct supervision of guiding staff or with written approval for research;
- Special Natural Value Caves are managed to provide opportunity for properly authorised research consistent with the special values of the cave, and access is only with written approval;
- Reference Caves are protected against further disturbance as far as is practicable, and access is only with written approval for research specifically related to the baseline functions of the cave, and where such research cannot reasonably be carried out elsewhere in the State.

A different management regime has been established for each of these categories.



Blanche Cave, Naracoorte – 1912

### **Wild Caves**

Access to wild caves is only granted to cavers from a recognised speleological club through a permit system. A club must apply for a permit at least one month prior to their visit to allow time for reference checks if required.

Caves used for wild caving have little or no fossil significance and mostly very little speleothem development, but periodic checks are undertaken

to determine any impacts from cavers. Each trip is recorded to calculate total use of each cave on an annual basis.

### **Adventure Caves**

Five caves are used for adventure caving tours that are led by DEH staff. The route is predetermined and in sensitive areas, track marking is used to define this. Staff are trained to ensure a good knowledge of the cave and provide interpretation as part of the tour. Some photo monitoring points have been established beyond tracked areas to detect transgressions. As with wild caves, each trip is recorded and total use of the cave recorded. In each of these first two categories, visitation is not at a level that has the potential to drastically alter the cave climate and no monitoring process is in place for this.

### **Show Caves**

The primary use of shows caves is to provide interpretation for park visitors. Tours of Alexandra, Victoria Fossil and Blanche Caves are all guided while Wet Cave may be visited without a guide. Each guided tour has a maximum number per tour, determined by the size of the cave, for cave protection and visitor safety, and for effective interpretation to be delivered. Visitor numbers are tracked through the computerized ticketing system and recorded for each cave annually.

Numbers that visit each cave are not high when compared to some large show caves of the world, with Alexandra Cave recording the most visits for 2005/6 with 16,970. Some climate monitoring is in place with data loggers recording temperature and humidity levels, with these compared to others placed in control caves (Sanderson and Bourne 2000). To date, no discernable temperature changes have been detected that could be attributed to visitors.

Infrastructure is kept to a minimum but of course a certain amount is required to enable visitor access. The following five areas are considered with show cave infrastructure at Naracoorte Caves:

- Safety – visitors must be able to move safely in the underground environment, hence light levels are critical. Infrastructure needs to be appropriate for the purpose and prevent the possibility of falls from heights etc.
- Removability of infrastructure – all structures has a life span and consideration should be given to their ease of removal when they are designed and installed. This will prevent negative impacts when the time comes for change.
- Aesthetics of infrastructure- structures should have minimal impact on the aesthetics of the cave and must not dominate the cave landscape.
- Avoidance of pollutants – care must be given to avoid materials that corrode or introduce toxins that may be harmful to cave fauna.
- Durability of infrastructure- where possible, materials with a long life span in cave environments should be used. (adapted from Spate *et al* 1997)

### **Special Natural Value and Reference Caves**

The distinction between these two categories is somewhat blurred and a project to assess the fossil values of the park will be used to redefine these. Much of the fossil research conducted at Naracoorte Caves can *only* be done here, so the majority of fossil sites fall within this category. Palaeontology is an extractive science hence any research requires a degree of disturbance and procedures and methodologies are required to ensure maximum information is gained from each excavation.

Fossil research is managed through a scientific permit system. The scientific committee oversees the research program to avoid duplication of projects and avoid unnecessary excavation of the fossil resource. Flinders University have been the lead institution working at the park for over 30 years and this long-standing partnership has been mutually beneficial. Other institutions have been utilised in research and Flinders University has been able to provide support in other disciplines including tourism and education.

### **A Framework for Fossil Site Classifications**

DEH employed a palaeontologist, Dr Liz Reed, to conduct an assessment of all fossil sites within the World Heritage Area. The project sought to develop a framework that could be used to assess the value of sites against a set of criteria. Sites may fit within one or more primary criteria and then the degree of significance was determined using comparative criteria.

#### **Primary criteria**

- Scientific value – research, good example, contribution to knowledge
- Historic value – association with people, places & events
- Social value – held in community esteem, contributes to community identity; living contemporary value.
- Intrinsic and/or Aesthetic value – existence value; symbolic for aesthetic qualities, evokes strong feelings or meanings.

**Comparative criteria** (for evaluating the degree of significance)

- Representativeness – of a particular category or type; a specific time period; stratigraphic range; temporal span; taxonomic composition.
- Rarity – unusual, rare or particularly fine example; are there comparable sites elsewhere (at what level).
- Condition, completeness, integrity – of site eg. unusually complete, sound, in original condition; of features (eg. fossils) eg. exceptional preservation, completeness, volume, density.
- Interpretive potential – value for interpretation & education (*in situ* objects/collections may be significant for their capacity to interpret & demonstrate aspects of the significance of the place eg. Fossil Chamber in VFC demonstrates WH values of site and whole park); accessibility.

- Degree of research conducted at the site and/or level of interest (eg. national, international)
- Taxonomic diversity and richness.
- Potential for ongoing research; suitability for correlation.
- Relevance to contemporary issues - fossils yield an understanding of the conservation status of modern taxa and communities; changes through time.
- Represented by a well-provenanced and/or extensive collection.
- Other features of natural value associated with the site that relate to the fossil source.

(from Reed 2005)

All research that has been conducted to date has been collated and all collections made by cavers identified wherever possible, many dating back over 40 years. Identification and determining the level of significance of sites provides an important tool when it comes to how a cave is managed. Cave morphology and accessibility are also important considerations, as site of high significance, such as that in Victoria Fossil Cave Fossil Chamber, can be used for interpretation as visitors may view the site from a distance.



Visitors listening to their site interpreter at the fossil bed in Victoria Fossil Cave

### **INTEGRATING RESEARCH AND TOURISM**

#### **A brief history of tourism at Naracoorte Caves**

The development of tourism at Naracoorte Caves is a long and interesting journey. Tourism began soon after the discovery of the first caves in 1845. At first, it was proud locals showing off “their caves” to visitors and later some structure with enthusiastic entrepreneurs collecting visitors at the township of Naracoorte and transporting to the caves.

Early tourism focussed on presenting the caves as “underground wonders”, similar fare to that offered at virtually every other show cave system. The two most popular caves were Victoria Cave, which was opened in 1897 and Alexandra Cave, opened in 1909. Blanche, Wet, Stick and Cathedral Caves were also available for public viewing, but with less restrictions than were placed on the more delicate Victoria and Alexandra Caves.



### Thylacoleo model in the Wonambi Fossil Centre



Tourism materials of the day, far less prolific than the plethora of materials available today, focussed on the beauty of the cave and of the fantastic shapes created by natural processes. Little mention was made of processes that developed the caves, nor of the bats or fossils found in them. Bat Cave and its large population of breeding bats were usually described as a cave least desirable to visit because of the strong-smelling guano. Fossils were first recognised in Blanche Cave by Woods in 1858 (Woods 1862). Despite many minor finds over the next century, nothing was regarded as worthy of presenting to visitors.

### Fossils and Tourism

Naracoorte Caves was the first cave site in Australia to display an ongoing research program as a tourist attraction (Wells *et al* 1979). Cavers discovered a huge deposit of megafauna fossils in 1969. One of the discoverers, Rod Wells, recognised the importance of the find and suggested to park management that access to the site for research and opening the cave for park visitors could be mutually beneficial. Science and tourism were merged in to a successful product with park visitors participating in guided tours through Victoria Fossil Cave by 1971.

Researchers and volunteers were often present at the excavation and able to speak with visitors in the 1970's, which proved immensely popular (Wells *et al* 1979). Once research efforts were directed towards other sections of the Fossil Chamber deposit, those working were out of sight of visitors and then excavations became restricted to just two weeks each year. Hence the presentations were static and little changed for a visitor on a repeat tour of the cave. Not surprisingly, visitation to the park declined after a period of buoyancy and new direction was needed.

### Wonambi Fossil Centre

The World Heritage listing of the park in 1994 lifted the profile and funds were secured to develop the park into a world-class visitor attraction. In 1998 the Wonambi Fossil Centre opened, recreating a scene of how Naracoorte may have looked 200,000 years ago. Models of extinct animals were built as scientifically accurate as possible and placed in a landscape of the time. Many of Australia's megafauna were described in the 1850's by the famous English palaeontologist Sir Richard Owen from fossils mostly found at Wellington Caves in New South Wales and transported back to England. He mostly worked with fragmentary remains but the perfect

preservation of Naracoorte fossils enabled very accurate reconstructions. As further fossils are discovered, some models have been changed to reflect our increased understanding of the animal.

The interpretation provided in the centre has been developed to meet a range of learning levels. Fossil material from the caves is on display and the diorama itself is self guided, with scientific-like notepads providing basic information. The scenes have been carefully crafted to deliver a like-like experience, transporting visitors back to a time when megafauna dominated the landscape. To encourage repeat visitation, efforts are made to continually add exhibits and alter scenes. Interpretive panels in the Flinders University Gallery both provide high-level scientific interpretation of the site and recognition to the university that has provided excellent support to the park for a long period of time. Touch screen computers housed in the centre have information delivered at a more basic level and are an excellent tool for students.

The Wonambi Fossil Centre and Victoria Fossil Cave together tell a comprehensive story of the fossil history of Naracoorte Caves. Critical to the future success is ongoing research and continuing development and refinement of products offered, for without new information and products, the park will become a stale tourism product. Conversely, tourism also provides the forum for scientists to promote their results to the general public, rather than just the usual scientific forum. This strong link is one of the great successes of Naracoorte Caves.



*A Midsummer Night's Dream* being performed the Blanche Cave. Cultural events are an important tool to bring a different audience to the park and retain cultural links to the past.

### Maintaining relevant interpretation

Over 100 fossil sites have been identified within the park boundaries, yet only seven have received a reasonable level of investigation. The focus has been on megafauna, gathering enough material to reconstruct animals and understanding how they may have lived. Research is now seeking to understand faunal change over time and responses to climate change and the impact of human populations. With such a number of sites and repeated sequences, Naracoorte is well placed to make a significant contribution in these areas on inquiry. This area of research is relevant to current issues with climate change a concern for the world's policy makers as well as the general community. Hence, interpretation will be relevant to issues of the present day.

A survey conducted on behalf of DEH identified that one quarter of Naracoorte Caves' visitors were visiting the park for a learning experience and a significant number (6%) were seeking participation.

The recommendations concluded Naracoorte Caves should focus on developing children's activities and activities that were appealing to families. It also identified opportunities to further capitalise on the World Heritage listing of the park and the recognition this has, particularly with international visitors. A number of activities and tours have been trialled and continue to be refined.



Kids at the fossil bed. Education programs are a big component of Naracoorte Caves.

### **Fossil Kidz**

Fossil Kidz is a program of activities targeted at 5-10 year olds. A mock fossil pit has been developed that enables children to play the role of the palaeontologist, first excavating fossils, identifying them from graphics painted on the walls of the "Kids Shed" and making a cast of their fossil to paint and take home. While the emphasis is on fun, young enquiring minds also find it a strong learning experience. The program can be delivered off site and has been offered at the seaside town of Robe, about one hours travel away, as a school holiday activity and as a summer holiday promotion for Naracoorte Caves.

### **Educational Programs**

Naracoorte Caves NP has a key role to play for DEH, delivering educational programs for schools. Fossils are the key product, but are expanded to include concepts such as biodiversity, conservation, evolution and extinctions. School children are proving a valuable marketing tool, as the school visit often stimulates a repeat visit with parents.

### **World Heritage Tour**

A small number of visitors to the park have a far deeper interest in fossils than the regular visitor and could be easily frustrated by the level of interpretation provided on a regular tour. The World Heritage tour was conceived to fulfil this need and is led by a palaeontologist currently researching at the site, giving an authentic experience. Participants are taken to active research sites and the fossil laboratory, which is normally out of bounds for visitors, to view fossil material from the caves.

### **Participatory Tours**

Fossil research can be a labour intensive process, where many tonnes of rock and soil need to be removed before fossils are found. Many sites around the world use volunteer labour, or even volunteers who pay to participate and assist researchers. Naracoorte Caves has trialled a program where visitors participated in a week long camp, working alongside palaeontologists excavating, preparing and identifying fossils. The key element of the week long tour is authenticity, participants are enthusiastic to assist in all aspects of the research, even contribute financially, so long as they were making a contribution to science. A partnership with a trusted operator is the key to offering this product successfully on an ongoing basis. The numbers of people who are willing to pay for this type of experience is small and best attracted using the database of an operator who has experience in conducting these types of excursions.

### **Bats and Tourism**

Bat Cave at Naracoorte Caves NP is one of only two known maternity sites for the Southern Bentwing Bat *Miniopterus bassanii*. Although the park is best known for extensive fossil deposits, bats also feature prominently in management strategies and interpretation. The population of bats was estimated at 100-200,000 in the 1960's (Dwyer and Hamilton-Smith 1965). By 2000, surveys found the population had reduced to around 35,000, which prompted a thorough investigation into the possible causes of the decline. Research has included chemical residue studies, invertebrate studies and bat ecology. In all cases, the results form part of the interpretation and in some cases, the community and even park visitors have been involved in research and conservation projects.

Visitors to the park prior to the 1960's often accessed Bat Cave although it appears it was never part of the structured visitor program. This no doubt caused considerable disturbance to the bats although there is little mention of the bats themselves in most accounts. Evening guided tours commenced in 1985 where visitors were taken to the entrance of Bat Cave during the summer months to witness the exit flight. In 1995, four infra red cameras were installed in Bat Cave and visitors could view real time images with no disturbance to the bats. Advances in technology have since allowed several upgrades and the Bat Observation Centre remains a major component of the guided tour program.

### **Bat Observation Centre**

The concept of allowing visitors to view the total darkness of the Bat Cave interior was inspired by a movie where soldiers used night vision glasses to watch their enemies (Hamilton-Smith pers comm.) A team from the Department for Correctional Services and Ranger Brian Clark worked together to trial, then develop and ultimately install a system that would allow real time, non invasive viewing of the bat colony. The in cave system has proved to be robust and has survived the humid cave atmosphere with minimal maintenance difficulties.

Five cameras have been placed at various locations in the cave. Two are placed where nurseries of bat pups collect each year and births are routinely observed during November and December. Another near the cave entrance operates under both daylight and infra red conditions, giving different visitor experiences depending on the time of day. One camera is placed where bats routinely drink from speleothems and the fifth camera is placed on the flight path from the maternity chamber to the cave exit. The best viewing is during the spring and summer months when the bats are most active, while recorded footage supplements live action during quieter winter months.

Presentations in the Bat Observation Centre involve interpreting observed behaviours and also provide the perfect forum for disseminating research. As with the fossils, integration of this research into the interpretation keeps the product current and relevant.

### **Cultural activities in caves**

Caves have been the focus for a range of cultural activities for centuries. They are used as sanatoria, as art sites, have spiritual importance, and for musical and theatrical performances (Watson *et al* 1996). It is important to appreciate all values of a karst system and this is considered with the management of Naracoorte Caves NP.

The park has been an important component of the local community since the discovery of the first cave. Aside from tourism and research, the park has been a favoured recreational site for caving and aboveground activities. Some past activities we would now disallow as too destructive, such as picnics and parties in the caves and the festivities of an event in 1924, when a table tennis tournament took place in Blanche Cave.

Restrictions have been put in place as to the type of activities that are allowed in the caves. Blanche Cave, by nature of its size, lends itself to cultural events. A removable stage has been installed in one chamber and has hosted jazz festivals, folk singing and annual community Christmas carols.

A series of roving performances of Shakespeare's *A Midsummer Night's Dream* were performed between Blanche and Wet Caves. The focus of Naracoorte Caves is scientific research and presenting this to the public, but cultural activities are still an important part of the park experience.

### **Whole of landscape management – the contribution of Naracoorte Caves National Park**

It is important to involve the community in protected area management, and it is equally important to influence how the community behaves on non-protected areas. To achieve this, a strong understanding of community interactions and good communication are essential. People must first be aware of conservation issues and be in a position to rectify or reverse underlying causes of problems. Economic restrictions, lack of knowledge and

making conservation issues relevant to landholders are the greatest barriers. The management agency may be able to assist with funds or sourcing of funds, provide advice on protection or restoration of natural resources and communicate issues to gain community support.

In the south east of South Australia, less than 13% of native vegetation remains and of this, less than half is under the management of environmental agencies (Croft *et al* 1999). Over 600 caves have been documented within the region and of these only 26 are protected within the Naracoorte Caves NP.

With such a small percentage of land left in its natural state and the majority not under formal protection and management, it becomes critical to have the cooperation of government agencies, local landholders and the entire community to achieve effective environmental management. Landholders within the Naracoorte Caves area have been engaged to contribute to the protection and re-establishment of native vegetation and protection of caves.



Perhaps the first Australian cave photo, of Father Tenison Woods in Blanche Cave about 1858

### **Vegetation**

The Caves Range re-vegetation project has been a cooperative project between two government agencies; DEH and Forestry South Australia. The vegetation cover along the Caves Range is highly fragmented. For many mammal, reptile and amphibian species, these fragments are essentially islands and little exchange of genetic material is possible placing some populations at great risk.

A project has been implemented to link small areas and provide a continuous area of vegetation along the majority of the range. Some of the land is privately owned and landowners have been encouraged and supported to join the project. The result to date is that several once discreet fragments are now linked and fauna are now freely moving along the range.

Areas of land containing caves that previously planted to *Pinus radiata* pine plantations have been cleared of plantations and returned to natural vegetation.

This has restored the natural hydrology of the karst system and more caves and important fossil sites have been included in the park. The removal



of pines is important to the conservation of both caves and fossils. A mature pine forest allows negligible water into caves below and that water that does get there can be highly acidic and has been personally observed to erode fossils.

The Mosquito Creek rises to the east of the park in the non-karst area of the neighbouring state Victoria. It passes through the Naracoorte Caves NP before terminating at the Bool Lagoon wetland complex, a Ramsar wetland.

Careful management of this watercourse is necessary to maintain water quality to Bool Lagoon and protect both the water source for terrestrial fauna and habitat for aquatic fauna. A project has commenced to protect the riparian zone of the creek and ensure the catchment area is defined and protected.

Vegetation and water are not values for which Naracoorte Caves was made a National Park nor inscribed on the World Heritage list, but as a site with a high profile, it is able to influence and assist in protecting other values in the overall landscape.

### **Caves and fossils**

The majority of the most significant fossil deposits found to date in the South East of South Australia lie within the caves of the Naracoorte Caves NP. However, a significant number occur on private land and this number is increasing as new caves are discovered, most often during vineyard developments.

World Heritage listing of Naracoorte Caves NP created some uncertainty with neighbouring landholders who had caves on their land. They were unsure of what World Heritage listing meant and had concerns that if caves or fossil sites were found on their land, they may lose it to be added to the World Heritage Area.

Some caves and potential fossil sites were destroyed rather than allowing access for investigation. There is no legal requirement for landholders to inform authorities of cave discoveries in South Australia; hence a positive relationship with the community is critical.



Cave cleaning. The Friends of Naracoorte Caves has made important contributions in cave conservation to restore bat habitat.

An opportunity to investigate, then excavate a fossil deposit found in a small cave and the subsequent promotion through the media has enabled several important discoveries since to be protected. Local landholders are aware that there is no agenda to increase the size of the World Heritage Area through compulsory acquisition of land. In fact, in most cases, normal land use can continue above the cave without any detrimental effects to fossil deposits below.

Management at Naracoorte Caves has worked with landowners to excavate fossils from three caves before quarrying continued, and assist landowners to install protection over cave entrances and preserve caves in another two cases. These sites are now offered the same level of protection as within the World Heritage Area, with normal land use above.



Ziggy plaster – participatory tours have been trialled and have proved successful

### **Caves and Bats**

The Southern Bentwing Bat population that breeds each summer in Bat Cave at Naracoorte Caves NP disperses to wintering caves each autumn. The bats are most susceptible to disturbance while torpid during the winter period and are quite specific in their requirements. Unfortunately, many caves that bats find suitable have been used for dumping rubbish and have been rendered unsuitable.

As part of its commitment to conserving the species, DEH has sought to assist landowners with caves to restore their caves and attract bats back to them. Two important caves close to the park have been cleaned out, with the assistance of a volunteer group, the Friends of Naracoorte Caves. This group assists with approved programs and projects to achieve better park management and at the same time creating community “ownership”.

Cave Park Cave is possibly the most important wintering cave for the species, often hosting half of the winter population. Rubbish including car bodies was removed and native vegetation established around the cave entrance to make it more suitable for the bats. Over 30 tonnes of rubbish was removed from Joanna Bat Cave, including material that effectively blocked the entrance. Within weeks of removal, bats were once again living in the cave.

## CONCLUSION

The Naracoorte Caves NP management plan identifies and sets objectives for the management of all elements of the karst landscape, including cave contents and inhabitants, scientific and cultural values, and the surface landscape. The park has been very successful in developing an excellent tourism product based around research conducted on the park. Central to this is maintaining links between interpretation and research and continually seeking to update and renew visitor experiences. Strong community support has been vital in the park's development and efforts are made to continue this relationship.

The level of understanding of environmental issues is increasing in the community and advances are being made with the conservation of both terrestrial and subterranean environments. The knowledge of the park's resources continues to improve with research.

Management of caves requires an understanding of the whole karst landscape in which they fit. It follows that management can improve as knowledge improves hence adaptability is critical. That is the primary reason for the success of Naracoorte Caves NP to date; identification, innovative and sustainable use of the park's resources involving all sections of the community.

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