AUSTRALIAN NATIONAL PERIODIC REPORT

SECTION II

Report on the State of Conservation of the Australian Fossil Mammal Sites - Riversleigh (Queensland) and Naracoorte (South Australia)

----------11.1. INTRODUCTION

a. State Party

Australia

b. Name of World Heritage property

Australian Fossil Mammal Sites - Riversleigh (Queensland) and Naracoorte (South Australia)

c. Geographical coordinates to the nearest second

Riversleigh: 18°59'13" and 19°04'33"S; 138'33'39" and 138°42'39"E

Naracoorte: 37°01'36" and 37°05'44"S; 140"47'40" and 140°50'15"E **d. Date**

of inscription on the World Heritage List

1994

e. Organization(s) or entity(ies) responsible for the preparation of the report Environment

Australia in conjunction with the Queensland Parks and Wildlife Service and National Parks and

Wildlife South Australia.

11.2. STATEMENT OF SIGNIFICANCE

Criteria

The Australian Fossil Mammal Sites (Riversleigh/Naracoorte) were inscribed on the World Heritage List for their outstanding natural universal values which met two criteria:

- Criterion 1 - outstanding examples representing major stages of the Earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features; and
- Criterion 2 - 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.

Justification for listing

Riversleigh is one of the world's richest Oligo-Miocene mammal records, linking that period (15-25 million years ago) to the predominantly modern assemblages of the Pliocene and Pleistocene epochs. The site provides exceptional examples of middle to

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late Tertiary mammal assemblages, in a continent whose mammalian evolutionary history has been the most isolated and most distinctive in the world.

The extensive fossil deposits at Riversleigh are encased in hard, rough limestone, which was formed in lime-rich freshwater pools. They span a record of mammal evolution of at least 20 million years in length, providing the first records for many distinctive groups of living mammals, such as marsupial moles and feather-tailed possums, as well as many other unique and now extinct Australian mammals such as 'marsupial lions'.

The variety of deposits at Riversleigh has led to an understanding of how the environment has changed over time from a rich rainforest community to semi-arid grassland, and how the animals that lived in it have changed too.

The discovery of the fossils at Riversleigh has profoundly altered the understanding of Australia's mid-Cainozoic vertebrate diversity. The remains of a 15 million-year-old monotreme have provided new information about this highly distinctive group of mammals, and several Tertiary thylacines have been identified. Placental mammals are represented by more than. 35 bat species and the Riversleigh fossil bat record is the richest in the world.

In stark contrast to the semi-arid conditions at Riversleigh stand the cool caves at Naracoorte. Here are fossils that document a distinctive fauna, with the ancestors of modem species alongside the doomed giants of a world that was about to be devastated by climatic changes.

The fossils in the Naracoorte Caves illustrate faunal change spanning several ice ages, highlighting the impacts of both climatic change and humankind on Australia's mammals from at least 350 000 years before the present.

Further research at the Naracoorte Caves sites is expected to document a series of snapshots of Pleistocene life in south east Australia, including details of climate and vegetation associated with the fauna. Recent geological research suggests that deposits of Pliocene and even Miocene age could be found at the site, thus providing closer links with the site at Riversleigh.

Specimens representing 99 vertebrate species have been discovered, ranging in size from very small frogs to buffalo-sized marsupials. These include exceptionally preserved examples of the Australian Ice Age megafauna, as well as a host of modem species such as the Tasmanian devil, thylacine and others. The Naracoorte fossils span the probable time of the arrival of humans in Australia, and this is valuable in analysing the complex relationships between humans and their environment.

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Both sites provide evidence separately of key stages in the evolution of the fauna of the world's most isolated continent. The history of mammal lineages in modem Australia can be traced through these fossil deposits and, as a consequence, there is a better understanding of the conservation status of living mammals and their communities.

The sites, each highly significant in its own right, are presented as a serial World Heritage listing. Together they represent the key stages in the development of ----------
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Australia's mammal fauna. While there are other important Australian fossil mammal sites, Riversleigh and Naracoorte are outstanding for the extreme diversity and the quality of preservation of their fossils. They also provide links through time that unify the biota of the past with those of today in the Wet Tropics of Queensland, the Central Eastern Rainforest Reserves (Australia) and Kakadu National Park World Heritage properties.

Additional information on the significance since listing

Riversleigh - New discoveries

The fossil deposits at Riversleigh continue to present information supporting the World Heritage significance of the site, with research revealing rich new information on the evolution of Australia's ecosystems, representing major stages of the Earth's history.

Marsupial Lion (Thylacoleonidae) Skull
Work is progressing on a thylacoleonidae skull recovered in 2001 from the Hiatus A Site. Presently, comparative studies of this find with other thylacoleonidae species are continuing. The find is extremely significant - it is one of only two thylacoleonidae skulls from Riversleigh (and the most complete) and one of only three complete skulls of this age in the world. It is crucial for research into the relationships (identification, palaeoecology and evolution) of this family of marsupials. It is also important for the biostratigraphical comparisons of sites at Riversleigh to enable comparative age dating.

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Dromornithidae new genus and new species
Numerous and various remains of a dromornithid bird have been and are being recovered from Hiatus A Site. A new, as yet unpublished, specimen of dromornithid appears to be extremely large and may be close in comparison to the largest species *(Dromornis stirtoni)* which was about 3 m tall and weighed approximately 300-500 kg. The specimens of this animal retrieved from Hiatus A are not only numerous but in very good condition. So far numerous cervical and dorsal vertebra, parts of the legs (femur, tarsometatarsus and phalanges) plus fragments of the previously unknown pelvis. Much more material is being studied and identified at the moment.

A partial skull *of* a dromornithid was discovered by Benita Chambers at Hiatus A during the 2001 season. Only part of the specimen was recovered and palaeontologists plan to retrieve the remaining parts of the specimen in the coming season. The skull is a first for Riversleigh and a cast of the animal's brain has also been preserved. This is an extremely rare event for any animal of this antiquity and a first for dromornithids. It is expected that the specimen will help solve the questions of how these animals lived, what they ate and their comparative level of intelligence. The cast was in such good condition, that preliminary observations indicated the position of blood vessels on the surface of the brain.

Miscellaneous Jaws
The identification of prehistoric life in the vast majority of cases relies on the identification of skull and jaw elements. So far the Mount Isa-based fossil laboratory alone has collected jaws *from Ekaltadeta ima* (carnivorous kangaroo), *Namilamadeta snideri* (Wynyardidae), *Baru sp.* (large freshwater crocodile), *Montypythonoides* ----------

riversleighensis (large python), agamidae and scincidae (lizards), and yet to be formally identified dasyurid, chiroptera, diprotodontidae and macropodidae. The python jaw was an exceptional find, being the most complete and well preserved python dentary from Riversleigh, and surpassed only by one other from Bullock Creek, in the Northern Territory.

Naracoorte - New discoveries
Research has expanded to include other fossil deposits in the protected area. Several of these deposits, while not producing the amount of fossil material as the Victoria Fossil Cave Fossil Chamber, have contributed significantly to our understanding of the accumulation of these faunal assemblages. To date, 20 areas of fossiliferous sediments have been identified, several of them still pristine. Many of these are associated with speleothem development, which has been accurately dated using U-series dating technique, constraining these deposits within a time period. Cross correlation of these deposits has increased the knowledge of the faunal communities over the past 500,000 years.
The Cathedral cave deposit has yielded several articulated specimens, contributing to the knowledge of anatomy of some species.
Research on the younger deposits has contributed to the knowledge and understanding of faunal change associated with the arrival of Europeans.

Indicative Values Table
The *Environment Protection and Biodiversity Conservation Act* 1999 prohibits actions that have "a significant impact on the World Heritage values of a declared World Heritage property" unless the action is approved or in accordance with an accredited management plan. The World Heritage values of a property are the natural heritage and cultural heritage contained in the property, which have the same meaning given by the World Heritage Convention.

The following indicative World Heritage values table includes examples of the World Heritage values for which the Australian Fossil Mammal Sites was listed for each World Heritage List criterion. These are, in the Australian Government's view, the statements of the outstanding universal values of each World Heritage property. While these examples are illustrative of the World Heritage values of the property, they do not necessarily constitute a comprehensive list.

Natural criteria against which the Australian Fossil Mammal Sites (Riversleigh/Naracoorte) was inscribed on the World Heritage List in 1994	**Examples of World Heritage values of the Australian Fossil Mammal Sites (Riversleigh/Naracoorte) for which the property was inscribed on the World Heritage List in 1994**
Criterion (i) outstanding examples	Riversleigh and Naracoorte are outstanding examples representing major stages of earth's history, including the record of life, particularly the middle to late Tertiary evolution of the mammals in Australia (Riversleigh), and an outstanding record of

Natural criteria against which the Australian Fossil Mammal Sites (Riversleigh/Naracoorte) was inscribed on the World Heritage List in 1994	**]Examples of World Heritage values of the Australian Fossil Mammal Sites (Riversleigh/Naracoorte) for which the property was inscribed on the World Heritage List in 1994**
representing major stages of the earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.	terrestrial vertebrate life spanning the last 170,000 years (Naracoorte), and significant on-going geological processes. The World Heritage values of Riversleigh include: • fossil deposits which: - contain an exceptional abundance and diversity of species and individual specimens; - include important and unique examples of middle to late Tertiary mammal assemblages; - demonstrate a rich Oligo-Miocene mammal record, including representation of rainforest species; - represent unusually wide temporal periods within the fossil record, including timeframes when Australia has been the most isolated continent on earth; - have a high quality of preservation of specimens; and - include evidence of links between the Australian mammal fauna with faunas outside Australia; • diverse Tertiary sediments which contain the fossil assemblages, particularly the Oligo-Miocene cave, fissure and alluvial tufa deposits which are geological antecedents to similar carbonate deposits that still form in the region today. The World Heritage values of Naracoorte include: • fossil deposits which: - include abundant and diverse fossils, including complete crania and disarticulated skeletons representing most age classes of the known extinct late Pleistocene mammals of Australia; - span the middle to late Pleistocene time period, representing the development of modern fauna; - have a high quality of preservation which enables both reconstruction and detailed anatomical descriptions and functional morphology of both crania and post-cranial skeletal elements.
Criterion (ii) outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.	Riversleigh and Naracoorte are outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of Australia's mammal fauna, including the richest Australian, and one of the world's richest, Oligo-Miocene mammal records, linking that period (15-25 million years) to the predominantly modern assemblages of the Pliocene and Pleistocene (Riversleigh), and a record of faunal change spanning two ice ages, highlighting the impacts of both climatic change and man on Australia's mammals (Naracoorte). The World Heritage values of Riversleigh include: • the fossil mammal record, which shows continuity and the effects of evolutionary and environmental change over at least the last 20 million years; • the quality and quantity of the fossil deposits, which has provided increased understanding of the past, present and possible future evolutionary path of many mammal species; • the Oligo-Miocene mammal record, the richest for the continent and one of the richest in the world, which includes fossil assemblages and sequences that: - provide evidence of temporal sequence of Oligo-Miocene rainforest

Natural criteria against which the Australian Fossil Mammal Sites (Riversleigh/Naracoorte) was inscribed on the World Heritage List in 1994	]Examples of World Heritage values of the Australian Fossil Mammal Sites (Riversleigh/Naracoorte) for which the property was inscribed on the World Heritage List in 1994
	mammals in Australia; - link the Oligo-Miocene assemblages of central Australia and the dominantly modern assemblages of the Pliocene and Pleistocene of eastern Australia; - provide evidence for the evolution of Australia's modern dry country mammal assemblages from ancestors within Australia's Oligo-Miocene rainforests; - preserve an important sequence of mammal species from Tertiary rainforest biotas; - provide a connection to other faunas within Australia - show evolutionary and ecological continuity to other World Heritage properties within Australia; - allow examination of community structure as well as the more conventional morphological and taxonomic study of particular individuals; - preserve examples of unique Australian prehistoric animals over the last 25 million years, including marsupial lions, carnivorous kangaroos, diprotodontids, huge pythons, early ancestors of the Tasmanian tiger, platypuses, crocodiles and bats; - provide an important collection of bat fossils in terms of the quantity and preservation of specimens; - include the oldest known specimens of many of Australia's mammal families (e.g. feather tailed possums, marsupial moles, wombats, gliding possums) which are amongst the best known in the world due to their quantity and degree of preservation; and • other fossil vertebrates and invertebrates, including some of which are Australia's oldest samples (e.g. millipedes, slaters and other arthropods). The World Heritage values of Naracoorte include: • The cave fauna deposits which includes fossil assemblages and sequences that: - date to the middle to late Pleistocene period, providing an important southern hemisphere site for the study of megafaunal extinction; - provide a window on faunal change spanning at least two ice ages and culminating in the appearance of humans on the Australian continent; - include representation of unique Gondwanan groups such as extinct madtsoiid snakes and monotremes due to the high quality of the preservation of most of the fossil material; - include a large quantity of individuals represented and a high quality of preservation due to the deposition of the fossils in a "pit fall trap" environment; - provide further evidence that the Australian fauna has evolved mainly in isolation; - are important in understanding the impacts of Milankovitch climatic cycles and humans on Australia's mammal fauna.; - include DNA which has been found and extracted from examples of the fossil material with a view to reconstructing detailed phylogenies for the extinct thylacoleonids (marsupial lions) and the extinct browsing sthenurine kangaroos.

11.3. STATEMENT OF AUTHENTICITY/INTEGRITY

Authenticity/Integrity

General

For Riversleigh effort was made to secure excellent representation rather than comprehensive inclusion of the deposit within the World Heritage property boundaries. This is the same approach as that which has been taken for Burgess Shale and Dinosaur Provincial Park World Heritage areas. In the case of Naracoorte, the entire deposit of the Victoria Fossil Cave is included in the World Heritage area boundaries.

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Riversleigh

The main extent of the Oligocene, Miocene, Pliocene and some of the Quaternary fossil deposits in the Riversleigh region is contained within the Riversleigh component of the Australian Fossil Mammal Sites World Heritage Area (Riversleigh). Riversleigh is contained within the boundaries of the current Boodjamulla (Lawn Hill) National Park. Other areas containing fossil mammals to the east of the current park boundary including the late Pleistocene Terrace Site are not contained within the circumscribed area. The vertebrate assemblage from Terrace Site is not particularly rich compared with late Pleistocene sites from other areas of Australia such as that of the Victoria Fossil Cave at Naracoorte.

Naracoorte

The full extent of the late Pleistocene fossiliferous sediments of the Naracoorte caves may never be known. The deepest caves in the Naracoorte region are confined to the Naracoorte East Ridge with its core of Gambier Limestone. Past exposure of the ancient cave entrances has occurred wherever the overlying Pleistocene coastal dune has been stripped away and this is most evident in the area bounded by the Naracoorte Caves Conservation Park. Each of the ancient entrances was a potential pitfall trap. The configuration of these entrances was crucial to the trapping of animals. The surface features are now totally obscured, however only further underground exploration will reveal the full fossil potential of the cave system. The fossil bearing sediments of the Victoria Fossil Cave (Fossil Chamber and the Ossuaries) are confined by the walls of the chambers in which they occur.

Maintenance of values ----------

The Australian Fossil Mammal Sites' inscription on the World Heritage List was based on outstanding natural heritage values, representing major stages in the earth's history, and outstanding representation of significant ongoing ecological and biological processes in the evolution and development, particularly, of terrestrial and freshwater communities of plants and animals.

The Australian and the relevant State Governments recognise the importance of research to identify and present the World Heritage values, and by doing so, protect, conserve and transmit that heritage to future generations. Therefore, governments support the lawful excavation and removal of fossiliferous material from Riversleigh and Naracoorte for research purposes. Research activities are primarily controlled by respective State legislation. The recent introduction of Australian Government legislation *Environment Protection and Biodiversity Conservation Act 1999* has added additional statutory provisions to control activities, including research activities, where they may have a significant impact on the World Heritage values of a declared World Heritage area.

The Australian Government acknowledges that the removal of material from the Australian Fossil Mammal Sites must be undertaken lawfully, with a view to the sustainability of the resource, an adherence to the principle of intergenerational equity and with sensitivity to concerns from the Indigenous community (including in relation to Riversleigh). These elements are fundamental to maintaining the Australian Fossil Mammal Sites' World Heritage values and are being addressed in management strategies for the properties.

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Riversleigh

The fossiliferous deposits on Riversleigh span in excess of 25 km^2 and are on average 20 m in depth. Although the exposed Tertiary limestone is not uniformly fossiliferous, much of it ranges from low-grade to high-grade material. This approximately translates to 500 million m^3 of potentially fossiliferous limestone. Between 1983 to 1993, approximately 15 tonnes of limestone per year were removed for study, with no more than 3 tonnes (ie about 2 m^3) from any single site. Most individual sites have at least 6 m^3 of highly fossiliferous deposit. Efforts at the time of nomination were to sample less than 25-50% of any individual site, recognising that future techniques and questions may require a return to previously sampled sites for new information.

Mr Frank Nissen of the Queensland Parks and Wildlife Service conducted preliminary monitoring work on the excavation of fossils at Riversleigh in 2001. Mr Nissen estimated from his survey data that between 45 to 80 m^3 of rock (including overburden on large sites) has been dislodged, approximately 10-15% of which contained fossil material. He inferred that the amount of fossil material being removed from the site for processing ranges from significantly less than 50% to significantly more than 50% of the fossil material excavated, depending on the specific excavation site. This is not fully consistent with the preservation status set out in the nomination document. An on-going monitoring system is necessary to assist researchers and managers to maintain a sustainable use of the resource.

An additional indicator for maintaining World Heritage values, which was not specified in the nomination document, is that research methodologies adhere to best practice standards for palaeontological research. Professor Michael Archer, the primary researcher at Riversleigh, produced a report on his research methodologies in August 1998 entitled `The Riversleigh Projects' Investigation of the Resources of Riversleigh World Heritage Property, Queensland'. The report was refereed by five eminent international palaeontologists who supported Professor Archer's research methods.

In 2002, the new research program proposed to be undertaken by Professor Michael Archer's team at Riversleigh in that year was assessed under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999,* and approved by the Australian Government.

Naracoorte

The Fossil Chamber in Victoria Fossil Cave is a cavern some 60 m long and 20 m wide. The fossil bed covers an area of more than 700 m^2. It is up to 4 m deep and estimated to contain more than 5000 tonnes of bone laden sediment.

At the time of listing, the deposit had been pegged on a 3 m grid, drilled and cored at each grid point. A 2 m by 1 m shaft was sunk to the base of the cave to assess the stratigraphic relationships. A larger pit, 4 m by 3 m formed the major excavation. The deposit had been divided in half along the longitudinal axis from the entrance cone to the distal end of the alluvial fan. All research was confined to one half of the chamber, the remainder was to be left in its original state.

The Upper and Lower Ossuaries cover an area of approximately 400 m^2. Other than a couple of exploratory cores and removal of a small quantity of bone for dating, these chambers were in pristine condition. Sediment cover is thin and the fossils remain as a lag deposit. At the time of listing, there were no plans to excavate these chambers.

Boundaries and buffer zones

Riversleigh

The Riversleigh component of the Australian Fossil Mammal Sites World Heritage property is situated within Boodjamulla (Lawn Hill) National Park (formerly Lawn Hill National Park).

An extension to the Riversleigh World Heritage area boundary was proposed in 2000. The area proposed to be included in the World Heritage area is situated to the northeast of the current boundary and includes the Terrace Site, other sites north of the Gregory River, Tarpeian Rock and associated fossil fields south of the Gregory River.

After a period of negotiation between the Australian Government, Queensland and the landholder (the Lawn Hill Riversleigh Pastoral Holding Company) in 2000, the landholder did not wish to progress with the nomination of the property for World Heritage Listing. The landholder continues to be open to discussion on entering into an

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agreement with Queensland for the use of certain areas of its property to improve the administration and management of the existing World Heritage area.

Naracoorte

The Naracoorte component of the Australian Fossil Mammal Sites World Heritage property is situated within the Naracoorte Caves National Park.

Recently, the Naracoorte Caves National Park boundary was extended to include the discovery of significant fossil deposits in 5U58 (a small cave known as Wombat Cave). The deposits in this cave may need to be assessed for World Heritage significance, leading to the possible extension of the World Heritage boundary to include this cave within the protected area.

11.4. MANAGEMENT National

legislation and controls

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The *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) is the Australian Government legislation for the protection of World Heritage Properties.

Other Australian Government legislation relevant to activities within the Australian Fossil Mammal Sites is the *Australian Heritage Commission Act* 1975 and the *Native Title Act* 1993.

The *Australian Heritage Commission Act* 1975 prohibits Ministers or Australian Government Departments from taking an action that adversely affects a place in the Register of the National Estate unless satisfied that there is no prudent and feasible alternative to taking the action. Before undertaking an action that might affect, to a significant extent, a place in the Register of the National Estate, a Minister or Australian Government Department must inform the Australian Heritage Commission and give the Commission an opportunity to provide advice or comment on the action. The Act has been effective in promoting heritage in the community through promotion of the Register of the National Estate and has contributed to promoting the heritage status of the fossil fields.

Claims have been made for determination of native title (under the *Native Title Act* 1993) over lands in the Riversleigh region including the conservation estate containing the Riversleigh fossil mammal sites.

State legislation and controls

Riversleigh

The following Queensland legislation is relevant to activities at Riversleigh: ----------

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Aboriginal Land Act 1991
Cultural Records (Landscapes Queensland and Queensland Estate) Act 1987 Fire and Rescue Authority Act 1990
Integrated Planning Act 1997
Local Government Act 1993
Nature Conservation Act 1992
Queensland Museums Act 1970
Rural Lands Protection Act 1985

The *Nature Conservation Act 1992* and associated *Nature Conservation Regulation 1994* (Queensland) provide the basis for effective protection and management of all Protected Areas in Qld. This legislation provides protection to all Natural and Cultural Resources within a Protected Area, including fossil deposits.

Naracoorte

The following South Australian legislation is relevant to activities at Naracoorte:

National Parks and Wildlife Act 1972
Heritage Act 1993 Development Act 1993

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The *National Parks and 'Wildlife Act 1972* contains strict management guidelines for the protection of the caves, including the World Heritage values. They provide the basis for the effective management of high visitation show caves, caves used for recreational activities and the sensitive fossil rich areas.

Local Government and Regional statutory controls

Riversleigh is within the Mount Isa City Council Local Government area. All developments on privately managed lands adjacent to the World Heritage Area require Local Government approval through the *Integrated Planning Act 1997.*

Two Pastoral Leases, administered under the *Land Act 1994* also adjoin the World Heritage Area to the east and west. To the east is Riversleigh Station, which is a pastoral development holding owned by the Lawn Hill Riversleigh Pastoral Holding Company Pty Ltd. The Lawn Hill Riversleigh Pastoral Holding Company Pty Ltd is jointly owned by Pasminco and the traditional owners for the area (the Waanyi people). Herbertvale Station to the west of the World Heritage Area is a family run cattle property.

The World Heritage Area. has protected areas to the north and south as it is contained within the larger Boodjamulla (Lawn Hill) National Park.

Naracoorte

The protected area is surrounded by agricultural land. Any developments require local government approval under the *Local Government Act 1999.* The Act gives the public opportunity for comment in relation to any development proposal.

Management Arrangements Administrative and

contractual arrangements

The Boodjamulla (Lawn Hill) National Park is administered by the Environmental Protection Agency (Qld). The Queensland Parks and Wildlife Service is a Division within the EPA responsible for the management of protected areas within Queensland. The Senior Ranger is based at Lawn Hill and directs the management of the protected area. The Senior Ranger reports to the District Manager Savanna, based in Townsville, who reports to Director QPWS Northern Region in Cairns.

The Naracoorte Caves National Park is administered by the Department for Environment and Heritage (SA). The Manager, Naracoorte Caves National Park reports to the Regional Manager who in turn reports to the Director NPWSA. The Manager for Conservation Strategies in Head Office provides support in World Heritage matters.

Joint Maria ement and Traditional Protective measures N/A

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Management Planning

Riversleigh

The Australian Government and Queensland governments signed off on `The Riversleigh Management Strategy in August 2002. The two levels of Government have been working with traditional owners, researchers, community groups and the public to establish the management strategy for Riversleigh. The strategy was developed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the *Nature Conservation Act 1992* (Qld).

Naracoorte

The Naracoorte Caves National Park Management Plan was formally adopted in February 2001 in pursuance of Section 38 in accordance with *the National Parks and Wildlife Act 1972 (SA).*

Amendments to the Naracoorte Caves Conservation Park Plan of Management were released in draft form for public review in 1997 and five written submissions were received. The Reserve Planning and Management Advisory Committee of the South Australian National Parks and Wildlife Council subsequently reviewed those comments and the draft plan.

For the management plan in its entirety see:
http://www.environment.sa.gov.au/parks/naracoorte/park.html#management_plan

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Naracoorte

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I%r Changes in ownership and/or legal status

Riversleigh

Claims have been made for determination of Native 'Title (under the Australian Government's *Native Title Act* 1993 over lands including the conservation estate containing the Riversleigh fossil mammal sites. Additionally, a claim has been made for title to land under the *Aboriginal Land Act 1991* (Qld) for Boodjamulla (Lawn Hill) National Park.

Native Title is the recognition in Australian law of Indigenous Australians' rights and interests in land and waters according to their own traditional laws and customs. Unlike land rights, native title is not a grant or a right that is created by governments. Australian law does not recognise native title over places where people have exclusive possession of the land, like privately owned freehold land.

Naracoorte

In recognition of the World Heritage values of the area, Naracoorte Caves was reconstituted as a National Park on January 18th 2001.

Staffing, Financial and Training Resources

Queensland

From 1996 to 2001 Riversleigh was part of a single management unit for all of Boodjamulla `Lawn Hill' National Park. This unit consists of 7 operational staff of which 1 full time equivalent was allocated for World. Heritage Area work. This ----------
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included regular patrols, maintenance and development works, visitor information and direction, and natural resource management tasks.

Since March 2002 Queensland Parks and Wildlife Service (QPWS) has recruited a permanent full time Ranger-in-Charge for Riversleigh. This person will be responsible for day-to-day management of the Riversleigh section of the Park.

QPWS in its current Agreement with the Australian Government employ 2 seasonal Cultural Rangers to the Riversleigh management unit. Their employment coincides with the dry season, which commences in April each year and continues until late October. The Waanyi Ministerial Advisory Committee recommends the nominations for these positions with preference for two men - an Elder and a young Waanyi man.

QPWS has completed recruitment of a Project Officer to oversee and run the Riversleigh Management: Strategy and support Management committees. The successful candidate Ms Hollie Wakefield commenced duties in November 2002.

This establishes the equivalent of 3 full time operational staff focused on the management of Riversleigh. In addition a team of six permanent staff at Lawn Hill Gorge provide assistance from time to time when extra support is required such as in fire management or larger capital projects.

In addition to this a Senior Ranger, District Manager and other Regional support staff (compliance, interpretation, planning) devote a percentage of their time to the management of the Riversleigh World Heritage Area. This amount varies depending on issues raised and support required.

All staff involved in the direct management of the Riversleigh World Heritage Area (District Manager, Senior Ranger, Rangers and Project Officer) require training from the Australian Government to ensure obligations under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) are met. Staff will also undertake any other training, as the Australian Government deems necessary, for the day-to-day management of the area.

The Australian Government has over time provided funding assistance to the State for a range of measures including staffing, maintenance, protection and presentation of the Riversleigh World Heritage values. The Queensland Government funds staff and day to day management costs in relation to the whole of Boodjamulla (Lawn Hill) National Park, including Riversleigh.

The Australian Government also funds a Palaeontologist employed by the Mt Isa City Council. Mt Isa City Council employ a graduate palaeontologist, Benita Chambers, at the Riversleigh Centre in Mt Isa to undertake research and to transmit the values of Riversleigh to the visiting public.

South Australia

Currently, there are 3.5 full time staff devoted to the management, protection and administration of Naracoorte Caves National Park. Presently there are 10 casual

employees involved in the provision of guided tours, equating to 5 full time equivalent positions. The casual nature of the workforce is dictated by the seasonal fluctuations in visitation.

Training of staff involved in cave and fossil presentations is undertaken internally with the assistance of Flinders University researchers, the principal research group. This involvement of the research group is critical to presenting up to date and current knowledge.

This level of staffing is the minimum required for the protection and presentation of the World Heritage values. As visitation increases, particularly in the educational sector, it will be necessary to employ a staff member with a palaeontological background for the training of staff and development of programs in regard to World Heritage values.

Scientific and technical studies

Riversleigh

The Riversleigh Fossil Centre Laboratory has catalogued in excess of 200 individual fossil specimens, with close to that amount again awaiting positive identification, and many more visible in rocks currently processing in the facility. A compilation of specimens is listed below:

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Type of Fossil Specimen	Number of specimens
Manunalia	
Jaws and teeth	23
Vertebrae	7
Claws	3
Dromornithidlae	
Cervical vertebrae	6
Dorsal vertebrae	3
Tarsometatarsus	3
Femur	3
Pelvis	4
Miscellaneous	23
Crocodylidae	
Jaws	2
Vertebrae	6
Scutes	5
Teeth	4
Claws	2
Serpentes	
Monthypythonoides jaws	1
Montypythonoides vertebrae Yurlunggur	33
vertebrae	8

Reptilia miscellaneous		
Lacertilia jaws	19	
Other jaws	2	
Vertebrae	7	
Teeth	123	
Miscellaneous		
Phalanges	13	
Misc remains	18	

Published papers - Riversleigh and Riversleigh related papers

Refer to Appendix 1

Naracoorte

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The Naracoorte Caves contain a series of fossil vertebrate deposits of high diversity that accumulated over discrete intervals spanning at least the last 500,000 years. These deposits allow researchers to investigate the question of faunal change over a number of global climatic cycles prior to and after the arrival of humans in Australia. The research program is coordinated through Flinders University by Assoc. Prof. Rod Wells. The following is a summary of the multi-discipline approach to this investigation.

TIMS U/Th dating

Research into the realisation of the World Heritage values of the Naracoorte Australian Fossil Mammal Site continued throughout 1999 and into 2000. Dr Linda Ayliffe's TIMS U/Th dating of speleothems sandwiching fossil bearing sediments from a number of chambers within the cave system enabled their contained faunas to be bracketed in time. This work has now been published.

Electron Spin Resonance Dating

Prof. Rainer Grun (ANU) has used the TIMS U series dates of Ayliffe as independent validation of the ESR dates. This work places the major deposit from the Victoria Fossil Cave, Fossil Chamber at between 500,000 - 280,000; Cathedral Cave at 280,000170,000; Grant Hall Vic. Cave at around 125,000.

Optical dating studies at Naracoorte Caves

Optical dating by Dr. Bert Roberts from La Trobe University. The results of these investigations have been submitted recently to the journal Radiation Measurements, and are currently under review. The paper is titled `Extending the age range of optical dating using single grains of quartz', by H. Yoshida, R.G. Roberts, J.M. Olley, G.M. Laslett and R.F. Galbraith.

Carbon Dating ----------

In order to refine the late Pleistocene-Holocene chronological sequence for the cave deposits, AMS radiocarbon determinations were made on 19 charcoal samples from stratified deposits in two caves, Wet Cave (11 samples) and Robertson Cave (8 samples).

These dates provide evidence for sedimentation and mammalian bone deposition throughout the majority of the radiocarbon dating range, i.e. 45,000 years to 740 **BP.** A date of 40,900 ± 850 yrs BP obtained just above the stratum in Wet Cave where a range of megafauna disappear provides a probable indicator of the timing of megafaunal extinction in southeastern South Australia. Faunal changes associated with the transition from the last glacial maximum to the Holocene will also be addressed. In addition, the upper sequences in these caves will provide a baseline for pre-European faunal composition.

(ii) Excavating and Anallysing the Faunas. During 1999 the fossil collection had to be moved and stored while a new holding facility was built. On the completion of the new facility the collection had to be re-organised and stored in the compactus units. This was a time consuming exercise but did provide an opportunity for some curatorial work on the older portion of the collection. During this period work also continued on the excavation and description of the faunas.

Fossil Faunas

The initial faunal samples from the chambers dated using TIMS U/Th and ESR were, with the exception of the main Fossil Chamber in Victoria Fossil Cave, relatively small however all contained elements of the extinct 'megafauna'. On-going research is aimed at greatly increasing these faunal samples and understanding more about the taphonomic biases inherent in each collection. This is essential to be able to reconstruct the pattern of faunal change through time.

Mr. Steve Brown (Biology, Flinders University) has been working on the Cathedral Cave fossil chamber faunal collection.

Ms. Rebecca Gresham (Biology, Flinders University) investigated the faunas of the Grant Hall site for her honours thesis.

Mr. Brown commenced an MSc.in 2000, which will involve a more extensive excavation of fossils from the dated Robertson Cave and Blanche Cave deposits.

Ms. Liz Reed (Biology, Flinders University) and Mr. Steve Bourne (DEHAA) have completed an overall survey and inventory of Pleistocene fossils and fossil sites from the Southeast of South Australia including both cave and open sites.

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Mr. Matt McDowell (Biology, Flinders University) and Assoc. Prof. Donald Pate (Archaeology, Flinders University) worked on the Robertson Cave and Wet Cave assemblages. Taphonomic processes operating here have restricted the assemblage to small vertebrates in Robertson Cave and a mixture of small and large vertebrates from Wet Cave. Both sections exhibit a very detailed high resolution superpositional stratigraphy. Research on. these assemblages has also revealed the remains of an

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undescribed species of extinct rodent that McDowell is in the process of formally describing and naming. Until now this species has only been reported from Victoria. Preliminary results of the Robertson Cave study were presented in poster form at the Australian Quaternary Studies meeting in Canberra in February 2000. A second poster by McDowell and Brown was also presented discussing the problems with dating cave deposits.

Assoc. Prof. Rod Wells presented a paper based on the Naracoorte research, at the Australian Quaternary Studies Meeting, Feb. 2000, entitled Pleistocene Pitfalls: a palaeontological perspective.

Gavin Prideaux completed his monumental work on the sthenurine kangaroos for which he was awarded his PhD in April 1999. This research is to be published in the University of California Special Publications in the Geological Sciences making it a companion work to the original review of the Sthenurines by Tedford published in 1966.

Lyndlee Easton (Turner) has completed a systematic review of the extant kangaroo genus Macropus from all sites within the cave system with a particular focus on the thorny old issue of the grey kangaroo taxonomy *(M.,fuliginosus vs M. giganteus vs M. titan).* Lyndlee is now preparing this for publication.

Nick Frangos (1999) completed his honours thesis in Information Technology entitled An Interactive Data Visualisation Tool for Palaeontologists . This tool assists the user in the analysis of complex multi-dimensional data sets and used the data set from Victoria Fossil Cave as the model system.

Raelene Sherwin (1999) completed her honours thesis entitled: Morphological Variations in the skull of *Thylacoleo carnifex.* This work was not of publication quality.

Publications

Refer to Appendix 2.

Visitation

Visitation to the Riversle:igh Fossil field is currently restricted to `D' Site which is adjacent to the Lawn Hill/Riversleigh Road, the main access route to Boodjamulla (Lawn Hill) National Park. `D' Site has an information shelter, car park, walking track and interpretive signs. Access to the area is limited during periods of wet weather. Visitation to the area is generally during the period of April to September with approximately 10,000 people visiting `D' Site each year. With an increased profile, improved access, improvement of the walking track and addition of a lookout planned for `D' Site the visitation will increase.

Visitors to the area are currently accommodated at either Boodjamulla (Lawn Hill) National Park Camp Ground or Adel's Grove Camping Ground. These camping grounds, which cater for approximately 250 people per night, are 45 kilometres from `D' Site along unsealed gravel road. The Lawn Hill Riversleigh Pastoral Holding Company are currently undertaking a feasibility study into tourism potential within Riversleigh and Lawn Hill Stations.

Naracoorte

Since the opening of the Wonambi Fossil Centre, Naracoorte Caves National Park has had an increase in annual', visitation from around 40,000 to a peak of about 80,000. This declined in 2000/1 to 66,000, largely due to external economic factors. A turn around in 2001/2 should see a level! of 75,000 reached again. The maintaining of this visitation will be influenced by the marketing strategies of state and regional tourism bodies.

Education, Interpretation and Awareness Raising

There is a QPWS published Park Guide for Boodjamulla (Lawn Hill) National Park which includes a section on Riversleigh World Heritage Area.

The `D' Site information centre is an unmanned centre with interpretive panels depicting the story of Riversleigh, with interpretation of the World Heritage values of the area, the history and methods of the palaeontological researchers, and examples of the mega fauna associated with the site. The D Site walking track is a self-guiding interpretive walk with signage describing the individual fossils and the research values of the site. Prior to 2002 there have been very few Ranger led interpretive activities on the site. With the appointment of the seasonal Cultural Rangers, interpretive activities have increased. Commercial Tour Operators in the area offer guided tours of `D' Site and also interpret the fossils and the research activities.

The Riversleigh Fossil Centre has been established in the town of Mt Isa to interpret the World Heritage Area and the ongoing fossil exploration and research. The Centre features a walk-through display of mega fauna animatronics and fossils, an audiovisual theatrette and an interactive display of the fossil field. The Centre also boasts a fully functional laboratory, palaeontologist and technicians who extract and interpret the fossil finds. Tour groups are taken through the laboratory daily. The Riversleigh Fossil Centre is managed by the Mt Isa City Council and has approximately 25,000 visitors per year. Funding from the Australian Government's Natural Heritage Trust supports the palaeontologist position.

Naracoorte

Naracoorte Caves National Park has two colour promotional brochures, both identifying the park as a World Heritage Area. A single colour park guide that is distributed widely throughout the south east of South Australia contains information on the products offered at the park including cave tours and walking trails, a brief history and an overview of World Heritage. Guided tours in the caves focus on the park values, with the Victoria Fossil Cave tour having a World Heritage and fossil focus. The walking

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trail signage is being developed around the themes of biodiversity and World Heritage. The World Heritage walking trail opened in June 2002.

An extensive educational program has been developed and is still expanding. Naracoorte now includes a building specially modified for the delivery of such programs. Literature on World Heritage is distributed to school groups that visit and the World Heritage video is also shown.

A website has been constructed and can be viewed at;
http://www.environment. sa.gov.au/parks/naracoorte/index.html

Special exhibitions and displays are an ongoing part of Naracoorte Caves National Park presentations. While some of these take place external to the park, predominantly they occur in the Wonambi Fossil Centre, the visitor information centre. The Wonambi Fossil Centre was created as a direct result of World Heritage listing and is central to the Naracoorte Caves experience. The Centre includes a sophisticated series of animatronic displays set within recreated habitats, which are popular with visitors and have proved to be an effective way to present the World Heritage values of the site.

Cultural and social effects

Riversleigh

Residents of North-west Queensland have long recognised Lawn Hill Gorge and the Gregory River as important recreation areas in the region. Boodjamulla (Lawn Hill) National Park is one of Queensland's icon parks which attracts both National and International visitors. Locals and visitors have acknowledged Riversleigh fossil field as an important fossil deposit in Australia and tourist operators have been taking visitors there for many years.

The Waanyi people, traditional owners of the land in which the Riversleigh World Heritage Area lies, are very proud of their culture and Cultural Rangers being employed to protect both the natural and cultural values of this area.

Naracoorte
Naracoorte residents have had a long association with `The Caves', using them for recreation purposes. In the past, this involved free access to some of the caves but not to those of significant scientific value. There is now a general acceptance that the caves are a special place and the previous unrestricted usage could not be allowed to continue.

The Wonambi Fossil Centre is a facility that the entire community is proud of and a sense of ownership still exists in the local area.

Economic effects

Riversleigh

Two local tour operators provide daily tours to the Riversleigh World Heritage Area during the dry season. Numerous other tour operators visit the site as part of their visit to Boodjamulla (Lawn Hill) National Park. As presentation of the World Heritage Area increases, visitation will also increase. This will in turn see a need for more support facilities and increased visitor opportunities in the area.

Waanyi people are investigating services that they can provide to establish an income base from the National Park and World Heritage Area. These initial investigations are looking at opportunities, which the Lawn Hill Riversleigh Pastoral Holding Company might support at Riversleigh Station.

Naracoorte
Naracoorte Township and the surrounding region have benefited greatly from the World Heritage listing of Naracoorte Caves National Park. The number of staff involved in presenting cave tours has doubled since 1994, the visitor numbers have doubled creating extra demand for accommodation, dining requirements and substantial increases in other attractions. Current studies by TAFE students are determining a financial value to the increase in visitation to the park.

Since the opening of the Wonambi Fossil Centre, a dramatic increase in visitation has been accompanied by an increase in revenue to $400,000 - $43,000 p.a. generated by guided tours of the caves.

Responses to World Heritage Committee and Bureau State of Conservation Reports

Australia contributed to an IUCN report to the World Heritage Committee in Helsinki, December 2001 on the State of Conservation of the Riversleigh component of the Australian Fossil Mammal Sites.

In the Report of the Rapporteur of the twenty-fifth extraordinary session of the Bureau, the Bureau noted that IUCN recognises that currently efforts are underway to address the different challenges in managing this serial site. IUCN has been in contact with the State Party and has received detailed information responding to the issues raised. The Bureau also noted that these issues will be addressed by the State Party in the context of the Asia Pacific regional reporting in 2003.

11.5. FACTORS AFFECTING THE PROPERTY

Development pressure

Riversleigh

Currently `D' Site is the only site in the World Heritage Area easily accessible to visitors. At present there are no plans to provide access to any other fossil sites. Development of the World Heritage Area for visitation will need to be investigated further as potential exists for other recreation activities, aside from viewing fossils,

which will help people appreciate the extent and importance of the 10,000 hectare World Heritage Area fossil field.

Naracoorte

Naracoorte Caves National Park has significant infrastructure, including Wonambi Fossil Centre, administration office, cafe and fossil laboratory. The long term plan is to increase the size of the fossil laboratory to accommodate excavated fossil material, but also to provide opportunities for visitors to view this material. The proposal includes educational facilities for school groups and public viewing areas in a "museum". This building would need to be approximately four times larger than the current laboratory but in the same location. There are no known areas of fossil value in the immediate vicinity, but the nature of the karst landscape doesn't eliminate the possibility.

Environmental pressure

Riversleigh

There is some evidence of exotic plant invasions along the riparian zone on the Gregory River and on the black soil plains adjacent to the protected area. QPWS Resource Rangers are currently reviewing the weed status of the whole Boodjamulla (Lawn Hill) National Park and will be prioritising weed control actions.

Feral Pigs also move along the Gregory River corridor. Rangers control pig activity when pigs are in the area.

Domestic and wild stock (horses and cattle) are often found within the World Heritage Area. The boundary fencing requirements of the Riversleigh section of Boodjamulla (Lawn Hill) National Park are significant and due to the fencing being incomplete stock management is a long-term problem. The impact from cattle is usually most significant on the river flats and black soil plains with minimal use of the limestone areas.

Fire management is a significant environmental concern for the World Heritage Area with two significant wildfire events crossing the area since 1996. QPWS is working with neighbours to develop a system of fire control on a broad scale to minimise risk of large scale conflagrations.

There is a current Mining Exploration permit issued over the Gregory River Base Resources Reserve, Gregory Resources Reserve and Riversleigh Pastoral Holding, all adjoining the World Heritage Area. Although much of the surrounding countryside has been explored historically, since the opening of the Century Zinc Mine the area is being re-explored using modern techniques. Exploration is not permitted within the World Heritage area.

Naracoorte

Some exotic plantings have established themselves in the park and become weed problems. There are control measures in place although these infestations do not pose a threat to the caves and protected area values.

There is some evidence that the population of Southern Bentwinged Bats that breed in the park each year *(Miniopterus bassanii)* has declined significantly over the past 30 years. Some preliminary studies have suggested agricultural and viticultural practices may be contributing to this decline with the use of pesticides. Further research is under way to establish baseline population data, pesticide usage, changes in land use, other possible chemical sources and the ecology of the species. Despite the Southern Bentwinged Bats being well studied, like many bat, species it is poorly understood.

Visitor/tourism pressure

Riversleigh

The number of tourists through the Riversleigh area has slowly increased with time. It is expected that tourism will increase in the area as local Councils push the Gulf Savanna region as a desirable tourist destination. The development of other proposed camping opportunities in the area might also lead to an increase in visitors to the World Heritage Area. Pressure to provide other recreational activities in the area will increase as visitation to the area increases.

In 2001 and 2002, there were a number of media reports claiming that Queensland and the Australian Governments had allowed vandalism to occur at Riversleigh due to `neglect' of the site. Specifically, the media reports alleged vandalism involving the illegal removal of fossil material and lack of site security.

Evidence of small-scale disturbance can be found at the D Site visitor node. This is likely to be activities from visitors wanting to take samples from Riversleigh for personal reasons. There is no evidence to substantiate claims that theft and disturbance is occurring for commercial interests. QPWS has run a media and public education campaign, which has been effective notwithstanding the remoteness of the site, to ensure visitors are as well informed as possible that removal of material is not permitted.

Naracoorte

Naracoorte Caves has a long history of tourism and although World Heritage listing has increased this, there is no pressure on protected area values. It is well documented that a high level of visitation to a cave can significantly alter a cave's environment. This is currently being monitored and variations currently fall within acceptable limits that do not affect World Heritage values.

Other pressures

Sustainable Research at Riversleigh

The Australian and Queensland Governments support extraction of Riversleigh fossiliferous material for research purposes. The Australian Government recognises the importance of research to meet its obligations under the World Heritage Convention to identify, protect, conserve, present and transmit cultural and natural heritage to future ----------

generations. The Australian Government also acknowledges that research activities need to be managed to ensure sustainability of the resource and to ensure that the activities do not impact on protected area values and Indigenous heritage values. As a result of these pressures, the Australian and Queensland governments have been working with researchers, community groups and the public to establish the management strategy for Riversleigh. The Riversleigh Management Strategy identifies the need to develop a five year research program.

Sustainable Research at Naracoorte

Research projects that are approved by the senior researcher are then examined by the Caves Manager to determine the impact on the area of cave to be accessed. The Caves Manager and researcher determine methods to minimise these impacts both from a conservation and aesthetic viewpoint if the area is in the public view. Naracoorte Caves National Park has implemented a `Researchers Protocol' that covers all aspects of fossil extraction including minimum information that is to be recorded and procedures that are to be followed. This includes safety, access and general park procedures.

Illegal activity

Riversleigh

In 2001 and 2002, there were a number of media reports claiming that Queensland and the Australian Governments had allowed vandalism to occur at Riversleigh due to `neglect' of the site. Specifically, the media reports alleged vandalism involving the illegal removal of fossil material and lack of site security.

In 2002 researchers also reported possible theft of fossils to the Queensland Government and provided statements supporting their claims.

Issues raised regarding fossil theft and damage were addressed in the following manner:

- The Queensland Government has investigated all claims that fossils had been disturbed or removed from the World Heritage Area. The Queensland Government reported to the Australian Government that the disturbance at D-site were minor and alleged theft from other sites cannot be substantiated.
- The claims of vandalism were considered under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* in parallel with the Queensland investigations. No further action was taken after the Queensland reports.
- Australian Government officers visited the site in November 2001 to gain a better understanding of the issues. The officers reported that D-site in particular is an old research site with evidence attesting to the ubiquitous presence of the scientists. For example a large drill rod is still stuck in a limestone boulder on the prominent easterly cliff face of D-site. Scree and larger discarded boulders can be discerned, as are drill and explosives marks. Explanations and interpretation of the former use of the site will need to be undertaken so as to indicate to visitors that quarrying is one important element of scientific research and that the site provides invaluable educational opportunities because of the previous exploration.

- Australian Government officers reported that it is quite difficult to determine areas that have been quarried during research from areas damaged by erosion (particularly as there is seasonal shifting of loose material during the wet season) or areas damaged as a result of illicit removal of material. Queensland has advised that it has completed work to calculate the quantity of removed material from all excavation sites (see 1.3 above). This work needs to be encouraged and supported to provide baseline data that will improve our ability to monitor the quantity of fossiliferous limestone that is being removed or displaced.
- As part of periodic strategic assessments for Riversleigh funding, Australian Government and State funds have been directed towards activities to mitigate risk to the property through increasing security, better visitor control, fencing and interpretive signage. As a result, in this past year, there has been construction of a visitors' car park near the D-site visitors' centre, new access tracks, fencing around the public D-site area., new walking tracks, interpretive and warning signs, and brochures. Recently, a new Ranger in Charge and two cultural ranger positions were assigned to Riversleigh. Queensland is also negotiating with a neighbouring landholder (the Lawn Hill/Riversleigh Pastoral Holding Company) for use of the nearby Riversleigh Homestead as a ranger base for the World Heritage property.

Number of inhabitants living within the property

Riversleigh
None

Naracoorte

None

----------11.6. MONITORING

Current monitoring program

Riversleigh

All exploration sites have been mapped and surveyed for volumes of material removed. Due to the sensitivity of some of these sites and for security reasons only a limited number of people have knowledge of these sites.

Current management actions include daily randomly timed patrols to all accessible areas during April to October. This includes maintaining a record of all sites visited, the discreet recording of vehicle registration numbers in the area (for analysing behavioural patterns) as well as people movements. Rangers have increased their contact with visitors at the site to promote and educate about world heritage values.

Recording of sites by photographic monitoring procedures and the survey of specific sites by a QPWS surveyor are also being undertaken.

More recently, a deal has been struck with the Riversleigh Station to secure the areas known as Bitesantennary Valley and Burnt Offering (and all other fossil research areas) behind a continuous fenceline along both edges of the main Riversleigh Road for a distance of 10km North of Gregory River. This will effectively provide protection to the entire World Heritage Area from vehicular access, as well as provide protection for other fossil sites not currently within the management area. This is an important and generous concession by the Riversleigh Station owners who have a strong wish to be actively involved in the management and protection of the area.

Naracoorte

The fossil areas of Naracoorte Caves National Park are photo-documented. Significant fossil areas are gated, either at the cave entrance or internally. There is a program to implement gates to those areas that are not yet protected in this manner. Non-guided access to all caves is only granted to recognised caving groups via a strict permit system. Caves deemed to have significant fossil values are not available for recreational activities.

Fluctuations in temperature and humidity caused by visitors to the Victoria Fossil Cave are a potential threat. Data loggers are recording this information every two hours. The first results of this study, completed in conjunction with Flinders University of South Australia, are to be published shortly.

Monitoring of the bat population and associated guanophyllic faunas is a collaborative project involving South Australian Museum, Flinders University, University of South Australia and Deakin University.

---------Results of current monitoring program and of Key Indicator measurement *Riversleigh*

Research activities pose a risk to the values of the World Heritage area. This risk is managed under the permitting provisions of Australian Government and Queensland legislation.

Visitor use also poses a threat to the values of the protected area. Current monitoring results show the threat to be minimal.

Naracoorte

Current results show very little variation in temperature and no threat to the protected area values.

•d 11.7. CONCLUSIONS AND RECOMMENDED ACTION

a. Main conclusions regarding the state of the World Heritage values of the property (see items 11.2. and 11.3. above)

Riversleigh
State of World Heritage 'values are being maintained.

Naracoorte

State of World Heritage values are being maintained.

b. Main conclusions regarding the management and factors affecting the property (see Items 11.4 and 11.5. above)

For Riversleigh, the main management challenges are to implement improved strategies for protection of a remote World Heritage site using ranger patrols, clear public information and securing of high public-use areas. A related challenge is to establish a community consultative process to manage the interests of researchers, Indigenous people and other stakeholders.

For Naracoorte, the current management challenges are to mitigate the increasing effects of visitation and party size tours through specific caves and redevelop presentation facilities given projected increases in visitation.

c. Proposed future action/actions

Riversleigh

On-going monitoring system for fossil displacement and removal and regular communication are required to assist managers and researchers to work better on presenting and transmitting the fossil resource for future generations.

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Appendix 1

Publications relating to .Riversleigh ***2001***

Crosby, K., Nagy, M and Archer, M. 2001. Wyulda asherjoeli, a new phalangerid (Diprotodontia: Marsupialia) from the early Miocene of Riversleigh, northwestern Queensland. *Association of Australasian Palaeontologists Memoir.*

2000

Crosby, K. and Archer, M. 2000. Durudawirines, a new group of phalangeroid marsupials from the Miocene of Riversleigh, northwestern Queensland. *Journal of Palaeontology* 74:327-335.

1999

Archer, M., Arena, R., Bassarova, M., Black, K., Brammall, J., Cooke, B., Creaser, P., Crosby, K., Gillespie, A., Godthelp, H., Gott, M., Hand, S. J., Kear, B., Krikmann, A., Mackness, B., Muirhead, J., Musser, A., Myers, T., Pledge, N., Wang, Y. and Wroe, S. 1999. The evolutionary history and diversity of Australian mammals. *Australian Mammalogy* 21:1-45.

Cooke, B. 1999. Wanburoo hilarus gen. et sp. nov., a lophodont bulungamayine kangaroo (Marsupialia: Macropodoidea: Bulungamayinae) from the Miocene deposits of Riversleigh, northwestern Queensland. *Records of the Western Australian Museum Supplement Series.* 57:239-253

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