



CORPORATE GUIDELINE No. 16

GUIDELINES FOR THE PROTECTION AND MANAGEMENT OF CAVES AND KARST

1. OBJECTIVE

To provide guidance for the management and protection of caves and karst on *Conservation and Land Management Act 1984* land (CALM Act land) and to provide guidance for liaison and advice on cave and karst protection on other lands.

1. SCOPE

This guideline is applicable to the Department of Parks and Wildlife's (the department) management of land that is classified in the *Conservation and Land Management Act 1984* (CALM Act) as a State forest; a timber reserve; a national park; a conservation park; a nature reserve; land referred to in section 5(1)(g) and vested in the Conservation Commission of Western Australia (Conservation Commission); land referred to in section 5(1)(h) and under the care, control and management of the Conservation Commission; or land that, under an agreement made under section 8A, and is managed for a public purpose that is consistent with the CALM Act. These lands are referred to in this guideline as 'CALM Act land'.

The department also provides advice and support in relation to the protection of caves and karst on other lands in Western Australia.

2. CONTEXT

There are extensive areas of karst landform and associated karst processes throughout Western Australia, some of which, together with their outstanding biological, geological, mineralogical and anthropological features, are also of national and international significance. The major Western Australian occurrences and associated CALM Act lands include:

- Devonian reef limestones of the Kimberley (*Geikie Gorge, Windjana Gorge and Tunnel Creek national parks*) and the karst-like quartz sandstone landforms (*Purnululu National Park*);
- Tertiary carbonates of the *Barrow Island Nature Reserve* (and numerous other islands around the WA coast);
- Tertiary limestones of the North West Cape (*Cape Range National Park*);
- Paleodrainage calcretes of the Pilbara region and the rangelands;
- Tamala limestones (aeolian calcarenite) along coastal margins of the South West Land Division (*Beekeepers Nature Reserve, Stockyard Gully Reserve and Nambung, Yanchep, Yalgorup and Leeuwin-Naturaliste national parks*); and
- Tertiary Nullarbor limestones which form the largest semi-arid karst area in the southern hemisphere (*Nuytsland Nature Reserve, Eucla National Park*).

Even in the absence of caves and other obvious features, karst terrain can have outstanding visual, geological, biological and cultural significance. For example, in Western Australia a number of threatened fauna and flora species and threatened ecological communities are associated with karst occurrence. In some cases there are relictual Gondwanan species with related taxa located in places

such as Madagascar and South America. Subterranean fauna are a special feature within karst and may be broadly classified into stygofauna living in the groundwater and troglifauna which are terrestrial but live in underground fissures and caves.

The cultural values of caves include Aboriginal significance in terms of location and landform as well as important sites for rock art and archaeological evidence. There is also a rich non-indigenous history dating mainly from the beginning of the 20th Century when cave reserves were established, including caves at Yanchep and Margaret River. These caves, usually with surface and subterranean tourist infrastructure, became the basis for the creation of some of the most significant national parks in the State's south west.

The drainage and water catchments of many karst areas, including those in CALM Act lands, extend well beyond where the karst features occur. Hence significant changes of hydrology and water quality within karst may result from sources and land uses outside the conservation reserves and thus beyond the immediate control of the department.

Many Western Australian cave features, including speleothems and other decorations or deposits, are of outstanding beauty and of international geological significance. Once damaged or destroyed they cannot be replaced for thousands of years if at all.

In some cases the more accessible and visually outstanding or 'challenging' caves also contribute in varying degrees towards the local economy through their development as public show caves or as controlled access adventure caves. In these cases they are managed primarily for tourism and recreation with visitors paying a fee for entry.

Awareness of potential damage to speleothems and other karst features has been a strong attribute of Western Australian cavers and speleologists for over half a century. In liaison with the department and its predecessors these enthusiasts have undertaken *de facto* cave management initiatives through the installation of security entrance gates, installation of track marking and defined walkways through fragile sections of caves, mapping, research and survey. These stakeholder groups have also contributed to the development of protocols for approval to visit sensitive caves through membership of the State Cave Access Committee.

At a national level the Australian Speleological Federation (ASF) and Australasian Cave and Karst Management Association (ACKMA) have become widely respected by caving organisations, cave tourism operators and land management agencies in Australia. Australian cave protection and management generally has a sound reputation at an international level.

Karst values within CALM Act lands

Once established, conservation reserves require planning and management in order to secure their long term integrity and natural values. In a large state such as Western Australia, the reserves containing karst features vary immensely with regard to their size, ease of access, remoteness and the practicalities of on-site management and protection.

Some natural karst features, such as decoration within caves, should be regarded as essentially 'non-renewable'. Hence any threats to susceptible karst values should be very carefully addressed in planning and management.

Entry into subterranean karst environments, even in otherwise readily accessible areas such as Yanchep National Park, usually requires specialist skills and significant experience, which may not be available within the local departmental workforce. It is therefore critical for department staff to be appropriately trained and for the department to continue to work collaboratively with experienced speleologists in order to achieve the best management and protection outcomes for karst and caves.

Visitor impacts from adventure activities such as caving and cave diving are addressed in more detail in *Policy Statement No. 18 – Recreation, Tourism and Visitor Services* (Sections 2.4 and 2.5).

Karst values outside CALM Act lands

Significant karst areas are located outside the conservation reserve system, primarily on unallocated Crown land (UCL). Most of the WA Nullarbor and Kimberley karst systems as well as the ancient calcrete landscapes of the Pilbara and rangelands occur outside CALM Act lands. There are also a number of “show caves” which are located as enclave reserves within the Leeuwin-Naturaliste National Park; Jewel, Lake, Mammoth and Ngilgi caves are enclaves within the Leeuwin-Naturaliste National Park but are vested in local tourist organisations. In many areas, highways and public road reserves and their associated drainage infrastructure overlie important karst. There are also considerable areas of private land within karst landscapes, especially on the Swan Coastal Plain. Extensive areas of pastoral leases overlie karst, notably on the Nullarbor.

When the department is requested to provide advice on planning matters in such areas the Environmental Protection Authority (EPA) *Guidance Statement No 33 (2008), Chapter B9 Karst, subterranean wetlands and fauna*, is a valuable resource.

Liason, advocacy and training

Given the presence of long-operating tourist caves and the more recently designated adventure caves in Western Australia, there is a reasonable level of community awareness of caves, especially those in the Yanchep and Leeuwin-Naturaliste areas. There is less awareness and understanding of karst landforms and features such as Tunnel Creek, the Nullarbor Plain, and the widespread occurrence of karst on the Swan Coastal Plain.

There is generally a poor understanding of the unique habitat within caves and karst including the presence of subterranean fauna and the existence of many threatened species of invertebrate fauna and threatened ecological communities. Knowledge of Aboriginal use of caves and their cultural significance is also poorly understood.

The department has an important role in education, creating awareness and providing advice and liaison in regard to karst values.

Impacts from rainfall events and climate change

Impacts on karst from surrounding areas will usually result from changes in the quantity or quality of water moving through as either surface or sub-surface flow, or a combination of both. For example, extreme rainfall events may result in massive surface flows in flat landscapes with torrential drainage into sink holes, dolines and fracture lines thereby entering cave systems below. This has been observed several times over past decades on the Nullarbor (e.g. Pannikin Plains Cave doline and subsequent rock pile collapse in 1988). In the case of karst landscapes, the flood water quickly penetrates through surface geology into subterranean features and water tables.

Where there has been disturbance or modification of surface vegetation (for example through human usage such as direct soil disturbance or pastoral activities where stock typically concentrate and move along fence lines) significant rainfall events can transport substantial quantities of soil, silt and pollutants such as chemicals and animal wastes into the underground landscape.

Furthermore, changes in the seasonality and volumes of rainfall are occurring in many parts of the Australian continent. Due to the sensitive interdependence of karst processes on groundwater tables and flows, and the rainfall that influences these, karst systems are vulnerable to several aspects of climate change including:

- changes in rainfall, particularly reductions and seasonality, that in turn impact on speleothem growth as well as stygofauna and troglifauna habitats;
- increased frequency and intensity of extreme rainfall events resulting in flooding with associated direct impacts on cave contents and visitor safety;
- changes in average temperature that may stimulate soil biological activity leading to more carbon dioxide release and subsequent changes in the calcium carbonate equilibrium; and

- increases in sea level that could cause salt water intrusion into groundwater systems in coastal karst, thereby affecting karst processes and fauna habitat.

Therefore, as hydrology is the major driving force for most karst processes, it is important that the impacts of climate change on karst values are monitored and the information made available to decision making agencies.

3. LEGISLATION

In some countries, there is specific cave legislation that provides detailed statutory protection to caves and their contents irrespective of surface land tenure arrangements, and in some cases protection also applies to surface karst features. In Western Australia there is no legislation specific to caves and karst.

The reservation and protection of subterranean voids in a legal sense can be problematic. There are many instances where a cave entrance may be located (and hence the access is manageable) on land of one surface tenure, but where underground sections of the cave cross cadastral boundaries and lie beneath land of another tenure. There is a need for sound legislation that can define and protect the subterranean caves and karst features irrespective of surface tenure.

Within CALM Act land there is protection of caves (including their contents) and karst through the provisions of the CALM Act and the *Conservation and Land Management Regulations 2002*. However, outside CALM Act land there is only moderate legal protection where a direct link with the *Environmental Protection Act 1986* or the *Wildlife Conservation Act 1950* occurs.

4. DEFINITIONS / GLOSSARY / ACRONYMS

Acronyms

ASF	Australian Speleological Federation
ACKMA	Australasian Cave and Karst Management Association
CALM Act	<i>Conservation and Land Management Act 1984</i>
CALM Regulations	<i>Conservation and Land Management Regulations 2002</i>
CDAA	Cave Diving Association of Australia
DPaW	Department of Parks and Wildlife

Definitions

CALM Act means *Conservation and Land Management Act 1984*.

CALM Act land means land and waters to which the CALM Act applies, and includes caves and parts of caves on or under that land.

karst means landscapes and landforms, with associated subterranean features such as caves, which are shaped by the dissolution of soluble bedrock such as limestone or other carbonate rocks.

karst values means biological, geological, mineralogical, recreational, anthropological and cultural attributes.

karst-like features and landforms means features that sometimes occur in other rock types which dissolve in water extremely slowly and which typically occur as karst-like features at a small localised level only. At a broader scale they may create karst-like landforms. There are also calcareous mounds and other deposits scattered across the Pilbara region and the rangelands, mostly in association with fossilised calcrete 'paleodrainage lines' (ancient river systems), and which also support a rich subterranean fauna.

pseudokarst means karst-like features that are produced by processes other than dissolution of rock material. The most widely known features are tubular caves and tunnels that remain in lava flows after cooling. Examples in Western Australia are not well documented.

speleothems means unique decorations typically found within caves and derived from secondary deposition of minerals through complex inter-relationships between water, air, temperature range and the local mix of dissolved minerals.

subterranean fauna means fauna that live within subterranean voids, including the karst environment. Subterranean fauna are a special feature of karst however they are not confined to karst alone. They are broadly classified into *stygofauna* which live in groundwater and *troglofauna* which are terrestrial but live in underground fissures, solution pipes and caves.

surface karst features means exposed limestone pavements, steep-sided dolines or sinkholes, narrow solution pipes, towers and pinnacles, cave entrances, and dry valleys or depressions no longer containing surface water flows or lakes.

5. PROCEDURES

6.1 Planning and management

6.1.1 To ensure that the protection of caves and karst is well planned and managed on CALM Act land, the following should be undertaken:

- a) consideration should be given to the inclusion of karst values, if present, when opportunities arise for addition of lands to the reserve system;
- b) when determining appropriate area boundaries of CALM Act land, consideration should be given to areas beyond the surface karst occurrence, as these may be critical for enhanced karst protection through factors such as catchment hydrology;
- c) special protection and management including strict access controls should be applied to areas of highly significant archaeological bone deposit sites (e.g. Devils Lair) and sites containing sub-fossil material (e.g. mummified thylacine and more recent sub-fossil discoveries on the Nullarbor), as well as caves and karst supporting threatened species and threatened ecological communities;
- d) notwithstanding the remoteness of many karst features and the resulting management and control challenges, public access to caves and other sensitive karst features should be classified and managed in accordance with the classification system contained in *Policy Statement No. 18 – Recreation, Tourism and Visitor Services* (Section 2.4);
- e) known areas of karst within CALM Act land will be documented and evaluated for their significance by the Cave and Karst Advisory Group, including recognition of potential regional, national or international heritage values. The evaluation will be used to inform decisions on the further inclusion of karst in the reserve system;
- f) impacts on karst values within CALM Act land should be explicitly addressed in departmental environmental checklists, necessary and compatible operations proposals and site and facility design with particular attention to natural vegetation and changes to water flows, and associated impacts on nearby caves. Where possible, liaison with speleologists, other karst experts, Traditional Owners or Aboriginal cultural heritage experts should be undertaken;
- g) tourist caves and adventure caves will be managed in accordance with appropriate visitor risk management procedures, best cave management practice and accepted cave guiding protocols. Commercial companies operating within caves in CALM Act land will be required to abide by these protocols as a condition of their authority to access the caves;
- h) the department will maintain a coordinated record of data regarding the monitoring of direct and indirect impacts of climate change on the hydrology and the natural values within karst systems;
- i) advice from specialist agencies such as the Western Australian Museum and the Department of Water as well as speleological groups and national bodies such as the ASF, ACKMA and CDAA should be sought in planning for karst protection (and in some aspects of site management), especially in remote areas, and department staff should collaborate closely with these groups and organisations; and

- j) the department's Aboriginal Heritage Unit and local traditional custodians should be asked to provide advice in the development of management strategies for caves of significance to Aboriginal people.
- 6.1.2 Management plans should address the protection and management of karst, and in the absence of a management plan, and where management issues and/or visitor levels require it, karst management should be addressed through the preparation of departmental Interim Management Guidelines.
- 6.1.3 Department staff should provide information on karst occurrence to emergency operations personnel, in particular wildfire suppression incident controllers, in order to assist in emergency response planning. Restrictions on the use of heavy machinery may be required for both personnel safety and environmental reasons where there are occurrences of hidden sinkholes, dolines and shallow roofed caves.
- 6.1.4 Sites on CALM Act land with potential Aboriginal cultural value should be referred to the Department of Aboriginal Affairs for possible addition to the Register of Aboriginal Heritage Sites established under the *Aboriginal Heritage Act 1972*.
- 6.1.5 Non-indigenous heritage values of caves and karst should also be recognised and preserved, for example in existing and former show cave areas of Yanchep National Park and the Leeuwin-Naturaliste Ridge.
- 6.1.6 The department will identify and consider hydrological catchment land use impacts on karst values when undertaking management planning for CALM Act lands. The department will also liaise with other land managers when such impacts originate from outside the reserve area.
- 6.1.7 Scientific research and the taking of mineral or biological samples within caves should be kept to a minimum level and will be authorised by formal permit application only. Detailed protocols, codes of conduct and operating procedures will be developed so as to minimise unacceptable direct, indirect or accidental damage to caves and to their geological, biological, cultural or anthropological contents. The use of photographic recording rather than physical removal of in situ materials should be encouraged.
- 6.1.8 Consistent with *Policy Statement No. 18 – Recreation, Tourism and Visitor Services* (Section 2.12.3) and *Policy Statement No. 68 – Guidelines for the management of events and organised group activities on CALM Act land*, competitive adventure activities will be prohibited in caves on CALM Act land.
- 6.1.9 Authorised commercial operators undertaking non-competitive activities in caves on CALM Act land should be required to have at least basic awareness of karst environments and should adhere to minimum impact codes of conduct and commercial adventure activity standards consistent with the Commercial Operator Handbooks.
- 6.1.10 Other than for tourist caves and well-managed adventure caves, detailed cave locations and names should not be promoted on publicly available maps or other information sources. Should such information be made public, immediate steps should be taken to discourage further use. This is an especially important protection strategy in more remote areas where there is no immediate department management presence.

6.2 Encouraging the protection of karst outside land managed by the department

- 6.2.1 Information and advice on karst issues and best practice karst management should be provided wherever possible to other organisations and individuals that manage land containing, or impacting upon, karst values.
- 6.2.2 Dialogue with protected area agencies in South Australia and the Northern Territory should be initiated regarding collaborative cross-boundary approaches to karst management.

6.3 Liaison, advocacy and training

- 6.3.1 A Cave and Karst Advisory Group will be convened as required, comprising of selected department staff, experienced speleologists and karst managers. The purpose of this group is to:
 - a) advise the department on appropriate karst management;

- b) coordinate dialogue between the (speleological) State Cave Access Committee, other land management agencies and recognised speleological organisations at a national level;
- c) promote the management of caves and karst in planning, including natural resource management strategies and broad scale land use planning; and
- d) promote the Aboriginal cultural significance of karst and caves.

6.3.2 The significant values of caves and karst features as well as their needs for special protection and management, including cultural heritage, should be promoted both statewide (for example through popular media such as *Landscape* magazine) and as part of the department's regional communication strategies. These will aim to improve community understanding of, and appreciation for, caves and karst, to engender support for their protection and management and to promote appropriate and safe visitor behaviour in cave and karst environments.

6.3.3 Cooperation with relevant organisations, including the ASF, ACKMA, CDAA and the Department of Indigenous Affairs, is encouraged in order to raise awareness of caves and karst and their values.

6.3.4 Department staff and volunteers working within karst areas should ensure they have attended appropriate training to undertake their role. The department will provide regular training on karst values and their management and/or seek to access external training courses as appropriate.

6.4 Legislation development and review

6.4.1 The department will liaise with other government agencies, notably the Department of Planning, the Department of Mines and Petroleum (Geological Survey Branch), and with the Conservation Commission of Western Australia, to consider potential mechanisms for the protection of subterranean features such as caves and their contents, irrespective of surface land tenure.

6.4.2 The effectiveness of the CALM Act and CALM Regulations and associated penalties with regard to protection of geological and anthropological features in addition to biodiversity should be monitored regularly, and amendments should be considered where appropriate. This may include consideration of stronger penalties for wilful damage to valuable karst features including irreplaceable cave decorations, fossils and bone deposits.

6. CUSTODIAN

Director Parks and Visitor Services

7. KEY WORDS

Caves; karst; subterranean; speleological; stygofauna; troglafauna.

8. REVIEW

This guideline will be reviewed no later than February 2019.

9. DIRECTOR GENERAL APPROVAL

Approved by



Jim Sharp
ACTING DIRECTOR GENERAL

Effective date 14/3/14