BUNGONIA STATE RECREATION AREA

PLAN OF MANAGEMENT

NSW NATIONAL PARKS AND WILDLIFE SERVICE

FEBRUARY 1998

Acknowledgements: This plan of management was prepared by staff of the Field Services Division and Nowra District of the National Parks and Wildlife Service. Considerable information and useful comments were provided by staff of other Service offices, the former Bungonia State Recreation Area Trust and retired Senior Ranger Don Stoneman.

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FOREWORD

Bungonia State Recreation Area is located on the southern tablelands of NSW 35 km east of Goulburn. It covers a large area (3971 ha) of bushland along the western side of the Shoalhaven Gorge adjacent to Morton National Park. Most of the state recreation area consists of steep and deeply dissected forested country, including the gorges of Bungonia and Jerrara Creeks and the Shoalhaven River. A major feature is an area of karst in the northern part of the state recreation area including over 175 caves and other limestone features.

The state recreation area has varied and important geological, biological and cultural features and magnificent scenery. It caters for a variety of activities including caving, walking, canyoning, abseiling, rock climbing, canoeing, camping, sightseeing and scientific research. Many of these are undertaken in environmentally sensitive locations or rugged terrain.

The plan of management recognises that the state recreation area is important to a number of recreational user groups, particularly those undertaking rock sports. The plan provides for protection of natural and cultural values while allowing continued recreational use in a manner which minimises environmental damage. Priority will be given to promotion of visitor appreciation of the conservation significance of the area and education about safe and non-damaging recreational use.

Particular emphasis is placed in the plan on protection of the multiple values of the caves. Several caves or parts of caves will be closed to public use to protect their significant values. Access to the remainder will remain largely unrestricted but subject to safety and environment protection requirements. Revegetation of eroded dolines will have high priority.

Weed and feral animal control will be undertaken and fire will be managed to protect life and property and the natural systems of the state recreation area.

Aboriginal sites will be protected from disturbance and historic places will be interpreted to encourage appreciation and non-damaging visitation.

Some of the recreation and management facilities in the state recreation area have deteriorated or are unsatisfactory by todays standards. The plan provides for re-organisation of the main camping area, upgrading of camping facilities for groups and improvement of some lookout areas.

This plan of management establishes the scheme of operations for Bungonia State Recreation Area. In accordance with the provisions of Section 75A of the National Parks and Wildlife Act, 1974, this plan of management is hereby adopted.

PAM ALLAN

Minister for
the Environment

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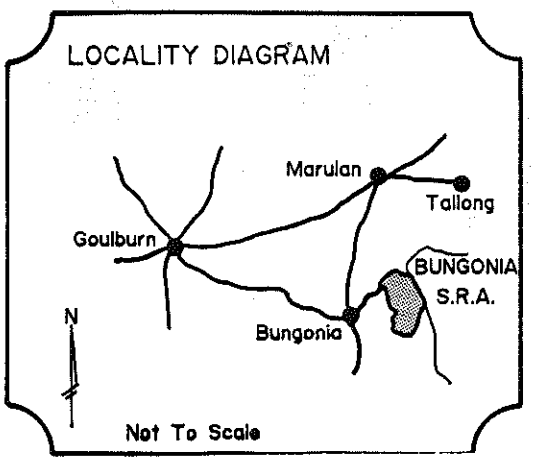

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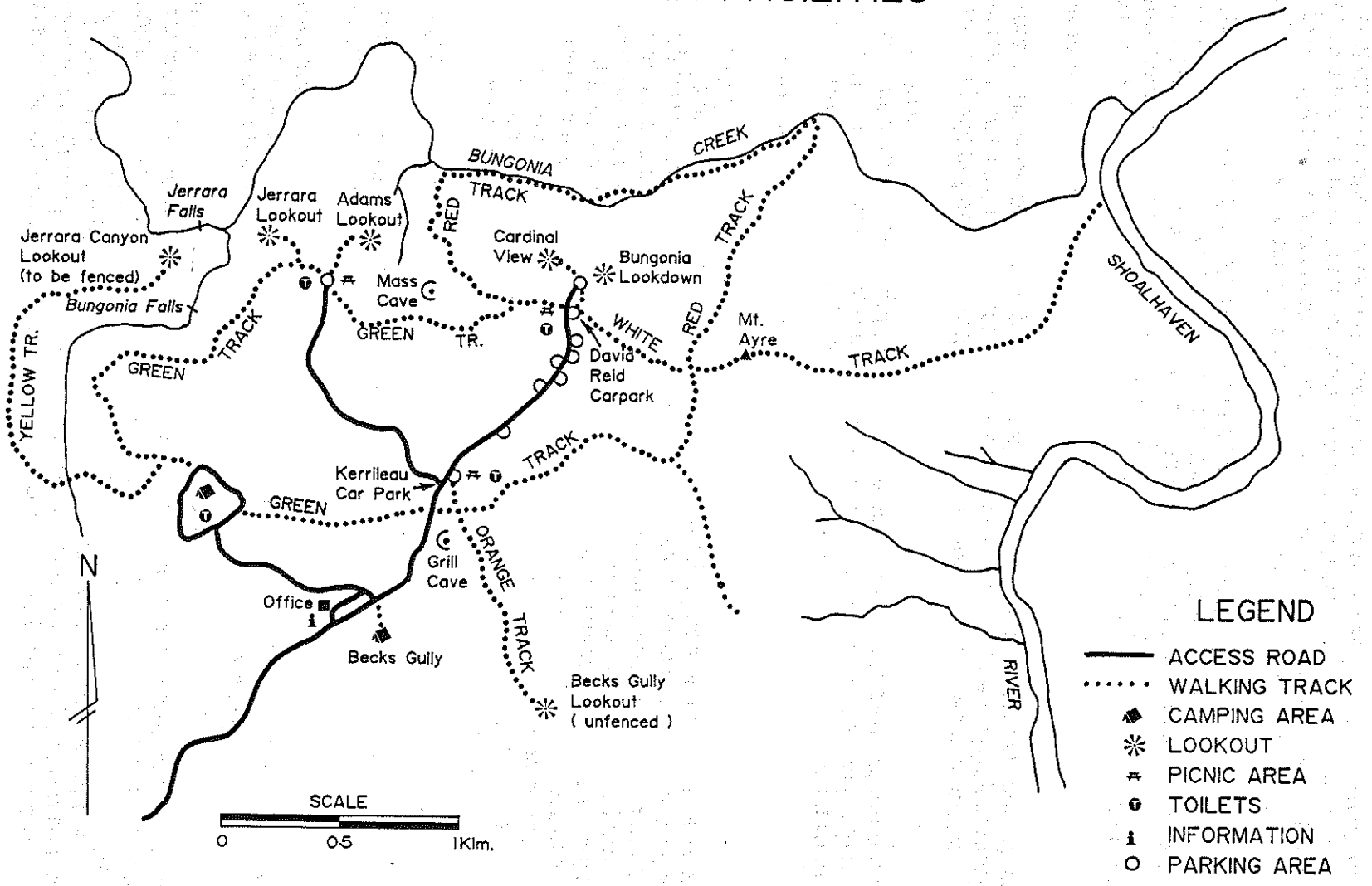

1. INTRODUCTION

Section 72 of the National Parks and Wildlife Act, 1974 provides that the Minister may cause a plan of management to be prepared for any state recreation area. A plan of management is a legal document which provides guidelines for the use and protection of the resources of the area and the provision of facilities and services. Once the plan has been adopted by the Minister, it must be implemented by the Service and no operations may be carried out in the state recreation area unless they are in accordance with the plan.

A plan of management for Bungonia State Recreation Area was placed on public exhibition from August until November, 1995. Fifty three representations were received during the period of public exhibition which raised seventeen issues. All submissions received were considered by the Minister.

The planning process leading to the development of this plan has involved the collection and use of a large amount of information, which for reasons of document size, has not been included in the plan. For additional information or enquiries about any aspect of the plan, contact the senior ranger at Bungonia State Recreation Area, Lookdown Road, Bungonia or by phone on (048) 444227. Alternatively, the Service's Nowra District Office can be contacted at 55 Graham Street, Nowra or by phone on (044) 239800.

2. MANAGEMENT CONTEXT

2.1 STATE RECREATION AREAS IN NEW SOUTH WALES

State recreation areas are reserved under the National Parks and Wildlife Act, 1974. They are areas which have important natural or cultural heritage values and which may accommodate environmentally sensitive recreational use.

2.2 BUNGONIA STATE RECREATION AREA

2.2.1 Location, History of Reservation and Regional Setting

Bungonia State Recreation Area is located on the Southern Tablelands of NSW, 190km southwest of Sydney and 35 km east of Goulburn (see centre map). It covers a large area (3,971 ha) of rugged bushland from the gorges of Jerrara and Bungonia Creeks southwards along the western side of the Shoalhaven River gorge to Paradise Creek. The state recreation area extends underground to include the limestone caves for which the area was first reserved.

The limestone area of the state recreation area was reserved for public recreation in 1872 and other reservations followed. It became a state recreation area in 1974. A number of large additions were subsequently made and several small areas around cave entrances outside the main boundary were added.

The Southern Tablelands are used mainly for sheep and cattle grazing. A number of towns and villages in the area are popular tourist stops along the busy route between Sydney and Canberra.

The state recreation area is contiguous with Morton National Park on its eastern and southern boundaries. The Shoalhaven River and escarpment areas in the district are extensively used for rugged bushwalking, camping, canoeing and four wheel drive touring.

2.2.2 Importance of Bungonia State Recreation Area

The unique geology and geomorphology of Bungonia State Recreation Area has resulted in an area of very high natural, scenic and recreational values.

Geological and Geomorphological Values

Three distinctive rock groups outcrop in the state recreation area (see 4.1.1). The most significant is the Bungonia Group limestone which occurs in a band across the northern part of the state recreation area. It has a wide range of karst features including dolines, blind valleys, springs, tufa deposits, solution forms, a slot canyon and over 175 cave entrances. A variety of speleothems (cave formations) occurs in the caves including stalactites, stalagmites, helictites, flowstone, pool formations and cave coral. Some parts are well decorated but generally the Bungonia Caves are relatively lacking in speleothems because of the absence of regular water flow and the long history of recreational use.

Australia has relatively few karst and cave areas and in particular lacks deep caves because it has not been subject to compressive mountain forming movements late in its geological history. Of the nearly 500 limestone

outcrops known in southeastern Australia only about 95 exhibit cave development. The majority of these occur in the central and southern highlands of NSW and the adjacent incised stream headwaters. Karst areas associated with eastward flowing streams tend to have much vertical development and include many of the major cave areas of eastern Australia including Jenolan, Colong, Tuglow, Wombeyan, Bendethera and Wyanbene.

The Bungonia Caves are located on the edge of an escarpment and are an important part of the range of landscape systems of eastern Australian caves. Other cave systems in NSW are in hillside, valley and plain locations. The full range of cave positions in eastern Australia forms a valuable reference system for studying environmental change.

Caves are usually highly stable environments and often preserve material which has been lost from surface landscapes. Caves may thus be relicts of past environmental conditions and base levels of erosion. Many of the Bungonia caves contain unusual cave sediments which are valuable for research into the origin of the caves. Odyssey Cave has been the site of long term cave chemistry research.

The Bungonia caves tend to be deeper and more vertically developed than other cave areas of the Eastern Highlands. Odyssey Cave, at 147.8m, is the second deepest on the Australian mainland.

The Bungonia caves also have unusually high concentrations of ‘foul air’ (carbon dioxide) on a world scale. This is primarily attributed to the large amounts of organic matter washed into the caves during heavy rain, combined with poor ventilation. The causes of foul air and its effect on cave fauna are scientifically interesting. Sediments accumulating in the high carbon dioxide levels through iron-precipitating bacterial action are important for research into conditions prevailing early in geological history (Jennings in ‘The Heritage of Australia’).

The Bungonia limestone contains many fossiliferous beds recording a diverse fauna including brachiopods, cephalopods, corals, trilobites and gastropods. Graptolite fossils have been found in the Adaminaby Group and Tertiary leaf impressions have been recorded in sandstone in the area. There are indications that Scuttle and other nearby caves may be profitable sites for vertebrate sub-fossils. The fossil record makes Bungonia one of the most important geological sites in Australia (Bauer, 1994).

Because of its great depth and steep sides Bungonia Canyon is one of the finest examples of a limestone gorge in Australia (Jennings et al, in Ellis, 1972).

The complex geology, geomorphology and hydrology of the Bungonia area present many challenges for scientific investigation.

Scenic Values

The scenery of the state recreation area is outstanding. The most prominent features are the dramatic gorges of Bungonia Creek and the Shoalhaven River, cutting up to 400m into the plateau. The tributary creeks fall steeply into the gorges and contain numerous waterfalls and plunge pools. Other features include cliffs, scree slopes, strike ribs which form pinnacled aretes, the many limestone depressions, rock outcrops and cave entrances, and the underground scenery of the caves, their speleothems and the outstanding solution flutes.

Biological Values

The variety of geology and landform in Bungonia is reflected in the range of vegetation associations and large number of species.

The state recreation area lies adjacent to the very large natural area of Morton National Park. This increases the viability of the natural systems of both reserves.

Galleries of dry rainforest occur along some creeks in the state recreation area, the most westerly occurrence of this restricted community in a conservation reserve in southern NSW.

Threatened plants *Haloragis exalata* (Schedule 2 Threatened Species Act. 1995)*)*, *Pterostylis calceolus* and *Acacia chalkeri* (Briggs & Leigh, 1988) occur in the state recreation area. *Pterostylis calceolus* has not been recorded outside the state recreation area and Bungonia is the only National Parks and Wildlife Service reserve in which *Acacia chalkeri* is known to occur. A number of other plants are at or near their most easterly limit.

Drum Cave and Grill Cave are maternity sites for a population (up to 15 000 individuals) of the vulnerable bent-wing bat *Miniopterus schreibersii* (Schedule 2 Threatened Species Act) and are the only maternity sites for this species between Kempsey and Wee Jasper. Chalk Cave is a bat wintering site.

The presence of koalas *Phascolarctos cinereus (Schedule 2 Threatened Species Act)* in the State Recreation Areas has been recently confirmed.

Some rare species of cave invertebrates appear to be endemic to the Bungonia caves. These include a silverfish *Trinemura anemone*, two beetles, *Notospeophonus jasperensis vicinus* and *Rybaxis sp.*, a pseudoscorpion *Paraliochthonius cavicolus* and a spider *Icona sp*.

Cultural Values

Little is known of the traditional significance of the area to Aborigines but the large extent of campsites on the plateau section of the state recreation area indicates frequent use for manufacturing of tools from a number of rock outcrops in the area. Correlation between Aboriginal sites and cave areas has been noted elsewhere in NSW (Spate, 1993) and is an important subject for future research. At least one cave at Bungonia was used as an Aboriginal burial site (Etheridge, 1893).

The Bungonia area lies close to the early land route to southern NSW and was settled by Europeans as soon as graziers were permitted to take their cattle beyond the County of Cumberland. The area is therefore rich in historical associations.

The caves were an attraction to many visitors including a number of well-known historical personalities such as William Hoddle, Thomas Mitchell, Conrad Martens, Governor Gipps, Oliver Trickett, Rev WB Clarke and the botanist Alan Cunningham.

Small scale fossicking and mining occurred during the late 19th and early 20th centuries. Numerous remains of this are scattered throughout the state recreation area including the remnants of a village built by miners. This is

known as the Depression Village and probably dates from the 1920's but possibly from the 1890's. There are few examples of such villages.

Bungonia was one of the first areas in Australia to be reserved for public recreation (see section 4.2.2). Its reservation in 1872 was in the same year as the establishment of the world's first national park; Yellowstone in the USA.

Recreational and Educational Values

Bungonia is a large rugged natural area with opportunities for bushwalking, pack camping and canoeing similar to those available in adjacent Morton National Park. It is more developed, however, than most parts of Morton and provides facilities for car camping, short and medium walks and scenery viewing within short distance of each other. It is within day trip distance of Sydney, Wollongong and Canberra and is easily accessible to a large population. It thus caters for a wide range of users, including tourists.

The state recreation area is best known for its caves and is one of the three most important recreational caving areas in Australia, the others being Wee Jasper and the southwest of Western Australia. It has a large number and variety of caves with few restrictions on access. The deep shafts, including one unbroken drop of 47m, make the caves especially attractive to the sporting caver (Jennings 1981).

The state recreation area is also an important area for other rock sports such as rock climbing, abseiling and canyoning and is a valuable local recreation resource for residents of the southern tablelands.

The area's easy accessibility and attractive, varied and significant natural features provide opportunities for education about the natural environment and need for conservation.

Statement of Significance

The conservation significance of Bungonia State Recreation Area can be summarised as follows:

Regional nature conservation value

- the state recreation area is geologically complex and unique;
- it contains a range of karst features including 182 known caves and one of the world's finest limestone gorges;
- the caves are deep compared to most other Australian cave systems, contain the second deepest cave on mainland Australia, are an important part of the range of landscape locations of eastern Australian caves and contain valuable cave sediments;
- the state recreation area provides a large area of wildlife habitat and extends the large natural area of Morton National Park;
- it contains the most westerly known occurrence of dry rainforest in a conservation reserve in southern NSW;
- the caves provide bat wintering and nursery sites including a population of the vulnerable bent-wing bat;

- a koala population is present in the state recreation area;

- a number of rare invertebrate cave species appear to be endemic to the state recreation area;

- three species of rare and threatened plants occur, one of which is protected only within the state recreation area;

Regional recreation, tourism and educational value

- the scenery of the state recreation area is outstandingly dramatic;

- it is one of the three most important recreational caving areas in Australia;

- the state recreation area provides easily accessible opportunities for a variety of recreational pursuits and outdoor training activities in dramatic and ‘wild’ country;

- the variety of easily accessible, interesting and significant natural features makes the area valuable for educational about the natural environment and conservation;

Regional and local cultural value

- the state recreation area provides opportunities for research into Aboriginal use of cave areas, a subject about which little is known;

- the area is closely associated with early exploration and settlement;

- the caves have been significant scientific, educational and recreational venues from the early nineteenth century to the present and the area was one of the first in Australia to be reserved for public recreation;

- the area illustrates small scale mining during the early part of the 20th century and probably earlier.

3. OBJECTIVES OF MANAGEMENT

3.1 GENERAL OBJECTIVES FOR STATE RECREATION AREAS

The following general objectives relate to the management of state recreation areas in New South Wales:

* protection of natural and cultural resources;

* maintenance of scenic values; and

* provision of a range of recreation opportunities consistent with protection of the natural and cultural environment.

3.2 SPECIFIC OBJECTIVES FOR BUNGONIA STATE RECREATION AREA

In addition to the above general objectives, the management of Bungonia State Recreation Area will be subject to the following specific objectives:

* protection of the rugged natural character of the state recreation area;

* protection of the scientific and habitat values of the caves;

* protection of rare and threatened plant and animal species, Aboriginal sites and historic places;

* provision of opportunities for bush walking, camping, picnicking, rock climbing and recreational caving;

* promotion of safe and responsible recreation use;

* promotion of day use and use by a wider range of visitors;

* promotion of visitor appreciation of the varied natural, cultural and recreational values of the area; and

* control of introduced species and rehabilitation of areas affected by soil erosion, clearing and frequent burning.

3.3 OVERALL STRATEGY

Bungonia State Recreation Area will be managed both to protect its natural and cultural heritage and as a relatively accessible natural area providing mainly for walking, caving, and other ‘rugged’ recreational activities.

Emphasis will be placed on protection of the karst, historic places and other features by:

- restriction of public vehicle access in the southern part of the state recreation area;

- revegetation of heavily used cave entrances;

- preparation of individual cave management strategies;

- promotion of alternative recreation opportunities to caving;

- promotion of visitor appreciation of the conservation significance of the area; and

- education about safe and minimal impact caving, walking and primitive camping.

Unsatisfactory recreation and management facilities will be progressively re-organised and upgraded to provide improved amenity, safety, interpretation, erosion and pollution control.

4. POLICIES AND FRAMEWORK FOR MANAGEMENT

This chapter contains the policies and framework for the management of Bungonia State Recreation Area together with relevant background information. Policies are summarised under the following section headings:

4.1 NATURE CONSERVATION
4.2 CULTURAL HERITAGE
4.3 USE OF THE AREA

The policies established in this plan of management provide the framework for future management consistent with anticipated resources available to the Service and anticipated community trends over the next five to ten years.

The actions identified in the plan implementation table are those to which priority will be given in the foreseeable future. Other management actions may be developed over the life-span of this plan consistent with the policies set out in the plan.

Where not specifically provided for in this plan, management of Bungonia State Recreation Area will also be in accordance with the National Parks and Wildlife Act and with general Service policies.

4.1 NATURE CONSERVATION

4.1.1 Geology, Landscape, Soils and Water Quality

The Bungonia area is located on the Lachlan Fold Belt adjacent to the southwestern edge of the Permian Sydney Basin. Most of the area consists of Ordovician sandstone, shale, phyllite and siltstone of the Adaminaby Group (Bauer, 1993). The Adaminaby Group formed in deep oceanic waters. The sequences have been tightly folded and faulted.

The late Silurian - early Devonian Bungonia Group overlays the Adaminaby Group unconformably and outcrops along the Bungonia Lookdown Road north from Inverary Park. It consists of shallow marine sediments and contains three limestone units plus volcanic sandstone, siltstone and shale (Bauer). The range of karst features is described in 2.2.2 and protection of the cave systems is discussed in 4.1.3.

The youngest rocks are the early Devonian Tangerang Formation (Bauer). They consist of conglomerate, limestone and shale interbedded with lava and lie west of the limestone in the Bungonia and Jerrara Creek areas. The Tangerang Volcanics lie conformably on the Bungonia Group and vulcanicity may have killed off the reefs which formed the limestones (Jennings et al in Ellis et al).

There is a patchy cover of Tertiary deposits of sandstone, conglomerate and silcrete over many of the hills and ridges (Bauer).

The state recreation area lies on the edge of a plateau. This is deeply dissected over most of the area by the Shoalhaven River and its tributaries, particularly Bungonia Creek, Becks Gully and Spring Creek. The Shoalhaven flows through a gorge over 400m deep along the eastern boundary of the state recreation area. Bungonia and Jerrara Creeks have also formed gorges. The limestone part of Bungonia Gorge is a slot canyon with vertical walls 275m high in the base of the gorge.

The limestone north of Bungonia Gorge (outside the state recreation area) is being quarried on a large scale. This affects views from Bungonia Lookdown and some walking tracks in the state recreation area, reducing the feeling of naturalness and isolation. Quarrying will eventually result in removal of a substantial part of the hillside opposite Bungonia Lookdown. Impacts will be reduced as refilling and revegetation proceed upon completion of quarrying.

An abandoned silica quarry is located in the northwestern part of the state recreation area. The surface is eroded but native vegetation is slowly regenerating.

The soils of the state recreation area are shallow and highly erodible when devoid of vegetation cover. Sheet and minor gully erosion are occurring in heavily used camping, picnicking and parking areas while major gullying has developed in the Jerrara Creek area associated with old vehicle tracks. Erosion is occurring along heavily used tracks to some caves, particularly Grill and around some cave entrances (see 4.1.3). The dry, relatively cool climate and free drainage through karst restrict vegetation growth and contribute to the erodibility of the area. Management of eroded recreation facilities is covered in section 4.3.2.

A weir located on Bungonia Creek provides the water supply for the camping area. Its catchment lies outside the state recreation area and is subject to activities such as agricultural use, quarrying and road construction. The quality of water in the creek is under doubt and testing and possibly installation of a treatment system are needed.

The state recreation area lies within the catchment area of the Shoalhaven Water Scheme. Facilities are managed so as to cause no pollution of the river.

Policy

* The significant geological and landscape features of the state recreation area will be protected from disturbance.

* The location of fossils will not be generally publicised and visitor facilities will not be located close to these areas.

* All work carried out in the state recreation area will be designed and undertaken so as to minimise soil erosion.

* Where soil erosion occurs as a result of recreation or management use, remedial works such as modification of facilities, restriction of use and rehabilitation will be undertaken.

* The cooperation of relevant land use authorities and landholders will be sought in prevention of pollution of Bungonia Creek.

* The state recreation area will be managed so as to cause no decline in the quality of water in Bungonia Creek and the Shoalhaven River.

* Liaison will be maintained with managers of the limestone quarry and other adjacent landholders in respect of impacts of development and landuse on the state recreation area.

Action

* Eroded tracks and adjacent land in the Jerrara area will be rehabilitated.

* Water quality in Bungonia Creek will be investigated and a water treatment system will be installed if found to be necessary.

4.1.2 Non-Cave Plants and Animals

The vegetation of most of the state recreation area consists of woodland on the ridges and steep slopes and open forest on the moderate slopes and plateau. Species vary greatly with soil and aspect. *Eucalyptus amplifolia*, *E. bosistoana* and *E. eugenoides* dominate the plateau where the caves and main visitor facilities are located. This community is restricted to the Bungonia area and is not represented in any other conservation area. The understorey is varied, being more dense and moist in the dolines. The ridges of the southern part of the state recreation area (south of the limestone) support a sparse understorey and dominant trees are *E. sieberi*, *E. agglomerata* and *E. mannifera*. *E. bosistoana*, *E. cinerea* and *E. eugenoides* are the main trees on the upper slopes and creek lines while the gorges are dominated by *E. tereticornis*, *E. melliodora* and *E. macrorhyncha*.

Some species are restricted to the limestone areas, including *Adriana glabrata*, *Notelaea longifolia*, and *Pelargonium spp.* The depressions above caves in the Corncob area have relatively undisturbed vegetation and are therefore floristically and structurally interesting.

Rainforest galleries including *Backhousia myrtifolia*, *Toona australis*, *Melia azederach*, *Dendrocnide excelsa*, *Ficus rubiginosa* and *Ficus coronata* occur along Bungonia Creek and some tributaries of Bungonia Creek and the Shoalhaven River. Bungonia gorge has a large number of ferns and climbers.

The Shoalhaven gorge and lower Bungonia gorge contain extensive stands of *Casuarina cunninghamiana*.

The Jerrara area (west of the limestone) was grazed until recently and has been partially cleared. Natural regeneration is expected to result in return of this area to a more natural condition. Recreation use has resulted in vegetation loss from around the main cave entrances. Revegetation of the dolines is discussed in section 4.1.3.

Firewood collection for barbecues and campfires has a significant impact near camping and picnicking facilities and in the Shoalhaven Gorge. Use of firewood will be phased out (section 4.3.2).

Weeds occurring in the state recreation area include serrated tussock *Nassella trichotoma*, fireweed *Senecio madagascariensis*, St Johns Wort *Hypericum perforatum*, Patersons curse *Echium plantagineum*, briar *Rosa rubiginosa*, broomrape *Orobanche minor*, tree of heaven *Ailanthus altissima,* prickly potato weed *Solanum sp.,* and blackberry *Rubus fruticosus*. Serrated tussock is spread throughout the plateau and on adjacent properties. Its control is a major task and requires a cooperative effort with other landowners. Fireweed occurs on the slopes of Bungonia Gorge and occasionally on the plateau. The other weeds occur in small isolated patches.

Mammals found in the state recreation area include the eastern grey kangaroo *Macropus giganteus*, wallaroo *Macropus robustus*, red necked

wallaby *Macropus rufogriseus*, swamp wallaby *Wallabia bicolor*, wombat *Vombatus ursinus*, koala *Phascolarctos cinereus*, brushtail possum *Trichosurus vulpecula*, ring tail possum *Pseudocheirus peregrinus*, greater glider *Petauroides volans*, sugar glider *Petaurus breviceps*, feathertail glider *Acrobates pygmaeus* and echidna *Tachyglossus aculeatus*.

The state recreation area has a diverse bird fauna. Birds in the open forest include several honeyeaters, the wonga pigeon *Leucosarcia melanoleuca*, spotted quail-thrush *Cinclosoma punctatum*, buff-tailed thornbill *Acantuiza reguloides* and tawny frogmouth *Podargus strigoides*.

The superb lyrebird *Menura novaehollandiae*, eastern whipbird *Psophodes oliaceus*, olive-backed oriole *Oriolus sagittatus*, Australian king-parrot *Aprosmictus scapularus*, flycatchers and the rock warbler *Origma solitaria* are among the birds which inhabit the moist forest near creeks. The latter nests near some cave entrances. Waterbirds found along the creeks and the Shoalhaven River include the little pied cormorant *Phalacrocorax melanoleucos*, dusky moorhen *Gallinula tenebrosa* and white-faced heron *Ardea novaehollandiae*.

The wedge-tailed eagle *Aquilax audax* and nankeen kestrel *Falco cenchroides*, use the state recreation area.

The most common snakes in the state recreation area are the black snake *Pseudechis porphryiacus* and brown snake *Pseudonaja textilis*. Others include the tiger snake *Notechis scutatus*, death adder *Acanthophis antarcticus* and diamond python *Morelia spilotes*. Lizards include the lace monitor *Varanus varius*, *Physignathus lesueurii* and jacky lizard *Amphibolurus muricatus*.

Introduced animals known to occur in the state recreation area are goats, pigs, cats, foxes and rabbits. Wild dogs also occur and have been subject ot control programs. Goats can occur in large numbers. They cause significant damage to native vegetation, contribute to erosion and may compete for shelter with the threatened rock wallaby. Regular control programs are undertaken for goats and pigs. Numbers of goats are continuing to increase, however, and more effective control programs are needed.

Numbers of rabbits appear to be increasing and control may be necessary to prevent significant grazing of native seedlings and permit revegetation of previously cleared areas. Control of foxes and cats is needed because of their impact on native animals and some domestic animals. Foxes occur mainly on boundaries with grazing properties and in the southern section of the state recreation area. They have not been observed in the gorges and it is not known whether they affect possible rock wallaby populations.

Policy

* The state recreation area will be managed to conserve all native plant and animal species and communities and maintain a variety of floristic and structural vegetation types and age classes. Priority will be given to protection of areas of rare or threatened plant species, uncommon plant communities and the habitat of rare or threatened native animals.

* Infestations of weed species will be controlled or eradicated where possible. Priority will be given to control of weeds where they pose a threat to native plant communities or have been declared noxious.

* Introduced animals will be controlled where they compete with or prey on native animals, threaten the regeneration of native plants, cause significant erosion or have been declared noxious.

* Inventory and research into the distribution and habitat requirements of threatened plants and animals in the state recreation area will be encouraged.

Action

* An introduced species control plan will be prepared and implemented detailing the impacts of introduced species, monitoring programs, control techniques and control programs. In the meantime, introduced species will continue to be controlled, with priority to serrated tussock, goats and pigs. Control programs will be undertaken in cooperation with Mulwaree Shire Council, NSW Agriculture, Goulburn Rural Lands Protection Board and adjacent landowners.

4.1.3 Cave Fauna and Cave Management

The caves are a very important feature of Bungonia State Recreation Area and have significant conservation and recreation values. The most important of these are described in section 2.2.2.

Drainage in the limestone area is underground via the caves after rain. Geomorphic and hydrologic evidence suggests that water from the caves emerges at the Efflux and a number of other springs. The caves vary from relatively small holes to several which are over 100m deep.

As stated in section 2.2.2 the Bungonia caves lack extensive speleothems compared to other limestone cave systems. Cave coral is abundant in the higher well ventilated parts, probably associated with high pH and heavily mineralised water. The middle sections of the deeper caves have a variety of speleothems. Re-solution of limestone is occurring in the lower levels where there are high concentrations of carbon dioxide in the air.

Odyssey Cave, as well as being the deepest at Bungonia, contains the most extensive speleothems and is relatively undisturbed. It is also a difficult and dangerous cave. Access has been restricted to assist scientific research and provide an undisturbed comparison with other caves. Flying Fortress Cave has been gated to protect fossils and B81 is gated because it is unstable.

Two species of bats occur in the state recreation area - the bent-wing bat, *Miniopterus schreibersii* and the eastern horseshoe bat, *Rhinolophus megaphyllus*. Both species are dependent upon a few nursery site caves. Drum Cave is used by the bent-winged bat as a nursery site and possibly also by the eastern horseshoe bat. Grill Cave is also used by large numbers of bent-wing bats during the nursery season, mainly for access to the B4-5 extension. The bent-wing bat ranges over a wide geographic area while the eastern horseshoe bat forms a number of relatively small populations each confined to a comparatively small area surrounding the nursery site. Chalk Cave is used by both species for over-wintering and bats also use Flying Fortress Cave. Restriction of access to these caves is necessary to protect the bat populations but must be done in a manner which does not prevent movement of bats. There is only limited information about the behaviour, habitat and therefore management requirements of these bats and research would be valuable.

The caves support a diverse invertebrate fauna which depends upon bat guano and organic material washed in during heavy rain. Grill Cave in particular contains a wide variety of invertebrates, especially in the lower level between the horizontal ladder and the mudslide, and in guano deposits such as in the loose boulder chamber. The fauna includes snails, slaters, millipedes, spiders, pseudoscorpions, springtails, crickets, flies, beetles and bat parasites. Cave invertebrates are vulnerable to the trampling impacts of cavers and other changes originating in the surface catchment, e.g. water

quality, sedimentation and nutrient inputs. Traffic through these sensitive areas will be discouraged. This section of Grill Cave also has an unstable boulder area and foul air. Phoenix Cave has been closed to protect the rare and endemic silverfish *Trinemura anemone*.

There is a high degree of integration between surface and subsurface environments in karst landforms. Because runoff flows directly into the caves there is no buffering from pollution and changes in flow. Many of the features in karst systems, particularly speleothems, are very susceptible to changes to the drainage system and maintenance of underground water quality in the karst area is vital to protection of the cave fauna. Cave organisms are very specialised and low in numbers and species diversity. Cave ecosystems are therefore vulnerable to the effects of pollutants.

Past uncontrolled and continued heavy recreation use in areas with dense groupings of caves has resulted in vegetation loss and erosion with consequent effects on cave drainage and water quality and possibly cave fauna. Vegetation is now regenerating in many areas but in some places erosion around cave openings threatens to cause collapse of the dolines and sedimentation of the caves. Fencing and planting are needed in these areas.

Roads and car parking areas are also sources of sedimentation in caves. Sediment control measures may be needed in some locations, plus eventual sealing of the roads with a substance which will not cause pollution of the caves.

Clearing, grazing, rubbish dumping and road formation in and adjacent to some of the cave systems outside the main state recreation area boundary (formerly within the Carne property) have resulted in excessive silt deposition and pollution with consequent degradation of their biological and recreational values. These caves are distant from the rejuvenating influence of the gorge and hence of geomorphological interest. Revegetation of the dolines is needed.

The vegetation above caves in the Corncob group is relatively intact and the environment of these caves is less disturbed than others at Bungonia because they have received much less recreational use. Scuttle Cave in the Corncob group has an undisturbed assemblage of entrance and twilight zone invertebrates and as stated in 2.2.2 the Corncob caves contain vertebrate sub fossils. Access to the Corncob caves is therefore restricted to protect their conservation and scientific values.

The Bungonia caves are essentially fossil environments. They have little capacity for recovery from damage caused by heavy or inappropriate use as they lack sufficient water flow for regeneration of speleothems.

The caves are extensively used for recreational caving. As well as unavoidable damage caused by the mere presence of caving groups in caves, damage is caused unknowingly by careless movement through caves and some deliberate vandalism occurs. This can result in permanent damage to the cave, alteration of the cave environment, interference to cave fauna and detract from the experience for subsequent visitors. Large caving parties tend to cause more damage because of the large numbers in the cave at the one time and the difficulty of supervision. Nevertheless the Bungonia caves are more suitable for adventure caving than many other cave systems in Australia and adventure caving will be permitted to continue. Awareness of the impact of caving and of the need for appropriate behaviour will be promoted (section 4.3.1). In order to minimise pressure on the caves,

alternative activities such as walking will be encouraged, particularly outside the karst area (section 4.3.2).

Caves in Bungonia rarely dry out and are relatively free from air currents. In the past a considerable amount of digging has been undertaken to open new passages for caving. Disturbances such as modification of the cave entrances, cave passages or connections can deleteriously affect cave fauna and speleothems. Digging can also disturb or damage fossils, bone or archaeological material which may be present. Any future digging will be closely controlled and will be subject to the Service's environmental impact assessment procedures.

Further individual consideration of the caves and requirements for protection of their scientific and recreational values is needed and will be undertaken as resources permit.

Policy

* Facilities and works will be located and designed to avoid pollution of surface and underground water and changes in the drainage system in the karst area.

* Any material such as gravel which is imported for works within the karst area will be of similar nature to that naturally occurring and of low nutrient content.

* Digging and other alteration will not be permitted within caves unless authorised for research, management or emergency rescue purposes.

* New openings resulting from digging will be sealed until their impact on the cave environment is assessed.

* Where digging uncovers bone or archaeological material, further digging will cease until an assessment is made of the scientific value of the material, unless the digging is for rescue purposes or authorised research into the bone or archaeological material.

* Public access will not be permitted to the following caves except for authorised research purposes:

    - Odyssey Cave B24, Flying Fortress Cave B17, Phoenix Cave B60 and the Corncob System B64, B69, B76-B79, B81, B104;

    - Grill Cave B44 between 1st December and 1st February each year;

    - Drum Cave B13 from 1st November to 1st April; and

    - Chalk Cave B26 from 1st May to 1st October;

    unless it is determined for Grill, Drum or chalk Cave that bats are not present and that caves may be opened during these periods without disturbing bat populations.

* Closure times may be altered and access to other caves or parts of caves may be restricted if this is found necessary to protect scientific or ecological values.

* Traffic will be discouraged from the sensitive invertebrate habitats in Grill Cave as described above.

* The possibility of using volunteers for cleaning of graffiti and thrown mud and removal of litter etc from caves will be investigated. Cleaning will be arranged as soon as possible after vandalism is reported.

* Sediment traps and other measures will be used along roads where necessary to minimise sedimentation in the caves. Any sealant used on the roads will be chosen to avoid pollution of the caves

* Research will be encouraged into the requirements for management of caves used by bats.

Action

* Bare and eroding areas in the vicinity of heavily used caves will be revegetated and access will be controlled.

* Disturbed dolines located outside the main state recreation area boundaries, within the Carne property boundaries, will be revegetated.

* Management strategies will be progressively prepared for each cave or group of caves detailing significance, hydrology, impacts, appropriate use and management needs.

4.1.4 Fire

Fire is a natural feature of the environment of Bungonia State Recreation Area. Plant communities in the area show differing responses to a range of fire regimes. Fire is essential to the survival of some plant communities while others are sensitive to fire. The frequency, intensity and season of fire influences the effects on plant and animal communities. Fire can damage karst, causing changes to cave microclimates and hydrology and accelerating erosion of surface limestone. Wildfire can also pose threats to visitor safety, recreation and management facilities, Aboriginal sites and historic places.

Fire can be expected to remain an important management issue in the state recreation area as all potential ignition sources, either lightning or human caused, can not be eliminated. The area will also continue to experience periodic high fire danger weather conditions conducive to the spread of fires. The management of fire to achieve both long term conservation of natural communities and the ongoing protection of life and property is a complex task.

The pre-European settlement fire regime is not known. It is likely that the occurrence of fire has been altered, however, with changes in both the structural composition and species diversity of plants and animals.

Major fires occurred over much of the plateau area of the state recreation area in 1966, 1977 and 1985. This appears to have been too frequent for regeneration of some of the understorey and shrub species. *Grevillea aspleniifolia*, for example, disappeared from the area of the 1985 fire as seedlings had not matured since the 1977 fire. Many areas have become quite open, with consequent loss of cover for native animals. Conversely exclusion of fire for long periods of time would result in a build up of fuel over much of the area and the loss of species which require more frequent fire.

A fire frequency of at least 15 years is considered to be appropriate for maintenance of most vegetation associations in the state recreation area, with the aim of having some areas remain fire-free for considerably longer. Moist forest in the gullies and gorges should not be subject to fire more frequently than every 30 years. The rainforest along the creeks should be protected from all fire. The fire responses of rare and threatened plants occurring in the state recreation area (listed in section 2.2.2) are not known. Until their management requirements are known, they should be protected from frequent fire.

A large proportion of fires in the state recreation area are started by lightning strike. These fires, however, are usually not very extensive. Major fires enter the state recreation area from grazing land to the west and can burn large areas including adjacent Morton National Park.

The state recreation area has been divided into blocks by a number of management tracks. These can be used to contain fire in conjunction with handraking, backburning and water suppression. The trails have been assigned priorities for maintenance works in accordance with their importance for fire suppression. The main management tracks are shown on the plan map.

Fire management in the state recreation area will generally aim to achieve a reduction in the frequency and extent of fires to which the area is presently subject. Coordinated hazard reduction in areas of identified high fire risk can be used to minimise fire spread.

Fire management in the state recreation area must be considered in relation to adjacent Morton National Park. The natural communities are contiguous between the two areas. There are no major impediments to the spread of wildfire, and the steep gorge of the Shoalhaven presents significant fire control problems.

The Service is an active participant on the Mulwarree Shire District Bushfire Protection Committee set up under The Bushfires Act, 1979. This committee aims to coordinate and monitor fire management and fire control on a district basis.

A fire management plan will be prepared for the state recreation area in accordance with the priorities established in the Service's overall fire management plan preparation program which will identify the bushfire threat, requirements for the conservation of native plants and animals and provide the basis for fire management strategies and prescriptions, including the requirements outlined above.

Policy

* Fire will be managed in accordance with the Fire Management plan and the principles below to ensure:

  - the protection of human life and property;

  - protection of rare species and plant communities of special significance;

  - protection of Aboriginal sites, historic places and landscape values;

- maintenance of those plant communities and plant or animal species which require a particular fire frequency or intensity;

- maintenance of a natural diversity of habitats for native animals; and

- protection of management and recreation facilities.

* Prescribed burning may be carried out in areas of identified high risk to protect adjacent properties, cultural resources, recreation facilities, fire sensitive vegetation and species diversity. In particular it will aim to minimise the risk of fires entering the state recreation area from the west.

* Hazard reduction programs will, wherever possible, aim to maintain a viable proportion of each vegetation type in as old an age class as possible.

* The use of fire for hazard reduction will be undertaken as far as possible during autumn and early winter, with the aim of removing fire fuels on the forest floor.

* Hazard reduction programs will not be undertaken in low risk areas, within rainforest or in the vicinity of rare and threatened plants and uncommon plants along Bungonia Creek, the Green Track, The Lookdown, the head of Becks Gully, Long Gully, Dog Den Creek, the northwest side of Dog Den Hill and other locations which may be identified.

* As far as possible the intensity and frequency of wildfires will be minimised in areas of rare and threatened and uncommon plants.

* Strategically critical fire trails will be maintained to a high standard of access, safety and stability. Trails of lesser importance will be maintained in a stable and trafficable condition as far as resources permit and in accordance with assigned priorities. Unnecessary trails will be closed and allowed to revegetate.

* Areas disturbed by fire suppression operations will be rehabilitated as soon as practical after the fire.

* The use of heavy machinery for fire suppression will be avoided in the vicinity of known and likely cave sites, rare plants, Aboriginal sites and historic places.

* The use of fire control chemicals will be in accordance with National Parks and Wildlife Service policy. Retardants will not be used within the karst area.

* Records will be kept of the extent and intensity of all fires within the state recreation area.

* Research will be encouraged into the ecological relationships of fire in the state recreation area.

* Liaison will be maintained with bushfire brigades, local government and neighbours to ensure coordination in suppression of wildfires in the state recreation area and on adjoining land.

* As far as possible fire protection will be carried out in cooperation with neighbours.

Action

* A fire management plan for the state recreation area will be prepared by June 1999 detailing strategies, resource and neighbouring lands protection considerations and cooperative arrrangements. The plan will be placed on public exhibition and public comment invited.

* Annual hazard reduction programs will be prepared detailing hazard reduction burns and trail maintenance requirements.

* Research will be undertaken to determine the fire response of rare and threatened plants occurring in the state recreation area and hence their fire management requirements.

4.2 CULTURAL HERITAGE

Cultural resources are important components of the environment that may have aesthetic, historic, scientific and social significance to present and future generations. Cultural heritage includes both Aboriginal and non-Aboriginal history.

4.2.1 Aboriginal Sites

Much of the information in this section comes from a survey report by Laila Haglund.

Bungonia lies on the eastern edge of the southern tablelands adjacent to the rugged Shoalhaven Gorge area. Its resources were exploited by Aborigines and it is probable that the Bungonia ridge tops were travel routes. There was much movement between the lowlands and uplands with seasonal availability of food, and interaction between the coastal and tableland tribal groups.

The state recreation area lies in the area of the Njunawal tribal group adjacent to the northwestern corner of the Wandandian tribal territory and the southern boundary of the Gandangara tribal group.

Several rock types outcrop in the state recreation area which were used to make stone tools, including silcrete, quartzite and various volcanics. The main plateau area and ridges provided suitable campsites. While the Shoalhaven River was the only permanent water source, tributary creeks, the springs and depressions on the plateau would have yielded water for much of the year. The limestone dolines contain a high proportion of plants known to have been eaten or used by Aborigines.

It is thought that the caves were an attraction to the Aborigines, although it is generally believed that they did not normally occupy the ‘dark zone’. Other karst areas in the region, including Yarangobilly, Cooleman and Abercrombie, have evidence of Aboriginal occupation including art, artefact scatters outside the caves and evidence of ritualised burial activities within them. As stated in section 2.2.2 a burial was found in a cave at Bungonia and it is possible that more are present. It is possible that myths were associated with the caves or gorges but there is no actual evidence for this.

The main visitor use areas on the plateau have been surveyed for Aboriginal sites. Sixteen sites have been recorded in this area and others are known to occur. Most sites are large and their full extent has not been determined. A few sites have also been recorded in the areas west and south of the limestone area and it is likely that many others exist.

All the known sites are open campsites containing a variety of flakes and cores, including blades, backed blades and small scrapers of the Bondain tradition (between 4,000 and 1,000 years ago). Other types of sites occur in the district and could be present in the state recreation area.

Open campsites are very fragile and several have been damaged by use for a long period for car parking and bushwalking. Open sites are also vulnerable to souveniring of artefacts. Because they are easily damaged and because of the scientific requirement that artefacts be left in their original position, the location of sites is not publicised.

Policy

* All Aboriginal sites within the state recreation area, apart from those already damaged by long use for carparking or other recreational use, will be protected from disturbance.

* Liaison will be maintained with the local Aboriginal land council on all aspects of Aboriginal site management in the state recreation area.

* All work proposed for the state recreation area involving ground disturbance will be preceded by an archaeological inspection and either protection or salvage of Aboriginal sites.

* Artefacts may be collected from recorded Aboriginal sites in existing carparks by an appropriately qualified person under permit and used in an interpretive display in the state recreation area office.

* Carparks will be regularly re-surfaced when necessary to minimise further damage to Aboriginal sites.

* The location of Aboriginal sites will not be publicised and new recreation facilities including walking tracks will not be located close to Aboriginal sites except where:

    - a conservation study has been prepared and any management works necessary to protect the site from damage have been implemented; and

    - the site will be interpreted to promote public knowledge of Aboriginal culture.

* Non-destructive research into past Aboriginal use of the area will be encouraged. Research into the presence of quarries and use of the caves will be given priority.

* The main management access track to the Jerrara area will be maintained but will not be upgraded in the vicinity of Aboriginal site BAS9 (in Haglund) and other sites further west unless designed to avoid damage to sites.

Action

* Aboriginal sites which are being eroded by use of walking tracks will be recorded and protected by relocation of the track or by covering with suitable material.

4.2.2 Historic Places

Explorers James Meehan, Charles Throsby and Hamilton Hume reached the Bungonia Creek/Jerrara Creek area in 1818 and it is thought that cattle were taken to the area around this date. Official leases were not issued until 1822, however, and the earliest settlers were William Bradbury in the Jerrara area and Louis Huon de Kerrilleau and William Mitchell at Carne.

The first recorded cave discovery, probably Drum cave, was in 1824 by botanist Alan Cunningham but he observed that others had been there before him. Further caves were explored over the following years by Major Thomas Mitchell and other persons of note.

In 1872 Water Reserve No 27 for Public Recreation and Water Supply was gazetted, comprising 1390 acres (579 ha) on Bungonia Creek. Following an inspection in 1889 and report by an officer of the Mines Department, in which the area was described as a "recognised public resort", a caretaker was appointed. The area was named Bungonia Caves by the Minister for Mines.

Louis Guymer was the first and only caretaker, between 1889 and 1909. He discovered further caves and erected gates, guard rails, ladders etc. at the lookouts and in Grill, Drum and Mass Cave. Grill cave was shown to tourists. Some of the ladders, gates and rails remain today and are in use.

A caretakers cottage was constructed in 1896 but was never occupied and it burnt down in 1897. The stone chimney survives near the intersection of the Adams Lookout and Bungonia Lookdown Roads.

A new reserve for Public Recreation and Preservation of Caves replaced the former reserves in 1936, trustees were appointed and improved public access, signs and picnic facilities were provided.

With the formation of the Sydney University Speleological Society in 1948, interest in caving and exploration of the area steadily increased and a number of new caves and extensions were discovered. Some of these caves were discovered by digging. Mass Cave was used for Roman Catholic services during the 1950s and contains the remains of an altar.

Small scale mining for alluvial gold, silver, tin and other minerals has been undertaken throughout the southern part of the state recreation area, probably since the late 1800s. Activity appears to have been greatest during the depression years from the late 1920s until World War II and to have ceased after the war. Despite government grants for development works only small amounts of gold were won and mining in the area proved unprofitable. Diggings, shafts, water races, weirs and equipment lie scattered throughout the bush.

The major area of mining occurred between Balchams Gully and Spring Creek. This locality contains two areas of shafts, water races and earth works. Nearby is an excavated and eroded area with associated roads, a reservoir, shed ruins, a boiler and a scatter of artefacts. This area appears to post-date the former two. A settlement site of at least seven huts with hearth and chimney ruins appears to be associated with the excavated area. Its name of ‘Depression Village’ suggests the 1920s-30s as the period of working. Some of the chimneys are in danger of falling over. A slab hut known as a single mens quarters was formerly located nearby but was destroyed by fire.

In 1907 the Tolwong Mineral Company leased land on the eastern side of the Shoalhaven gorge opposite what is now the state recreation area. Sporadic mining of copper, silver, gold, lead and zinc occurred in the area until the company went into liquidation in 1912 as the ore proved difficult to refine. During this period a crushing plant and furnaces were constructed and an aerial cableway was erected to the western side of the river at a site now within the state recreation area (The Trestles). The base of the upper cableway support, the associated horse mill and a few artefacts remain but most of the structures were destroyed by fire. At least one stage is located downhill from The Trestles. The earthworks and general area are likely to contain archaeological evidence. A bridle track led down to the river from the cableway site and is still used by walkers.

Removal of relics from the old mining areas by visitors is the main management concern. Restrictions on vehicle access in the southern part of the state recreation area (see section 4.3.2) will minimise this in future.

Policy

* The historic places and artefacts of Bungonia State Recreation Area will be conserved in accordance with the Burra Charter of Australia ICOMOS.

* All work involving ground disturbance within the state recreation area will be preceded by a check for historic places.

* Research into the history of the area, particularly of mining in the southern part of the state recreation area, will be encouraged.

* Where mine shafts and other works are threatened by collapse, erosion or other damage, the significance of the feature will be assessed and, if warranted, a conservation strategy prepared and implemented.

* Historic places and relics will be interpreted so as to promote public understanding and appreciation of their history and cultural significance and to assist in site protection.

* Historic rails and other features at the lookouts and caves may be replaced if considered necessary for public safety. All features will be recorded by description, mapping and photography prior to removal.

* The picnic shelters at Bungonia Lookdown and Adams Lookout will not be maintained. They will be removed if they become a risk to public safety.

Action

* Historic places in the state recreation area will be progressively recorded.

* Historic ladders and rails in the caves will be regularly inspected by an engineer to determine whether they are safe for public use.

* A sample of the Depression Village chimneys will be retained by propping or other measures where necessary to stabilise structures.

* Historic place signs will be erected at the Depression Village and The Trestles.

4.3 USE OF THE AREA

The major categories of use that can be appropriate, to varying degrees, on Service areas are:

- education and promotion of the area, the Service and the conservation of natural and cultural heritage;

- certain types of recreation;

- research; and

- management operations, by the Service itself and other authorities with statutory responsibilities in the area.

The extent to which these categories of use will be provided for in Bungonia State Recreation Area is indicated below.

4.3.1 Promotion and Interpretation

The sensitive nature of the karst and cave system, the challenging topography of the state recreation area and the dangers inherent in such activities as recreational caving, rock climbing and canyoning present special needs for promotion, interpretation and visitor guidance. Emphasis will be placed on increasing visitor appreciation of the values of the area and encouraging safe and responsible recreational use.

Caving opportunities will not be promoted because of the need to protect the special and sensitive values of the caves. Increased use would accelerate the rate of damage to the cave environments. Appropriate behaviour, safe practices and equipment will, however, be encouraged.

The Shoalhaven Gorge receives heavy use for walk-in camping and could not cope with increased use without significant deterioration of its values. Minimum impact bushwalking will be promoted to minimise environmental impacts and make the area more attractive for those seeking a natural area. The remainder of the state recreation area, west and south of the limestone, is little used. These areas have interesting and attractive features. Promotion of them for walking, picnicking and pack camping would divert use away from the karst area and gorges.

Bungonia is well known amongst caving and bushwalking groups but less well known by the wider community. Promotion of opportunities for scenery viewing, picnicking and short and medium walks would broaden the range of visitors and activities undertaken by existing visitors and attract more day visitors. An increase in day visitors would result in a rise in income without placing pressure on the heavily used camping area.

More informative signposting of walking tracks, with destinations and distances provided, would encourage greater use of tracks and allow visitors to choose walks in keeping with their abilities. The longer walks are strenuous and people commonly choose walks beyond their ability, sometimes resulting in accidents and rescues.

Blasting in the limestone quarry above the slot canyon presents a safety hazard. Walkers are warned by signs in the gorge to keep out during fixed times each day but this information should be available prior to starting a walk. The signs in the gorge should also include warnings about possible rock falls caused by rock climbers.

The state recreation area is promoted at the Fitzroy Falls Visitor Centre in Morton National Park, the Service interpretive caravan, district tourist offices, local shows, audio-visual presentations at schools, in tourist newspapers and books on bushwalking.

A display area is located in a small visitor centre adjacent to the state recreation area office and further displays have been placed in the camp kitchen. These two areas provide valuable opportunities for educating visitors about the state recreation area and appropriate recreational use. At present the displays are not coordinated and little attempt has been made to interpret

the features of the state recreation area. Creation of a new and larger office as provided for in section 4.3.4 will allow expansion of interpretive and information displays.

A large proportion of visitors to the area are groups undertaking adventure activities. These groups commonly do not appreciate the conservation significance of the area and the need for appropriate practices to avoid environmental damage. Large groups and repeated use by groups can cause considerable damage. Provision of interpretive material and encouragement of inclusion of an educational component in adventure activities would alleviate this problem.

The camp kitchen conference room is available for use by visitor groups for talks and audio visual presentations. Refurbishment is needed to provide satisfactory facilities.

Bungonia Lookdown and Adams Lookout are key destinations for visitors to the state recreation area, particularly new and day visitors. Advantage should be taken of this by providing information on the area's recreational opportunities at these locations, thus encouraging visitors to explore more of the area and make return visits.

The parking and picnicking areas in the state recreation area are named on signposts after historical figures of the district. Explanation of the role of these figures and their relationship to the historic significance of the state recreation area is needed.

The close relationship between Bungonia and adjacent Morton National Park requires coordinated promotion and interpretation. The state recreation area should be promoted as one of a number of major visitor areas in the Nowra District of the Service. Information on natural and cultural resources should also be related to Morton as the natural systems and history of mining for example are similar on each side of the Shoalhaven River and contiguous where the two areas meet at the southern end of Bungonia.

Policy

* Bungonia State Recreation Area will be promoted as an easily accessible dramatic and significant natural area with special opportunities for walking, scenery viewing, camping and appreciation of the natural environment.

* Understanding and appreciation of the natural and cultural values of the state recreation area by visitors and the local community will be promoted. Emphasis will be placed on:

    - the significant and varied geology and geomorphology;

    - the significant values and sensitive nature of the caves and the importance of appropriate use;

    - the value of the state recreation area for provision of habitat for a wide range of native plants and animals and threatened species in particular;

    - the history and cultural significance of the state recreation area, including the role of the persons named at the parking and picnic areas.

* Information will be provided on recreational opportunities and requirements with emphasis on:

  - opportunities for walking, primitive camping and nature study in the Jerrara area and south of the limestone;

  - promotion of minimum impact bushwalking;

  - the need for adequate fitness and experience for a number of walks in the area; and

  - the impacts and dangers of caving and other rock sports and requirements for adequate experience and equipment and safe, minimal impact practices.

* The camp kitchen conference room will be available for hiring by visitor groups for presentations and other appropriate activities.

* Promotion and interpretation of the state recreation area will be linked to promotion and interpretation of Morton National Park.

* Large groups undertaking activities in the state recreation area will be encouraged to include environmental education and minimum impact camping practices in their programs.

Action

* The interpretive displays in the office (when relocated) and the camp kitchen will be expanded and upgraded. Maps and information on walking tracks and routes and other recreation facilities will also be provided at these locations.

* Information will be displayed at the state recreation area office on cave access regulations and restrictions, the impact of caving on cave features and environments, bats and invertebrate fauna, requirements for safe caving or other rock sports, and practices and behaviour which minimise environmental damage.

* Visitors will be made aware by signposting at the beginning of the red walk and at each end of the slot canyon of the risks of rock falls from the limestone quarry and rock climbing activities.

* All walking tracks will be clearly and fully signposted. Existing signs will be replaced where necessary to improve information provision.

4.3.2 Recreation Opportunities

Overview

The State Recreation Area is within easy day or weekend travelling distance of Sydney, Canberra, Wollongong and a number of regional centres. As stated in section 2.2.2, it is an important local and regional recreation resource and has high potential as a tourism destination in association with other sites in the Southern Highlands.

Traditionally, most visitors have been attracted by opportunities for caving, climbing, canyoning and bushwalking. A large proportion are part of an

organised group, mainly caving groups, and organisations such as scouts, the armed forces, youth and educational groups use the state recreation area for adventure and training activities. The range of visitors has widened in recent years to include an increasing number of families and groups seeking less strenuous activities such as sight-seeking and picnicking in the dramatic surrounds.

The state recreation area currently receives approximately 27 000 visitors per year. Numbers of visitors have significantly increased in recent years and there is expected to be a continuing increase, particularly in day visitors.

The rapid increase in use has resulted in a number of environmental and amenity problems. Facilities at the lookouts have been recently upgraded to modern standards but walking tracks and cave entrances are suffering erosion and improvement of camping and some day use facilities is needed. The plan of management provides a framework for progressive improvement of facilities and services in association with environmental protection. Objectives for provision of visitor use are set out below and give priority to works which address public safety and environmental issues:

- ensure a safe drinking water supply and a sewage disposal system which does not cause pollution of watercourses in the state recreation area;

- provide as far as is feasible for visitor safety in the vicinity of cliffs, cave entrances and steep walking tracks;

- minimise siltation of the caves caused by runoff from roads and tracks, and erosion around cave entrances resulting from visitor use;

- control erosion in other heavily used visitor areas;

- provide a basic level of visitor facilities which will provide a satisfying experience and cope with reasonable visitor numbers without stressing the environment.

The various types of recreation use and facilities are dealt with individually below. Works related to information services, water and sewerage are covered in sections 4.3.1 and 4.3.4. The environmental impact of all works will be assessed in accordance with established Service procedures. Public consultation will be undertaken during design of major visitor facility improvements.

Because of the fragility of the karst area and the concentration of non-karst use in the Shoalhaven and Bungonia Gorges, it is necessary to limit the numbers of visitors using the state recreation area at any one time. The capacity of the camping and day-use areas as set out in this plan is intended to be the maximum that will be provided in the state recreation area, with no further development of facilities beyond this level. Introduction of a system of monitoring of impacts in heavily used areas will also be necessary.

Caving

A significant number of visitors go caving and for the majority of these caving is their major activity and reason for visiting the state recreation area. Bungonia is one of the few karst areas in NSW where access to the caves is virtually unrestricted. Caving parties are, however, required to register at the

state recreation area office prior to entering caves and to report after leaving the caves.

The level of experience of visitors to the caves varies greatly and minor accidents are common. Many of the caves have constrictions, high concentrations of foul air and deep pitches requiring specialist equipment.

The National Parks and Wildlife Land Management Regulation 1995 makes it necessary to obtain consent to enter a cave or undertake certain acts including marking, excavation, removal of any substance or organism, interfering with equipment, lighting a fire etc. The Australian Speleological Federation has prepared a code of ethics for safe and non-damaging caving. Guidelines are also being prepared under the National Outdoor Recreation Leadership Training Strategy. These and other measures will be required to be followed for caving and other rock sports. Provisions for making visitors aware of these requirements are in section 4.3.1.

Little development of the caves has occurred. Some ladders and rails remain in Grill Cave from the 1890s (see 4.2.2) and a ladder and chain have recently been placed in Fossil Cave at two dangerous locations. The cave entrances, apart from Mass Cave, are not signposted in order to preserve the wild nature of the caves and the caving experience and to avoid encouraging unprepared casual visitors. Tourist caves and guided adventure caving are available elsewhere in the region at Wombeyan, Jenolan, Abercrombie and Wee Jasper. The Bungonia Caves are not suitable for tourist development because of their vertical nature and lack of decoration.

Few of the caves are suitable for casual visitation. The most suitable is Mass Cave which has a walk-in entrance into two large chambers. The cave is a short distance from the Green Walk. Grill was shown as a tourist cave in the 1890s but requires a reasonable degree of fitness and confidence to negotiate the ladders.

Some of the cave openings such as B1 Putrid Pit, B7 Steampipe and B14 Canberra Hole consist of dangerous drops from ground level. Fencing of these is needed for public safety reasons.

Because of the special needs for safety measures and environmental protection in the caves, a consultative committee was established to deal with caving issues and develop appropriate management measures. This committee (the Bungonia Recreation Activities Group) now deals with all aspects of management of use of the state recreation area and is made up of representatives of various organisations including caving clubs, rock climbers, scouts, the Police Rescue Squad, the military and Mulwaree Shire Council.

Rock climbing and canyoning

Canyoning is undertaken in Jerrara Gorge, Bungonia Gorge, Long Gully, Main Gully and Spring Creek.

Rock climbing is carried out at various locations in the state recreation area and Bungonia Canyon provides one of the few opportunities for climbing limestone in Australia. Rock climbing does, however, have environmental impacts such as dislodgement of rock, placement of bolts and disturbance of nesting birds. It is of particular concern in Bungonia Canyon because of the very high geomorphological heritage value of the canyon and risks to the safety of walkers below. Introduction of safety and environmental protection

measures will be needed to enable climbing to continue to occur while protecting the other important values of Bungonia Canyon.

Walking

Walking opportunities in the state recreation area range from short strolls, through longer walks on marked tracks to rugged overnight or longer walks. Walking and canoeing trips often include both the state recreation area and Morton National Park. A significant proportion of visitors walk through Bungonia Gorge and the number of people going for walks of more than one day in the Shoalhaven Gorge is increasing.

Maintenance and in places upgrading of the walking tracks is needed, particularly of the steep and very popular Red Walk which goes through Bungonia Gorge.

The track to Cooeeing Point below Bungonia Lookdown has been closed to use because of its unsafe condition. The feasibility of upgrading the track as far as Cardinal Point and provision of a lookout platform will be investigated. The section below Cardinal Point will remain permanently closed to general use for public safety reasons. It is recognised, however, that abseilers and climbers will continue to require access to the edge of Bungonia Canyon (Cooeeing Point).

Construction of a lookout is needed at the end of the yellow walk to provide views into Jerrara Gorge and a safe track terminus.

Camping

About one third of visitors camp in the state recreation area.

The main camping area is located near Bungonia Creek, off the karst area. Parts of the area are suffering sheet erosion, as stated in section 4.1.1. The capacity of the toilet and shower block is being regularly exceeded, largely because of the rapid increase in use of the area by groups. Augmentation of the water and power supply, and construction of toilet and shower facilities for disabled persons are needed. Refurbishment of the camp kitchen and meeting room is being carried out.

The capacity of the main camping area will be set at a maximum of 200 people in order to retain the relatively low key character of the camping area, permit resting of sections of the area, avoid overloading the sewage disposal system and assist in limiting overall visitor numbers to a level which will not result in significant damage to the fragile environment of the state recreation area.

Large groups of campers and excess numbers of campers during peak use periods are accommodated in an area at the head of Becks Gully. This separates large groups from family and small group users and prevents conflicts. Drinking water and pit toilets are currently provided. The large groups commonly seek a natural camping setting and do not want sophisticated facilities. Because of the large and increasing numbers using Becks Gully, however, with potential for health and environmental problems, a toilet and shower block will be constructed. This will take pressure off the facilities in the main camping area and direct effluent disposal away from the Bungonia Creek catchment. The facilities will be designed to provide for a maximum of 150 people.

Primitive camping is popular at a number of locations, particularly in the Shoalhaven Gorge. It is not appropriate in areas of karst or in Bungonia Gorge because of conflicts with day visitors and the risk of pollution. High levels of faecal contamination occur in Bungonia Gorge because of the restricted area available.

Jerrara Creek upstream of the gorge is an attractive location for picnicking or primitive camping and could cater for people who cannot make the descent into the Shoalhaven Gorge. There are few opportunities for relatively short distance easy walk-in camping in the district because of the rugged topography throughout the coastal escarpment area.

Day-visitor facilities

Day-visitor facilities consisting of lookouts, carparks and picnic facilities are provided at Bungonia Lookdown, Adams Lookout, Jerrara Lookout and a picnic area at the junction of the Lookdown and Adams Lookout roads. Facilities at the Lookdown and Adams Lookout were substantially upgraded in 1995 and 1996. In particular improved lookouts, parking, picnic facilities and tracks suitable for access by disabled persons were provided. Upgrading of Jerrara Lookout has yet to be carried out.

There are currently no flush toilets in the state recreation area for day visitors. Provision of flush toilets is considered necessary for tourists and family visitors to the area and to promote day use.

The state recreation area is a considerable distance from any town and there may be a need for on-site sale of food, particularly for casual day visitors.

Organised adventure programs

Several companies hold licences to conduct commercial adventure programs within the state recreation area. These commonly include camping, walking, abseiling, caving and other activities. Similar programs are also undertaken by school groups and organisations such as scouting groups and the military. These programs provide opportunities for many people to undertake activities which they would otherwise be unable to do. The large number of people involved and in particular large group sizes can, however, have high and repeated impact on popular areas, including caves, and result in conflicts between groups or with individual visitors. Limits on total numbers, groups sizes and frequency of use of the state recreation area are likely to be necessary.

Orienteering and horseriding

Some orienteering is currently carried out in the karst area. This is inappropriate because of vegetation damage in the cave catchments and conflict with other visitors. It should be relocated to the Jerrara area or suitable parts of the area south of Becks Gully.

Horseriding will not be permitted in the state recreation area because of the sensitive nature of the karst area, the steep slopes and high erodibility in much of the rest of the area and the high potential for the introduction and spread of weeds.

Vehicle use

Public vehicle access within the state recreation area is currently provided via roads on the limestone plateau and The Trestle Track Fire Trail. The eastern part of the Trestle Track is narrow and in poor condition. In order to avoid safety problems, minimise maintenance costs and protect historic relics in the Tolwong mining area, it will be closed to public vehicle use at its junction with the Stan Jones Fire Trail.

Other vehicle tracks in the state recreation area are negotiable by 4WD only and are generally rough and steep. Public vehicle use of these tracks is not permitted in order to minimise maintenance costs, protect the historic places at the southern end of the state recreation area and maximise the state recreation area's value for walking.

Policy

* The northern part of the state recreation area between Bungonia Gorge and Becks Gully will be managed as the main visitor use area with a variety of facilities. Existing facilities will be maintained, except as provided below, and will be upgraded as specified.

* The remainder of the state recreation area will be managed for such activities as walking, bush picnicking and primitive camping with no facilities provided other than existing tracks.

* The Service recognises the high recreational value of the Bungonia caves and the importance of retaining unrestricted access as far as possible, consistent with protecting significant scientific and habitat values. Any necessary alterations to access or to management of caving or individual caves will be implemented in consultation with the Consultative Committee.

* Generally the caves will be maintained in a wild state with no markings, signs or development. Ladders, chains etc. may, however, be placed in caves where necessary to reduce the likelihood of accidents or significant delays for caving parties or to protect important features (see 4.1.3).

* Where necessary a trail will be marked through sections of caves in order to protect cave features such as sediments, bone deposits and speleothems.

* Large groups may be required to camp in the Becks Gully area. This area will also be used to accommodate excess campers during peak use periods. Only facilities of basic standard will be provided. A rotation program will be used as necessary to maintain vegetation cover on camp sites.

* Primitive camping will be permitted in the Jerrara area (west of the limestone), Shoalhaven Gorge and southern part of the state recreation area (south of the limestone). Camping will not be permitted in karst areas or in Bungonia Gorge from the state recreation area boundary to within 200m of its confluence with the Shoalhaven River.

* Where appropriate, facilities will be designed to permit use by disabled visitors.

* Public vehicle access will be permitted on roads shown on the plan map in the limestone area and on the Trestle Track to its junction with the Stan Jones Fire Trail.

* Horseriding will not be permitted.

* Orienteering will not be permitted in the karst area. It may be permitted in the Jerrara area and the area south of Becks Gully.

* Use of wood fires will be progressively phased out by providing gas barbecues in picnic and camping areas and encouraging visitors to bring their own portable stoves for use throughout the state recreation area. Wood fires will not be permitted in picnic and camping areas once gas stoves have been provided.

* Registration will be required prior to undertaking caving, rock climbing, abseiling and other adventure sports.

* Activities such as caving, rock climbing and abseiling will be subject to safety standards and environmental protection requirements.

* Abseiling and other rock sports will not be permitted at developed day use areas.

* Base jumping (parachuting) and other dangerous or inappropriate activities will not be permitted in the state recreation area.

* Bicycling will be permitted only on public vehicle tracks and roads.

* The Service will support the operation of the Bungonia Recreation Activities Group.

* Licensed adventure tours and adventure training programs by schools, government and community organisations may be permitted subject to the following:

    - use will be confined as far as possible to existing appropriate tracks and designated camping areas;

    - walking routes and camp sites in other areas will be varied as far as possible to prevent vegetation loss and minimise other impacts;

    - limits will be placed on group sizes and frequency of use to minimise environmental impacts and conflicts with other users;

    - use of safe and minimum impact practices will be required;

    - as far as possible holiday periods and weekends will be avoided;

    - program leaders will be required to have adequate qualifications and experience;

    - prior notice will be provided to the Service of routes, activities, frequency, group sizes and any other information deemed necessary;

    - a limit may be placed on the number of commercial adventure operation licences to avoid unacceptable environmental impacts and effects on other users; and

    - licences will be altered or revoked if unacceptable environmental impacts are found to occur.

* The need for sale of food and other supplies within the state recreation area will be considered as part of on-going assessment of visitor trends and needs. A food outlet may be established if found to be warranted. Any such facility will be small scale and located away from visitor features such as lookouts.

Action

Priority 1 - safety

* Safety barriers will be constructed around cave openings which consist of vertical holes from ground level.

* A warning sign will be constructed indicating the steep drop at the end of the yellow track. When funds are available a lookout will be constructed.

* The Trestle Track will be closed to public vehicle use at its junction with the Stan Jones Fire Trail.

Priority 2 - environmental protection

* Maintenance work will be carried out on the walking tracks where necessary to address erosion and safety problems.

* Public access roads on the limestone will be progressively sealed or surfaced. Speed controls will be constructed where necessary.

* Limits on group use such as maximum group size, frequency of use and the number of licensed commercial operations will be determined through consultation with user groups and the Bungonia Recreation Activities Group.

* A system will be developed and put in place for monitoring environmental damage caused by recreational use of the state recreation area. Where monitoring shows unacceptable impacts to be occurring, action will be taken to rehabilitate damaged areas and minimise further damage.

Priority 3 - improvement of visitor facilities

* Jerrara Lookout will be improved by provision of extended lookout fencing, a platform and upgraded walking tracks.

* The following works will be carried out in the main camping area:

    - augmentation of the water reticulation system and power supply;

    - provision of toilet and shower facilities for disabled persons;

    - organisation of the layout and introduction of a resting system; and

    - refurbishment of the conference room.

* A toilet/shower block with a capacity for 150 people will be constructed in the Becks Gully group/overflow camping area, with effluent disposal via a treatment system which will not cause pollution of karst or water courses (see section 4.3.4). Landscaping and definition of the boundaries of the camping area will also be undertaken.

* Flush toilets for day visitors, with provision for disabled access, will be constructed adjacent to the relocated office (4.3.4).

* Refurbishment of the camp kitchen and meeting room will be completed.

* The feasibility of upgrading the walking track from Bungonia Lookdown to Cardinal View and construction of a lookout platform will be considered.

* Wood barbecues in the camping and picnic areas will be progressively replaced with gas barbecues.

* The picnic area at the junction of the Lookdown and Adams Lookout Roads will be re-arranged and landscaped to improve its function and attractiveness.

* The track to Grill Cave will be restored to a stable condition and runoff controlled to prevent further erosion.

4.3.3 Research

Research into geology, geomorphology, karst processes, bats, invertebrates, hydrology and sedimentation within the caves, rare plants and other subjects has been carried out in the state recreation area by scientists from a number of institutions. Interested visitors and members of the community also study the caves and other aspects of the state recreation area and may have information useful for improving management.

Research is a valuable and appropriate use of the state recreation area. In many cases, however, the results of research have not been provided to state recreation area staff and hence have not been available to assist improvement of management methods and programs.

Earlier sections of the plan have identified some priority areas for research. These are:

- the distribution and habitat requirements of threatened plants and animals;

- the fire response and fire management requirements of rare and threatened plants;

- an inventory of reptiles and amphibians occurring in the state recreation area;

- the management requirements of bats; and

- past Aboriginal use of the area, particularly the presence of quarries and use of the caves.

Policy

* Bungonia State Recreation Area will be available for appropriate research.

* Research design which improves knowledge of the resources of the area and assists management will be encouraged.

* Only research which causes minimal disturbance to the natural and cultural values of the state recreation area will be permitted unless alternative opportunities are not available outside the state recreation area and the expected results of the research offer significant benefits

for improvement of management programs or knowledge of natural and cultural resources.

* Digging will not be permitted in or near caves without the submission and approval of a detailed research proposal and will be subject to the Service's environmental impact assessment requirements.

* Visitors such as speleologists, birdwatchers and others who may have knowledge about the state recreation area and its use will be encouraged to discuss their observations with staff.

* Liaison will be maintained with researchers to obtain as much mutual information and assistance as possible.

* The results of research will be required to be made available to Service staff.

4.3.4 Management Operations

A staff house, office and workshop are located close to the state recreation area entrance and a second small house is located near the main camping area. Location of a staff residence in the state recreation area is needed for satisfactory management of the camping area and rapid response when rescues are required.

Entry fees are charged via a boom gate system. The present arrangement is unsatisfactory as it cannot easily be supervised and visitors cannot obtain information prior to entry. The second house, currently unoccupied, will therefore be relocated to the road between the entry and exit lanes to serve as an office and information centre. The existing office, which is very small, will be used for storage.

Staff lunch and washroom facilities in the workshop are inadequate and will be improved.

The wall of the water supply weir on Bungonia Creek is being undercut because of incorrect construction. Rebuilding is needed.

Effluent from the management and recreation facilities is disposed of by a soakage system and occasionally pumped out. In order to cope with existing and increasing numbers of visitors, upgraded treatment and disposal are needed at a location which will not cause pollution of surface or ground water. Investigation will be needed to determine the most appropriate treatment system. In the meantime, additional absorption trenches will be constructed for the main camping area.

The road to Bungonia Lookdown has been dedicated as a public road and is not part of the state recreation area. This hinders improvement and maintenance programs. Addition of the road to the state recreation would facilitate proposals for improvement of public safety and prevention of siltation of the caves.

Policy

* Management facilities and services will be maintained and will be relocated or upgraded as provided below.

Action

* Satisfactory staff facilities will be provided in the workshop.

* The small house near the camping area will be relocated to the boom gates and modified for use as an office, fee collection station and visitor centre. Associated road works, signage, landscaping and provision for parking will be carried out. An external information/registration area will be provided.

* The wall of the weir on Bungonia Creek will be rebuilt and the supply take-off will be improved.

* Investigations will be undertaken to determine the most appropriate effluent treatment system and a system will be installed which will ensure that no pollution of karst areas, Bungonia creek or other watercourses will occur.

* The Service will seek addition of the Bungonia Lookdown Road to the state recreation area.

5. PLAN IMPLEMENTATION

This plan of management is part of a system of management developed by the National Parks and Wildlife Service. The system includes the National Parks and Wildlife Act, management policies, established recreation and conservation philosophies, and strategic planning at corporate, Regional and District levels.

Implementation of this plan will be undertaken within the annual programs of the Service's Nowra District. Priorities, determined in the context of district and regional strategic planning, will be subject to the availability of necessary staff and funds and any special requirements of the Director or Minister.

District programs are subject to ongoing review, within which, works and other activities carried out at Bungonia State Recreation Area are evaluated in relation to the objectives laid out in this plan.

The environmental impact of all development proposals will continue to be assessed at all stages of the development and any necessary investigations undertaken in accordance with established environmental assessment procedures.

Section 75A of the Act requires that this plan shall be carried out and given affect to, and that no operations shall be undertaken in relation to the state recreation area unless they are in accordance with the plan. If after adequate investigation operations not included in the plan are found to be justified, this plan may be amended in accordance with section 75A(6) of the Act.

As a guide to the orderly implementation of this plan, relative priorities for identified activities are summarised below:

Activity **Plan ref**

HIGH PRIORITY

* Investigate Bungonia Creek water quality, install treatment if needed 4.1.1

* Prepare introduced species control plan 4.1.2

* Control serrated tussock 4.1.2

* Control goats and pigs 4.1.2

* Revegetate eroding areas around cave entrances 4.1.3

* Prepare cave management strategies 4.1.3

* Prepare annual hazard reduction programs 4.1.4

* Protect threatened Aboriginal sites
4.2.1

* Stabilise Depression Village chimneys
4.2.2

* Expand interpretive displays in office and camp kitchen
4.3.1

* Display information about rock sports requirements
4.3.1

* Provide information on rock fall risk in canyon
4.3.1

* Construct safety barriers around vertical cave openings
4.3.2

* Provide warning sign at end of Yellow Track
4.3.2

* Provide disabled toilets for campers, augment power and water
4.3.2,4.3.4

* Close part of Trestle track
4.3.2

* Provide staff facilities in workshop
4.3.4

* Upgrade sewage disposal system 4.3.4

MEDIUM PRIORITY

* Rehabilitate eroded tracks and land in Jerrara area
4.1.1

* Revegetate dolines outside main boundaries (Carne)
4.1.3

* Research fire response of rare plants
4.1.4

* Prepare fire management plan
4.1.4

* Place signs at Depression Village and Trestles
4.2.2

* Record historic places
4.2.2

* Inspect historic ladders and rails
4.2.2

* Clearly signpost walking tracks
4.3.1

* Upgrade Jerrara Lookout
4.3.2

* Maintain and where necessary upgrade walking tracks
4.3.2

* Replace wood barbecues with gas
4.3.2

* Rehabilitate Grill Cave track
4.3.2

* Complete refurbishment of camp kitchen and meeting room
4.3.2

* Relocate house and undertake road works at entry
4.3.4

LOW PRIORITY

* Consider feasibility of providing lookout platform at Cardinal View
4.3.2

* Seal roads and build speed controls
4.3.2

* Construct flush toilets for day visitors
4.3.2

* Construct toilet/shower block in Becks Gully group camping area
4.3.2

* Construct lookout at end of yellow track
4.3.2

* Improve picnic area at junction of roads to lookouts
4.3.2

* Rebuild weir wall, improve supply take-off
4.3.4

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Glossary of karst terms

blind valley. A valley with closed contours in which a stream sinks.

cave coral. Speleothem formed by splashing, or diffuse capillary flow.

cave sediments. Material washed into the cave.

doline. A closed depression produced by solution, subsidence and/or collapse.

flowstone. Speleothem produced by degassing of thin films of water flowing over cave walls.

helictite. Horizontal stalactite formed in stable cave environment where the rates of water percolation are so slow as to prevent drops forming.

karst. Landforms, above and below ground, produced by chemical solution of the bedrock.

*solution form. S*mall scale feature such as pits and ripples in rock surface produced by water dissolving limestone.

speleothem. Cave decoration such as stalactites etc.

tufa. A porous deposit often containing organic material.