CECIL HOSKINS NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

May 1999

A plan of management for Cecil Hoskins Nature Reserve was adopted by the Minister for the Environment, Pam Allan, on 4th October 1998. Amendments to the plan were adopted by the Minister for the Environment, Bob Debus, in May 1999.

Acknowledgements: This Plan of Management was prepared by staff of the Nowra District and Field Services Division of the National Parks and Wildlife Service.

The assistance of the Sydney Water Board, Wingecarribee Shire Council, the Bureau of Meteorology and the Southern Highlands Historic Society in provision of a considerable amount of information is gratefully acknowledged.

ISBN 0 7310 7676 1

FOREWORD

Cecil Hoskins Nature Reserve is located in the Southern Highlands of NSW on the banks of the Wingecarribee River. It lies between the towns of Bowral and Moss Vale and has an area of 47 ha.

Almost half the area of the reserve is comprised of a lagoon formed by the backed up waters of the Bong Bong Weir. Consequently the reserve is an important habitat for native bird species and in particular wetland birds.

The reserve is historically interesting as a portion of the land granted to Dr. Charles Throsby, a member of the first official exploration party in the Southern Highlands, and because of its proximity to the first European village in the Southern Highlands.

The reserve contains important stands of Paddys River box *Eucalyptus macartharii* and snow gum *E. pauciflora* and a range of other native species. Protection of these is provided for in this plan of management.

Considerable emphasis is given in the plan to regeneration of a native vegetation cover similar to that which would have occurred prior to clearing, combined with control of weeds.

The southern section of the reserve was enclosed by a macropod-proof fence containing a large kangaroo population. The plan of management adopted by the Minister for the Environment in October 1998 recognised that maintenance of captive native animals was not appropriate in a nature reserve. Following removal of the captive kangaroos due to flooding, the plan was amended to provide that they not be re-introduced into the reserve.

The reserve is valuable for education about the wetland environment and for scientific research. This plan of management provides for expansion of the educational and research opportunities provided in the reserve.

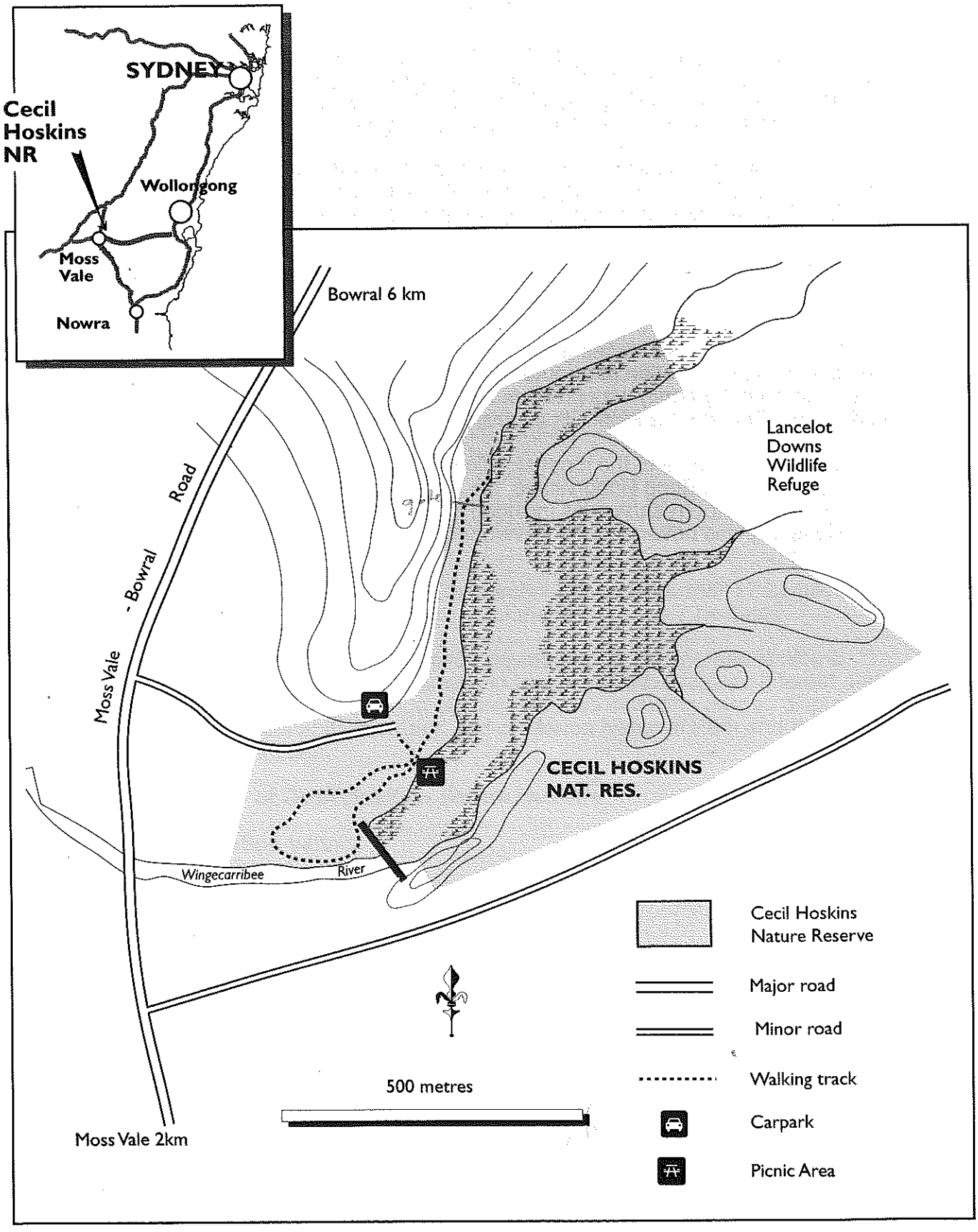
This plan of management establishes the scheme of operations for Cecil Hoskins Nature Reserve. In accordance with the provisions of Section 76 of the National Parks and Wildlife Act, 1974, this plan of management is hereby adopted.

BOB DEBUS

Minister for
the Environment

CONTENTS

Cecil Hoskins Nature Reserve



1. INTRODUCTION

The National Parks and Wildlife Act, 1974, requires that a plan of management be prepared for each nature reserve. A plan of management is a legal document that outlines how the area will be managed in the years ahead.

The procedures for the adoption of a plan of management for a nature reserve are specified in the Act:

- where a plan of management has been prepared, the Director-General is required to refer the plan to the National Parks and Wildlife Advisory Council for its consideration and advice;

- the Director-General is required to submit the plan to the Minister, together with any comments or suggestions of the Advisory Council; and

- the Minister may adopt the plan without alteration or with such alterations as the Minister may think fit, or may refer it back to the Director-General and Council for further consideration.

Once a plan has been adopted by the Minister, no operations may be undertaken within the nature reserve except in accordance with the plan.

Although not a requirement under the Act, a plan of management for Cecil Hoskins Nature Reserve was placed on public exhibition for a period of three months ending 24th March 1997. The plan attracted 13 submissions which raised 9 issues. All comments received were referred to the National Parks and Wildlife Advisory Council for its consideration and advice. The comments and suggestions of the Advisory Council were in turn considered by the Minister when adopting this plan.

For additional information or enquires about any aspect of the management of the nature reserve, please contact the:

Nowra District Office
National Parks and Wildlife Service
55 Graham Street
(P.O. Box 707)
NOWRA 2541

or by phone on (02) 4423 9800.

2. MANAGEMENT CONTEXT

2.1 NATURE RESERVES IN NEW SOUTH WALES

Nature Reserves dedicated under the National Parks and Wildlife Act, 1974 are areas of special scientific interest containing wildlife or natural environments or natural phenomena. Nature reserves are dedicated under Section 49(3) for the purpose of:

"(a) the care, propagation, preservation and conservation of wildlife;

(b) the care, preservation and conservation of natural environments and natural phenomena;

(c) the study of wildlife, natural environments and natural phenomena; and

(d) the promotion of the appreciation and enjoyment of wildlife, natural environments and natural phenomena.

They differ from national parks which include as a major objective the provision of appropriate opportunities for outdoor recreation.

2.2 CECIL HOSKINS NATURE RESERVE

2.2.1 Location, Dedication and Regional Setting

Cecil Hoskins Nature Reserve is located in the Southern Highlands of NSW, 120km south of Sydney and 85km west of Wollongong. It lies on the banks of the Wingecarribee River between the towns of Bowral, 7km to the north, and Moss Vale, 3 km to the south.

The nature reserve was gazetted on 7th March 1975 and a further 17.21 hectares was added in 1981, bringing the total area of the reserve to 47 hectares.

The Southern Highlands has largely been developed for grazing and is also a popular tourist destination. Several towns in the district have historic interest and visitors are also attracted by a range of other features including garden displays, the lookouts and waterfalls at the northern end of Morton National Park and the highland scenery and cool climate.

2.2.2 Importance of Cecil Hoskins Nature Reserve

Nature conservation values

As the nature reserve is based on a dammed waterway in a previously cleared area, it is largely a cultural landscape rather than a natural environment. Nevertheless it has very high nature conservation values.

The reserve contains one of only a few samples of the original vegetation of the district, which has largely been cleared and developed. It has important stands of the rare and threatened species Paddys River box *Eucalyptus macartharii* and the best examples of snow gum *Eucalyptus pauciflora* in the district.

The primary value of the reserve lies in its provision of extensive habitat for a range of resident and migratory waterbirds. There are few wetland habitats in the district and most of the others have been degraded by grazing. The reserve is an important regional resting and feeding area, strategically located between the coast and inland areas. Large numbers of birds use the reserve during drought periods.

More than 90 bird species have been recorded in the reserve. Two, the Australasian bittern *Botaurus poiciloptilus* and blue-billed duck *Oxyura australis* are listed as vulnerable on Schedule 2 of the *Threatened Species Conservation Act 1995*.

Scientific and educational value

Because of its high conservation values, large numbers of waterbirds, uncommon plant communities and essentially human created environment, the reserve offers several unusual and interesting topics for study. It is also easily accessible and close to large population centres and to accommodation.

The reserve provides unusually good opportunities for viewing wildlife in a semi-natural setting and is the most easily accessible body of water in the Southern Highlands. The average observer visiting the reserve should be able to see a wide variety of birds at close range on any visit and the more experienced observer should see at least thirty or more species in about two hours of observation time.

Historic value

The reserve is part of 1000 acres granted to Dr. Charles Throsby in 1819 in recognition of his exploration of a route from the Southern Highlands to the Bathurst district. The Throsby family was prominent in the district and members of the family owned nearby Throsby Park until its acquisition by the state government in 1975.

The reserve lies adjacent to the most significant historic place in the Southern Highlands, the site of Bong Bong village, the first settlement in the Southern Highlands. Part of the reserve was included in the area surveyed for establishment of the village but was never actually developed.

3. OBJECTIVES OF MANAGEMENT

3.1 GENERAL OBJECTIVES FOR NATURE RESERVES

The following general objectives relate to the management of nature reserves in New South Wales:

* protection and preservation of scenic and natural features;

* maintenance of natural processes as far as is possible;

* conservation of wildlife;

* preservation of Aboriginal sites and historic features; and

* encouragement of scientific and educational enquiry into environmental features and processes.

3.2 SPECIFIC OBJECTIVES FOR CECIL HOSKINS NATURE RESERVE

In addition to the above general objectives, the management of Cecil Hoskins Nature Reserve will be subject to the following specific objectives:

* maintenance of the reserve's value as a wetland habitat for a wide range of waterbird species;

* conservation of the stands of Paddys River box and snow gum;

* encouragement of regeneration of a natural vegetation cover similar to what is thought to have occurred prior to clearing;

* increase in diversity of terrestrial native animals;

* control and if possible elimination of introduced plant and animal species;

* provision of opportunities for scientific research; and

* provision for education about the natural environment, the value of the reserve and the importance of conservation.

3.3 OVERALL STRATEGY

The reserve will be managed to maximise its nature conservation values. The following programs will be given high priority:

- regeneration of a native vegetation cover in association with a reduction in introduced plants;

- management of fuel levels to minimise the risk and intensity of unscheduled fire; and

- regular control of foxes.

The important educational role of the reserve will be maintained and enhanced by provision of a viewing platform adjacent to the northern walking track, and additional interpretive signs.

4. POLICIES AND FRAMEWORK FOR MANAGEMENT

This chapter contains the policies and framework for the management of the Cecil Hoskins Nature Reserve 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 will provide the framework for management consistent with anticipated resources available to the Service and with anticipated community trends over the next five to ten years. The area will also be managed in accordance with the Services Field Management Policies which are not repeated in this plan.

The actions identified are those proposals 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 will also be in accordance with the National Parks and Wildlife Act and with general Service Policies.

4.1 NATURE CONSERVATION

Natural heritage comprises all aspects of the natural environment including physical features such as geology and soils, plants and animals and the relationships between these. For convenience, management of landscape values and of fire are also considered in this section as, in Cecil Hoskins Nature Reserve, these relate primarily to natural features.

4.1.1 Geomorphology, Soils, Landscape and Climate

Most of the reserve is located on low-lying river flats of Quaternary alluvium, almost half of which has been flooded by construction of the Bong Bong Weir. Soils include yellow earths of clay and shale and alluvial red and brown earths. Nearby hills are formed on rocks of the Triassic period, belonging to the Liverpool sub-group of the Wianamatta shales.

The alluvial flats of the reserve are prone to sheet flooding. Over most of the area the water table is less than a metre below the land surface. There is evidence that the Wingecarribee River has altered its course several times through the area during past years. Since the completion of the Bong Bong Weir in the 1920's, however, the river has been confined to its present route.

The lagoon contains extensive shallow areas and deeper channels along the river course. Water plants such as water milfoil *Myriophyllum sp*., hornwort *Ceratophyllam demersum*, water primrose *Ludwigia peploides*, red azolla *Azolla sp*. are gradually encroaching into areas of open water and reducing their size. This is most evident in sections of shallow still water where the edges have been invaded by plants and transformed into a thick spongy mat. Unless controlled, this process will continue until all the shallow areas are transformed into marshes. This problem is further discussed in section 4.1.3.

The landscape of the reserve is very attractive and relaxing. Broad views are available from a walkway along the northwestern boundary. Any works or structures which reduce the high natural landscape value of the reserve will be avoided.

The reserve lies approximately 690 metres above sea level. Frosts are common and can occur in any month except January and February. Snow is infrequent and sporadic although a healthy stand of snow gums *Eucalyptus pauciflora* occurs in the reserve. This is due to trapping of cool air in the low-lying topography of the reserve, thereby creating a microclimate suitable for snow gums.

Due to its low topography and sparse vegetative cover the reserve experiences strong blustering winds in both winter and summer. Hot summer winds can rapidly dry out the vegetation and soil. For tree planting to be successful, it must be initiated in autumn and wind protection provided for plants in exposed locations.

Policies

* All works carried out in the reserve will be designed and undertaken so as to minimise soil erosion.

* The attractive natural scenic character of the reserve will be protected.

4.1.2 Water Management

As the values of the reserve are largely based on the maintenance of water levels and water quality in Bong Bong Weir, it is important to establish the responsibilities of the various government authorities involved.

The Wingecarribee River is part of the Shoalhaven Water Supply and Power Generation Scheme which is managed by Sydney Water. Water destined for consumption in the Sydney Metropolitan Area may be pumped from Lake Yarrunga (Tallowa Dam) via a circuitous route to the Wingecarribee Reservoir and released to flow along the Wingecarribee River via the reserve to Lake Burragorang (Warragamba Dam).

It is uncertain at this stage what impact the inclusion of the proposed Welcome Reef Dam into the Shoalhaven Water supply would have upon water flow through the reserve. Use of a canal/pipeline connecting the Welcome Reef Reservoir with the Wollondilly River has been proposed, bypassing the Tallowa Dam/Wingecarribee River route.

The Department of Land and Water Conservation is responsible for the riverine corridor. The Department's approval must be sought for taking water out of the river for domestic or agricultural use, cutting trees along the banks, alteration of the course of the river, construction of dams on the stream bed or discharge of water into the stream.

NSW Fisheries is responsible for management of the fish in the waterways of the reserve.

The Service is responsible for management of the land surfaces of the reserve, including the bed of the river and lagoon. It is also responsible for maintenance of Bong Bong Weir

The Wingecarribee River is not a regulated stream. Sydney Water is required to transfer water without any detrimental effect upon the river system, so the transfer of water must mimic a natural regime. Significant changes in flow could alter rates of erosion or siltation, affect invertebrate populations and hence food supplies for waterbirds and fish, and flood nests or burrows. Ministerial approval is required to

effect a "transfer" of water (volumes in excess of natural flow levels) from Wingecarribee Dam to Warragamba Dam.

Under normal circumstances Sydney Water provides for a nominal riparian release of 5 to 12 megalitres/day. This volume of release permits just a gradual flow at the headwaters below the wall of Wingecarribee Dam. A release of 12 megalitres/day would provide a slight flow below Berrima. The rest dissipates through evaporation, ground soakage, rural water consumption and other means.

Studies conducted by Sydney Water during a controlled water release in September - October 1991 indicated that discharges of 1 060 megalitres/day were not great enough to cause "measurable erosion or sedimentation within the water pondage" and that there was no significant mechanical damage to submerged aquatic vegetation (Erskine *et al.* 1991). A discharge of this volume represents a level change of approximately 20cm at the weir's crest.

It was also concluded that there were no obvious major impacts on vegetation or food sources of waterbirds. Some waterbirds seemed to benefit from the varying water levels when rising water covered new feeding grounds for plant eating species such as ducks and swans, or flushed out invertebrates which were taken by herons and ibises. Birds most obviously responsive to variations in water levels were ibises. After a heavy flood (elevated water level of about 80cm at Bong Bong Weir) a flock of sixty ibis with equal numbers of sacred ibis and straw-necked ibis were counted at the reserve.

While the plants and animals of the reserve are adapted to a natural flooding regime, large or unseasonable floods could be damaging. Most waterbird species in the reserve nest between August and February and any highly fluctuating releases during this time could cause loss of eggs, especially for species nesting at or near to the water surface. Musk duck *Biziura lobata* and Australasian grebe *Tachybaptus novaehollandiae* are species of particular concern and other species such as the black swan *Cygnus atratus*, purple swamphen *Porphyrio porphyrio*, dusky moorhen *Gallinula tenebrosa*, Eurasian coot *Fulica atra* and Australasian bittern *Botaurus poiciloptilus* may also be affected. Any stable depth of water during the breeding season would most likely have little effect on the waterbirds.

During the release studies it was found that water quality in the reserve is generally good, with low salinity and acceptable turbidity and faecal coliform levels.

Phosphorus and nitrogen levels were reasonably high, probably as a result of surface flushing of fertilised pasture lands. High nutrient levels stimulate the growth of algae, depleting the oxygen content of the water and adversely affecting fish and aquatic organisms. Levels in the reserve were generally not sufficient to create algal or cyanobacterial blooms. Any increase in levels, however, as a result of activities adjacent to the reserve or upstream could create problems.

While release of water from Wingecaribbee Dam must mimic natural flow, there is no guarantee that adequate amounts of water will reach the nature reserve. Increases in agricultural water use upstream, for example, could reduce amounts available to areas of waterbird habitat downstream, including the nature reserve.

Policies

* Bong Bong Weir will be maintained.

* The Service will liaise with Sydney Water or other appropriate authorities to ensure that any controlled water releases through the reserve follow a natural

regime as closely as possible and that the reserve receives adequate amounts of water.

* The Service will seek regular information about water quality in the river and will liaise as necessary with land use planning authorities to ensure that water quality in the reserve is not detrimentally affected by developments adjacent to or upstream of the reserve.

4.1.3 Vegetation

Virtually the entire area of the reserve was formerly cleared and was grazed until its reservation in 1975. Similarly, natural vegetation in the district has been severely reduced and a number of species have probably become locally extinct.

It is difficult to obtain a clear picture of the vegetation cover prior to European settlement. The historic records are vague and imprecise. The journal of Dr. Charles Throsby of March 1818 records that on 12th March he "set out through brushy country to a forested hill called by the natives Boom Boong, this is a clear forest with fine hills on both sides". It is also said that during Charles Throsby's time it was possible to drive a horse and cart between giant stands of Paddys River box. A few of these trees remain in what is now the picnic area. It is known that cattle grazed on dense clumps of tea tree, hakea, banksia and bursaria which grew along the river banks.

Remnant stands of trees scattered through the reserve together with shrubs and grasses give some indication of what plant species prevailed over the area, but do not clearly show what their group arrangements or distribution patterns were like. Sufficient information is available, however, to identify the general location, form and species array of the major communities. These are described below, based on preliminary assessment by Wingecarribee Shire Council (Stone, 1993) in connection with plans for the revegetation of the Old Bowral Airfield, west of and downstream from the reserve.

Aquatic - riparian community.

A significant area of the lagoon is deeper than 2m and supports the larger aquatic plant species such as tall spikerush *Eleocharis sphacelata*, ribbonweed *Vallisneria sp*., yellow bladderwort *Utricularia australis* and water milfoil *Myriophyllum spp*.

In small embayments around the margins of the water body the floating leaves and yellow flowers of water snowflake *Nymphoides geminate* and floating plants of starwort *Callitriche sp.* and the fern *Azolla* may be found.

In the large embayment on the southern side of the pondage, near the macropod enclosure, there are small islands and large mats of floating vegetation. Plant species associated with the islands include water primrose *Ludwigia peploides ssp. montevidensis*, river buttercup *Ranunculus inundatus* and starwort. The floating mats consist chiefly of an introduced species, parrots feather *Myriophyllum aquaticum*, with some nardoo *Marsilea mutica*.

On the fringe of the river emergent macrophytes of common spikerush *Eleocharis acuta*, common reed *Phragmites australis* and cumbungi *Typha orientalis* dominate.

Riparian open forest

Several species of eucalypts including swamp gum *Eucalyptus ovata* and Paddy's River box *E. macartharii* combine with a dense shrub layer to form a narrow band of

vegetation along the banks of the Wingecarribee River. The understorey is dominated by river tea tree *Leptospermum obovatum* and small-fruited hakea *Hakea microcarpa*. Mat rush *Lomandra longifolia* is common in the groundcover on drier sites while rushes *Juncus spp*. and sedge *Carex gaudichaudiana* prefer moist habitats.

Floodplain forest/woodland

Vegetation on the alluvial flood plains includes a variety of associations. Snow gum *E. pauciflora subsp. pauciflora* may be present either as a forest stand or in a woodland association with Paddy's river box. Silver banksia *Banksia marginata* is likely to be found in this association.

Two other eucalypts, black sallee *E. stellulata* and the taller manna gum *E. viminalis,* are less common, the former occurring as scattered individuals and the later in almost pure stands on slightly higher ground. The understorey is formed of large clumps of river tea tree, sweet bursaria *Bursaria spinosa* and blackwood *Acacia melanoxylon*. Mat rush is the most significant groundcover species along with kangaroo grass *Themeda australis* and tussock grass *Poa labillardieri*.

Lower slopes woodland

Paddy's River box persists from the riparian zone through to the well-drained slopes where it is associated with manna gum and narrow-leaved peppermint *E. radiata* in a woodland formation.

Blackwood also occurs in a woodland formation. It is associated with black wattle *Acacia decurrens*, and broad leaved bitter pea *Daviesia latifolia* is dominant in the understorey.

Regeneration

Following dedication of the nature reserve in 1975 the Service established plantings of non-locally indigenous trees and shrubs.

Regeneration of native plant communities is now being being encouraged in order to enhance the natural character and educational values of the reserve, provide further habitat for native animals and conserve significant plant and animal communities. Small areas near the picnic area have been planted with *E. pauciflora*, *E. stellulata* and *Acacia melanoxylon* and some natural regeneration has occurred.

Prior to extensive regeneration programs a detailed inventory of native plant species will be needed, along with determination as far as possible of the pattern of plant communities by comparison with other sites of similar geology and topography.

Extensive natural regeneration of Paddys River box is occurring on the hill and slopes in the vicinity of the car park.

Grazing by kangaroos kept in an enclosure was threatening regeneration of a significant stand of Paddys River box and clumps of snow gum in the south-eastern corner of the reserve. The removal of the kangaroos (refer to section 4.1.4) will protect these stands and is expected to result in some natural regeneration in other parts of the enclosure.

The narrow upstream section of the reserve is not fenced and is grazed by stock from adjacent properties. Erosion is occurring along the bank edge. Fencing is necessary to protect existing trees and bank stability and allow regeneration and improvement of habitat values.

Introduced plants

The nature reserve suffers continuing and recurring weed invasion, with a large number of weed species present. It is a managerial responsibility which requires constant monitoring so that action can be initiated immediately, before the weeds become dominant.

A complete survey of weed species and assessment of their impact on the reserve's ecology has not been undertaken as yet but the major problems have been identified. Weeds recorded so far in the reserve include:

- *Rubus fruticosus* blackberry
- *Ulex europaeus* gorse
- *Sisymbrium orientale* mustard
- *Rumex acetosella* sorrel
- *Rumex sp*. dock
- *Geranium dissectum* crane's bill
- *Rununculus sp*. buttercup
- *Cirsium vulgare* black thistle
- *Sisymbrium marianum* variegated thistle
- *Plantago sp*. narrow leaved plantain
- *Sonchus sp*. common sowthistle
- *Hypochoeris sp.* cats ear
- *Taraxacum officinale* dandelion
- *Chenopodium album* fat hen
- *Plantago major* great plantain
  Nelumbo sp. lotus
- *Cretageus spp*. hawthorn (two species)
  Berberis vulgaris common barberry
- *Medicago sp*. spotted medic
- *Trifolium sp*. white clover
- *Myriophilum aquatica* parrots feather
- *Pyrocantha sp*. firethorn
- *Salix spp*. willows

By far the most insidious weed species in the reserve is blackberry. This species grows sporadically either as individual plants or in clumps throughout the reserve, but is particularly prevalent along the waters edge and on the silt islands. The largest population of birds inhabiting the reserve is the common starling . These birds use the blackberries as a food source and subsequently disperse the seeds throughout the reserve. It is expected that blackberries will be a perennial weed problem and that total eradication will be impossible.

If permitted to become rampant, blackberries invade the territory of native plant and animal species, reducing their habitat area and threatening their populations in the reserve. The golden-headed cisticola *Cisticola exilis* is particularly susceptible to blackberry invasion. As well as the threat to plants and animals blackberries may re-invade neighbouring properties, are unsightly and foster a poor image with the public.

Besides blackberries the most prevalent introduced plants are willows adjacent to the river, hawthorn, firethorn and gorse. The hawthorn trees provide cover for small native birds and must be removed gradually to allow replacement of cover by native species.

As stated in section 4.1.1 the aquatic weed parrots feather is causing considerable concern. This species has long been considered a potential major weed of

waterways. It has the habit of gradually invading shallow water, creating a thick sponge mat as it progresses. Other water plants eventually inhabit and convert the mat into level bogs. This weed has covered large areas of the water surface in the reserve to the extent that foxes and other predators can now reach the former islands.

The species spreads by stem fragmentation. Only female flowers have been introduced thus far into Australia, and fertile seeds are not produced. Mechanical removal aids its spread and plants must be disposed of carefully. The best control is with suitable herbicides.

Because of the possible effects of herbicides on frog populations and other wetland species it will be necessary to choose chemicals which are considered safe to use and to monitor their effects.

The Service is required under the Noxious Weeds Act 1993 to control noxious weeds to the extent necessary to prevent them spreading to adjoining lands.

Adjacent areas

Wingecarribee Council's proposal to redevelop the former Bowral Airfield site combines facilities for passive recreation with extensive revegetation work. The ultimate aim is to restore the indigenous plants along the river and link up with Cecil Hoskins Nature Reserve, thus creating a wildlife corridor for the combined length of that part of the Wingecarribee River. This would provide a greater diversity of plant and animal species and enhance the value of the area for visitors. The two areas are connected by a short stretch of river under the Moss Vale/Bowral Road bridge. As well as revegetation of the intermediate area it may be necessary to provide fencing to encourage animals to move between the two areas under the bridge rather than across the road.

The permanently ponded water of Bong Bong Weir extends upstream beyond the boundaries of the nature reserve into private property. This area is grazed and only parts contain native vegetation along the edges. The wildlife habitat value of the area would be greatly enhanced by fencing of sections of this area to promote natural regeneration.

Because of its meandering, gently flowing nature, the Wingecarribee River has high habitat values along much of its length. The small area of the reserve is insufficient to support high bird numbers and nearby river areas are important for maintenance of local populations. Any changes in the river's character, particularly straightening, could severely affect its habitat value.

Policies

* The existing variety of native vegetation communities and species occurring in the reserve will be conserved and enhanced.

* Progressive re-establishment of a vegetation cover similar to what would have existed prior to clearing will be undertaken.

* Tree planting will be undertaken in autumn and staking or wind protection will be provided.

* Propagation material for use in revegetation work on the reserve will be collected from within the Wingecarribee River floodplain and surrounding slopes, or from similar sites within the immediate district. The propagation

material will be collected from at least three (preferably more) different individual plants located no closer than 100m to each other.

* Introduced plant species will be controlled where they have been declared noxious, have the potential to invade uninfected areas, hinder the regeneration of native plant communities or significantly affect the habitat of native animals.

* Preference will be given to weed control measures which have minimal impact on water quality and on frog and bird populations. Impacts on native species will be monitored.

* Where appropriate, control programs will be undertaken in association with neighbours and local councils.

* The Service will support Wingecarribee Shire Council's plans to revegetate the former Bowral Airfield site and efforts to link this area with the reserve by a continuous stretch of native vegetation cover.

* The Service will liaise with neighbours and land use authorities to encourage the retention and establishment of native wetland and river bank vegetation along the weir pondage upstream of the nature reserve.

* The Service will seek to have the high habitat values of the Wingecarribee River protected by retention of its natural character.

* The impact and significance of the plantings of the non-locally indigenous trees and shrubs will be reviewed.

* Where plantings of non-locally indigenous trees and shrubs are shown to have an unacceptable impact on the revegetation of the nature reserve by locally indigenous tree and shrub species, such plantings will be progressively removed.

Actions

* An inventory will be prepared of native plant species present within the reserve and the pattern of native plant communities and species prior to clearing will be determined as far as is possible. This information will be used to prepare and implement a revegetation program for the reserve.

* The revegetation plan will provide for:

  - assisted regeneration of the former kangaroo enclosure;

  - screen plantings inside the Headlam Road boundary;

  - planting along the river banks to control erosion; and

  - plantings along the bank of the reservoir below the walking track in scattered clumps so that adequate views of the wetland and waterbirds will be maintained.

* The reserve boundaries generally upstream of the former kangaroo enclosure (see section 4.1.4) will be surveyed and fenced to exclude stock.

* Blackberry will continue to be controlled with the aim of reducing its occurrence in the reserve to as small an amount as possible.

* Hawthorn will be progressively removed as native plants replace former areas of hawthorn.

* The area of the weed parrots feather will be progressively reduced, with priority given to re-creation of islands within the pondage. An investigation will be undertaken to determine the least environmentally damaging control method.

* The area of the former kangaroo enclosure may be slashed to control introduced plants. Slashing will not be undertaken adjacent to the lagoon or bird nesting sites, and nesting seasons will be avoided as far as possible. The need for slashing will reduce as regeneration of native vegetation occurs.

* Other weeds will be controlled where necessary to allow regeneration of native plant communities.

4.1.4 Native and Introduced Animals

Ninety three bird species have been recorded in the reserve. Approximately one third are waterbirds which depend upon maintenance of the artificial pondage of Bong Bong Weir. Approximately half are residents and nearly 20 species are known to breed in the reserve.

Unfortunately, the nature reserve cannot be considered an important breeding ground for waterfowl. The reserve is undersized for the use of large concentrations of waterfowl species and, climatically it is too cold for too long, thus restricting plant and other types of food growth and making the reserve unsuitable for breeding for most species or allowing only a short breeding season. It is, however, as stated in section 2.2.2, a valuable feeding and resting area.

Birds commonly seen in the reserve include waterfowl such as the Pacific black duck *Anas superciliosa*, black swan *Cygnus atratus*, dusky moorhen *Gallinula tenebrosa*, Eurasian coot *Fulica atra* and grey teal *Anas gibberifrons*. Other waterbirds include four species of cormorant, three species of egret, three species of ibis, the yellow-billed spoonbill *Platalea flavipes* and white-faced heron *Egretta novaehollandiae*. Several raptors have been recorded including the black-shouldered kite *Elanus axillaris*, brown goshawk *Accipiter fasciatus*, peregrine falcon *Falco peregrinus* and swamp harrier *Circus approximans*. Woodland birds in the reserve include the southern boobook *Ninox novaeseelandia*e, white throated needletail *Hirundapus caudacutus*, welcome swallow *Hirundo neoxena*, Richard's pipit *Anthus novaeseelandiae*, golden-headed cisticola *Cisticola exilis*, yellow-rumped thornbill *Acanthiza chrysorrhoa* and spotted pardalote *Pardalotus punctatus*. It is likely that other species such as quails, rails and crakes that have not yet been recorded also occur.

It is expected that the species diversity will increase substantially, particularly by addition of further woodland species, as re-establishment of native vegetation and elimination of introduced species proceeds.

There is some indication that waterbird numbers have fallen in recent years. This could be due to a number of factors including changes in water quality and hence invertebrates, increase in the area covered by parrots feather and predation by foxes. Long term monitoring of species diversity, numbers and environmental factors is needed.

Native mammals known to occur in the reserve include the platypus *Ornithorhynchus anatinus*, water-rat *Hydromys chrysogaster* and eastern grey kangaroo *Macropus giganteus*. With regeneration of forest cover, arboreal mammals and other species are likely to utilise the reserve.

There is little information about reptiles or amphibians occurring in the reserve but the following species have been observed: common eastern froglet Crinia signifera, bleating tree frog Litoria dentata, Peron's tree frog Litoria peronii, eastern banjo frog Limnodynastes dumerilii, brown-striped frog Limnodynastes peronii and copperhead snake Austrelaps superbus (Pat Jordan, pers. comm.).

Introduced animals

Kangaroos

A macropod-proof fence was constructed upon establishment of the reserve, enclosing most of the area south of the weir pondage. Eastern grey kangaroos were introduced in order to provide a location where people could view them in a semi-natural environment.

The primary purpose of nature reserves is the conservation of wildlife and natural environments. Maintenance of a captive wildlife population is not appropriate. Additionally, the introduced kangaroo population prevented regeneration of a native vegetation cover and hence improvement in the conservation of the uncommon plant communities in the reserve and of habitat for a variety of native animal species. It was recognised, however, that the kangaroos were of interest to locals and visitors and were a well known feature of the reserve. For this reason it was planned to progressively reduce the captive kangaroo population through a combination of culling and management of a non-breeding population, possibly through sterilisation.

As the kangaroos were obtained from several different sources the animals within the reserve were likely to be of a genotype unique to the reserve and different to kangaroos occurring naturally in the district or elsewhere. Release into the wild was therefore considered to be inappropriate but it was considered that some of the animals could be relocated to other captive locations.

The exhibited draft plan explained the inappropriateness of maintaining a captive population of kangaroos (or other native animals) and indicated that the number of kangaroos would be reduced over time. However an unusual weather event overtook the implementation of this strategy. Unusually heavy rains in August 1998 resulted in Sydney Water having to release water from Wingecarribee Reservoir. This posed the risk of flooding Cecil Hoskins Nature Reserve and an inhumane death for the captive kangaroo population. It was therefore decided to undertake an emergency relocation of the population to another site.

Kangaroos or any other captive native animals will not be re-introduced to the reserve. The nature reserve will be available to free ranging populations of native animals, including kangaroos.

The fence along Headlam Road will be retained to protect regenerating areas and prevent unauthorised vehicle use or other access into the reserve. The value of retaining a macropod-proof fence along boundaries with neighbouring properties for fox control and to assist regeneration will be assessed.

Other Introduced animals

Introduced animals in the reserve include the common myna *Acridotheres tristis*, common starling, cats, dogs, foxes and rabbits. The cats and dogs are generally domestic animals invading the reserve from the neighbourhood or are abandoned at the reserve by their owners. Foxes have been frequently observed taking native and feral animals and in some cases molesting the kangaroos within their enclosure. Control measures have included shooting, poisoning and trapping.

Policies

* The habitat values of the reserve for waterbirds and other indigenous animals will be protected and where possible improved.

* Survey and research will be encouraged into the species diversity and management needs of the native animals occurring in the reserve.

* The nature reserve will be available to free ranging populations of native animals. No native animals will be introduced into the nature reserve to form a captive population.

* Introduced animals will be controlled as far as is practicable where they have a significant impact on native species. In particular, numbers of foxes will be kept as low as possible.

* The cooperation of neighbours and the Moss Vale Rural Land Protection Board will be sought for control of foxes and other introduced animal species.

Actions

* Ongoing fox control will be undertaken in the reserve. The effectiveness of fox control in reducing impacts on native animals will be monitored.

* The inner kangaroo enclosure and shelters will be removed.

* The long term value of retaining the macropod-proof fence along boundaries with neighbouring properties for fox control and to assist regeneration will be assessed. If it is not found to be of value, the unnecessary parts of the fence will be removed and replaced with a stock and rabbit-proof fence.

4.1.5 Fire Management

There are no records of significant fires occurring in the area of the nature reserve and it is not regarded as an area of high risk. The reserve is almost completely surrounded by small land holdings and farms and is bordered by roads along its southern and western boundaries. The grass on adjacent properties is kept short by grazing stock and any ignition points occurring are quickly notified.

With progressive regeneration of native vegetation communities in the reserve and removal of kangaroos the fire risk may increase slightly but is not expected to be significant because of the generally damp substrata and the cool climate. Maintenance of a short grass verge along Headlams Road would reduce the risk of fire both entering and leaving the southern section of the reserve. Prescribed burning could be undertaken in areas where young trees would not be affected.

The primary area of concern is the grassland in the vicinity of the picnic area and walkways. Several small arson/accidental fires have occurred in this area and fuel

reduction may be needed from time to time, combined with slashing along the boundary. Fuel reduction by burning and slashing could affect ground-dwelling birds and would have to be located and timed to minimise impacts.

The Service is part of local cooperative fire management and fire control arrangements through district bush fire management committees set up under the *Rural Fires Act, 1997*. The reserve straddles the Bowral NSW Fire Brigade area to the north and the Moss Vale NSW Fire Brigade area to the south.

Policies

* Fire will be managed in the reserve to ensure:
    - the protection of human life and property within and adjacent to the reserve;
    - conservation of stands of native vegetation, including areas of regeneration;
    - maintenance of habitat values for native animals; and
    - protection of management and visitor facilities.
* Unscheduled fires will be contained to as small an area as possible while minimising the environmental impact of suppression operations.
* The use of heavy machinery for fire suppression will be avoided as far as possible.
* Close contacts will be maintained with the Bowral and Moss Vale fire brigades.
* Fuel reduction by slashing or burning will be undertaken where necessary along boundaries with private land and in other parts of the reserve.
* Fuel reduction will be undertaken in a manner which avoids water pollution and damage to regenerating native vegetation and minimises impact on native animals.

Actions

* A fire management plan will be prepared for the nature reserve in accordance with the Serviuce's state wide priorities for reserve fire management planning.
* The agreement of Wingecarribee Shire Council will be sought for regular slashing to maintain a short grass cover on the verge along Headlams Road.
* Fuel reduction programs will be prepared and implemented as necessary.

4.2 CULTURAL HERITAGE

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

The reserve lies within the area of the Bong Bong Aboriginal tribal group and is now within the Illawarra Local Aboriginal Land Council area. No Aboriginal sites are known to exist in the nature reserve.

The Southern Highlands were first visited by Europeans around 1793 following escaped convicts. Kennedy explored the area near Bargo in the early 1800s and John Oxley, Surveyor General, established an outstation near Berrima in 1815.

The credit however of being the "official discoverer" of the Southern Highlands went to Dr. Charles Throsby I (1777-1828), who explored the area between 1816 and 1821 together with Surveyor James Meehan, Hamilton Hume, Joseph Wild and others. For his discoveries, Throsby was granted 1000 acres on the Wingecarribee River by Governor Macquarie in 1819, including part of the land now forming the nature reserve.

Dr. Throsby had a hut just downstream from the reserve and his nephew, also Charles Throsby, built a house at what is now Throsby Park Historic Site, on a hill southeast of the reserve.

In 1816 an Aboriginal uprising resulted in dispatch of the 46th Regiment to take action against the Aborigines at "Winge Karrabee". Thus in 1817 at a place generally known as "Bong Bong" on the banks of the Wingecarribee River the first military settlement outside Sydney was established.

The site of Bong Bong was intended to be the principal town of the county of Camden. Governor Macquarie was responsible for the choice of the site when he visited the New Country in 1820. On the 14th November 1821, Surveyor Harper recorded a survey of "reserved lands for a township". Part of this land lies within the nature reserve. The village however was never actually proclaimed.

In 1821 Bong Bong accommodated a police post consisting of four constables, a scourger and a magistrate's clerk, a small military station manned by one subaltern, one sergeant and twelve privates, a post office, a commissariat store, Bowman's Argyle Inn and no doubt a blacksmiths. The inn was reported to be a "first rate house of entertainment"

There were however, major disadvantages with the Bong Bong site. In August 1830 William Edward Riley, said in his journal "Boong Boong (sic) is a miserable looking place". The site of the village was located on an alluvial flat adjacent to the Wingecarribee River. The water levels in the river fluctuated enormously, either there was insufficient water, as reported by Major Mitchell, or it was a raging torrent.

The terminal blow to the Bong Bong village occurred with the construction of the new line of road to the south and the establishment of a town at Berrima. Government administration and services shifted to Berrima and Bong Bong entered a rapid demise.

There is nothing remaining of Bong Bong village except some mounds, in the old burial ground. On the Old South Road (Old Argyle Road) 200 metres north of the bridge over the Wingecarribee River and 300 metres from the entry into the nature reserve, an obelisk was erected in 1946 to mark the location of the military post.

Bong Bong Weir was built in the early 1920's and served initially as the water supply to the people of Moss Vale. Water was drawn from a sump located adjacent to the weir wall, within the reserve. Trees in the vicinity were used as fuel for the pumps (John Moore, pers. comm. 1997).

The lagoon and swamp areas of the current nature reserve were declared a Wildlife Sanctuary on December 2nd, 1932, Gazette No. 172. This was subsequently confirmed by the Fauna Protection Act of 1948. During the 1965-68 drought Wingecarribee Council considered destruction of the weir to send water downstream for the Berrima Cement Works. This proposal was vigorously fought by neighbours and subsequently abandoned (John Moore, pers. comm. 1997).

In November 1968, it was reported that Wingecarribee Shire Council had given permission to the Bong Bong Social Water Ski Club to use the lagoon area for water skiing. Following this, a wide controversy raged with the skiing fraternity on one side and birdlife enthusiasts on the other. During the controversy the ski club installed a concrete boat ramp and commenced clearing water weeds. The weeds were very vigorous, however, and resisted attempts to remove them. Eventually use of the area for water skiing lapsed.

Cecil Hoskins Nature Reserve was gazetted on 7th March 1975 and officially opened by Lady Dorothy Hoskins on 14th December 1975, wife of the late Sir Cecil Hoskins after whom the reserve is named.

Sir Cecil Hoskins had been a resident at Exeter and Moss Vale for about 40 years and had a keen interest in gardens. He had a profound knowledge of trees and shrubs in particular and his advice on parks and gardens was sought by many. As well as his extensive home gardens at "Invergowrie" Exeter and later at "Cardrona" Moss vale, there is much evidence of his keen interest in creating parks and gardens. For example he planned the unique garden setting for the Portland Cement Works at Berrima, he was responsible for the planning and development of "Seymour Park" in Moss Vale and was Chairman of the Berrima District Committee of the Remembrance Driveway.

Policies

* Any Aboriginal sites found in the reserve will be protected from disturbance.

* The Illawarra Local Aboriginal Land Council will be consulted about all aspects of management of Aboriginal heritage in the reserve and active involvement of Aboriginal people in management of any sites will be encouraged.

* Any work proposed for the reserve which involves ground disturbance will be preceded by an inspection for Aboriginal sites and historic features.

* The cultural values of the nature reserve including its relationship to the surrounding district will be identified. Culturally significant components will be retained and conserved.

* Research will be encouraged into the history of the reserve.

4.3 USE OF THE AREA

The major categories of use that can be appropriate on Service areas are:

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

- outdoor recreation in a natural setting;

- research; and

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

The extent to which these categories of use will be provided for in Cecil Hoskins Nature Reserve is indicated below.

4.3.1 Public Use

The primary purposes of nature reserves are conservation of wildlife, natural environments and significant cultural features and scientific research into these resources. Educational use is appropriate where it does not conflict with conservation.

From its establishment, Cecil Hoskins Nature Reserve has been managed to provide for public viewing of wildlife and is widely used by educational institutions. This use has little impact on wildlife and is appropriate given the high educational value of the reserve. It must be managed carefully however, with priority directed to wildlife conservation.

Access into the reserve is along a short road off the Moss Vale/Bowral Road. At the end of the road a public use area has been established with parking area, picnic tables, barbecue facilities, toilet, interpretive shelter and walking tracks. Because of the environmental impacts of wood collection, the lack of native vegetation and the small size of the reserve, barbecues are not considered appropriate and will be removed. Improvement of the turning circle is needed to prevent vehicles from becoming bogged during wet weather.

A walkway traverses the high bank along the north western boundary of the reserve, providing excellent viewing points across the weir pondage. A seat at the end of the track enables visitors to enjoy the view but there are no facilities for viewing by groups. Construction of an observation platform combined with provision of further interpretive information would increase the value of the reserve for school groups and the general public. Lopping of trees may be necessary from time to time to maintain views of the lagoon.

Construction of a hide would facilitate observation by bird watchers and researchers and enhance the educational value of the reserve. This could be undertaken by an interested organisation in association with the Service.

A loop walkway across the floodplain beside the river, downstream of the weir, provides opportunities to experience another aspect of the environment of the reserve. The educational and recreational value of this area will improve with further regeneration of native species.

As well as interpreting the natural environment, it would be appropriate to interpret the history of the reserve and to integrate this with the Throsby Park Historic Site.

Arrangements exist for use of the reserve by neighbours for activities such vehicle access to properties and for water pumping. Not all of these activities are licenced and this should be addressed.

Policies

* Low key public use will be provided for in the reserve to enable enjoyment of the environment and to facilitate the viewing and study of wildlife.

* Provision of visitor facilities will be restricted to the northern side of the Wingecarribee River, within existing developed areas.

* Existing public use facilities will be maintained.

* Limited additional facilities may be provided to facilitate viewing of wildlife and the natural environment of the reserve.

* Selective lopping of trees may be undertaken if necessary to maintain views from observation points.

* Public understanding and appreciation of the natural and cultural heritage and the conservation value of the reserve will be promoted by such means as on-site interpretive information, media releases and field days.

* Interpretation of the reserve and of Throsby Park Historic Site will be integrated.

* Use of the reserve for educational field studies by schools and community groups will be encouraged.

* Institutional, community and commercial educational tours may be permitted subject to the following:

    - use will be confined to formed tracks and the picnic area;

    - provision of accurate and adequate interpretive information will be encouraged; and

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

* Prior consent will be required for use of the reserve by organised groups.

* A hide may, with prior consent, be constructed in the reserve for the purpose of viewing waterbirds. It must be located, constructed and used in a manner which does not disturb significant vegetation communities, habitats or threatened animal species, and controls access to the waters edge.

* Visitors will be encouraged to keep to formed tracks and lookouts.

* Camping, boating and swimming will not be permitted in the reserve except when necessary for management or authorised research purposes.

* Horseriding, bicycle riding, orienteering and other inappropriate recreational activities will not be permitted in the reserve.

* Close liaison will be maintained with neighbours concerning matters of mutual interest.

Actions

* A viewing platform with interpretive information will be constructed adjacent to the northern walking track, approximately 150 m from the picnic area.

* Barbecues will be removed from the picnic area.

* The access road and turning circle will be improved to prevent vehicles becoming bogged.

* Interpretive information will be provided on the history of the reserve and its relationship to adjacent areas.

* A review will be undertaken of use of the reserve by neighbours and licences issued where appropriate.

4.3.2 Research and Management Operations

Research into the reserve's natural and cultural heritage, their maintenance requirements and the impacts of visitors is important for development of appropriate management practices. Unfortunately because of limited staff and financial resources the Service can carry out very little research. Encouragement of research by others, including students and amateur birdwatchers, may provide valuable information for management.

Research topics available in the reserve include wildlife ecology, the effects of alteration of the original environment of the reserve area and maintenance of what is in fact an artificial landscape, methods and species for re-creating a natural vegetation cover, control of the large variety of weeds and introduced animal species and the environmental effects of use of such a small area for recreation and education. Topics important for management purposes are listed in earlier sections of the plan.

Management facilities located in the reserve are fences, grids and a turnstile on the northern side of the river to keep out neighbouring stock, and the weir. Structures within the kangaroo enclosure are to be removed (see section 4.1.4).

Because of the high water table, much of the reserve area is not negotiable by vehicle even during dry periods. Access to some areas for weed control must be undertaken by boat.

Policies

* The reserve will be available for appropriate research.

* Research programs must be designed and undertaken to minimise environmental impact and interference with public enjoyment of the reserve.

* Researchers will be encouraged to design programs to provide information useful for management purposes.

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

* Essential management facilities will be maintained and may be modified as necessary.

* Liaison will be maintained with reserve neighbours regarding matters of mutual interest.

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 conservation and recreation philosophies and strategic planning at corporate, Regional and District levels.

The implementation of this plan will be undertaken within the annual programmes 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 to any special requirements of the Director-General or Minister.

District programmes are subject to ongoing review, within which, works and other activities carried out at Cecil Hoskins Nature Reserve 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 their development and any necessary investigations undertaken in accordance with established environmental assessment procedures.

Section 81 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 nature reserve unless they are in accordance with the plan. If, however, after adequate investigation, operations not included in the plan are found to be justified, this plan may be amended in accordance with section 76(6) of the Act.

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

	Activity	**Plan ref**
HIGH PRIORITY		
*	Control blackberry	4.1.3
*	Fence upstream section of reserve boundary	4.1.3
*	Control parrots feather	4.1.3
*	Slash former kangaroo enclosure as necessary to control introduced plants	4.1.3
*	Control foxes	4.1.4
*	Remove inner kangaroo enclosure and shelters	4.1.4
*	Prepare and implement fuel reduction programs	4.1.5
MEDIUM PRIORITY		
*	Progressively remove hawthorn	4.1.3
*	Prepare and undertake revegetation program	4.1.3
*	Assess value of macropod fence on private property boundaries and replace with stock proof fence if not required	4.1.4

*	Seek agreement of Council to slashing along Headlands Road	4.1.5

LOW PRIORITY

*	Control other weeds	4.1.3
*	Review retention of kangaroo fence	4.1.4
*	Construct bird observation platform	4.3.1
*	Review neighbour use of reserve and issue licences	4.3.2

REFERENCES

Chessman *et al*. 199*1 The Water Quality of the Wingecarribee River and Tributaries 1980-1990*, Water Board.

Chessman *et al.* 1992 *Water Quality Study of the Wingecarribee River, Controlled Water Release, September-October 1991*, Water Board.

Erskine *et al.* 1991 *River Morphology Report,* Water Board.

Leishman A.J. 1993 *Compiled Birdlist for Cecil Hoskins Reserve*, information supplied to NPWS.

Roxburgh, R. undated *Compiled Notes on Bong Bong*.

Mount King Ecological Surveys (1988) Fauna and Flora Survey of the Wingecarribee River. Unpublished Report to the Sydney Water Board, Sydney.

Sonter C. 1976 *The Avifauna of the Cecil Hoskins Nature Reserve*, information supplied to NPWS.

Stone, G. 1993 *Old Bowral Airfield Project*, Report to Wingecarribee Shire Council.

Straw, P. 1991 *Special Report, Avifauna,* Water Board.

Wall, C. *et al.* 1992 *Wetland Vegetation Report, Assessment and Monitoring, Wingecarribee River Management Project,* Water Board.